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## Trial and Error, Delayed Prompting, and Reinforcement of Prompted Responses in Teaching Receptive Identification of Pictures

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TRIAL AND ERROR, DELAYED PROMPTING, AND REINFORCEMENT  
OF PROMPTED RESPONSES IN TEACHING RECEPTIVE  
IDENTIFICATION OF PICTURES

by

Kristen Lynn Gaisford

A Dissertation  
Submitted to the  
Faculty of The Graduate College  
in partial fulfillment of the  
requirements for the  
Degree of Doctor of Philosophy  
Department of Psychology  
Advisor: Richard W. Malott, Ph.D.

Western Michigan University  
Kalamazoo, Michigan  
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OF PROMPTED RESPONSES IN TEACHING RECEPTIVE  
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Kristen Lynn Gaisford, Ph.D.

Western Michigan University, 2010

Three strategies to train receptive identification of pictures were compared: (a) trial and error, (b) delayed finger-point prompt followed by a reinforcer, and (c) delayed finger-point prompt followed by the spoken word, "good". These three strategies were compared using a multi-element design, assessing the performance of four children, ranging from two to four years of age, selected from a classroom that provides services to children with Early Childhood Developmental Delays (ECDD). Two children mastered the receptive identification of pictures at the same rate regardless of the strategy. For the remaining two participants, the rate of mastery was the same for both of the prompting strategies, but for one child the rate of mastery was much slower with trial and error and for the other child the skill was never acquired with trial and error. Additionally, there was no difference between prompting strategies, suggesting that the reinforcement of prompted responses did not hinder the rate of mastery for all four children. While it was not the focus of the study, generalized receptive identification data were also presented for two of the children. Both of the children two tested for generalization acquired at least some concept generalization.

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I would like to start by acknowledging a special little boy named Spencer. I began working with Spencer seven years ago in his preschool classroom, knowing very little about children with special needs. In just a few short months of working with him, Spencer changed my life and inspired me to continue my education. He has continued to be my inspiration throughout this process.

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Kristen Lynn Gaisford

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## CHAPTER I

### INTRODUCTION

Prompting strategies are commonly used to teach the receptive identification of pictures to learners with disabilities. The two prompting strategies often selected to teach the receptive identification of pictures are within-stimulus prompting (Richmond & Bell, 1983; Strand, 1989; Wolfe & Cuvo, 1978) and extra-stimulus prompting (Aeschleman & Higgins, 1982; Koegel & Rincover, 1976; Richmond & Bell, 1983; Smeets & Lancioni, 1981, Wolfe & Cuvo). The popularity of using within-stimulus prompting techniques stemmed from the work conducted by Terrace (1963a, 1936b), when it was discovered that visual discriminations were acquired more quickly and with fewer errors than when using trial and error techniques (as cited by Strand & Morris, 1986). While all three methods, within-stimulus prompting, extra-stimulus prompting, and trial and error have been used to teach visual discriminations, in applied research there is not yet a clear superiority amongst methodologies (Richmond & Bell, 1983; Smeets & Lancioni, 1982).

#### Stimulus Prompting

##### Within-Stimulus Prompting

Within-stimulus prompting involves altering some aspect of the stimulus in a way that will increase the likelihood of the occurrence of a desired response (Green, 2001).

Stimuli can be changed along a variety of dimensions such as size and color. The

difference between the  $S^D$  and the  $S^A$  is faded until the two stimuli only differ along a single dimension. For example, if we wanted the learner to discriminate between the typed words "Michael" (the  $S^D$ ) and "Mitchell" (the  $S^A$ ), then training could start with "Michael" in size 24 font, while "Mitchell" is in size 12 font. Over the course of training, the size of "Michael" will diminish until "Michael" is also in size 12 font.

### Extra-Stimulus Prompting

Extra-stimulus prompting and within-stimulus prompting differ in that with extra-stimulus prompting the  $S^D$  and the  $S^A$  remain constant throughout training, but the context in which the  $S^D$  and the  $S^A$  are presented changes in some way (Green, 2001). For example, if a simple discrimination of a green card as an  $S^D$  (correct response) and a white card as an  $S^A$  (incorrect response) has been previously trained, the color green can be used as an extra-stimulus prompt. To teach the discrimination of the written name "Michael" from the written name "Mitchell" using an extra-stimulus prompt, training would start with the written name "Michael" on a green card ( $S^D$ ) and the written name "Mitchell" on a white card ( $S^A$ ). The instructor would deliver the  $S^D$ , "touch Michael" and the learner would touch the written name "Michael" because of the green background. Over time the background of the green card with "Michael" written on it would be faded to lighter and lighter shades of green and finally to white so that there would be no difference between the two name cards except for the different letters of the name. At this point, the relevant features of the stimulus should control behavior. In addition to using colored cards as extra stimulus prompts (Koegel & Rincover, 1976), a finger point (gestural prompt) has also been utilized (Richmond & Bell, 1983; Smeets &

Lancioni, 1981; Wolfe & Cuvo, 1978). While the previous example included the fading of the extra-stimulus prompt, one research study that used a gestural prompt did not fade out the finger prompt and prompt dependency occurred; in other words, once the finger prompt was removed, learners failed to make the correct response to the remaining stimuli (Smeets & Lancioni, 1981).

The systematic fading of prompts is crucial to prevent prompt dependency. Prompt dependency means that learners will not respond correctly in the absence of the prompt or will not respond until the prompt is presented (MacDuff, Krantz, & McClannahan, 2001). While prompt dependency can occur with both within-stimulus prompting and extra-stimulus prompting, it is more often the case that prompt dependency occurs with extra-stimulus prompting (Schreibman, 1975; Wolfe & Cuvo, 1978). This may be why it has been argued that the use of extra-stimulus prompting has the potential to be detrimental to teaching visual discriminations to children with autism in comparison to trial and error (Koegel & Rincover 1976) when there is no transfer of stimulus control from the prompt to the related stimulus features of the task that should evoke behavior (Schreibman, Charlop, & Koegel, 1982; Touchette & Howard, 1984). It has been argued that stimulus transfer does not occur because children with autism have trouble responding to two cues presented at the same time. However, it is important to note that failure to make a correct response once a prompt is removed does not necessarily mean a learner is prompt dependent. Prompt dependency only occurs when the learner could have acquired the skill in the absence of prompts. If the discrimination is so difficult that the learner could not make the discrimination without the prompt, it is

not prompt dependency. An alternative to using a stimulus prompt is to employ a training method of no prompting, referred to as trial and error.

### Trial and Error

In the trial and error condition, both name cards would be presented on the desk and the experimenter would deliver the  $S^D$ , "touch Michael", without any prompts. If the learner responded correctly, a reinforcer would be delivered. If the learner responded incorrectly, the experimenter may move on to the next trial without saying anything or may provide verbal feedback, such as, "no" or "that's wrong"; however, the learner is not prompted to touch the correct card. (Aeschleman & Higgins, 1982; Smeets & Lancioni, 1981; Richmond & Bell, 1983)

### Comparison of Stimulus Prompting and Trial and Error

#### Within-Stimulus vs. Extra-Stimulus vs. Trial and Error

A review of the literature found two studies that compared within-stimulus prompting to both extra-stimulus prompting and trial and error, Richmond and Bell (1983) and Strand and Morris (1986). Richmond and Bell (1983) used a finger point prompt, which was faded along the dimension of proximity, as the extra-stimulus prompt in the first condition to teach size discrimination of two circles. The size of the  $S^A$  was gradually increased in the within-stimulus condition. In the third condition, trial and error, the stimuli were presented and no prompts were used; only correct responses were reinforced. While all participants acquired the skill under the assigned condition, the

within-stimulus prompting was superior as it produced fewer errors in comparison, to both the extra-stimulus prompting and trial and error conditions. Furthermore, the extra-stimulus prompt produced fewer errors than trial and error. In this study, the variable of interest was the percentage of errors made during training. On average, for the learners in the within-stimulus condition, of the responses made, 11.2 percent were errors, for learners in the extra-stimulus condition, of the response made, 29.4 percent were errors and those in the trial and error condition, of the responses made, 39.8 percent were errors during training.

