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Prompt Level: Examination of Whether Preference and Effectiveness Correspond in Children With ASD

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by

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ABSTRACT

Individuals diagnosed with Autism Spectrum Disorder (ASD) may be taught novel skills using various prompting strategies. Some studies have compared effective prompting procedures for these learners. Results have shown that no single procedure has been effective for all learners. Instead, efficiency of each response prompt type varied across participants. Some research suggests that identifying an individual's preference may help identify an effective treatment. However, it is unknown if response prompt preference corresponds with effectiveness. Thus, the purpose of the present study is to evaluate whether preference corresponds with the most effective response prompt in children with ASD.

CHAPTER ONE:

INTRODUCTION

Individuals with Autism Spectrum Disorder (ASD) typically exhibit impairments in verbal and non-verbal communication and social interactions (Lord et al., 2000). In addition, many of these individuals find it difficult to acquire skills (Noens & van Berchelaer-Onnes, 2004; O'Brien & Pearson, 2004). These characteristics pose considerable challenges in the education of people with ASD (Noens & van Berchelaer-Onnes, 2004).

Many studies have been conducted to help individuals with ASD who have difficulty acquiring skills. These studies have focused on improving skills in the domains of communication (Noens & van Berchelaer-Onnes, 2004; Polick, Carr, & Hanney, 2012), daily living (Demchak, 1989; Horner & Keilitz, 1975), vocational activities (McKay, Weiss, Dickson, & Ahearn, 2014), social involvement (Szumski, Smogorzewska, Grygiel, & Orlando, 2017), and play (Libby, Weiss, Bancroft, & Ahearn, 2008). Research has also shown that behavioral deficits can lead to problem behavior that may further hinder skill acquisition (Demchak, 1989; Sigafoos, 2000; Weeks & Gaylord, 1981). The learning deficits exhibited by individuals with ASD implicate the need for intensive learning (e.g., discrete-trial learning) outside of the natural environment (Noens & van Berchelaer-Onnes, 2004).

Response Prompts

Response prompts (e.g., verbal, gestural, model, physical) are one extensively researched strategy to help individuals with ASD acquire various skills (e.g., Libby et al., 2008; Seaver & Bourret, 2014). Previous researchers have attempted to determine which response prompts are

the most effective in teaching novel skills to individuals with ASD. Many of these studies demonstrated that a single prompting method was not the most efficient across participants. Instead, efficiency of each response prompt varied across participants (Cengher et al., 2015; Leaf et al., 2016; McGhan & Lerman, 2013; Seaver & Bourret, 2014). For example, Seaver and Bourret (2014) compared the effects of verbal and gestural prompts, model prompts, and physical prompts in teaching 10 individuals between 7 and 20 years of age diagnosed with ASD to build Lego® models. The experimenters used forward chaining to teach all of the steps in building the Lego® models. In the first experiment, the researchers used a progressive time-delay (PTD) to fade each prompt. The PTD began with an immediate prompt and gradually increased to a 1-s delay, 2-s delay, 4-s delay, and then no prompt. During the no prompt condition, if the participant did not respond after 5 s for two consecutive trials, the 4-s delay was reintroduced. The experimenters found that faster acquisition occurred with model prompts for six participants, physical for two participants, verbal and gestural for one participant, and the results were inconclusive for the final participant.

In contrast to Seaver and Bourret (2015), Cengher et al. (2015) conducted a less extensive response prompt assessment with three 5-year-old children diagnosed with ASD. They evaluated the effects of several response prompts on the completion of 10 one-step instructions. The response prompts included a vocal discriminative stimulus alone (no prompt), model prompt, gestural prompt, and physical prompt. Some participants' behavior were assessed in additional conditions that involved several variations of partial physical prompts. During the vocal discriminative stimulus alone condition, the researcher stated the instruction (e.g., "Jump!"), and the child was given 5 s to respond. In the model prompt condition, the researcher stated the instruction, immediately demonstrated the response, and allowed the child 5 s to

respond. In the gestural condition, the researcher stated the instruction followed by pointing to the correct picture and allowed the child 5 s to respond. In the physical prompt condition, the researcher stated the instruction followed by hand-over-hand guidance and allowed the child 5 s to respond. Conditions that involved partial physical prompting were similar to the physical prompt condition, except researchers prompted with a light touch on the participant's arm after the vocal discriminative stimulus was provided. There were no programmed consequences provided across conditions. The experimenters found that participants engaged in the highest level of correct responding during the physical prompt condition. The studies conducted by Cengher et al. and Seaver and Bourret suggest the need for using individualized assessments to identify efficient response prompts.

Preference

Several studies recommend including participants' preference in developing individualized treatment plans (Couper et al., 2014; Leaf et al., 2016; Son, Sigafoos, O'Reilly, & Lancioni, 2006; van der Meer, Sutherland, O'Reilly, Lancioni, & Sigafoos, 2012). Some studies found faster acquisition occurred with procedures that were the most preferred by their participants (Couper et al., 2014; van der Meer et al., 2012). In addition, these studies suggest the participants' most preferred procedures lead to better maintenance of the target behavior. Although research suggests that participants' preference is important, there is little research on the evaluation of preference for response prompts. Identifying preference for response prompts could provide clinicians with an alternative method of identifying the most effective response prompt for their clients. In addition, using the most preferred response prompt may enhance maintenance of the target behavior. Thus, the purpose of the present study was to evaluate whether preference corresponds with the most effective response prompt in children with ASD.

We conducted an assessment to determine the most effective response prompt for each participant and evaluated whether the most effective prompt is also the most preferred. In addition, we conducted a preference assessment prior to baseline and following training, to determine whether preference would change after increased exposure to the prompt conditions. This allowed us to consider the role of prompt efficacy in the development of preference.

CHAPTER 2:

METHOD

Participants, Setting, and Materials

Five children diagnosed with ASD were recruited to participate in the study. Cole was a 9-year-old male with limited three-word vocal mands. He also had a concurrent diagnosis of failure-to-thrive. Noah was a 5-year-old male who communicated using one-word vocal mands. Grace was a 7-year-old female who communicated with fluent speech. Kayla was a 7-year old female who communicated with three-word mands via picture exchange. Miles was a 5-year-old male who communicated with four to five-word vocal mands. All participants attended schools for children with ASD and also received behavioral services throughout the week. Research sessions were conducted at home for Miles. Research sessions for the remaining participants were conducted at the clinic in which participants received behavioral services. Kayla and Miles did not complete the study. Kayla engaged in problem behavior that prevented us from running sessions, and Miles demonstrated that he was able to independently complete all the tasks that we assessed.

A pre-screening questionnaire developed by the primary investigator was provided to the participants' behavior analysts to gather information about each participant's problem behavior, communication, and skill level. Individuals were eligible to participate in the study if the skills described in this study were not already part of their receptive repertoire and they did not typically engage in severe problem behavior. Because we conducted our research during the sessions in which each participant received behavioral services, we assessed skills based on

clinical relevance. The pre-screening tool aided us in determining relevance. The information we collected from it allowed us to identify which skills were already targeted and which had not yet been or just started being targeted with behavioral services. Cole and Kayla could match identical and non-identical pictures and objects but could not match associated pictures. Noah could match identical and non-identical pictures and objects, associated pictures, and could tact all letters of the alphabet. However, he could not vocally identify letter sounds or read words. Grace and Miles could match identical and non-identical pictures and objects, associated pictures, vocally identify all letters and their sounds and were reported to have limited skills in reading words.

All participants were reported to engage in minimal-to-no problem behavior when presented with demands. However, Kayla engaged in excessive amounts of disruptive behavior that prevented us from conducting a sufficient number of sessions. The topography of disruptive behavior included laughing while turning away from stimuli during task presentation, grabbing and hiding stimuli under the table or under her upper legs, standing on top of her seat, or sliding out of her seat to go under the table. We terminated Kayla's involvement in the study during the initial preference assessment, because the high levels of problem behavior interfered with conducting sessions.

