A COMPARISON OF TRANSFER OF STIMULUS CONTROL OR MULTIPLE CONTROL ON THE ACQUISITION OF VERBAL OPERANTS IN YOUNG CHILDREN WITH AUTISM: AN EXTENSION

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One language intervention approach for individuals with autism involves teaching one response topography under multiple sources of control and then establishing that response under individual controlling variable. Another approach involves establishing one response topography under singular control and then using that response to establish the response topography under different controlling variables. The study sought to extend previous research by investigating the impact of each approach on the acquisition of verbal responses. Three of the eight participants acquired all target responses for at least one response topography. The results of previous research were not replicated directly and the findings were discussed in terms of preexperimental verbal repertoires and restricted interests.

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INTRODUCTION

Language development is one of the core deficit areas for individuals with developmental disabilities, such as autism (Filipek et al., 1999).Yet, language skills play an important role in the overall development of humans. Previous research has indicated that verbal communication is an indicator of positive outcomes in the development of children with autism and that development of functional, spoken language should be a focus of intervention designed for this population (Koegel, Shirotova, & Koegel, 2009). In most intervention programs for children with autism, an emphasis is placed on the development of language and communication skills (Leaf & McEachin, 1999; Lovaas, 1987; Lovaas & Smith, 1989; Sundberg & Partington, 1998).

Behavioral intervention has been shown to be more effective than other types of interventions that have attempted to address the deficits exhibited by individuals with autism (Green, 1996). Within behavioral interventions for children with autism there are various strategies that are employed to teach language. For example, trainers may address language acquisition in the context of a psycholinguistic conceptual framework or in the context of Skinner's (1957) analysis of language (LeBlanc, Esch, Sidener, & Firth, 2006).

Skinner (1957) defined "verbal behavior" and created the concept of the verbal operant, which he defined as the single unit of analysis of verbal behavior. He emphasized the necessity to differentiate between words and verbal operants and argued that because an individual emits the same word on different occasions, it does not mean that it has the same behavioral function (Sundberg & Michael, 2001). For example, in one situation in which a child is thirsty, that child may emit the word "water" in the presence of his mother and gain access to a drink of water. In another situation the same child may see a picture of a waterfall, point to it, say "water," and gain his mother's attention. While the child emitted the same word in both situations, the antecedent and consequent stimuli were different and may be argued that the two instances of behavior served different functions. Skinner suggested that we need to focus on the function *and* the form of the response in order to have a complete account of verbal behavior. He clearly outlined the antecedent and consequence stimuli for each of the verbal operants he defined. This analysis of verbal behavior was deemed advantageous by many (cf., Bondy, Tincani, & Frost, 2004) because it allows for each teaching procedure to be analyzed in terms of the actual stimuli that control behavior, rather than based on the convictions of the trainer.

Sundberg and Michael (2001) discussed the state of language intervention for children with autism and noted that the vocabulary used by most who implement behavioral interventions is that used in language instruction implemented in general education settings, special education, and speech and language instruction. Specifically, concepts such as receptive and expressive language are used to categorize overall language development and terms like *labels, requests, nouns,* and *verbs* frequently describe target behaviors in language intervention. This is inconsistent with or lacks the use of Skinner's (1957) analysis of verbal behavior and the "stated behavioral focus" of these language intervention programs.

Language training programs that use Skinner's (1957) analysis of verbal behavior have typically utilized a transfer of stimulus control procedure (e.g., Barbera & Kubina, 2005; Bloh, 2008; Ingvarsson & Le, 2011; Miguel, Petursdottir, & Carr, 2005; Vedora, Meunier, & MacKay, 2009). Transfer of stimulus control involves establishing one response topography under the control consistent with one type of verbal operant (e.g., a vocal stimulus). Subsequently, experimenters use that reliable verbal response to establish the same response topography under different controlling variables that are characteristic of another type of verbal operant (e.g., a nonverbal stimulus; Barbera & Kubina, 2005; Bloh, 2008; Emmick, Cihon, & Eshelman, 2010;

Ingvarsson & Le, 2011; Vedora et al., 2009). For example, the experimenter may first teach the child to reliably say "apple" when the experimenter says "apple." This response is then established under the control of the vocal stimulus "apple" *and* a picture of an apple. Finally, the experimenter removes the vocal stimulus which initially controlled the child's response and the child emits the response "apple" in the sole presence of the picture. In this example, control was transferred from an echoic response to a tact response. Barbera and Kubina (2005) and Bloh (2008) successfully used a receptive to echoic to tact transfer of stimulus control procedure and an echoic to tact transfer procedure to establish tact responses with children with autism. Vedora et al. (2009) transferred control from either an echoic or textual response to an intraverbal response and concluded that textual prompts were more effective than the echoic prompts in teaching the target responses. Emmick et al. (2010) successfully employed transfer of stimulus control from textual to intraverbal relations to teach intraverbal responses to children with developmental disabilities. Ingvarsson and Le (2011) also successfully used transfer of stimulus control to establish intraverbal responding when textual, vocal, and picture prompts were employed.

Furthermore, some researchers have compared the effects of teaching a single verbal operant with teaching multiple verbal operants in alternation (e.g., Arntzen & Almas, 2002; Carroll & Hesse, 1987; Kodak and Clements, 2009; Sidener, Carr, Karsten, Severston, Cornelius, & Heinicke, 2010). Kodak and Clements (2009) reported that their participant did not acquire independent mand or tact responses when he participated in mand-only or tact-only training. The researchers noted an increase in unprompted mand and tact responding when echoic training was combined with mand or tact training, respectively. Caroll and Hesse (1987) concluded that it took fewer trials to teach tact responses when mand contingencies were alternated with tact contingencies than when tact contingencies were presented alone. These results were replicated by Arntzen and Almas (2002). However, Sidener et al. (2010) did not replicate the previous results, their data showing no clear benefits of alternating mand and tact contingencies on the acquisition of tact responses over tact training only. Wallace, Iwata and Hanley (2006) suggested the idiosyncratic findings may be related to the role of the motivating operation in the mand relations.

Cihon, Neef, Canella-Malone, and Heward (in preparation) offered yet another approach to language intervention for individuals with autism. They suggest teaching one response topography under multiple sources of control simultaneously (Michael, Palmer, & Sundberg, 2011) and then establishing the same response topography under individual sources of control. Language intervention utilizing this procedure may be highly efficient and may simulate procedures already utilized in clinical settings more closely. Training under multiple sources of control may expedite language acquisition because it requires only one step to establish pure verbal responses while transfer of stimulus control procedures involve two steps (establishing compound stimuli and establishing pure responses). Additionally, establishing response topographies under compound control may be easier to accomplish in a clinical environment where all necessary antecedent stimuli may already be present. In contrast, establishing an initial response under one source of control would imply removing all unnecessary stimuli from the subject's environment, which would require more labor and would be more difficult to accomplish.