Strand and Morris (1986) used a shape discrimination to evaluate the three methods. The trial and error condition was consistent with the other study in that the stimuli were always presented without any prompts. The extra-stimulus prompting condition differed from the other study. Instead of a finger pointing prompt, the initial sessions started with a full physical prompt, which was later reduced to a gestural prompt and finally to a verbal prompt. The within-stimulus condition followed traditional stimulus fading with the  $S^A$  starting off as a blank card and gradually the intensity of the lines defining the shape were increased until they reached full intensity. There was no significant difference between the prompting strategies, yet both of the prompting strategies led all subjects to acquire the discriminations more quickly and with fewer errors than with the trial and error condition. Additionally, not all of the participants in the trial and error group acquired all of the discriminations, thus the prompting strategies were more effective and efficient than trial and error. Both of the comparison studies consistently found that the prompting strategies were superior to trial and error. While Strand & Morris (1986) did not find a significant difference between prompting

strategies, within-stimulus prompting was superior to extra-stimulus prompting as reported by Richmond & Bell (1983). These two studies compared three different conditions: (a) trial and error, (b) within-stimulus prompting, and (c) extra-stimulus prompting; however a review of the literature revealed other studies that have compared two of the three above conditions and will be discussed in the next two sections.

### Extra-Stimulus Prompting vs. Trial and Error

Three studies compared an extra-stimulus prompt to trial and error to teach a discrimination task, Aeschleman and Higgins (1982), Koegel and Rincover (1976) and Smeets & Lancioni (1981). Aeschleman and Higgins (1982) compared two extra-stimulus prompting strategies to trial and error by teaching the learners to discriminate two-dimensional drawings of a bottle from two-dimensional drawings of a jar. The first extra-stimulus prompt was a grey matte overlay that was placed over the  $S^A$  and gradually faded over ten steps. The second extra-stimulus prompt involved a finger-point prompt that at first was presented simultaneously with the  $S^D$  and was then delayed by increments of 0.5 seconds until the delay was increased to 4.5 seconds. The trial and error condition was consistent with traditional trial and error methodology, only correct responses were reinforced and no prompts were used. In terms of effectiveness, at least some learners acquired the discrimination with all three strategies; however, none of the three conditions resulted in skill acquisition for all participants. The first extra-stimulus prompt involving the removal of the matte overlay, resulted in five of the eight children acquiring the skill, the trial and error condition led to four of the eight children acquiring the skill, and the second extra-stimulus prompt involving the delayed finger-point prompt

led to three of the eight children acquiring the skill. Furthermore, there was not a significant difference between all three conditions for the number of trials necessary for acquisition.

Koegel and Rincover (1976) compared trial and error training to training involving pretrained colored cards as an extra stimulus prompt to teach four different discriminations. These four discriminations included: (1) X vs. O, (2) hexagon vs. octagon, (3) high tone vs. low tone, and (4) quiet tone vs. moderate tone. This study differs from the other studies in that sixteen typically developing elementary school students were included along with a group of eight children with autism. The trial and error group of typically developing children acquired all four discriminations. The prompted group of typically developing children on average only acquired three of the discriminations, with the hexagon vs. octagon discrimination and the quiet vs. moderate tone discrimination as the two most common discriminations that were not acquired. All eight children with autism were trained with the colored cards as an extra-stimulus prompt. The children with autism on average only acquired one discrimination (range of 0 to 3 discriminations) with the X vs. O as the most common discrimination acquired. No child with autism acquired all of the discriminations in the prompting condition. Following training with the extra-stimulus prompt, three children with autism received further training using trial and error and all three children acquired all four discriminations. Additionally, the typically developing children who failed to acquire the discriminations in the prompting condition also received additional training using trial and error and were able to acquire those discriminations.

Smeets and Lancioni (1981) taught three sets of discriminations with different levels of difficulty under three different conditions. The first condition was a traditional trial and error condition, which used no prompts. The second condition used an immediate finger prompt as an extra stimulus prompt and the third condition used a delayed finger prompt. The immediate finger prompt did not result in any of the learners acquiring a single discrimination. Easy discriminations were acquired by forty-four percent of learners in the trial and error condition, but learners did not acquire any difficult discriminations with trial and error. The delayed finger prompt resulted in eighty percent of learners acquiring the easy discrimination, and twenty percent of learners acquiring the difficult discriminations.

#### Within-Stimulus Prompting vs. Trial and Error

Both simple and complex visual discriminations were taught to twenty-seven severely mentally handicapped children to compare three different training conditions; stimulus fading along the  $S^D$ , stimulus fading along the  $S^A$ , and trial and error (Strand, 1989). Both of the within-stimulus fading conditions produced fewer errors than the trial and error condition for the simple discrimination task. The first condition that faded along the  $S^D$  produced an average of 26.1 errors during training; the second condition that faded along the  $S^A$  produced an average of 29.4 errors during training, while the trial and error condition produced an average of 46.9 errors during training. All nine children in the fading along the  $S^D$  condition acquired the simple discrimination, while eight of the nine children in the fading along the  $S^A$  condition and only six of the nine children in the trial and error condition acquired the discrimination. Only one child from each of the three

conditions acquired the complex discrimination. This suggests that both of the within-stimulus prompting strategies produced fewer errors and were more effective than trial and error to teach the simple discrimination; however neither the prompting conditions nor trial and error were effective in teaching the difficult discrimination.

#### Within-Stimulus Prompting vs. Extra-Stimulus Prompting

Letter discrimination was taught to twenty-four severely mentally retarded adults to compare the effectiveness of an extra-stimulus prompt to a within-stimulus prompt (Wolfe & Cuvo, 1978). The extra-stimulus prompt consisted of a pointing prompt that was faded from directly pointing to the correct stimulus to pointing to the correct stimulus from thirty centimeters away. The within-stimulus prompt consisted of highlighting the correct stimulus, fading out the intensity of the highlighting over time. The within-stimulus prompt resulted in significantly fewer trials for mastery than the extra-stimulus prompt. Furthermore, a significantly higher proportion of letters were acquired and retained with the within-stimulus prompt. This study suggests that within-stimulus prompting was more effective and efficient than extra-stimulus prompting.

#### Discussion of Results

Two studies compared all three conditions, trial and error, within-stimulus prompting and an extra-stimulus prompting. The findings were inconsistent between the two studies; in one study, all three conditions were effective in leading to acquisition of the skill, but within-stimulus prompting was superior in terms of efficiency and the pointing prompt was more efficient in comparison to trial and error (Richmond & Bell,

1983). The second study did not demonstrate a difference between the within and extra-stimulus prompt as both were effective in teaching the skill; however, the trial and error condition was not effective for all participants (Strand & Morris, 1986).

Three studies compared trial and error to an extra-stimulus prompt. It was demonstrated that an immediate finger prompt was not effective for any of the participants; however, when the finger prompt was delayed it was more effective than trial and error (Smeets & Lancioni, 1981). In the second study it was demonstrated that trial and error was more effective for both the typically developing children and the children with autism in comparison to an extra-stimulus prompt (Koegel & Rincover, 1976). Finally, Aeschleman and Higgins (1982) found that neither of the extra-stimulus prompts nor trial and error was effective for all participants and there was no significant difference between conditions in terms of efficiency.

The final two studies compared a within-stimulus prompt to trial and error and a within-stimulus prompt to an extra-stimulus prompt. When comparing a within-stimulus prompt to trial and error, the within-stimulus prompt was more effective and produced fewer errors than trial and error (Strand, 1989). When a within-stimulus prompt was compared to an extra-stimulus prompt, the within-stimulus prompt was more effective and resulted in better retention of the skill.