The screening questionnaire was also used to gather information on each participant's history with response prompts (e.g., what response prompts the participant has already experienced). Previous research has shown that faster skill acquisition may occur with the most recently used prompt procedure (Coon & Miguel, 2012). We used the pre-screening tool was to take into to consideration whether a history of exposure to different response prompts may have influenced prompt effectiveness and preference. All participants were reported to have been

exposed to all the response prompts throughout the course of their behavioral services, including within 30 days prior to their beginning the study.

All sessions were conducted at the participants' home or the clinic in which they received behavioral services. Throughout the study, participants were seated at a desk and the experimenter was seated across from or next to the participant. The materials included several tasks, four different-colored backgrounds using folders or sheets of construction paper, and data sheets. Each background color corresponded with a response prompt condition, but the color-condition relations varied across participants. For example, an orange background was used for the gestural condition with Cole, but a purple background was used for the same condition with Grace. Various match-to-sample tasks (e.g., matching associated pictures, matching words to pictures) were identified on an individual basis and were determined based on each participants' skill level. Cole and Kayla were assigned tasks involving matching associated pictures. Grace was assigned tasks involving matching three-letter words to pictures. Noah was assigned tasks involving matching letters to pictures beginning with the same letter. For Noah's tasks, the names for each picture were also printed at the bottom of each picture in all lowercase letters. Miles demonstrated he could match a sufficient number of three-letter words to pictures when tasks were being identified. Miles was excluded from the study, because we were unable to identify a clinically relevant, alternative skill that we could use in the study. All pictures and letters were approximately 2.5 by 2.5 in, printed on paper, and laminated. All words were written on 3 by 5 in index cards.

Response Measurement

An independent correct response for the match-to-sample tasks was scored when the participant placed the sample stimulus on top of its corresponding comparison stimulus within 2

s of the discriminative stimulus (S^D) provided by the experimenter. The sample stimulus must have overlapped with at least half the comparison stimulus to be considered correct. Independent correct Reponses were also scored whenever the participant pointed to or grabbed the corresponding comparison stimulus within 2 s of the S^D provided by the experimenter. An error was scored if the participant placed the sample on top of a non-corresponding comparison stimulus, failed to respond within 2 s (i.e., no response), required a prompt (i.e., error correction) or responded in such a way that the sample stimulus overlapped with less than half the comparison stimulus. An error was also scored whenever a participant pointed to or grabbed a non-corresponding comparison stimulus. A correct response following error correction was not considered an independent correct response but was scored as a correct response following a prompt. Incorrect or no responses following the prompt were scored as well. Repeated errors were not scored. We collected data on the frequency of independent correct responses, correct responses following a prompt, and errors on a trial-by-trial basis using paper and a writing tool. Percentage of independent correct responding was calculated at the end of each session by dividing total number of independent correct responses by the number of trials in a session (i.e. nine trials) and multiplying by 100%. Percentage of correct responding following a prompt was calculated by dividing the total number of correct responses after the prompt by the number of prompting opportunities and multiplying by 100%.

During the preference assessments, data were collected on selections. A selection was scored when the participant pointed to, touched, or grabbed one of the initial-link stimuli (i.e., colored background) or the associated task when they were displayed in an array. Percentage of selections were calculated by dividing the total number of selections for a condition by the number of opportunities to select the condition.

Interobserver Agreement

A second observer was trained to collect data for the baseline, RPA phases and modified RPA phases, task re-assignment phases, and both preference assessments for all participants. The average agreement across participants was 97.9%, with a range from 81%-100%. Both observers collected data on independent correct responses and errors in baseline and training phases and the selections made during the preference assessments. Trial-by-trial interobserver agreement was assessed each session by dividing the number of trials with agreement by the total number of trials and multiplying by 100%. An agreement was defined as the same response or absence of a response recorded by both observers. Data were collected during 49% of sessions for Cole, with a mean agreement of 98.5% (range, 97%-100%). Data were collected during 34% of sessions for Noah, with a mean agreement of 95.3% (range, 81%-100%). For Kayla, data were collected for 40% of sessions, with a mean agreement of 100%.

Treatment Integrity

An independent observer collected data using checklists (See Appendix) developed for each task to verify correct implementation by the experimenters (e.g., an observer recorded a correct response if the experimenter provided the S^D and an incorrect response if the experimenter failed to do so). The independent observer scored each step as correct or incorrect and reported the percentage of responses scored correctly. Treatment integrity was measured as the percentage of steps performed correctly and the percentages were averaged across sessions in the baseline, RPA phases and modified RPA phases, task re-assignment phases, and both preference assessments for all participants. The average integrity score across participants was 97.9%, with a range of 80%-100%. Treatment integrity was assessed for an average of 32.3% of sessions for Cole, with an integrity score of 100%. Treatment integrity was assessed for an

average of 46% of sessions for Noah, with an integrity score of 99.5% (range, 80%-100%). Treatment integrity was assessed for 50% of sessions for Kayla, with an integrity score of 94.4% (range, 86%-100%).

Procedure

The experimental design consisted of a reversal with an embedded multielement. The four conditions evaluated were S^D alone, gestural prompt, model prompt, and physical prompt. Each condition included three tasks resulting in a total of 12 tasks across all conditions for the baseline phase, response prompt assessment phases—including the RPA phases that were modified—and task reassignments phases. During each condition, each task was presented three times each and interspersed throughout the session. In addition, each condition was associated with a different colored background, and the tasks were presented on their corresponding colored backgrounds. The same set of tasks were used across the baseline, response prompt assessments, and task reassignment phases. A separate set of tasks were used for the preference assessments (i.e., initial and final preference assessments), but the tasks were the same across both assessments. A total of four tasks were used across both preference assessments, one for each condition.

Task identification. Prior to conducting the assessments, we identified the tasks that would be assigned to each condition. Cole was the first participant in the study, and the task identification procedures for him were different from those of the remaining participants due to Cole's responding during the baseline phase. For Cole, two to three trials were conducted per task until a total of 16 tasks were identified. Four of the tasks were used for the initial and final preference assessments and the remaining 12 tasks were used in the baseline and response prompt assessment phases. When identifying tasks, the experimenter first displayed an array of

three comparison stimuli in front of Cole. Next, the experimenter provided the S^D by saying, "match" and handed the sample stimulus to Cole. The experimenter then waited 2 s for a response or no response. No programmed consequences were provided for a response or no response. The experimenter simply initiated a second trial with the same array. Tasks were included in the study when Cole made an error or did not respond across two trials. When Cole made an error during one of the two trials, an additional trial was conducted with the same array. If Cole made an error on the third trial, the task was included in the study. Tasks were excluded from the study whenever Cole engaged in correct responding for two of two or two of three trials. After we identified 16 tasks for Cole, four of the tasks were assigned to each of the four conditions in the preference assessments while the remaining 12 tasks were assigned to each of the four conditions in the baseline and response prompt phases. All tasks were assigned using Random Group Maker ©, an online random assignment generator. However, during baseline, Cole would respond correctly with certain tasks for three out of the three trials in which the tasks were presented within a session. We would often have to identify additional tasks and restart baseline. This happened several times, suggesting that using three trials in the task identification assessment was not enough to determine whether the skill was already in Cole's repertoire. As a result, modifications were made to the identification procedures for the remaining participants.

For the remaining participants, procedures were similar to Cole's, except three to five trials were conducted per task until the total of 16 tasks were identified. Each participant's tasks are displayed in Table 1. A task was added to the study if the participant made an error or did not respond across three trials. A task was excluded from the study if the participant engaged in correct responding for at least three and up to five trials. The same random assignment method for Cole was used for the remaining participants after 16 tasks were identified.