Cihon et al. (in preparation) used an adapted alternating treatment design to compare the effects of a transfer of stimulus control procedure and a multiple control procedure on the acquisition of three verbal operants (i.e., mand, tact, and echoic). In the transfer of stimulus control condition, the experimenters first brought one response topography under echoic control. Next they established the same response topography under the control of at least two stimuli, by superimposing the antecedent variables for echoic (i.e., vocal verbal stimulus) and mand (i.e., 30 min of deprivation) or echoic and tact (i.e., nonverbal stimulus) responses, respectively. Finally, the experimenters used transfer of stimulus control via stimulus fading to bring the response topography under pure mand or tact control. During stimulus fading the echoic stimulus was faded from full word to partial word to initial sound to no presentation. In the multiple control procedure, Cihon et al. first taught a response topography under the simultaneous control of antecedent stimuli that control echoic, mand, and tact responses and then utilized transfer of stimulus control via stimulus fading to establish the same response topography under the control of pure mand, tact, or echoic antecedent stimuli. During the stimulus fading phase the unnecessary stimuli were gradually attenuated at the same time (e.g., to establish pure tact control, mand and echoic controlling stimuli were faded). Time of deprivation prior to teaching sessions decreased from 30 min in 10 min intervals until no state of deprivation occurred. The nonverbal stimulus was cut by thirds until it was simply presented and removed quickly (to signal availability), while the echoic stimulus was faded from full word to no presentation, as described above.

Cihon et al. (in preparation) taught different response topographies under each independent variable for five individuals with autism. The authors concluded that three of the participants acquired the echoic, mand, and tact responses in fewer trials when teaching occurred under multiple sources of control, while two participants acquired the echoic, mand, and tact responses in fewer trials when responses were first taught as echoic and then control was transferred to the other operant classes. The experimenters commented that the idiosyncratic findings of their study may be due to the type of transfer procedure used (i.e., stimulus blocking effects that may occur as a function of the use of stimulus fading) and suggested that a time delay procedure may lead to more differentiated responding.

Further research is needed on the efficiency of a multiple control procedure such as the one used by Cihon et al. (in preparation) on the acquisition of verbal responses. Additionally, the effects of incorporating a time delay prompting procedure as opposed to a stimulus fading procedure to accomplish transfer of control in this type of experimental manipulations should be investigated. The purpose of the present study was to extend the research conducted by Cihon et al. (in preparation), replacing transfer of stimulus control via stimulus fading with transfer of stimulus control via time delay. The present study set to answer the following experimental questions: a) Does teaching a response topography using a multiple control procedure require fewer teaching trials than teaching the same response topography using a transfer of stimulus control procedure? b) How does each procedure affect the emergence of untrained verbal operants? Additionally, the present study may provide information regarding the effects of utilizing a progressive time delay prompting procedure to transfer control on the acquisition of pure verbal operants.

METHODS

Participants and Setting

Eight individuals between 2 and 4 years old, diagnosed with autism or pervasive developmental disorder not otherwise specified (PDD-NOS) participated. All participants emitted fewer than 20 echoic responses, demonstrated a record of good attendance, were recommended for participation by the child's teacher or BCBA, and had the parents' consent to participate.

Kyle was a 3-year-old male with a diagnosis of PDD-NOS who participated in sessions three times per week. Jackson was a 4-year-old male with a diagnosis of autism. His sessions were conducted three to four times per week. Nick was a 4-year-old male with a diagnosis of autism, who participated in sessions three to four times per week. Jackson and Nick were fraternal twins. George was a 3-year-old male with a diagnosis of PDD-NOS. Two to three sessions were conducted weekly with George. Justin was a 4-year-old male with a diagnosis of autism. Justin's sessions were conducted five to seven times per week. Carl was a 3-year-old male with a diagnosis of autism. Sessions were conducted with Carl two to three times per week. Simon was a 2-year-old male with a diagnosis of PDD-NOS and he participated in four to five sessions per week. Cecilia was a 3-year-old female with a diagnosis of autism and she participated in two to three sessions per week. The study was conducted at a non-profit treatment center that provides behavior analytic intervention and speech and language services to children with autism and other developmental disabilities, ages 0 through 12 years old. All sessions were administered in one of three rooms, separate from the main therapy area. The rooms were furnished with a small table and chairs, as well as shelves with toys and children's books. Sessions were conducted either at the table or on the floor.

Experimental Design

An adapted alternating treatments design (Sindelar, Rosenberg, & Wilson, 1985) was used to determine the effects of the two different teaching procedures on the acquisition of mands, tacts, and echoics. Both interventions were implemented with each participant.

Measures

The dependent variables were mands, tacts, and echoics. A mand was defined as, "…a verbal operant in which the response is reinforced by a characteristic consequence and is therefore under the functional control of relevant conditions of deprivation or aversive stimulation" (Skinner, 1957, p. 35–36). A tact was defined as, "…a verbal operant in which a response of given a form is evoked (or at least strengthened) by a particular object or event or propriety of an object or event that is maintained by generalized conditioned reinforcement" (Skinner, 1957, p. 81–82). An echoic was defined as a vocal response controlled by a vocal stimulus that has "a point to point correspondence between the sound of the stimulus and the sound of the response" (Skinner, 1957, p. 55) and that is maintained by generalized reinforcement.

The number of trials to criterion required for the emission of each pure verbal operant was tabulated for each intervention. The experimenter analyzed the data across conditions in an effort to determine the most efficient procedure (i.e., number of trials to criterion) for establishing the target verbal repertoires.

Independent Variables

Two independent variables were evaluated: multiple control and transfer of stimulus control (using time delay) via superimposition. During multiple control, a response was taught under tact, mand, and echoic control simultaneously and then a time delay procedure was used to establish the response under pure mand, tact, and echoic control. During transfer of stimulus control, a response was taught to occur under echoic control and then the echoic response was used to establish a response under mand and tact control (via superimposition and time delay), respectively.