In general, these data show that all three conditions are in some instances effective; however there is no consistent pattern of one prompting strategy or trial and error being superior to the others in terms of effectiveness or efficiency. Within-stimulus prompting was in some cases more effective and efficient than extra-stimulus prompting (Richmond & Bell, 1983; Wolfe & Cuvo, 1978) and than trial and error (Strand, 1989).

However, within-stimulus prompting is effortful and costly in terms of preparing materials, and thus not commonly implemented in clinical settings (Strand & Morris, 1986). Within-stimulus prompting was not compared to a delayed finger prompt, because within-stimulus prompting will not typically be a prompting strategy employed by practitioners. The current study will use a delayed finger prompt because Smeets and Lancioni (1981) showed that immediate finger prompt was not effective and the delayed finger prompt was more effective than no prompt (trial and error).

The failure to fade prompts in a systematic manner can lead to prompt dependency; as learners will either fail to transfer stimulus control from the prompt to the relevant features of the stimulus and/or the learner will not respond until the prompt is presented. The use of the delayed finger prompt may address both of these concerns. When a prompt is presented simultaneously with the training stimulus, often the prompt will overshadow or block the other stimulus from acquiring stimulus control (Trabasso & Bower, 1968; Fellows, 1968; Sutherland & MacKintosh, 1971; as cited by Koegel & Rincover, 1976). In the present study, the learner will have an opportunity to respond independently before the prompt is presented, thus potentially reducing the amount of times the prompt is presented with the training stimulus. Additionally, because there is a delay before the prompt, learners will gain access to the reinforcer more immediately if they respond before the prompt than if they wait for the prompt to be presented, which should result in learners responding before the prompt is provided instead of waiting for the prompt. However, the delayed prompt does not guarantee that prompt dependency will not occur; therefore trial and error (no prompts) is compared to the delayed finger prompt. Finally, some research suggests that numerous errors and the resulting low rates

of reinforcers can lead to emotional responding (Demchak, 1990); therefore there will be one delayed finger-point prompting procedure where both correct unprompted and prompted responses will be reinforced.

In summary the present study compared the acquisition of receptive identification of pictures using trial and error, and two different delayed finger-prompting conditions. In one finger-prompt condition, all correct unprompted and prompted responses were reinforced and in the second finger-prompt condition, only correct unprompted responses were reinforced.

## Methods

### Participants

Four female students in an Early Childhood Developmental Delay (ECDD) classroom at Croyden Avenue School, participated in this study. At the start of the study, their ages ranged from two years and four months to four years and six months. They were in the school three hours a day, five days a week receiving discrete trial instruction. They had been enrolled in the school an average of 11 months with a range of 5 months to 17 months at the start of the study. All of the children had mastered at least one receptive identification procedure in which the tutor gave a verbal S<sup>D</sup>, such as "touch apple" and the child would then point to that picture or object. Additionally, all the children had had multiple procedures involving gestural prompts and they responded correctly to those prompts. Prior to the start of the study they were assessed by the author and the school psychologist using the Vineland Adaptive Behavior Scale (VABS) (see Appendix A). All the children scored below their chronological age in all eleven

categories of the VABS; most relevant to this study, each child scored an average of one year and four months (with a range of nine months to two years and four months) below their chronological age on receptive language. Two of the four children had no history of emotional responding; however one child had a history of noncompliance and the other child had a history of emotional responding during discrete trial training.

### Setting

All sessions were conducted by the author in the children's study carrels, which were approximately 3.0 x 2.0 m. The carrels contained a desk and two chairs, with the experimenter sitting perpendicular to the child.

### Materials

All four children were pretested for receptive identification on a total of thirty-five different picture cards. The nine picture cards that all four children were unable to identify were used in the study. There were three different sets of pictures; one set for each training condition—trial and error, delayed finger-prompt followed by a reinforcer, and delayed finger-prompt followed by the spoken word, "good". The first set of pictures consisted of (a) astronaut, (b) judge, and (c) firefighter, the second set (a) sailor, (b) construction worker, and (c) referee; the third set (a) soldier, (b) wizard, and (c) caveman. Each of the three different sets of pictures was assigned to different procedures for each of the four children. For example, the picture set consisting of sailor, construction worker and referee was assigned to the trial and error procedure for Kylie, but that same picture set was assigned to the delayed finger-point prompt followed by a reinforcer procedure

for Brenda. All picture cards were three and a half inches wide by five inches tall. During training, they were presented side by side using Velcro®, on a piece of black foam board, eight inches high by twenty inches wide.

### Experimental Design

A multielement design was used to compare the three procedures. All three procedures were presented in a different sequence each day and the order of the three procedures were alternated across days. Due to the heterogeneity of the children in the study a within-subject design was chosen so that each child could serve as her own control.

### Identification of Reinforcers

Twice a week as part of the regular classroom procedures conducted by one of the child's regular tutors, the children selected eight tangible items from two large bins of tangibles. Following this selection, the eight tangibles along with three to four preferred edibles were arranged on the desk in front of the child. Then a tutor conducted a brief multiple-stimulus assessment without replacement (MSWO) to identify and rank the top five of the eleven to twelve preferred items (Higbee, Carr, and Harrison, 2000). At the beginning of each session the experimenter offered the child the two top-ranked items and used the first one the child selected as a reinforcer for that session. However, if during the session that item lost its reinforcing value (e.g. the child pushed it away, did not engage with the tangible or did not eat the edible) this process was repeated with the two top-ranked items from the remainder of the array of five.

## Procedures

### Instruction, Data Collection, and Mastery Criterion

The training session began with the experimenter presenting the relevant set of three picture cards on the black foam board for a total of 12 trials, with the configuration of the three pictures rotated from trial to trial. Each of the three pictures was to be identified four times and was selected in random order. The session order for the three procedures was rotated across days.

The data collected for each trial included: (a) prompt level needed for a correct response (not applicable for trial and error), (b) whether a correct response, incorrect response, or no response was made, and (c) whether any emotional responding occurred. To be compatible with the standard classroom criterion, the mastery criterion was set at two consecutive sessions at 92 percent or higher or three consecutive sessions at 75 percent or higher; however due to an error, a few sessions were run past mastery criterion for all children.

### Interobserver Agreement

Sessions were videotaped and later viewed separately by a graduate student and the experimenter. Interobserver data were collected on the identical data sheets that the experimenter used during training. Interobserver agreement was collected for twenty-five percent of the sessions. The percentage of agreement was calculated by dividing the number of agreements by the number of agreements and disagreements and multiplying

by 100. The average percentage of agreement was 99 percent with a range of 92 percent to 100 percent.

### Training Procedures

#### General Procedure

All three procedures started identically; the experimenter started the session by presenting the  $S^D$ , "touch (name of stimulus)", and allowed the child two to three seconds to respond. If she made a correct response the experimenter immediately delivered a reinforcer. The procedures only differed when an incorrect response or no response was made.

#### Trial and Error

In the trial and error procedure, if the child did not respond within two to three seconds or made an incorrect response, the experimenter removed the stimuli, rotated their placement on the foam board, and started the next trial. No prompts were given during this procedure.

#### Delayed Finger-Prompt Followed by a Reinforcer

In the delayed finger-prompt followed by a reinforcer procedure, if the child did not make a response or made an incorrect response, the experimenter would repeat the  $S^D$ , "touch (name of stimulus)," while simultaneously pointing to the correct stimulus. Frequently the experimenter would have removed her finger from the picture before the

child touched it. Once the child made the correct response, a reinforcer was delivered. While the situation did not arise during the experiment, if after the finger-point prompt was provided the child still did not respond or responded incorrectly, the experimenter would have moved on to the next trial.

#### Delayed Finger-Prompt Followed by the Spoken Word, "Good"

The delayed finger-prompt followed by the spoken word, "good" procedure is identical to the delayed finger-prompt followed by a reinforcer procedure as described previously, except that prompted responses were not reinforced. If the experimenter provided a finger-point prompt, following the child's correct response the experimenter would state in a neutral tone, "good."