Table 1. Tasks Identified for Each Participant

Participants	Unknown Sample Stimuli	Known Sample Stimuli	No. Tasks Assessed
Cole	Trash bag (trash can), shirt (shorts), candle (cake), dustpan (broom), watering can (flowers), scissors (glue), baseball (bat), money (wallet), needle (thread), key (lock), tissue (nose), chalk (chalk board), bookmark (book), kneepads (knees), jacket (snow), deodorant (armpit)	Paint brush (paint), nail (hammer), toothbrush (toothpaste), pillow (bed), cap (gown), umbrella (rain), shovel (bucket), spider (web), pasta (strainer), train (railroad tracks)	39
Noah	W (watermelon), T (tiger), O (octopus), H (hat), D (dog), L (lion), E (elephant), U (umbrella), S (snake), P (pig), A (apple), G (grapes), M (mouse), B (ball), C (cat), F (flower)	Z (zebra)	17
Grace	Sun, cup, bus, bed, pen, bat, cat, bug, dog, leg, boy, tub, mop, key, ant, eye	Cow	20
Kayla	Drum (drumsticks), toothpaste (toothbrush), trashcan (trash bag), TV (remote), bowl (spoon), glasses (eyes), cake (candle), bubble bottle (bubble wand), toilet (toilet paper), hair brush (comb), chair (table), shirt (shorts), pencil (paper), baseball (bat), socks (shoes), dustpan (broom)	Paintbrush (paint), knife (fork)	18
Miles	Egg, bus, ten	Fox, owl, hat, cow, pig, bee, ear, key, sun, car, cat, eye, cup, two, six, red, bed	20

Note. Words in parentheses are the corresponding comparison stimuli.

Preference assessment. A preference assessment was conducted before the response prompt assessment. A Multiple Stimulus Without Replacement (MSWO; DeLeon et al., 2001) with an embedded concurrent chains arrangement was used to identify the preferred response prompt. The initial link stimuli were the colored backgrounds associated with each condition. The terminal links involved the experimenter delivering the corresponding response prompt to teach a single task.

Pre-session exposure. Prior to the beginning of the first session conducted each day, we exposed the participant to the contingencies associated with each colored background. A demonstration of each condition was provided with the tasks from each condition. To illustrate, the experimenter displayed four different colored folders enclosing a task in front of the participant. Next, the experimenter pointed to each task and told the participant, "If you pick this,

here's what happens." The experimenter then proceeded to provide the S^D immediately followed by contact to the terminal link. To demonstrate the S^D alone condition, the experimenter provided the S^D and waited 2 s for a response. No programmed consequences were provided for a response or no response. The experimenter simply pointed to the next task, repeated "If you pick this, here's what happens" and demonstrated the condition. To demonstrate the gestural condition, the experimenter presented the S^D immediately followed by pointing to the corresponding comparison stimulus. Again, no programmed consequences were provided for a response or no response. For the model condition, the experimenter presented the S^D immediately followed by demonstration of the correct response, and no programmed consequences were provided for a response or no response. For the physical condition, the experimenter provided the S^D and immediately guided the participant's hand to the corresponding comparison stimulus. The experimenter performed this exposure session until the participant was exposed to each of the four terminal links two times each.

Initial preference assessment. Ten sessions with up to four trials each were conducted during the assessment. At the start of each session, the experimenter displayed each folder with the tasks enclosed in front of the participant and instructed the participant to pick a set of tasks from the array. A selection was immediately followed by access to the terminal link and removal of the remaining tasks from the immediate area. Simultaneous selecting was blocked, and no differential consequences were provided for alternative responses in the initial link. Each trial consisted of a single presentation of the task within the selected condition. In other words, each task was used one time in the demonstration of the selected prompt condition. Prior to the next trial, the order of the folders were rearranged by switching the left-most folder to the right end and shifting each folder so that they were of equal distance to each other and the participant.

The second trial followed, and the same procedures were used until all folders were selected or no folder was selected within 25 s from the beginning of a trial. On a trial in which no selection was made, the session was terminated, and all remaining tasks recorded as "not selected."

Baseline. During baseline, we evaluated the percentage of independent correct responding in each session. However, procedures were identical for each prompt condition in baseline. One condition was implemented per session in recurring order. This order differed across some participants. For example, conditions for Cole were presented in the order of S^D alone, gestural, model, and physical prompt. Conditions for Grace were presented in the order of model, gestural, S^D alone, and physical prompt. Each session consisted of nine trials in which each task was presented three times each and interspersed throughout the session. The corresponding comparison stimulus was always displayed in a different position relative to the other two comparison stimuli. To illustrate a session in the S^D alone condition, the experimenter first displayed the three comparison stimuli from a task on a colored background in front of the participant. The corresponding comparison stimulus was the first picture in the array. Next, the experimenter provided the S^D by saying "match" and handed the sample stimulus to the participant. The experimenter waited 2 s for a response. No programmed consequences were provided for a response or no response. The experimenter simply initiated a new trial following the participant's response or no response. During the next trial, the corresponding comparison stimulus was the second or third picture in the array. The session ended following the ninth trial, and the next session began with the next prompt condition. I f the participant's scores were equal to or below 44% for three consecutive sessions in each condition and at least one error was made per task within each session, the participant moved on to the response prompt assessment. If the participant's scores were above 44% or three correct responses were made on a task within a

session, the task associated with the three correct responses was replaced with another and baseline was restarted.

Response prompt assessment. The response prompt assessment phase was conducted similar to baseline, except, praise (e.g., "You got it! High five!") was provided for independent correct responses and prompts were used for errors, when applicable. Praise was not provided for errors or no responses. This included responses that followed error correction. To control for the length of each session across conditions, trials were presented approximately every 25 s in each session. The S^D alone condition was conducted similar to baseline in order to serve as the control to assess whether the participant would perform the correct response in the absence of prompts. Praise was provided for independent correct responses, but no consequences were provided for errors in this condition. The experimenter simply initiated the next trial once 25 s elapsed. In the gestural condition, the experimenter provided the S^D and waited 2 s for a response. If the response was an error or there was no response, the experimenter re-presented the S^D, immediately pointed to the corresponding comparison stimulus, and waited 2 s for the participant to respond. Verbal praise was provided for independent correct responses. No feedback was provided for a response following error correction, whether the response was correct or a repeated error. The experimenter simply initiated a new trial. In the model condition, a set of comparison stimuli was displayed in front of the participant. The experimenter then provided the S^D and waited 2 s for a response. If an error occurred or there was no response, the experimenter re-presented the S^D and immediately demonstrated the correct response. If the S^D was followed by an independent correct response, praise was provided. In addition, no feedback was provided for any response following error correction, and a new trial was initiated. In the physical prompt condition, the experimenter provided the S^D and waited 2 s

for a response. If the participant made an error or did not respond, the experimenter re-presented the S^D, and guided the participant's hand to the corresponding comparison stimulus. Verbal praise followed independent correct responses. An independent correct response was scored when the participant placed the sample stimulus on top of its corresponding comparison stimulus without being prompted. This phase was terminated after the participant scored at 78% or above for three consecutive sessions in at least one condition and no more than one error occurred with each task during those three consecutive sessions at or above 78%.

RPA plus edible. A modification was made to the RPA phase because Cole and Noah did not demonstrate an increase in independent correct responding after 40 and 24 sessions, respectively. Therefore, edible reinforcement was added for both participants in the RPA plus edible phase to increase motivation to engage in independent correct responding. We conducted an MSWO to determine each participants' highly preferred edible items to use during this phase.

RPA and edible plus tasks presented in consecutive order. According to the data, Cole responded in a way that suggested a position bias and did not engage in consistent independent correct responding. Therefore, an additional change was made to the procedures by presenting the same tasks in consecutive order (TCO) each session as opposed to interspersing each task throughout the session.

RPA and edible plus modified task presentation. Noah did not demonstrate an increasing trend in independent correct responding when edible reinforcement was added. Since the start of the study, he had been engaging in stereotypy and did not attend, or orient his gaze, to the stimuli. Therefore, we modified the task presentation (MTP). We attached the array of comparison stimuli to the colored backgrounds with Velcro and raised them in an upright position on an easel. The experimenter then required Noah to engage in an observing response.