Procedure

Assessment of incoming verbal repertoire. The Behavioral Language Assessment Form (BLAF; Sundberg & Partington, 1998) was administered to all participants prior to the beginning of the study in order to assess each individual's verbal repertoire. This assessment evaluated skills across a variety of verbal operants (e.g., mand, tact, echoic etc.).

Figure 1 displays language assessment results for Kyle who used three words to ask for preferred items. He was able to repeat or closely approximate a few sounds or words and identify no more than 10 objects and actions. Jackson's prestudy language assessment scores are depicted in Figure 2 and indicate that he would pull someone toward items or point to items to gain access to preferred objects. He was able to repeat sounds and approximate a few words. Jackson did not identify any objects. Figure 3 shows the language assessment results for Nick, who did not use words to request preferred items. He was able to repeat a few specific sounds and he did not identify any objects. Figure 4 depicts George's language assessment. He typically grabbed, pulled others toward, or stood by desired items in order to gain access to those items. He was able to repeat or closely approximate several sounds and words. George was not able to identify any objects or actions. Justin's prestudy BLAF scores are represented in Figure 5. He used a few word approximations and several pictures to access preferred items. Justin repeated a few specific sounds and did not identify objects. Carl's language assessment results are depicted in Figure 6. He requested preferred items by pulling someone toward the items or pointing or standing near the items. Carl was able to closely approximate several sounds and words and could identify no more than five objects. Figure 7 shows the language assessment results for Simon. He generally engaged in maladaptive behavior in order to access preferred items. He did not repeat any sounds or words, nor did he identify any objects. Figure 8 shows the language assessment results for Cecilia. The scores indicate she used only a few words to gain access to preferred items. She generally reached for objects or engaged in problem behavior in order to receive desired items. She was able to repeat or closely approximate several sounds and words, and could identify no more than five objects.

Preference assessment. A multiple stimulus without replacement (MSWO) preference assessment (DeLeon & Iwata, 1996) was conducted to determine a list of preferred items and activities for each participant. The preference assessment was conducted by presenting each individual with an array of five stimuli and indicating that one of the stimuli should be selected. As soon as the participant made a choice, he/she was allowed 10 s of access to that particular item or activity. The remaining four stimuli were presented again for the individual to make a choice, and so forth. The trials were repeated until only one stimulus was left in the array. The stimuli used in the preference assessment were determined based on direct observation and an interview with the participants' parents. The Reinforcer Assessment for Individuals with Severe Disabilities (RAISD; Fisher, Piazza, Bowman, & Amari, 1996) was used to guide the parent interviews. Food items were not included in the preference assessment due to manipulations of motivating operations during intervention, which required the participants to have free access to the items. The results of the preference assessment were calculated by dividing the number of times an item was selected by the number of times the same item was presented and multiplying it by 100. The two highest ranked items were used during the teaching procedures and were alternated between conditions. For example, if the highest ranking item was assigned to the transfer of stimulus control and the second highest ranking items was assigned to the multiple control condition (see Figures 9 to 22). When a participant demonstrated all three target responses for one response topography in one condition (transfer of stimulus control or multiple control) the experimenter administered a second preference assessment and selected a second responses topography to be taught in the same condition.

Pure operant probes. The experimenter conducted pure operant probes (Figure 23) prior to teaching each of the target response topographies. Baseline probes were implemented until responses for all three operants were stable for three consecutive sessions. Pure operant probes were also conducted prior to the onset of superimposition or time delay in each experimental condition. Pure operant probes consisted of five opportunities to respond to the controlling stimulus for each pure verbal operant. Consequences for correct responses were consistent with Skinner's (1957) definition of the verbal operant controlling variables; incorrect responses resulted in no programmed consequences. Pure operant probes for all three target responses were conducted each time probe sessions were administered.

During echoic pure operant probes, the experimenter presented a vocal verbal stimulus while an abolishing operation was in effect (contrived by providing a period of free access to the target stimulus) and a correct echoic response emitted within 3 s of the stimulus was followed by social praise (assumed to be a generalized conditioned reinforcer). No response or an incorrect response resulted in no programmed consequence. During mand pure operant probes, the experimenter contrived an establishing operation by restricting access to the target stimulus for 30 min prior to the experimental session and providing a brief period of reinforcer sampling before the onset of probe trials. The target stimulus was also briefly presented and the removed to signal the availability of the stimulus. A correct mand response emitted within 3 s of the trial initiation was followed by the delivery of characteristic consequence; an incorrect or no response resulted in no programmed consequence. Tact pure operant probes began with the presentation of a nonverbal stimulus while an abolishing operation was in effect (contrived by providing a period of free access to the target stimulus). A correct tact response emitted within 3 s of the stimulus presentation resulted in delivery of social praise (assumed to be a generalized conditioned reinforcer); an incorrect or no response resulted in no programmed consequence.

Transfer of stimulus control. Transfer of stimulus control teaching sessions occurred in three phases: imitation training, simultaneous presentation, and time delay (Figure 24). During imitation training, the target vocal response was brought under echoic control. At the onset of the teaching session, the experimenter created an abolishing operation by allowing the participant a period of free access to the target stimulus. Each trial began with the experimenter emitting the target vocal verbal stimulus. If the participant emitted a correct echoic response within 3 s of the experimenter presented vocal verbal stimulus the experimenter delivered social praise. A tangible reinforcer nonspecific to the form of echoic response was delivered for some of the participants on a variable ratio 3 (VR3) schedule of reinforcement. An incorrect response, a partial echoic response or no echoic response within 3 s of the presentation the vocal verbal stimulus resulted in the termination of the teaching trial and the onset of the next teaching trial, when appropriate. Five consecutive correct echoic responses initiated a pure verbal operant probe session prior to onset of the simultaneous presentation for one of the remaining target operants (e.g., mand or tact). Participants completed both the simultaneous presentation and the time delay phases for one verbal operant (e.g., mand) prior to introducing the simultaneous presentation and the time delay phases for the remaining verbal operant (e.g., tact) for the target response topography.

During simultaneous presentation, the experimenter exposed the participant to two antecedent stimuli at the same time to establish a compound stimulus. For example, when teaching a mand, the compound stimulus consisted of an establishing operation (e.g., access to the preferred/target stimulus was restricted for 30 min prior to the teaching session and the subject was allowed to sample the reinforcer just before the session) and the vocal verbal stimulus used during imitation training. The target stimulus was also briefly presented and then removed to signal the availability of the stimulus. Access to the reinforcing stimulus was provided when the participant emitted the target response (e.g., mand-echoic) within 3 s of the compound stimulus presentation. If the participant emitted an incorrect, a partial, or no response within 3 s of the presentation of the compound stimulus, no programmed consequence(s) were delivered and the next trial was initiated. The simultaneous presentation phase was terminated when the participant emitted five consecutive correct responses within one teaching session.