### Results and Discussion

All children succeeded in mastering the skill with both of the delayed finger-prompting procedures, and there was essentially no difference in terms of efficiency between the two procedures (see Appendix B, figures B.1, B.2, B.3, and B.4). In addition, for two of the children, Alyssa and Kylie, a direct comparison of sessions to mastery criterion shows that there was essentially no difference between the three training procedures (Table 1). While Kiarra mastered the skill with all three procedures, there was a noticeable in efficiency between the two prompting procedures (four to five sessions to mastery) and trial and error (18 sessions to mastery) (Table 1). Brenda had similar results as she mastered the skill within nine sessions with both prompting procedures; however, she never acquired the skill under trial and error. Brenda moved on

to another classroom at the end of the school year and sessions were run until she left. After twenty-four sessions, Brenda had not yet met mastery criterion. The classroom criterion for failure to learn is twenty sessions, thus trial and error was not effective for Brenda (Table 1).

Table 1: Sessions to Mastery Criterion for All Children

	Sessions to Mastery		
	Trial and Error	Delayed Finger-Point Followed by the Spoken Word, "Good"	Delayed Finger-Point Followed by a Reinforcer
Kylie	5	4	5
Alyssa	6	5	4
Kiarra	18	5	4
Brenda	24*	9	9

\* Skill was not acquired in this condition

Also, even though all prompted responses were reinforced in one of the procedures, prompt dependency did not develop. One possible explanation is that responding correctly immediately instead of waiting for the prompt, resulted in faster access to the reinforcer. There are times where it will be useful to use strong reinforcers for the prompted response to prevent emotional responding for some children and these data suggest that if the prompt is delayed, the strongly reinforced prompt will not result in prompt dependency.

There was a marked difference between the delayed finger-prompting procedures and trial-and-error in terms of efficiency for two children and in terms of effectiveness for one of those two. While both Kylie and Alyssa were successful using all three

strategies, the delayed finger-prompting strategies were clearly superior to trial-and-error for both Kiarra and Brenda. The demonstrated difference for two of the children suggests that a delayed finger-point prompting procedures should be utilized when teaching visual discriminations.

Interestingly, for all four children, there was no difference in terms of effectiveness or efficiency between the two delayed finger-prompting procedures. As previously mentioned, low rates of reinforcers can lead to emotional responding; and the reinforcement of prompted responses can reduce this emotional responding (Ducharme, 2003; as cited by Mueller, Palkovic, & Maynard, 2007; Gaisford, 2009; Weeks & Gaylord-Ross; as cited by Mueller, Palkovic, & Maynard, 2007). However, emotional responding was not the main reason for reinforcing prompted responses in this study; instead the intent was to investigate the effects on skill acquisition. Kylie and Brenda had a history of noncompliance and emotional responding and continued to engage in emotional responding and noncompliant behaviors with their regular tutors in procedures outside of this experiment. However, along with the other two children, they showed no emotional responding during this experiment.

One possible explanation for why Kylie did not exhibit any emotional responding or noncompliance was that she got such high rates of reinforcement during training. In the trial and error procedure, on average she got reinforcers seventy-two percent of the time during training and in the delayed finger-prompt followed by the spoken word, "good", she got either an edible or tangible reinforcer seventy-eight percent of the time during training. For Brenda, in the trial-and-error procedure on average she got an edible or tangible reinforcer fifty percent of the time and only sixty-five percent of the time

during the delayed-finger prompt followed by the spoken word, "good". For these two children, they were getting between 50 and 78 percent of the time during training, which is substantially higher than what they get in the classroom with typical procedures when they typically exhibit emotional responding. While the children in this study did not exhibit emotional responding under any of the three different procedures, the reinforcement of prompted responses did not inhibit or slow down skill acquisition, suggesting that prompted responses should be reinforced.

### Foliow-Up Experiments

The following three experiments were not part of the design for the original experiment; however, they were closely related and therefore presented here.

#### Generalization Testing

Visual discrimination of two-dimensional picture cards is a skill commonly taught to children with developmental delays in early intensive behavioral interventions, and quite often only one exemplar is used. However, mastery of single trained exemplars will be of little value to the child if that child has not acquired a generalized repertoire, so that he or she can use that skill in a variety of educational and practical tasks that involve novel or untrained stimuli from the trained stimulus class (e.g., concepts) Therefore, following the main experiment, the children's generalized concept repertoires were assessed with regard to different exemplars of the same concepts as the originally trained stimuli.

### Generalized Concept Mastery of Two-Dimensional Picture Cards

Following the original receptive identification training, two of the children, Alyssa and Kylie, remained in the ECDD classroom long enough to conduct a series of generalization tests. When each of the children met mastery criterion for receptive identification across all three procedures, she was tested for a generalized concept mastery repertoire. To assess this generalized repertoire, she was presented with a set of three picture cards that were different exemplars of the same concepts as the originally trained stimuli. For example, one of the training sets was (a) astronaut, (b) firefighter, and (c) judge; she was then presented with different exemplars of each of the three concepts, and then was told, "Touch (name of stimulus)." This was done three times with each of the three new picture cards, for a total of nine trials. The procedure was repeated with two more sets of exemplars of each concept in the set of three, thus, there were three novel exemplars of astronaut, firefighter and judge presented and each card was presented three times, for a total of 27 generalization trials. This same procedure was repeated for the remaining two sets of three concepts used with the other two training procedures (e.g. wizard, caveman, soldier, sailor, referee, and construction worker).

This testing was done in extinction and in order to avoid potential negative effects of extinction, only one set of each concept was tested per session (nine trials). Also, with both Kylie and Alyssa, each novel exemplar in set one was tested first, then each novel exemplar in set two was tested, and finally each novel exemplar in set three was tested. This sequence does not seem to have affected the children's performance on the generalization testing (see Appendix C, figure C.2). Additionally, there does not seem to

be a difference in the amount of generalization conceptual control acquired as a result of the training procedure that was used (see Appendix C, figure C.3). In generalization testing of receptive identification, the similarity of the exemplars to each original training stimulus can vary from concept to concept, which should affect the amount of generalization for each concept. However, there is no correlation between the two children and the amount of generalization of each concept, suggesting that there is no intrinsic difference in the exemplar similarity among concepts or that perhaps the two children are under the stimulus control of different stimulus dimension in the various concepts. For example, for one child, and one concept, color might be the dominating controlling stimulus dimension, whereas for the other child, size might be the dominating controlling stimulus dimension (see Appendix C, figure C.4). Surprisingly, with just one exemplar, both Alyssa and Kylie were able to accurately identify at least one of the novel pictures for all nine original concepts. However, neither child was able to accurately identify all twenty-seven novel exemplars, thus a completely generalized receptive identification repertoire was not established. On average, Kylie responding with 70 percent accuracy on the generalization testing and Alyssa responded with 52 percent accuracy on the generalization testing (see Appendix C, figure C.1 for each child's average responding on each concept).

#### Finger-Prompting and Passive Learning

Our anecdotal experience suggests that the word "good," spoken in a neutral tone was a considerably less valuable reinforcer than edibles and tangibles for this group of children. Therefore, for all four children, the lack of a demonstrated difference in the

efficacy and efficiency of training with prompted responses followed by a highly valued reinforcer and prompted responses followed by a weak reinforcer suggests that the reinforced response may not be crucial to the acquisition of receptive identification for these children. Thus, the experimenter tested a training procedure where no touching response from the child and no reinforcers were involved: While stating the picture name, "football player", the experimenter (not the child) pointed to the picture of the football player. When one of the children, Kylie, had met mastery criterion for all three procedures, this passive training began with three novel picture cards, that a pretest showed, she could not identify. To start the session, all three novel picture cards were presented on the black foam board as in the original experiment. Kylie sat facing the foam board, with the experimenter sitting perpendicular to her. She was not permitted to touch the picture cards; and if she attempted to touch a card, which she tried to do during the first four presentations, the foam board was moved backwards out of her reach. This process was repeated for four trials per session with a total of five sessions, as five training sessions was the average number needed for mastery during the original training. She showed not emotional responding during these sessions.