That is, the experimenter raised the sample in front of Noah's face and requested him to label the sample by asking, "What letter?" and waited 2 s for Noah to respond with the letter on the card. If no responding occurred, the experimenter provided a full vocal prompt (e.g., "say B"). The vocal prompt was presented every 2 s until Noah repeated the letter. Following the observing response, the experimenter instructed Noah to match the sample stimulus but held on to the sample rather than handing it to Noah. This was done in order to prevent Noah from rubbing the sample stimulus on his body, which was one of the topographies of Noah's stereotypy. The experimenter then waited 2 s for Noah to respond. An independent correct response was followed by specific praise (e.g., "Good job matching 'E' for elephant!") and an edible. No programmed consequences were provided for prompted responses.

Final preference assessment. This preference assessment was identical to the initial preference assessment, including pre-session exposure to each of the terminal links.

Task reassignment. Following the final preference assessment tasks from the condition with the lowest average score in the response prompt assessment were reassigned to the condition that was identified as most effective in that phase. For example, if the tasks from the S^D alone condition were associated with the lowest average score in the response prompt assessment, and model prompting was identified as the most effective condition in that phase, then model prompting was used to teach the tasks from the S^D alone condition. The prompting procedure was conducted identical to the procedures outlined in the response prompt assessment. The task reassignment phase was terminated when the participant scored at 78% or above for three consecutive sessions and no more than one error occurred with each task in each of the three consecutive sessions.

CHAPTER THREE:

RESULTS

Figure 1 displays the results for the MSWO from the initial and final preference assessments for Cole, Noah, and Grace. The graph for Kayla's results from the initial MSWO is also displayed in Figure 1. The model prompt condition was slightly more preferred than the other conditions for Cole , Noah, and Grace across both assessments. The model condition became slightly more preferred in the final MSWO for the three participants. The gestural condition was slightly more preferred than the other conditions for Kayla.

Figure 2 displays results of the baseline, RPA phase, and modified RPA phase for Cole. Cole's independent correct responding was under 44% for each session in baseline (range, 11% to 33%). During the RPA phase, Cole's independent correct responding ranged from 11%-55% across sessions. Cole's scores for independent correct responding remained near baseline levels in both the RPA plus edible phase and the RPA and edible plus TCO phase across all conditions. For the gestural condition, prompted correct responding ranged from 71% to 100% in the RPA phase and remained at 100% across the RPA plus edible phase and the RPA and edible plus TCO phase. For the model condition, prompted correct responding ranged from 0% to 17% in the RPA phase and remained at 0% across the RPA plus edible phase and the RPA and edible plus TCO phase. Cole did not acquire the response in any of the conditions. The second graph in Figure 2 displays the results of the baseline and RPA phases for Noah. Independent correct responding was under 44% for each session in baseline (range, 0-33%) and remained under 44% in the RPA phase and the RPA plus edible phase. Independent correct responding increased to a

range of 0% to 44% in the RPA and edible plus MTP phase but remained below acquisition criteria across conditions. For the gestural condition, prompted correct responding ranged from 22% to 78% in the RPA phase, 38 to 86% in the RPA plus edible phase, and 44% to 100% in the RPA and edible plus MTP phase. For the model condition, prompted correct responding ranged from 23% to 43% in the RPA phase, 0% to 22% in the RPA plus edible phase, and 0% to 40% in the RPA and edible plus MTP phase. Noah did not acquire the response in any of the conditions. Grace's scores in the baseline, RPA, and task reassignment phase are displayed in the third graph in Figure 2. Scores for independent correct responding were at 44% or less across sessions in baseline (range, 22-44%). In the RPA phase, scores for independent correct responding showed an increase from baseline with scores ranging from 22% to 100%. Grace met mastery criteria in the RPA phase with the physical prompt condition. For prompted correct responses in the RPA phase, scores ranged from 67% to 100% for the gestural condition and from 33% to 100% for the model condition. In the task reassignment phase, tasks from the S^D alone condition were reassigned to the most effective condition from the RPA phase, which was the model prompt condition. In this phase, scores for independent correct responding ranged from 78% to 100%. Scores for prompted correct responses were 100% across sessions. Grace met mastery criteria in the task reassignment phase after three sessions.

Figure 3 shows results of Cole's middle-biased selections across baseline, response prompt assessment, and modified response prompt assessment phases. Sessions in this graph correspond with those in the aforementioned phases. Bias data was collected for 37 sessions.

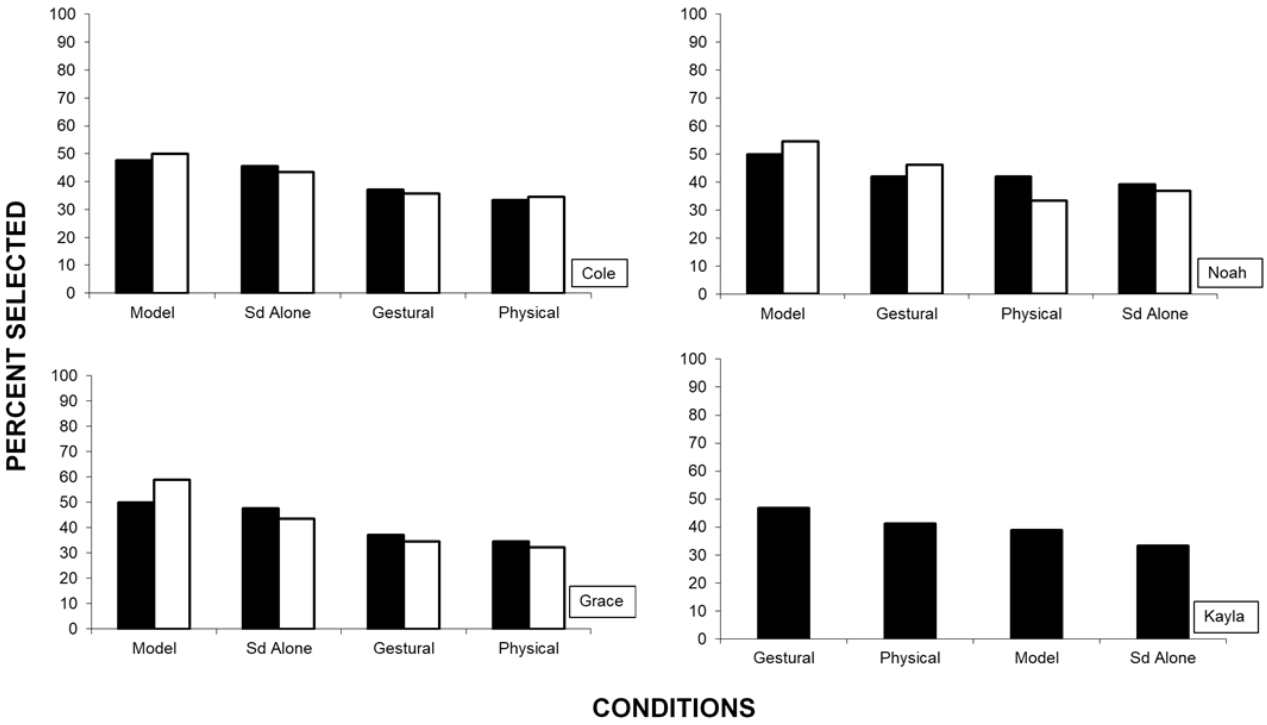

Figure 1. Results of the MSWOs from the initial preference assessments (shaded bar) and final preference assessments (white bar) for Cole, Noah, and Grace. Only initial preference assessment results displayed for Kayla.