When transferring to tact control, the compound stimulus consisted of a nonverbal stimulus (i.e., the actual target stimulus) and the vocal verbal stimulus established as an echoic during imitation training. An abolishing operating (contrived by providing a period of free access to the target stimulus) was also set up. When the participant emitted the target response (i.e., echoic-tact) within 3 s of the presentation of the compound stimulus, the experimenter delivered social praise. If an incorrect, a partial, or no response was given within 3 s of the compound stimulus presentation, no programmed consequences were delivered. The teaching trial was terminated and a new teaching trial began. Simultaneous presentation ended when the participant emitted five consecutive correct responses during one teaching session. Once simultaneous presentation ended, time delay sessions began for the target verbal operant and response topography.

During time delay sessions stimulus control was transferred from the compound stimulus used during simultaneous presentation to the establishing operation when the target response was a mand or to the nonverbal stimulus when the target response was a tact. Transfer of stimulus control was achieved by gradually delaying the presentation of the original controlling stimulus (i.e., the echoic stimulus) in increments of 1 s up to 5 s. At the onset of the time delay procedure to transfer to a pure mand the experimenter set up an establishing operation (contrived by restricting access to the target stimulus for 30 min prior to the experimental session and providing a brief period of reinforcer sampling before the onset of time delay trials). Each level of time delay was initiated when five consecutive correct responses at the previous fading level had been recorded within the same session. Fewer than two consecutive correct responses within the same session at one time delay level resulted in a return to the previous time delay level. The time delay procedure was terminated for transferring stimulus control to a pure mand when the participant responded before the presentation of the original controlling stimulus (i.e., the echoic stimulus) a minimum of four responses out of a total five consecutive correct responses. At the onset of the time delay procedure to transfer to a pure tact the experimenter set up an abolishing operation (contrived by providing a period of free access to the target stimulus). Each level of time delay was initiated when five consecutive correct responses at the previous fading level had been recorded within the same session. If the participant made a minimum of four consecutive correct responses before the presentation of the original controlling stimulus out of a total of five consecutive correct responses, the experimenter terminated the session and a probe session was conducted during the next experimental session. If acquisition of the target pure operant was not demonstrated during probes, the time delay procedure was reintroduced at the delay level used prior to the probe session.

Multiple control. The multiple control teaching procedure was conducted in two phases: simultaneous presentation and time delay (Figure 25). During simultaneous presentation the experimenter taught each participant to emit the target response under mand, tact, and echoic control. In this phase the compound antecedent stimuli consisted of an establishing operation (i.e., 30 min of deprivation from the target stimulus and brief period of reinforcer sampling), the brief presentation of the target stimulus, and the nonverbal and vocal verbal stimuli specific to the response topography. Correct responses emitted within 3 s of the simultaneous presentation of the three antecedent stimuli resulted in access to the target stimulus (mand) and social praise (echoic, tact). The teaching trial was terminated if an incorrect, partial or no response was emitted within 3 s of the presentation of the antecedent stimuli and a new teaching trial began. Advancement to the time delay phase for each separate verbal operant was determined by the participant's emission of five consecutive correct responses during the same teaching session. Time delay for one verbal operant (e.g., echoic) was completed before beginning time delay for the next verbal operant (e.g., mand). Before continuing with time delay for the third operant the participant was exposed to simultaneous presentation of all three antecedent stimuli to ensure maintenance of mand, tact, and echoic compound control.

During time delay for each verbal operant, the presentation of each unnecessary stimulus was gradually delayed (e.g., during time delay for mand control, controlling stimuli for tact and echoic were gradually delayed) with the exception of the establishing operation. Time delay sessions for each operant were conducted until the participant emitted the target response under the target stimulus for five consecutive teaching trials within one teaching session. Fewer than two consecutive correct responses in one teaching session prompted a return to the previous time delay level. Time delay of echoic control was achieved by gradually increasing the time to the presentation of the vocal verbal stimulus in increments of 1 s up to 5 s. The presentation of the nonverbal stimulus was also gradually delayed in increments of one second up to 5 s. When the participant emitted a correct echoic or tact response within 3 s of the target stimulus presentation, social praise was delivered. When the participant emitted a correct mand response within 3 s of the target stimulus presentation, reinforcement specific to the response form was delivered. An incorrect, a partial, or no response within 3 s of the target stimulus presentation resulted in the termination of the teaching trial and the immediate beginning of the next teaching trial.

The establishing operation was maintained throughout the time delay procedure until all other unnecessary stimuli were removed. At the end of the time delay procedure an abolishing operation (contrived by allowing the participant free access to the response topography stimulus) was set up by the experimenter when transferring to those pure operants for which an establishing operation was an unnecessary stimulus (i.e., echoic and tact) and sessions were conducted at a 5 s time delay until the participant made four correct responses prior to the presentation of the unnecessary controlling stimuli out of a total of five consecutive correct responses.

Interobserver agreement. Independent observers were trained to score the dependent variable with a minimum of 90% accuracy. Interobserver agreement (IOA) was scored for at a minimum of 30% of all experimental sessions. IOA was calculated by dividing the total number of agreements by the total number of agreements plus disagreements and multiplying by 100. Observers used the same data sheets that were used for recording probe and teaching data. Mean IOA was 100% for Jackson, Nick, George, and Simon. Mean IOA for Kyle was 99.8% (range, 90% to 100%). Mean IOA for Justin was 99.4% (range, 80% to 100%). Mean IOA for Carl was 99.3% (range, 83% to 100%). Mean IOA for Cecilia was 99.2 % (range, 80% to 100%).

Treatment integrity. Observers were trained to collect data on how the experimenter arranged the teaching and probe procedures, such as presenting the appropriate antecedent stimuli and delivering or withholding programmed consequences according to the established procedures. Treatment integrity (TI) data were collected during at least 30% of all experimental sessions. Treatment integrity data were calculated by dividing the number of steps performed accurately by the total steps and multiplying by 100. Mean TI was 100% for Jackson, Nick, and George. Mean TI was 99.6% (range, 93% to 100%) for Kyle. Mean TI for Justin was 99.7% (range, 92% to 100%). Mean TI for Carl was 99.8% (range, 95% to 100%). Mean TI for Simon was 99.7 (range, 96% to 100%). Mean TI was 98.4% (range, 68% to 100%) for Cecilia.