Following the five sessions, Kylie was tested under extinction to determine if she would touch the football player picture, when the experimenter said, "Touch football player". On the first instruction to, "Touch football player," she said, "No" and made no other response. Therefore, the experimenter repeated three of the original receptive identification training trials, reinforcing each response with a tangible reinforcer; and Kylie responded promptly and correctly on each trial. Then the experimenter returned to the testing of the passive learning procedure with the football player and the two

associated distracters, and Kylie responded with 80 percent accuracy (see Appendix D, figure D.1).

Kylie was then tested with three novel examples of "football player". A novel picture of a football player was placed into the array with the two original distracter pictures and she was given the  $S^D$ , "Touch football player", for a total of three trials. All testing was conducted under extinction. This testing was repeated with two other novel pictures of football players. Kylie responded with 100 percent accuracy on all three novel examples of "football player" (see Appendix D, figure D.1).

The passive training procedure was then repeated with a second set of three novel stimuli. Kylie was pretested with these three novel picture cards to make sure she could not identify any of them. She was trained on the novel stimulus, "musketeeer". During testing she was also able to make the discrimination with 80 percent accuracy. Following the training of the two simple discriminations, both "football player" and "musketeeer" were put in the same array to test if she could make a conditional discrimination, touching football player or musketeeer as instructed. She responded with 100 percent accuracy (see Appendix D, figure D.2). These results suggest that, at least for Kylie, it is possible that reinforcers contingent on a correct response were irrelevant and that passive learning was responsible for the success of her original receptive identification training.

#### Assessment of the Spoken Word "Good" as a Potential Reinforcer

Because there was no demonstrated difference between the two finger-prompting procedures it seemed possible that the spoken word, "good" functioned as a fairly powerful reinforcer, though this is quite contrary to the anecdotal experience with these

children. To test this, Kylie was presented with three novel stimuli on the foam board as described in the original experiment. The stimuli included, superhero, mountie, and hippie. The experimenter presented the  $S^D$ , "Touch (name of stimulus)", and allowed Kylie two to three seconds to independently respond. If she responded correctly, the experimenter said, "Good" in a neutral tone and then moved on to the next trial. If she did not respond or responded incorrectly, the experimenter said, "Touch (name of stimulus)", while simultaneously pointing to the correct picture card. If Kylie responded correctly to the prompt, the experimenter said, "Good" in a neutral tone and moved on to the next trial. During the original training, Kylie did not engage in any emotional responding; however, during this follow up experiment, on average Kylie exhibited emotional responding during 33.5 percent of trials with a range across sessions of 0 to 67 percent. Additionally, during original training, she consistently responded independently to the statement of the  $S^D$ . However, during this follow up experiment, on average Kylie did not respond to the  $S^D$  on 11 percent of trials, with a range across sessions of 0 to 25 percent. Finally, during the original experiment, Kylie acquired all of the nine discriminations in six sessions or less. In this follow up experiment, she did not master the discrimination within six sessions and training was terminated (see Appendix E, figure E.1).

### Conclusions

- 1.) Delayed- finger-point prompting procedures were equally effective and efficient in teaching the receptive identification of nine picture cards for all four children, regardless of whether prompted responses were followed by edibles and tangibles or the

spoken word, "Good". Trial and error was less efficient than the delayed finger-point prompting procedures for one child and it was ineffective for another child. Therefore, these results suggest that trial and error should not be used for children with developmental delays, and instead a prompting procedure should be used in skills training.

2.) Two children were prone to emotional and disruptive behavior during procedures outside of this study when the frequency of reinforcers was low; however, they exhibited no emotionality in the main experiment where the frequency of reinforcers was relatively high. However, the word, "Good" in one procedure did not seem to work as an effective reinforcer and did not prevent disruptive, emotional responding. In addition, the reinforcement of prompted responses did not hinder skill acquisition. These combined data suggest the reinforcement of prompted responses in skills training with similar children.

3.) While the two children tested, both acquired some concept generalization with just one exemplar per concept, they did not acquire a completely generalized concept repertoire, suggesting that more than one exemplar may be necessary to achieve a generalized concept repertoire.

4.) The one child tested demonstrated passive learning. She was able to acquire both simple and conditional discriminations by merely watching the experimenter point to the stimuli and simultaneously name them. It is unknown if this repertoire was present prior to the original study or if her participation in the study aided in the acquisition of this skill. It is also unknown how many presentations of the auditory stimulus were

necessary to result in skill acquisition. This repertoire is a valuable one and the acquisition of such a repertoire should be investigated further.

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Appendix A

Vineland Adaptive Behavior Scale (VABS) Results for all Children

## Appendix

## B

Vineland Adaptive Behavior Scale (VABS) Results for all Children  
Participant Characteristics

Child	Age	Length of Time in Classroom	Vineland-II Survey Interview Data		Mastered Receptive Identification Procedures Prior to Training
Alyssa	3yrs 7mo	1yr2mo	Receptive	2 years 10 months	ID Body
			Expressive	1 year 10 months	ID Clothing
			Written	3 years 1 month	Class member ID
			Personal	2 years 5 months	ID Shapes
			Domestic	1 year 10 months	ID colors
			Community	11 months	
			Interpersonal Relationships	1 year 4 months	
			Play and Leisure Time	10 months	
			Coping Skills	1 year 11 months	
			Gross Motor Skills	3 years	
			Fine Motor Skills	2 years 6 months	
Brenda	4yrs 6mo	7 mo	Receptive	2 years 2 months	ID Name
			Expressive	1 year 11 months	Class member ID
			Written	3 years 5 months	
			Personal	2 years 9 months	
			Domestic	2 year 2 months	
			Community	11 months	
			Interpersonal Relationships	1 year 4 months	
			Play and Leisure Time	1 year 10 months	
			Coping Skills	1 year 11 months	
			Gross Motor Skills	3 years	
			Fine Motor Skills	2 years 5 months	
Kiarra	3yrs 6mo	1yr 5 mo	Receptive	2 years 2 months	Class member ID
			Expressive	1 year 11 months	ID Name
			Written	3 years 5 months	
			Personal	2 years 9 months	

Child	Age	Length of Time in Classroom	Vineland-II Survey Interview Data	Mastered Receptive Identification Procedures Prior to Training	
			Community	11 months	
			Interpersonal Relationships	1 year 4 months	
			Play and Leisure Time	1 year 10 months	
			Coping Skills	1 year 11 months	
			Gross Motor Skills	3 years	
			Fine Motor Skills	2 years 5 months	
Kylie	2 y 4 mo	5 mo	Receptive	1 year 6 months	ID Objects List-A
			Expressive	1 year 11 months	ID Objects List-B
			Written	NA	ID Objects List C
			Personal	2 years 5 months	ID Objects List -D
			Domestic	10 months	ID Body (simple)
			Community	11 months	ID Body (complex)
			Interpersonal Relationships	1 year 1 month	ID Pictures List -A
			Play and Leisure Time	1 year 3 months	
			Coping Skills	1 year 9 months	
			Gross Motor Skills	2 years 2 months	
			Fine Motor Skills	1 year 8 months	