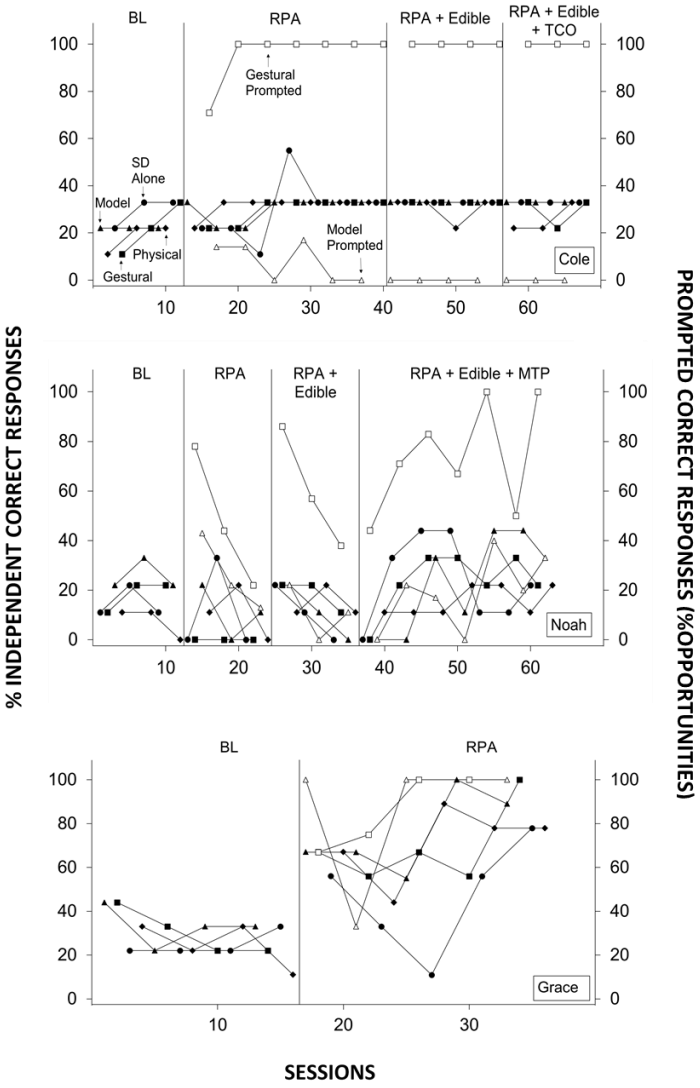

Figure 2. Results of baseline, response prompt assessment phases, and modified response prompt assessment phases for Cole and Noah are displayed in the first two graphs. Results of baseline, response prompt assessment, and task re-assignment phases for Grace are displayed in the third graph. Percentage of independent correct responses are graphed as closed symbols, and percentage of prompted correct responses are graphed as open symbols. Circles represent the S^D alone condition, squares for the gestural condition, triangles for the model condition, and diamonds for the physical condition. Open squares represent prompted responses in the gestural condition, and open triangles represent prompted responses in the model condition.

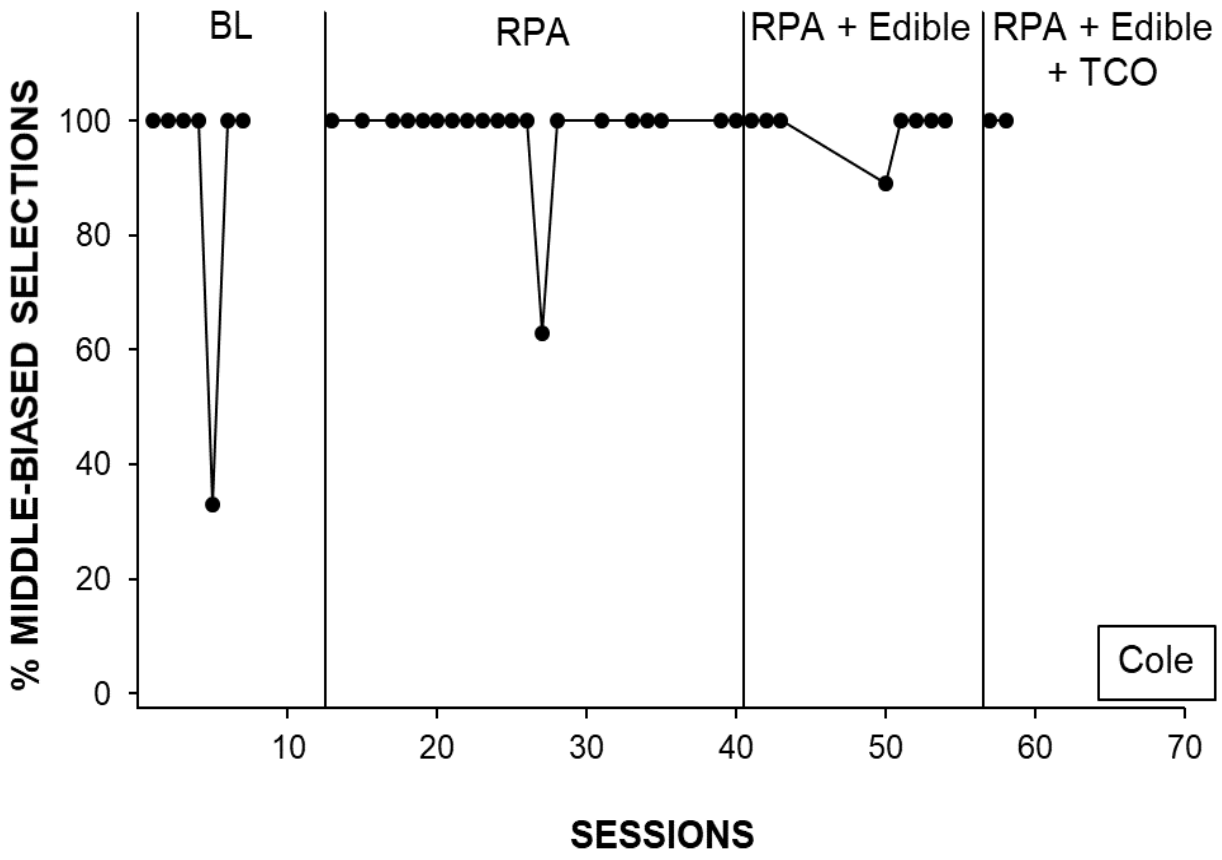

Figure 3. Results of Cole's middle-biased selections across baseline, response prompt assessment, and modified response prompt assessment phases.

CHAPTER 4

DISCUSSION

This study was conducted to evaluate whether preference and most effective response prompt correspond in individuals with ASD. Grace's data were the only dataset that can be used to evaluate correspondence, because both prompt efficacy and preference were demonstrated with only her. The most effective prompt for Grace corresponded with her most preferred prompt condition, which was the model prompt condition.

During the initial MSWO, Grace responded by selecting the right-most folder on each trial for three consecutive sessions, suggesting a position bias. Prior to beginning sessions 4 to 6, we positioned Grace approximately 3 ft away from the table before the experimenter instructed her to make a selection. Again, Grace responded by selecting the right-most task on each trial for each session. Prior to beginning the seventh session, the experimenter switched seats with Grace and remained in those seated positions for the remainder of the sessions in the initial MSWO. Following this switch, Grace responded by selecting folders from various positions in the array. The folder representing the model condition was consistently selected first or second from sessions 7 to 10. Grace's position bias may have influenced the results of the initial MSWO. It is possible that a stronger, or even slightly stronger, preference could have been demonstrated given additional sessions. Grace also appeared to have acquired the response for the task in the S^D Alone condition, because she responded correctly during each session. This may have affected the assessment results as well.

All participants demonstrated a preference for response prompts, however slight. Cole, Noah, and Grace demonstrated a preference for the model prompt condition, and Kayla demonstrated a preference for the gestural condition. Preference for the model prompt condition remained consistent across both MSWOs for Cole, Noah, and Grace. Noah and Grace demonstrated marginally more differentiation in preference across conditions during the final MSWO, suggesting increased exposure to the prompts may have affected preference.