RESULTS

Figure 26 represents the total number of trials to criterion by condition for Kyle. Kyle acquired all three target operants for the first response topography (i.e., "ball") in the transfer of stimulus control condition. Kyle met criterion for the echoic response during the first set of post-delay probes and for the tact response (targeted first) during the third set of post-delay probes (Figure 27). The mand response emerged without specific training during the third set of post-delay probes (Figure 27). Figure 28 shows the phases for transfer of stimulus control and the number of consecutive correct responses for each session. Kyle acquired echoic and tact responses for the second response topography (i.e., "letters") in the transfer of stimulus control condition. Kyle engaged in echoic responding during baseline probes, while the criterion for tact responding was met during post-delay probes (Figure 27). Kyle did not meet criterion for acquisition of the mand response for the second response topography prior to the termination of the experiment. The experimenter targeted one response topography (i.e., "noofie," approximation for "movie") in multiple control. Baseline data were collected for the response topography "Word World," the name of the movie; however, "noofie" was selected after a series of unsuccessful imitation sessions. Kyle met criterion for echoic responding during the post-delay probes (Figure 29). The experimenter then moved multiple control instructions to the tact relation. Kyle did not meet criterion for tact or mand responses prior to the termination of the study (Figure 30).

Figure 31 represents the cumulative number of trials to criterion by condition for Jackson. The experimenter initially conducted baseline probes for "putty" (Figure 32) in transfer of stimulus control. Jackson did not emit a full echoic during the course of 10 imitation sessions; rather, he often repeated "tuh". The experimenter repeated baseline probes, this time with the target response “tuh” (an approximation to putty). Jackson consistently emitted the echoic response during baseline probes and superimposition for the mand responses followed. He did not acquire the mand or tact responses (Figure 33). The response topographies targeted in the multiple control condition followed a similar progression. The experimenter first conducted baseline probes for “fuzzy” (Figure 34). After 10 imitation sessions with little to no responding (Figure 35), the experimenter switched the response topography to an approximation, “zuh”. Again, Jackson emitted the echoic response at stable rates during baseline probes. Superimposition began for echoic, tact, and mand; however, Jackson did not acquire mand or tact responses (Figure 35).

Figure 36 shows the total number of trials to criterion by condition for Nick. The experimenter initially conducted baseline probes for “Bob”, the name of the movie (Figure 37). Nick did not emit a full echoic during the course of 10 imitation sessions. A similar progression was observed with the target responses “buh” (an approximation for “Bob”) and “mmm” (an approximation for “movie”). The experimenter then repeated baseline probes with the target response “moo” (an approximation for “movie”) as a target response. Nick demonstrated echoic responding during baseline probes (Figure 37) and advanced through imitation, superimposition of echoic and tact responses, and time delay phases. He did not acquire tact or mand responses prior to the termination of the study (Figure 38). In the multiple control condition the experimenter conducted baseline probes (Figure 39) and superimposition of echoic and tact responses for the target responses “monkey” and “mmm-eee” (an approximation to “monkey) with little to no responding; rather Nick consistently said “eee-eee”. The experimenter then selected “eee-eee” (an approximation for “monkey”) as the target response topography. Nick demonstrated the echoic response during post-superimposition probes and the tact response during post-delay probes (Figure 39). The mand response emerged during post-delay probes without being specifically taught (Figure 39). The experimenter selected a new response topography, "tuh" (an approximation to "toy") in the multiple control condition; however, Nick did not complete baseline probes prior to the end of the study (Figure 40).

Figure 41 shows the cumulative number of trials to criterion by condition for George. The experimenter initially targeted the tact response for the response topography "fussy" (an approximation for "fuzzy"). George demonstrated the echoic response during post-imitation probes and the tact response during the post-delay probes (Figure 42). George did not meet criterion for the acquisition of the mand response in the transfer of stimulus control condition prior to the termination of the study (Figure 43). George demonstrated the tact response for the response topography "tue" (an approximation to "tube") during post-delay probes in the multiple control condition (Figure 44). The experimenter then targeted the echoic response; however, George did not acquire the echoic or mand responses prior to the end of the experiment (Figure 45).

Figure 46 shows the total number of trials to criterion by condition for Justin. The experimenter targeted three response topographies in the transfer of stimulus control condition. Following baseline probes and 10 imitation sessions with no responding for the target response topography "monkey", the experimenter selected "m" (an approximation to "monkey") as a target response topography. Justin demonstrated the echoic response during post-imitation probes, and the mand and tact responses during post-delay probes (Figure 47). He engaged in echoic responding for the second response topography, "shh" (an approximation to "sing-a-majig"), during baseline probes. Post-delay probe data show acquisition of the mand and tact responses for the same response topography (Figure 47). The experimenter selected "ooo" (an approximation to “koosh”) as the third response topography in the transfer of stimulus control condition and initially targeted the mand response. Justin demonstrated the echoic response during post-imitation probes; however, he did not meet criterion for mand or tact responses before the end of the study (Figure 48). The experimenter selected the initial response topography “wah” (and approximation for “Woody”, a character in a book) in the multiple control condition; however, Justin did not respond for seven consecutive superimposition sessions and the experimenter conducted baseline probes for the response topography “buh”, an approximation to “book” (Figure 49). Justin acquired the echoic response during post-superimposition probes, and the mand response during post-delay probes (Figure 49). The tact response emerged without specific training during post-delay probes (Figure 49). The experimenter selected “eee” (an approximation to “putty”) as the second response topography in the multiple control condition, and targeted the tact response following baseline probes (Figure 49). Justin demonstrated the echoic response during post-delay probes. He did not acquire the tact or mand responses prior to the termination of the study (Figure 50).

Figure 51 shows the number of cumulative trials to criterion for Carl. The experimenter targeted the response topography “iceey” (an approximation to “ice cream”) in the transfer of stimulus control condition. Carl consistently emitted the echoic response during baseline probes (Figure 52) and imitation and superimposition of echoic and mand followed. Carl quickly progressed through the time delay stages; however, he did not consistently provide independent correct responses during the 5s time delay sessions. The experimenter modified the procedure so that the echoic prompt continued to delay 1 s intervals up to a 10 s delay. Carl still did not meet criterion for mand or tact responding (Figure 53). The response topography “newmaster” (an approximation to “viewmaster”) followed a similar progression in the multiple control condition.