## Appendix B

### Acquisition Data of All Procedures for All Children

Appendix B

Acquisition Data of all Procedures for All Children

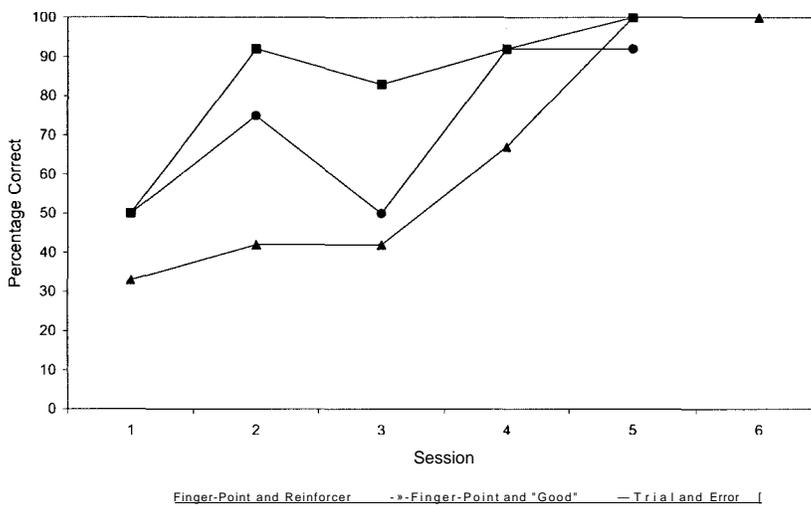


Figure B.1. The Acquisition of Receptive Identification for Alyssa

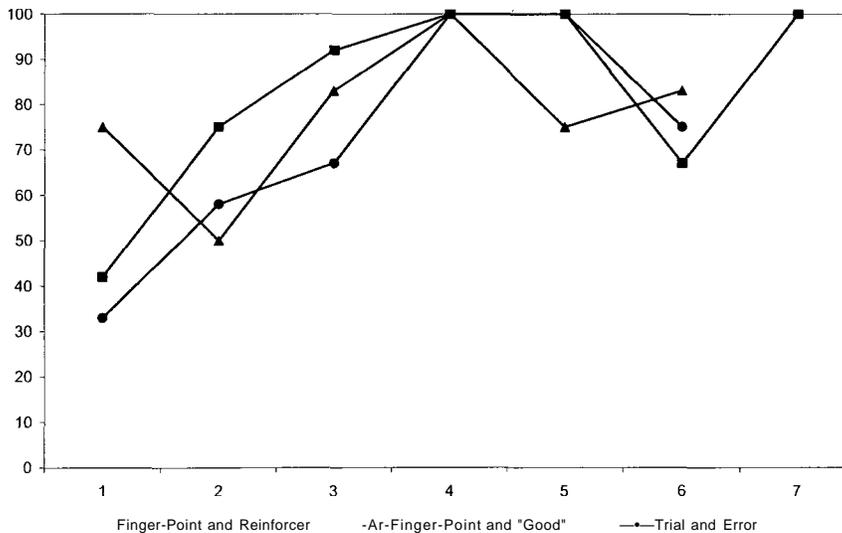


Figure B.2. The Acquisition of Receptive Identification for Kylie

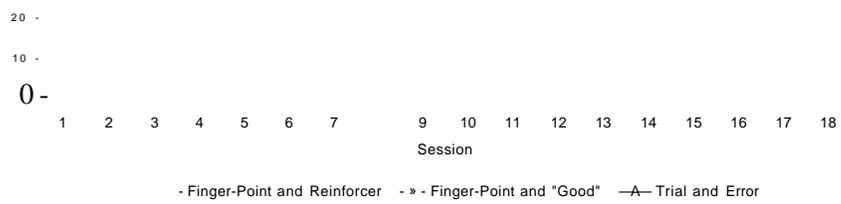


Figure B.3. The Acquisition of Receptive Identification for Kiarra

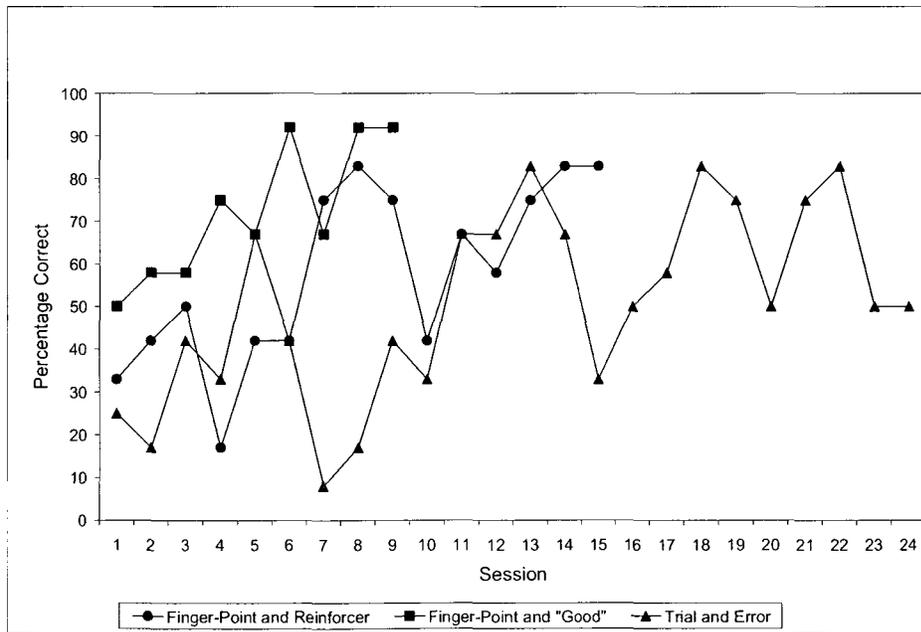


Figure B.4. The Acquisition of Receptive Identification for Brenda