Several factors could have affected the lack of drastically differentiated preference across conditions for each participant. First, it is possible the participants lacked certain prerequisite skills needed for an MSWO with embedded concurrent chains arrangement. Future studies should, first, test for whether participants can track initial and terminal links in concurrent chains arrangements. One way to do this may be to use access to edible reinforcers, after identifying a hierarchy of preferred edible reinforcers, as terminal links. The edible reinforcers could be hidden in different colored cups that serve as the initial links. If selection results are similar to those of the MSWO that was used to identify preferred reinforcers, this may suggest participants can track initial and terminal links. Second, lack of prompt efficacy for Cole and Noah may have corresponded with lack of more differentiated preferences. In other words, the two participants may have not demonstrated a strong preference before or even after copious amounts of repeated exposure, because none of the prompts were associated with much reinforcement. This also suggests that repeated exposure to the terminal links was not enough to facilitate the emergence of a strong preference for these participants. Also, it is possible that Cole and Noah did not acquire the skill, because they may have had a history of slow acquisition of skills. Future research should consider prospective participants' learning history in regard to speed of

acquisition when determining inclusion criteria. Perhaps reviewing participants' data collected from their behavioral searches could provide some insight on rate of acquisition.

None of the response prompts were effective in helping Cole acquire the skill in the assessments. During baseline and RPA phases, data were collected on the position of Cole's selections for 37 sessions (see figure 3). Cole matched the sample stimulus to the middle comparison stimulus for 34 sessions on 100 % of trials across all conditions, suggesting a position bias. Independent correct responding occurred almost exclusively when the corresponding comparison stimulus was displayed in the middle of the other two stimuli. The addition of edible reinforcement to increase motivation seemed to have no effect. After this phase, we conducted a quick probe using the same baseline procedures but with known match-to-sample tasks to observe whether the position bias would remain. The position bias did remain even with known tasks. Next, we probed a different placement of stimuli by presenting the same known task for three consecutive trials. Independent correct responding with known tasks occurred with this method. Therefore, this task presentation order was replicated with the unlearned tasks in an additional phase (i.e., RPA and edible plus TCO) of the RPA. Nonetheless, when sessions in the RPA and edible plus TCO phase were conducted with the unlearned tasks, Cole's position bias returned. Even though correct responding after the gestural prompt was high, independent correct responding (i.e., correct responding that is unprompted) in the gestural condition remained at low levels. If Cole's position bias were to be extinguished, it could be helpful to evaluate whether gestural prompts may be effective in teaching him the skill. Across all assessments, Noah did not attend to the discriminative stimulus and attempted to engage in vocal and motor stereotypy with and without the stimuli. Noah demonstrated stereotypy by repeatedly engaging in the following responses: singing various songs throughout

the assessment, tugging on his shirt or pants while facing away from the stimuli, rubbing his face and feet with his fingers, or rubbing stimuli over his face. It is possible that Noah's low attending to the stimuli could have inhibited acquisition. Also similar to Cole, responding remained low even with the addition of edible reinforcement during the RPA plus edible phase. In the RPA and edible plus MTP phase, changes were made to the stimuli to prevent Noah from using them to engage in motor stereotypy. In addition, an observing response was added to increase the likelihood that Noah would attend to the sample stimulus (Dube & McIlvane, 1999; Eikeseth & Smith, 1992). These changes did not produce acquisition of the skill. It is also possible that Noah lacked pre-requisite skills to complete the tasks. A repertoire of letter sounds may have been helpful to complete the tasks he was assigned.

Kayla was involved in only a portion of the study due to her behaviors inhibiting us from conducting sessions. We were able to conduct seven sessions of the initial MSWO before her behavior escalated to unmanageable levels. Kayla would often not orient towards the stimuli during the MSWO and would sometimes make physical contact with a folder while engaging in problem behaviors, such as standing up and looking away while slamming her hand on the folder. These responses were still scored as selections but may have attributed to her lack of a strong preference in the initial MSWO.

Based on the results of this study, preference as a predictor of efficacy was indeterminable, because correspondence was only demonstrated for a single participant. Future studies should evaluate the correspondence between prompt efficacy and preference with additional participants. Furthermore, research should evaluate alternative preference assessment arrangements for response prompts. If a clear preference can be identified, measuring preference for prompting procedures can serve as an alternative method to determine the most effective

prompting strategy for children with ASD. This could be especially helpful for clinicians, because previous studies have shown better maintenance of skills when using the most preferred treatment (Couper et al., 2014; van der Meer et al., 2012).

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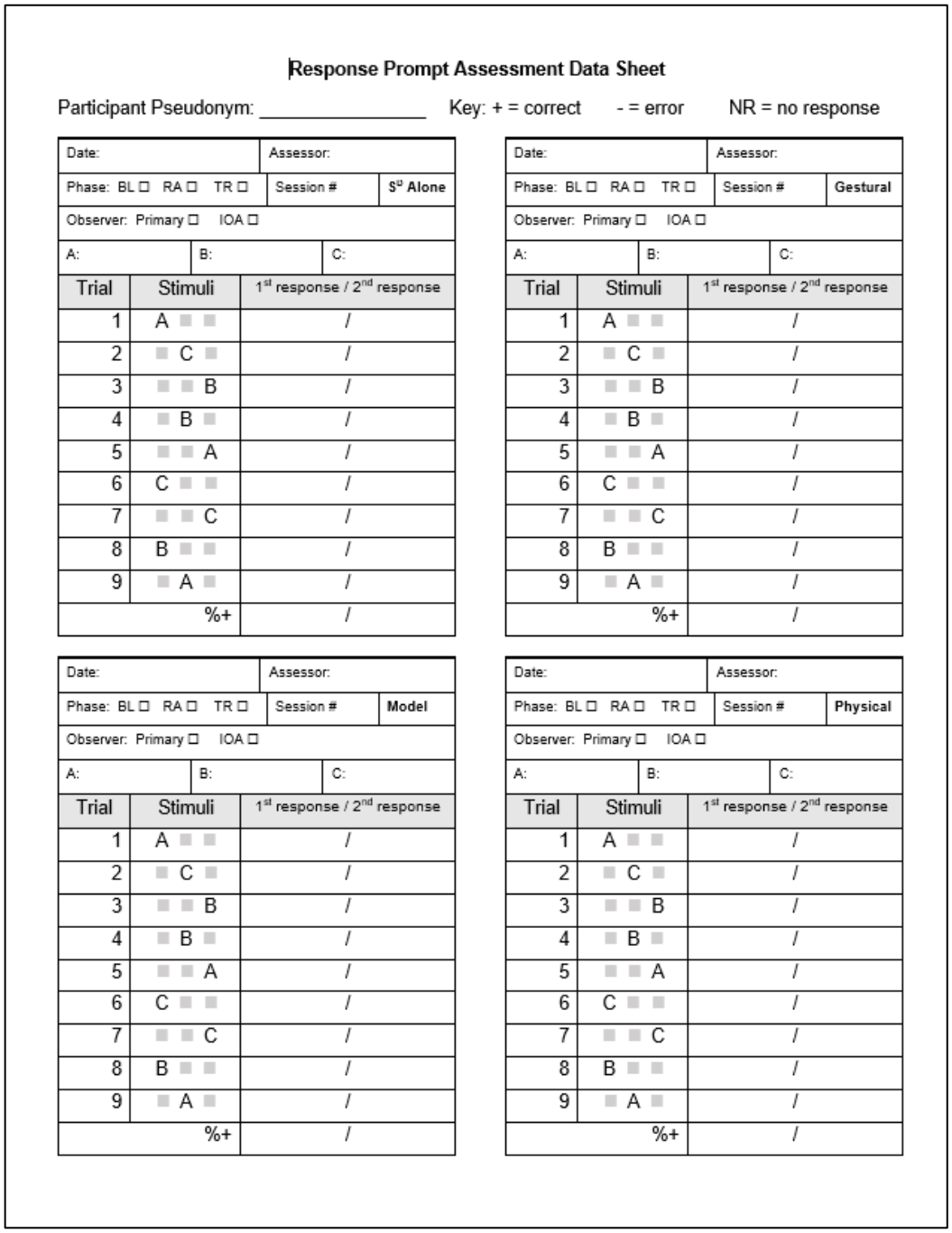
APPENDICIES