Carl met criterion for the echoic response during baseline probes (Figure 54). The experimenter targeted the tact response; however, Carl did not engage in tact responses prior to the presentation of the echoic prompt and a similar variation to the procedure was also implemented in this condition. Carl did not meet criterion for tact or mand responding prior to the end of the study (Figure 55).

Figure 56 represents the number of teaching trials to criterion for Simon. The experimenter first targeted the mand response for the topography “peh” (an approximation to “pig”) in the transfer of stimulus control condition. Simon met criterion for the echoic response during post-superimposition probes (Figure 57). He did not consistently provide correct responses before the presentation of the prompt during the 5 s second delay. Moreover, he returned to the previous time to delay and did not engage in more than two consecutive correct responses for several sessions (Figure 58).

The experimenter administered another preference assessment and selected a second response topography, “book” (the response topography “computer”, selected prior to “book”, was discontinued because a similar item was used frequently during Simon’s regular therapeutic sessions). Simon consistently emitted the echoic response during the baseline probe (Figure 57). Because the experimenter was not able to determine what controlled Simon’s responding she decided to return to the procedures originally used by Cihon et al. (in preparation) in order to verify if the time delay procedure proved to be ineffective with this participant. The experimenter first targeted the mand response and used a stimulus fading procedure. Simon demonstrated the tact response during post-superimposition probes. He did not acquire the mand response prior to the termination of the study (Figure 58). Simon responded similarly in the multiple control condition. The experimenter first targeted the tact response for the response topography, “bah” (an approximation to ball) and Simon met criterion for the echoic response during the post-superimposition probes (Figure 59). He did not consistently provide correct responses before the presentation of the prompt during the 5 s second delay and the experimenter discontinued the procedure (Figure 60). The experimenter selected a second response topography, “puzzle” and Simon consistently engaged in the echoic response during baseline probes (Figure 59). The experimenter used a stimulus fading procedure to target the tact response; however, Simon did not acquire the mand or tact responses prior to the termination of the study (Figure 60).

Figure 61 shows the number of trials to criterion for Cecilia. The experimenter targeted the response topography “puzzy” (an approximation to “fuzzy”) in the transfer of stimulus control condition. Cecilia engaged in echoic responding during the baseline probes (Figure 62). The experimenter first targeted the tact response and Cecilia quickly progressed through the time delay phase. However, during the 5 s delay, Cecilia stopped responding and consistently returned to previous levels of time delay. Based on observations made during sessions the experimenter determined that Cecilia spent increasingly more time in free access to response topography item (to create an abolishing operation) and engaged in little to no responding during teaching trials. The experimenter hypothesized that Cecilia’s responding may have been a result of the procedure used to establish motivating operations and the amount of effort required during sessions (low effort requirement during free access and high effort requirement during teaching trials).

Next, the experimenter removed the item from the sessions and replaced it with a picture of the item. Free access was then considered unnecessary. Cecilia still did not acquire the tact or mand responses prior to the termination of the study (Figure 63). Sessions progressed similarly in the multiple control condition. Cecilia engaged in echoic responding during baseline sessions (Figure 64). The experimenter targeted the tact response and Cecilia quickly progressed through the time delay level. She did not respond correctly before the prompt was presented in the 5s delay level and she then consistently returned to the previous delay levels. The experimenter modified the procedure in the multiple control condition along with the procedure in the transfer of stimulus control condition so that a picture of the response topography item was flashed before each trial instead of the actual item. Cecilia did not acquire the mand or tact responses before the end of the study (Figure 65).

DISCUSSION

Three out of the eight participants acquired all target responses (i.e., mand, tact, echoic) for at least one response topography. Justin acquired all target responses for two response topographies in the transfer of stimulus control condition and one response topography in the multiple control condition. Kyle acquired all target responses for one response topography in the transfer of stimulus control condition, while Nick met criterion for mand, tact, and echoic responses for one response topography in the multiple control condition. Participants acquired the echoic response for all response topographies, in both treatment conditions, with the exception of George, who did not engage in echoic responding for the response topography targeted in the multiple control condition. One participant, Jackson, left the study before its completion because his parents enrolled him in a different therapeutic program. The remaining seven participants also terminated sessions prior to the completion of the study and prior to acquiring all target responses due to changes in their schedule or their case manager's concern regarding the length of the experimental sessions which limited the amount of time the children spent in their therapeutic sessions.

The present study sought to investigate if teaching a response topography using a multiple control procedure required fewer teaching trials than teaching the same response topography using a transfer of stimulus control. When comparing the cumulative number of trials conducted in each condition for each participant it appears that five out of the eight participants completed fewer trials in the multiple control condition than in the transfer of stimulus control condition. However, Justin was the only participant who acquired all three target responses (i.e., mand, tact, echoic) in both treatment conditions. The success of the transfer procedure reported by Cihon et al. (in preparation) was not replicated in the present study. Yet, the data seem to suggest that, had the experimenter had more time to explore and identify the appropriate procedure to teach the target responses to all participants, multiple control as a transfer procedure may have led to completion of teaching objectives in fewer trials. This is in accordance with the findings of the original study, in which multiple controlled proved to be more efficient than transfer of stimulus control with three out of five participants. Given that transfer of stimulus control is frequently used to promote language acquisition and the procedures consistent with the multiple control condition in this experiment more closely replicate those used in typical classroom instruction, further research examining this relation is warranted.

Another experimental question this study attempted to answer was how each procedure affected the emergence of untrained responses. Kyle and George were the only subjects who demonstrated emergence of untrained responses for topographies for which teaching was completed. Kyle demonstrated emergence without specific training of the mand response after the tact response was targeted in the transfer of stimulus condition. Nick also emitted the mand response without explicit training when tact response trials were completed in the multiple control condition. These findings are consistent with those of Wallace et al., (2006) whose data indicate that establishing tact responses facilitate the acquisition of mand responses for high preference items. Because intervention for both participants mentioned here began by addressing the tact response, no conclusions can be drawn regarding how the emergence of tact or echoic responses would have been affected had the mand response been initially targeted. Additionally, because these two participants did not acquire all three target operants in both treatment conditions we cannot draw any clear conclusions about how each procedure affected emergence of untrained responses.

The experimenter also asked questions regarding the effects of using time delay as a prompting procedure to obtain transfer to pure verbal responses. The use of the time delay procedure did not lead to clear differentiation in participants' data (for example, the experimenter did not show that the multiple control procedure was clearly more efficient than the transfer of stimulus procedure). Moreover, because most participants did not acquire all target responses, no clear answers regarding the effects of the time delay procedure on the acquisition of verbal responses can be offered.