## Appendix C

### Generalized Concept Mastery

## Appendix C

### Generalized Concept Mastery

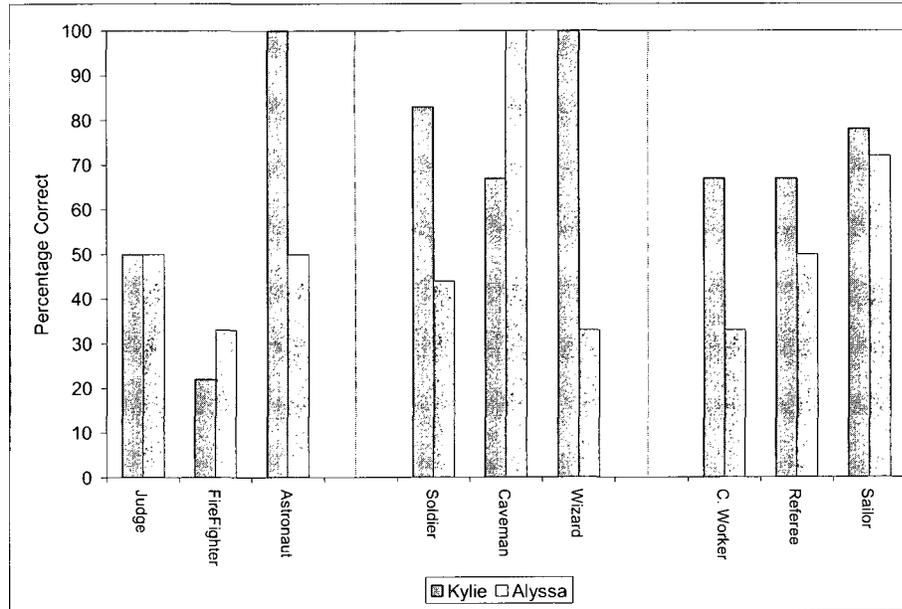


Figure C.1. Generalized Concept Mastery as a Function of the Concepts

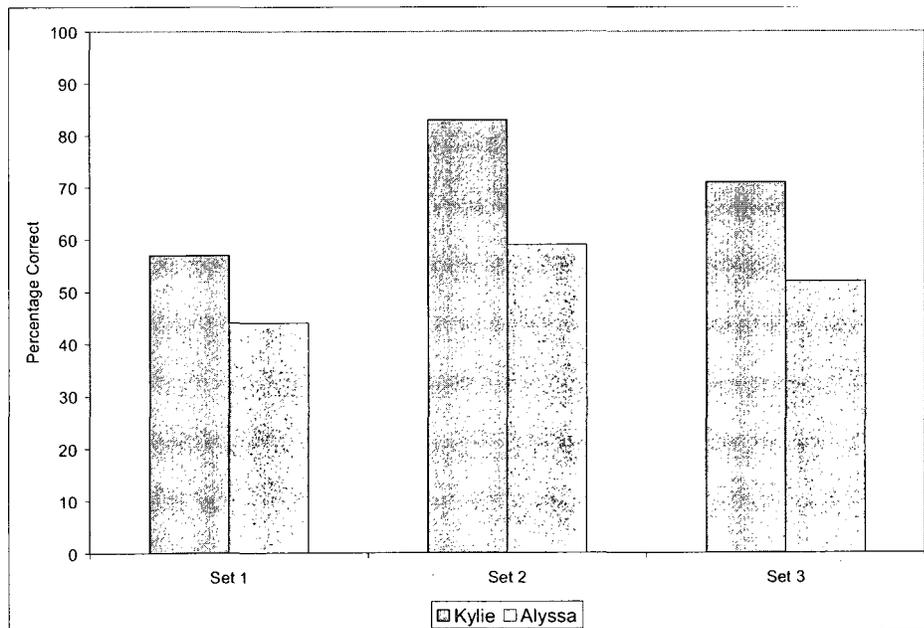


Figure C.2. Generalized Concept Mastery as a Function of the Set of Concepts

### Generalized Concept Mastery Testing

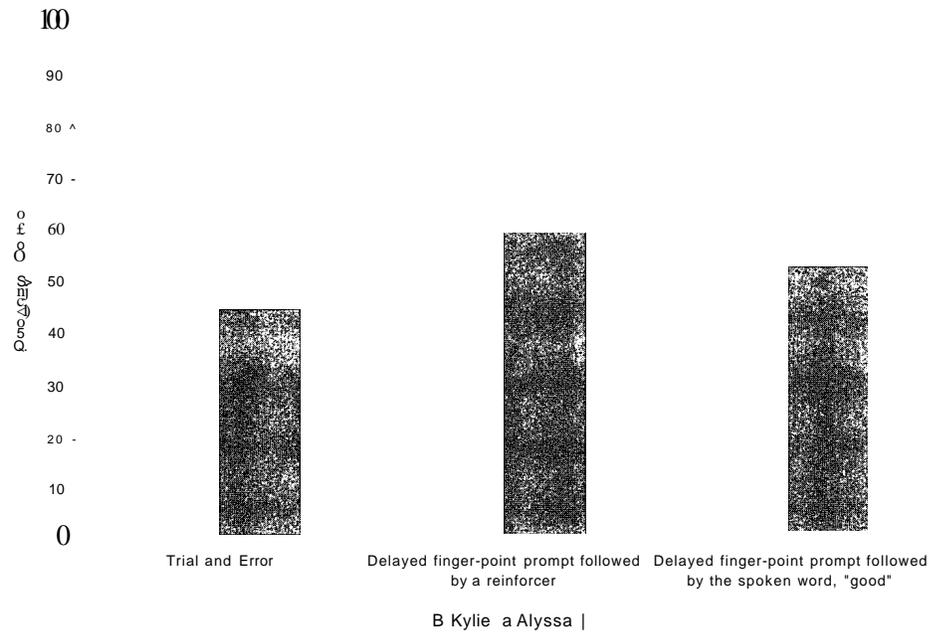


Figure C.3. Generalized Concept Mastery as a Function of the Training Procedures

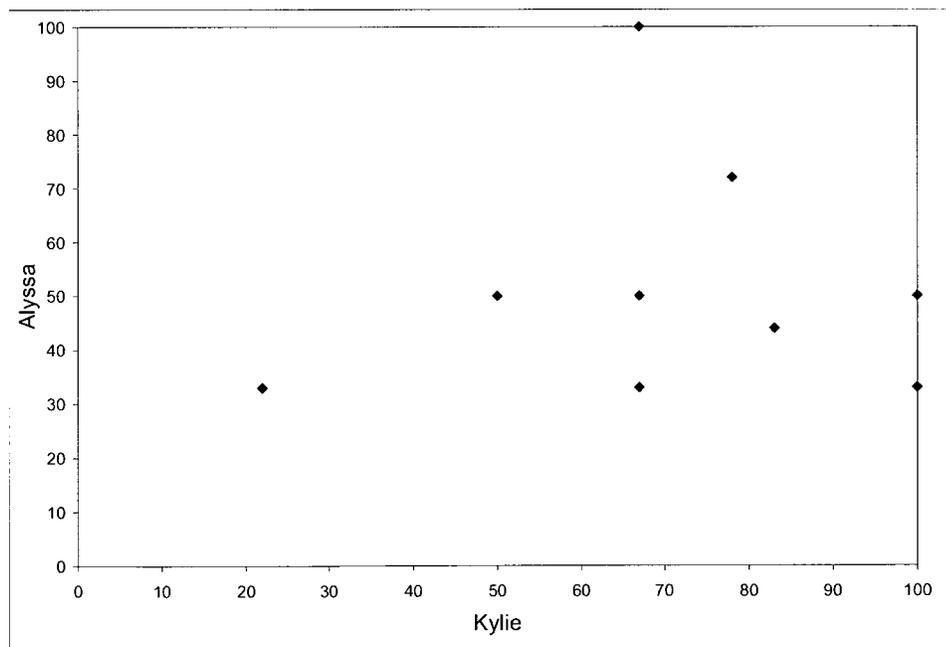


Figure C.4. Inter-subject Correlation of Generalized Concept Mastery as a Function of the Concept being Trained