Appendix A: Data Sheets



Response Prompt Assessment Data Sheet

Participant Pseudonym: _____ Key: + = correct - = error NR = no response

Date:	Assessor:	
Phase: BL ☐ RA ☐ TR ☐	Session #	S^D Alone
Observer: Primary ☐ IOA ☐		
A:	B:	C:

Trial	Stimuli	1st response / 2nd response
1	A ■ ■	/
2	■ C ■	/
3	■ ■ B	/
4	■ B ■	/
5	■ ■ A	/
6	C ■ ■	/
7	■ ■ C	/
8	B ■ ■	/
9	■ A ■	/
	%+	/

Date:	Assessor:	
Phase: BL ☐ RA ☐ TR ☐	Session #	Gestural
Observer: Primary ☐ IOA ☐		
A:	B:	C:

Trial	Stimuli	1st response / 2nd response
1	A ■ ■	/
2	■ C ■	/
3	■ ■ B	/
4	■ B ■	/
5	■ ■ A	/
6	C ■ ■	/
7	■ ■ C	/
8	B ■ ■	/
9	■ A ■	/
	%+	/

Date:	Assessor:	
Phase: BL ☐ RA ☐ TR ☐	Session #	Model
Observer: Primary ☐ IOA ☐		
A:	B:	C:

Trial	Stimuli	1st response / 2nd response
1	A ■ ■	/
2	■ C ■	/
3	■ ■ B	/
4	■ B ■	/
5	■ ■ A	/
6	C ■ ■	/
7	■ ■ C	/
8	B ■ ■	/
9	■ A ■	/
	%+	/

Date:	Assessor:	
Phase: BL ☐ RA ☐ TR ☐	Session #	Physical
Observer: Primary ☐ IOA ☐		
A:	B:	C:

Trial	Stimuli	1st response / 2nd response
1	A ■ ■	/
2	■ C ■	/
3	■ ■ B	/
4	■ B ■	/
5	■ ■ A	/
6	C ■ ■	/
7	■ ■ C	/
8	B ■ ■	/
9	■ A ■	/
	%+	/

MULTIPLE STIMULUS WITHOUT REPLACEMENT (MSWOR)
Preference Assessment Data Sheet

Name: _____ Date: _____ Assessor: _____

Primary IOA

Initial/Final (Circle one)

Session	Sd Alone	Gestural	Model	Physical

Task Reassignment Data Sheet

Participant Pseudonym: ________________

Previous Phase: _____________________

Reassigned Phase: ___________________

Date: __________ Assessor: ____________

Primary____ IOA_____ Session: _______

A:	B:	C:
Trial	Stimuli	1st response / 2nd response
1	A ■ ■	/
2	■ C ■	/
3	■ ■ B	/
4	■ B ■	/
5	■ ■ A	/
6	C ■ ■	/
7	■ ■ C	/
8	B ■ ■	/
9	■ A ■	/
	%+	/

Date: __________ Assessor: ____________

Primary____ IOA_____ Session: _______

A:	B:	C:
Trial	Stimuli	1st response / 2nd response
1	A ■ ■	/
2	■ C ■	/
3	■ ■ B	/
4	■ B ■	/
5	■ ■ A	/
6	C ■ ■	/
7	■ ■ C	/
8	B ■ ■	/
9	■ A ■	/
	%+	/

Date: __________ Assessor: ____________

Primary____ IOA_____ Session: _______

A:	B:	C:
Trial	Stimuli	1st response / 2nd response
1	A ■ ■	/
2	■ C ■	/
3	■ ■ B	/
4	■ B ■	/
5	■ ■ A	/
6	C ■ ■	/
7	■ ■ C	/
8	B ■ ■	/
9	■ A ■	/
	%+	/

Date: __________ Assessor: ____________

Primary____ IOA_____ Session: _______

A:	B:	C:
Trial	Stimuli	1st response / 2nd response
1	A ■ ■	/
2	■ C ■	/
3	■ ■ B	/
4	■ B ■	/
5	■ ■ A	/
6	C ■ ■	/
7	■ ■ C	/
8	B ■ ■	/
9	■ A ■	/
	%+	/

Appendix B: Treatment Integrity Forms

Treatment Integrity Form

Participant Pseudonym: _____ Date: _____ Assessor: _____

Record a ✓ in the "Yes" column for each step the experimenter performs correctly. Record a × in the "No" column for each step the experimenter performs incorrectly. Record a × in the "N/A" column if the step does not apply.

PA-INITIAL/FINAL (circle initial or final) Session #_____

Procedure	Yes	No	N/A
1. Experimenter displayed each task of an array of three comparison stimuli on different colored backgrounds in front of the participant.			
2. Experimenter instructed participant to select a task from the display by saying, "pick one."			
3. After selection, experimenter provided S^D immediately followed by corresponding prompt for that condition, if applicable, with each task one time			
4. No programmed consequences were provided.			
5. Experimenter removed selected task prior to next trial.			
6. Experimenter moved left-most task to right end prior to next trial.			
7. Experimenter followed steps 1-6 with remaining tasks.			
8. If no task selected within 20 s from beginning of trial, experimenter terminated session.			
% of ✓			

Treatment Integrity Form

Record a ✓ in the "Yes" column for each step the experimenter performs correctly. Record a × in the "No" column for each step the experimenter performs incorrectly. Record a × in the "N/A" column if the step does not apply.

Participant Pseudonym: _____ Date: _____ Assessor: _____

BASELINE Session #_____ Prompt condition_____

Procedure	Yes	No	N/A
1. Experimenter displayed one task of an array of three comparison stimuli on different colored backgrounds in front of the participant.			
2. Experimenter provided the S^D by saying "match" and handed the sample stimulus to the participant.			
3. Experimenter waited 2 s for a response.			
4. Experimenter initiated a new trial approx. every 25 s.			
5. No programmed consequences were provided by experimenter for a response or no response.			
% of ✓			

Participant Pseudonym: _____ Date: _____ Assessor: _____

BASELINE Session #_____ Prompt condition_____

Procedure	Yes	No	N/A
1. Experimenter displayed one task of an array of three comparison stimuli on different colored backgrounds in front of the participant.			
2. Experimenter provided the S^D by saying "match" and handed the sample stimulus to the participant.			
3. Experimenter waited 2 s for a response.			
4. Experimenter initiated a new trial approx. every 25 s.			
5. No programmed consequences were provided by experimenter for a response or no response.			
% of ✓			

Treatment Integrity Form

Record a ✓ in the "Yes" column for each step the experimenter performs correctly. Record a × in the "No" column for each step the experimenter performs incorrectly. Record a × in the "N/A" column if the step does not apply.

Participant Pseudonym: _____ Date: _____ Assessor: _____

RESPONSE PROMPT ASESS. Session #_____ Prompt condition_____

Procedure	Yes	No	N/A
1. Experimenter displayed each task of an array of three comparison stimuli on different colored backgrounds in front of the participant.			
2. Experimenter provided the S^D by saying "match" and handed the sample stimulus to the participant.			
3. Experimenter waited 2 s for a response.			
4. If participant responded incorrectly or did not respond, experimenter re-presented the S^D followed by the corresponding prompt for that condition, if applicable.			
5. No programmed consequences were provided for repeated errors or responses following prompts.			
6. Experimenter provided praise for independent correct responses.			
7. Experimenter initiated a new trial approx. every 25 s.			
% of ✓			

Treatment Integrity Form

Record a ✓ in the "Yes" column for each step the experimenter performs correctly. Record a × in the "No" column for each step the experimenter performs incorrectly. Record a × in the "N/A" column if the step does not apply.

Participant Pseudonym: _____ Date: _____ Assessor: _____

TASK REASSIGNMENT Session #_____

Procedure	Yes	No	N/A
8. Experimenter displayed each task of an array of three picture cards on different colored sheets of construction paper in front of the participant.			
9. Experimenter provided the S^D by saying "match" and handed the label to the participant.			
10. Experimenter waited 2 s for a response.			
11. If participant responded incorrectly or did not respond, experimenter re-presented the S^D followed by the corresponding prompt for that condition, if applicable.			
12. No programmed consequences were provided for repeated errors or responses following prompts.			
13. Experimenter provided praise for independent correct responses.			
14. Experimenter initiated a new trial on an average of 20 s.			
% of ✓			

Appendix C: Pre-screening Tool

Questionnaire

To be completed by supervising analyst for each participant.