It is possible that the present experimental manipulations did not lead to acquisition of all target responses for most participants due to the limited verbal repertoires the participants demonstrated during the pre study assessment. All participants presented with limited verbal repertoires as shown by the BLAF administered prior to the beginning of the study. Three participants (Kyle, Justin, and Cecilia) used only a few words or word approximations to gain access to desired items. The remaining five participants (Jackson, Nick, George, Carl, and Simon) requested for preferred items by pointing, standing next to, or pulling someone to the items. Most participants engaged in problem behavior to access desired items. Six participants (Kyle, Jackson, George, Justin, Carl, and Cecilia) were able to imitate a few words, while Nick and Simon did not repeat any words or word approximations. Only three participants (Kyle, Carl, and Cecilia) were able to identify a few objects or actions (less than ten). It may be due to the incoming verbal repertoires that all eight participants required word approximations as response topographies (with the exception of Kyle's first response topography, "ball", in the transfer of stimulus control condition). Word approximations were frequently selected based on observations during baseline pure operant probe sessions at the time when the participant did not respond using full words. Additionally, word approximations were replaced during intervention for Justin and Nick due to both participants' decreased responding with the initial word approximations.

Another explanation for the lack of replication may be the interaction between using the time delay prompting procedure with children with limited verbal repertoires and the methods for manipulating motivating operations. For example, one participant (Carl) rarely engaged in independent responses prior to the presentation of the prompting stimuli in the 5s delay level. He did not acquire independent responses even when the time delay procedure was modified to extend the delay to 10 s. Carl's responding may indicate that, with some participants, the time delay procedure in combination with the procedures used in this study to manipulate motivating operations may lead to difficulties with transfer control to relevant stimuli for pure verbal operants. In addition, some participants engaged in independent mand or tact responses during teaching sessions but did not engage in the same responses during pure operant probes. This pattern of responding may indicate that either an establishing operation was not in effect (in the case of mand pure probes) or that praise did not consistently function as generalized conditioned reinforcement (in the case of echoic and tact probes).

It is also possible that the results in the present study were unclear due to the participants' limited or restricted interests. The majority of participants preferred edible items during their regular therapy sessions and had very few non-edible preferences. However, edibles were excluded preference assessments due to the free access period necessary to establish an abolishing operation. It may be that a more expansive set of reinforcers needs to be conditioned prior to using the types of language intervention used in this study.

There are several limitations to the current study. The experimenter used an adapted alternating treatment design; however, the experimenter did not control for order effects for verbal responses targeted by alternating responses between conditions (e.g., counterbalancing transfer to tact before mand or mand before tact). This may have influenced the acquisition of target responses, as previous research has shown that the order in which operants are targeted may influence emergence of other operants. Additionally, a certain degree of experimenter error was noted. The experimenter did not advance to upper levels of time delay or return to previous levels of delay when criterion was met in a few instances. This may be avoided in the future by consistently making decisions regarding the next experimental session at the end of each current session and by frequently updating graphs.

Future research should attempt to replicate the research conducted by Cihon et al. (in preparation) and the present experiment. One direction for future studies could include children with more expansive verbal repertoires or incorporate procedures that would insure children with limited verbal repertoires acquire necessary prerequisite skills prior to the implementation of the treatment interventions. For example, strong cooperation and reinforcer effectiveness skills, such as those suggested by Sundberg and Partington (1998) should be built prior to beginning of the study. Additionally, as it has been shown by repeated changes in response approximations necessary for some participants in the present study, a consistent echoic repertoire is necessary for individuals participating in this type of language intervention. Experimenters should also take reinforcer expansion into consideration. This would imply building motor skills necessary for each child to be able to explore items and activities in their environment, exposing each child to a variety of items/activities, as well as conditioning these items/activities as reinforcers. In addition, establishing social praise as a generalized conditioned reinforcer would support consistent responding during echoic and tact pure operant probes.

The present study did not replicate the results of Cihon et al. (in preparation). Only three out of the eight participants demonstrated all target responses for at least one response topography. Additionally, only two of the participants' data showed emergence of mand responses after acquisition of tact responses was completed. The current study contributes to the already existing body of research on language acquisition by children with autism by providing information on how a time delay procedure influences acquisition of echoic, mand, and tact responses. The data appear to also provide some support that tact training leads to emergence of mands for highly preferred items. Finally, this study suggests that prerequisite skill training and reinforcement expansion may be needed before specifically targeting verbal operant acquisition.