## Appendix D

### Extension of the Finger-Point Prompt

## Appendix D

### Extension of the Finger-Point Prompt



Figure D. 1. Concept Generalization Resulting from Passive Learning

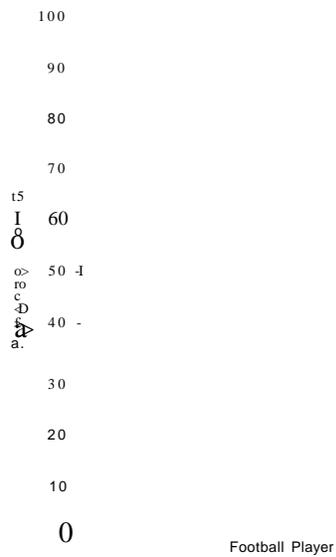


Figure D.1. Conditional Discrimination Resulting from Passive Learning

## Appendix E

Using the Spoken Word, "Good" as a Reinforcer

## Appendix C

### Using the Spoken Word, "Good" as a Reinforcer

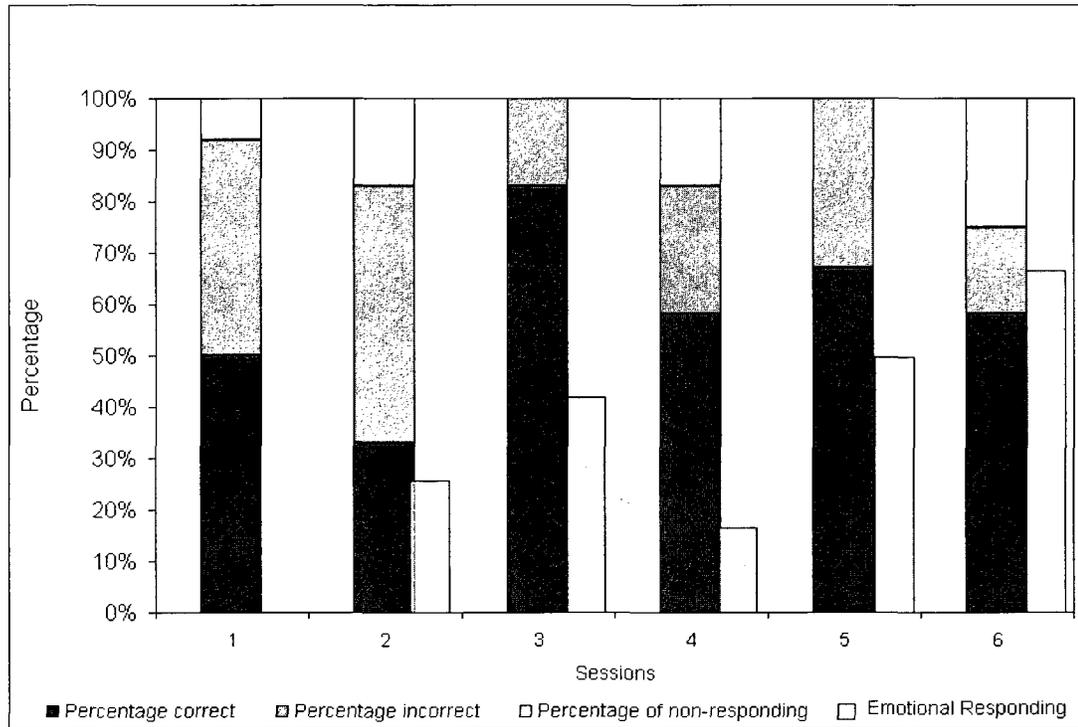


Figure E.1. The Acquisition of Receptive Identification with the Word "Good" as a Reinforcer for Kylie

Appendix F

HSIRB Approval Letter

## Appendix C

### HSIRB Approval Letter

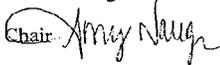
WESTERN MICHIGAN UNIVERSITY



Human Subjects Institutional Review Board

Date: November 26, 2008

To: Richard Malott, Principal Investigator  
Breanne Hartley, Student Investigator

From: Amy Naugle, Ph.D., Chair 

Re: JISIRB Project Number: 08-11-28

This letter will serve as confirmation that your research project entitled "Croyden Avenue School Practica: Continuous Quality Improvement" has been **approved** under the **exempt** category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note that you may **only** conduct this research exactly in the form it was approved. You must seek specific board approval for any changes in this project. You must also seek reapproval if the project extends beyond the termination date noted below. In addition if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: November 26, 2009

## Appendix G

### Protocol Outline

## Appendix G

### Protocol Outline

#### Project Title:

Croyden Avenue School Practica: Continuous Quality Improvement

#### **Abstract**

The purpose of this study will be (1) to evaluate an intensive behavioral treatment provided in a preschool for children diagnosed with autism and, based on these evaluations, (2) to continuously improve aspects of the treatment and assessment procedures provided to the children. This program evaluation and treatment/assessment adjustments are part of the standard continuous quality improvement efforts of the classroom where the study will be conducted. The study will be documented through direct observation and video recordings, which will capture the children's behavior. The study will take place in the Early Childhood Developmental Delay (ECDD) preschool classroom at Croyden Avenue School, where the treatment is provided by undergraduate and graduate practicum students. We are asking permission to use these evaluation, training, and assessment data in Master's theses, presentations, and publications to document the effectiveness of this continuous quality improvement effort.

#### **Purpose/Background Information**

I (Richard Malott) am training BA, MA, and PhD students to be human-service practitioners, generally with a specialty in preschool autism and early childhood developmental delays, not to be either basic or applied researchers. I am not using the researcher/practitioner model. However, I am training my students to continuously evaluate the effects of their work with the children and to modify their treatment/training procedures accordingly. So our first criterion in any practicum, thesis, or dissertation is that the children directly involved in those projects will immediately benefit from their involvement, not just that their involvement will contribute to the long-term betterment of the treatment of subsequent children, though we also have that as a goal, of course.

The current project will involve a case study objectively evaluating the performance of children diagnosed with autism. The study will examine the background of the children (e.g., pre-intervention assessments, medical conditions, behavioral history), the behavioral treatment provided to the children, the measurement and data collection process, performance results, and problem behavior.

#### **Participant Recruitment**

All participants will be preschool-aged children who are currently enrolled in the Early Childhood Developmental Delay (ECDD) Classroom at Croyden Avenue School. As part of the continuous quality improvement standard within the classroom, all the children will be involved in the evaluation and improvement process. The students

whose parents decide not to provide permission for Dr. Malott's graduate students to use their data will not have their data included, however they will still be part of all evaluation and training improvements. The student age range in the classroom is from 12 months to 5 years of age. Before data are presented, used in publications, or used in theses an informed consent form will be sent home to the parents asking for permission to use their child's data. The parents will be assured that neither names nor any other identifying information will be used in publications, presentations, or in the theses. Whether or not the parents consent for our use of the data for the theses, publications, and presentations their children's performance will still be closely monitored and their children will receive any improved training programs that are developed. Undergraduate and graduate student tutors record daily performance data for each child and will not be asked to perform any additional tasks not included as a regular part of their practica.

### **Informed Consent Process**

All data collection methods that involve the children participating in this study are used as a regular part of the undergraduate and graduate practica during which this study will take place. All parents participating in the use of their child's data will receive two copies of an informed consent document asking permission for their data to be used confidentially for theses, publications, and/or presentations. They will have the opportunity to sign and return one copy and keep the other copy for their records. As stated earlier, all results will be displayed confidentially for each participant. The consent forms will be returned to Dr. Richard Malott. The focus of our data collection process will be the performance of the children, not the performance of the tutors. The tutors and classroom teacher will only be asked to perform the duties already required as part of their regular obligations. For HSIRB protocols concerning the practicum students, see the section below, though data concerning their performance will not be part of this study.

### **Research Procedure**

As part of standard classroom procedure Richard Malott, his graduate students, and the Early Childhood Developmental Delay (ECDD) classroom staff are constantly working to improve all aspects of the treatment provided to the children to improve each individual child's performance. This standard procedure involves an initial Pre-primary Evaluation Team assessment (PET), yearly IEP goal-setting meetings between Croyden staff and parents, parent meetings, data collection, data analysis, changes made to the training system based on the data analyses, and continuous quality improvement of all procedures, data collection methods, and treatment methods. Specifically, data collected include the percentage of correct responses for each child for the procedures assigned to him or her as part of enrollment in Croyden Avenue School, the occurrence of problem behaviors, and skills obtained throughout their time at Croyden Avenue School. Examples of areas that may be addressed in this study include prompting strategies, skill maintenance, generalization, transfer of training, and revisions of skill acquisition procedures. All improvements made to classroom training procedures are part of standard continuous quality improvement designed to constantly improve the service provided to the children in the classroom. All data sources are already part of the

undergraduate and graduate practica through Western Michigan University. These projects and their approved HSIRB Project Number are as followed:

- Pre-Practicum: 06-12-12
- Intermediate/Advanced Practicum: 08-11-15
- Language Facilitation Training System: 06-12-09

### **Methodology**

The model for this study will be an intensive case study model (Green, Brennan, & Fein, 2002) that includes continuous empirical assessment and improvements made based on these assessments, as well as based on the goals of the parents and the classroom teacher. Performance data for the children involved in the study are collected and evaluated as part of the normal duties of the Croyden Avenue Early Childhood Developmental Delay (ECDD) preschool classroom.

### **Risks and Costs to and Protections for Participants**

There are no known risks to the participants.

### **Benefits of Research**

A primary objective of this study is to thoroughly evaluate the performance of the children involved in this study and work to continuously improve their instructional procedures and their skill acquisition as well as the other children in the classroom.

### **Confidentiality of Data**

The data collected will be stored on a computer disk for at least three years. The computer disk will be filed and locked in Richard Malott's lab. Once all paper data have been analyzed and compiled for presentation, the original copies of the data will be stored in a box, and locked in a psychology lab at Western Michigan University. The only people who will have access to the disk and paper data will be Nicholas Weatherly and Richard Malott.

### **References**

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