1. Which prompting procedures have been used with the participant during implementation of behavioral services? Circle ALL that apply.

   Gestural Model Physical None

2. Which prompting procedures have been used with the participant during implementation of behavioral services WITHIN THE LAST 30 DAYS? Circle ALL that apply.

   Gestural Model Physical None

3. How does the participant communicate? Circle ALL that apply.

   Vocal Signs AAC device Other_____ (please specify)

4. How would you rank the severity of the participant's problem behaviors when presented with tasks? Circle ONE.

   Low intensity Moderate intensity High intensity

5. How would you rank the participant's reading skills? Circle ONE.

Proficient 3-4 letter words Cannot read Unknown Other_____

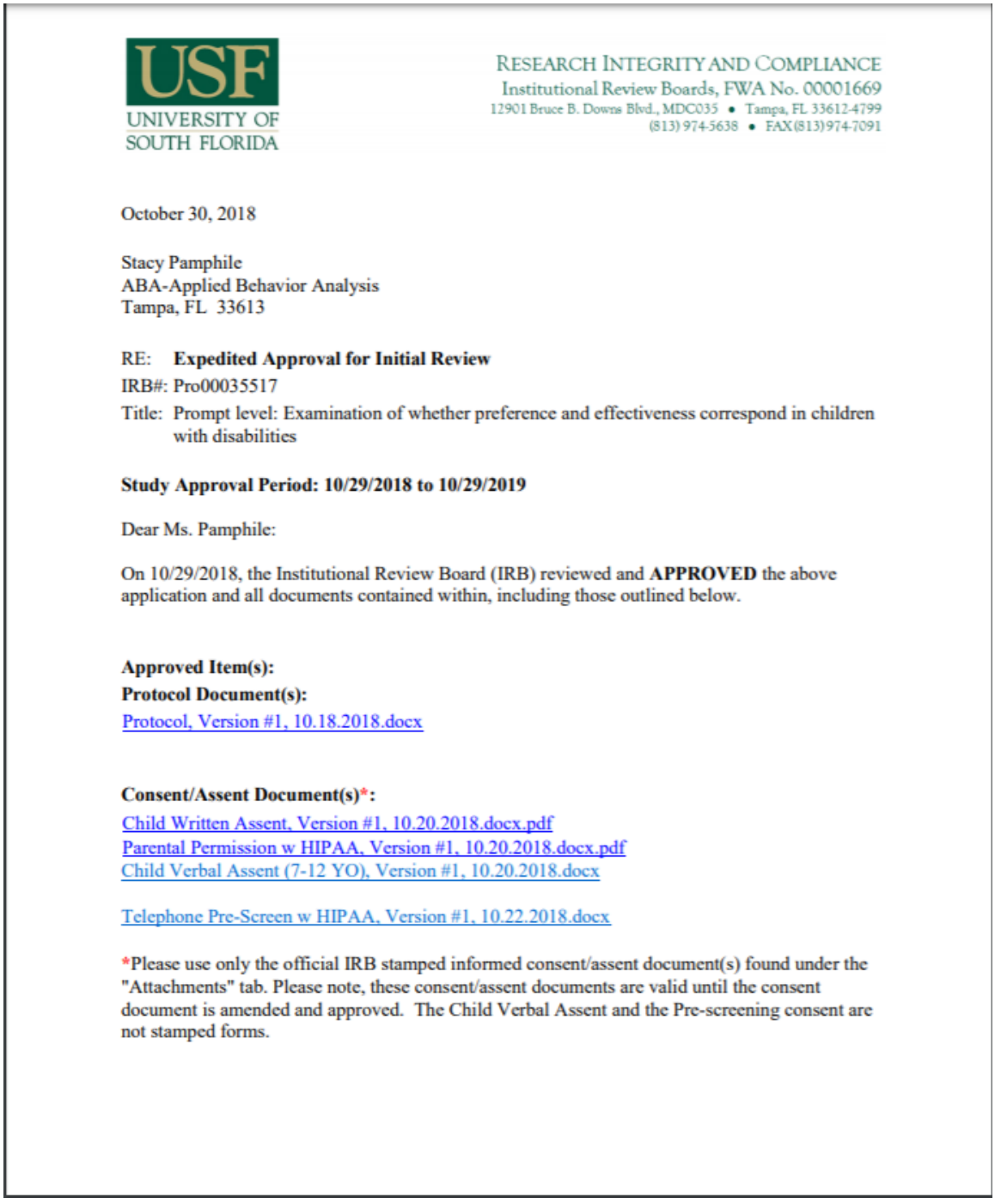
6. What match-to-sample tasks can the participant currently perform proficiently? Check ALL that apply.

   Identical pictures/objects____ Non-identical pictures____

   Associated pictures____ Objects to pictures/pictures to objects____

   None____ Unknown____

Appendix D: USF IRB Approval Letter



USF
UNIVERSITY OF SOUTH FLORIDA

RESEARCH INTEGRITY AND COMPLIANCE
Institutional Review Boards, FWA No. 00001669
12901 Bruce B. Downs Blvd., MDC035 • Tampa, FL 33612-4799
(813) 974-5638 • FAX (813) 974-7091

October 30, 2018

Stacy Pamphile
ABA-Applied Behavior Analysis
Tampa, FL 33613

RE: **Expedited Approval for Initial Review**
IRB#: Pro00035517
Title: Prompt level: Examination of whether preference and effectiveness correspond in children with disabilities

Study Approval Period: 10/29/2018 to 10/29/2019

Dear Ms. Pamphile:

On 10/29/2018, the Institutional Review Board (IRB) reviewed and **APPROVED** the above application and all documents contained within, including those outlined below.

Approved Item(s):
Protocol Document(s):
Protocol, Version #1, 10.18.2018.docx

Consent/Assent Document(s)*:
Child Written Assent, Version #1, 10.20.2018.docx.pdf
Parental Permission w HIPAA, Version #1, 10.20.2018.docx.pdf
Child Verbal Assent (7-12 YO), Version #1, 10.20.2018.docx

Telephone Pre-Screen w HIPAA, Version #1, 10.22.2018.docx

*Please use only the official IRB stamped informed consent/assent document(s) found under the "Attachments" tab. Please note, these consent/assent documents are valid until the consent document is amended and approved. The Child Verbal Assent and the Pre-screening consent are not stamped forms.

It was the determination of the IRB that your study qualified for expedited review which includes activities that (1) present no more than minimal risk to human subjects, and (2) involve only procedures listed in one or more of the categories outlined below. The IRB may review research through the expedited review procedure authorized by 45CFR46.110. The research proposed in this study is categorized under the following expedited review category:

(6) Collection of data from voice, video, digital, or image recordings made for research purposes.

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Your study qualifies for a waiver of the requirements for the documentation of informed consent as outlined in the federal regulations at 45CFR46.117(c) which states that an IRB may waive the requirement for the investigator to obtain a signed consent form for some or all subjects if it finds either: (1) That the only record linking the subject and the research would be the consent document and the principal risk would be potential harm resulting from a breach of confidentiality. Each subject will be asked whether the subject wants documentation linking the subject with the research, and the subject's wishes will govern; or (2) That the research presents no more than minimal risk of harm to subjects and involves no procedures for which written consent is normally required outside of the research context. (Pre-screening form).

This research involving children as participants was approved under 45 CFR 46.404: Research not involving greater than minimal risk to children is presented.

Requirements for Assent and/or Permission by Parents or Guardians: 45 CFR 46.408 : Permission of one parent is sufficient.

Assent will be obtained as outlined in the IRB application.

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB for review and approval via an amendment. Additionally, all unanticipated problems must be reported to the USF IRB within five (5) business days.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

Kristen Salomon, Ph.D., Chairperson
USF Institutional Review Board