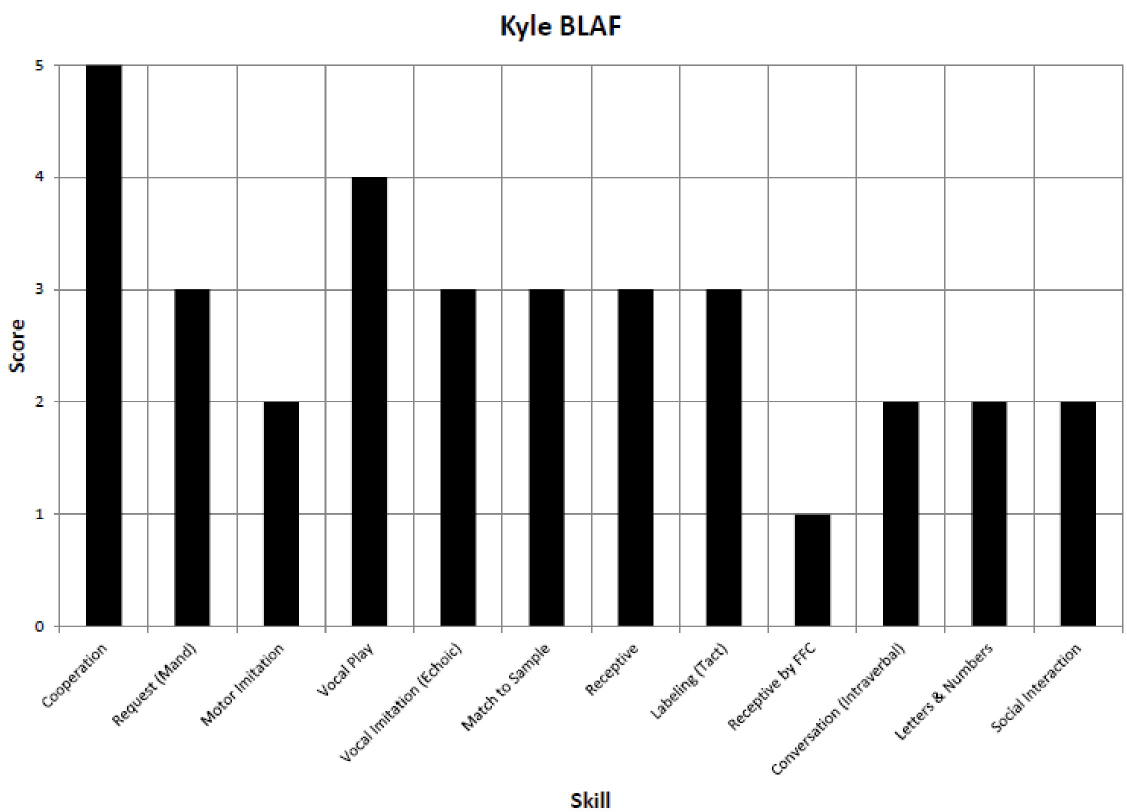

Figure 1. BLAF scores by area of skill for Kyle.

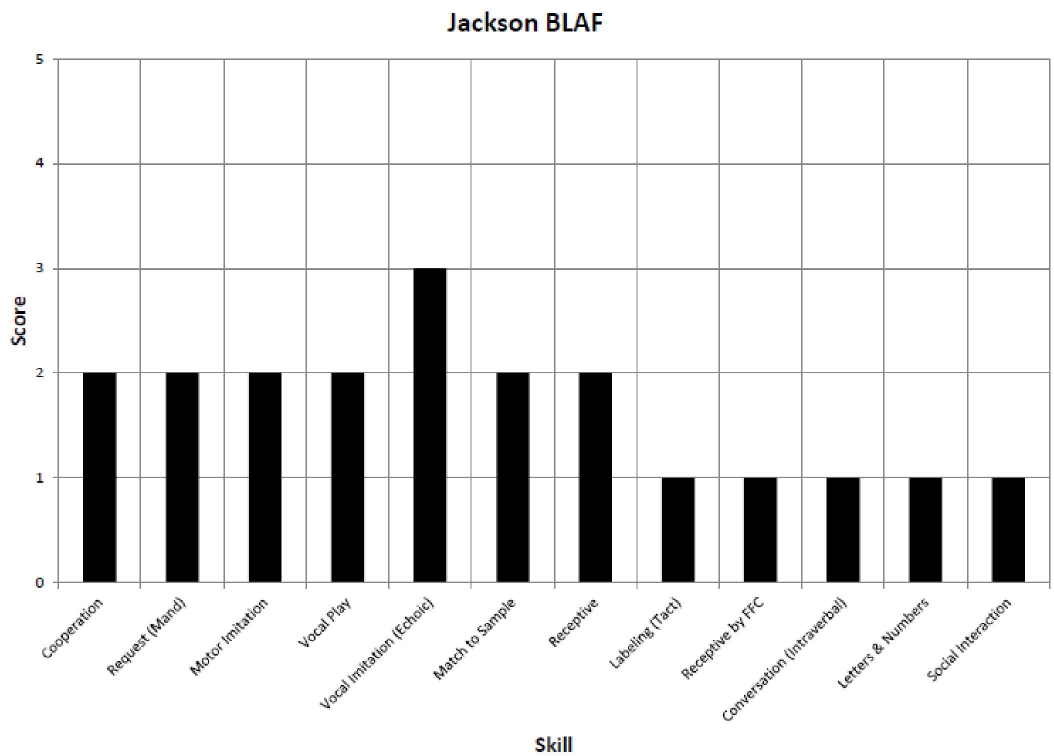

Figure 2. BLAF scores by area of skill for Jackson.

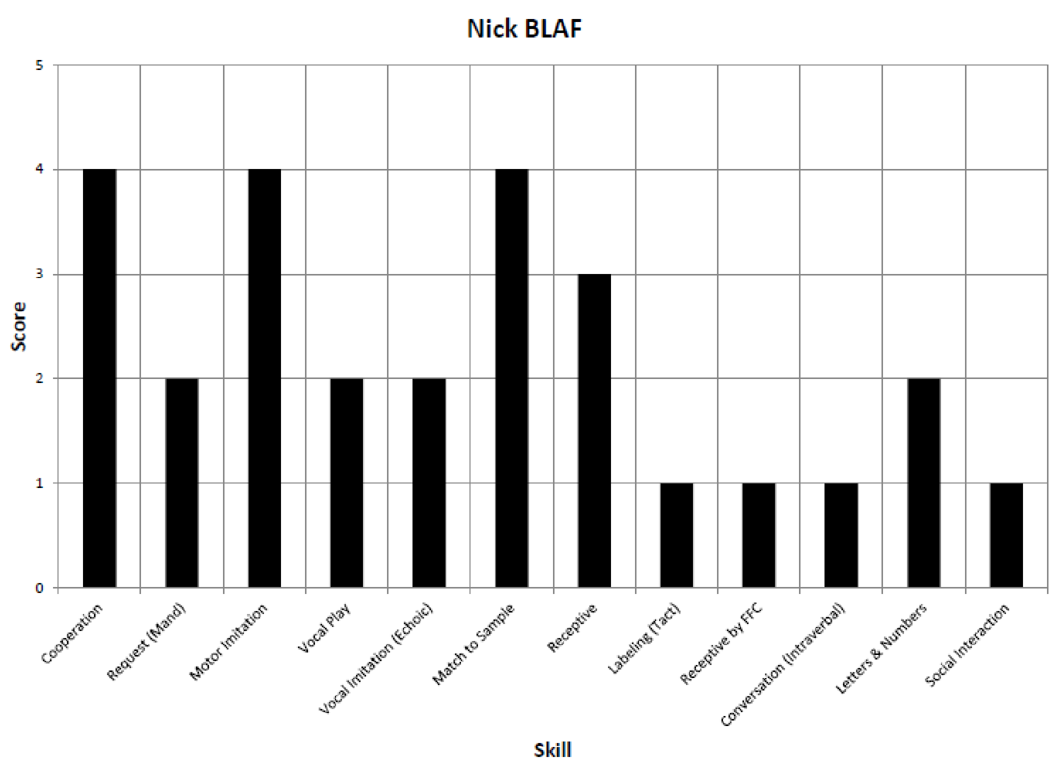

Figure 3. BLAF scores by area of skill for Nick.

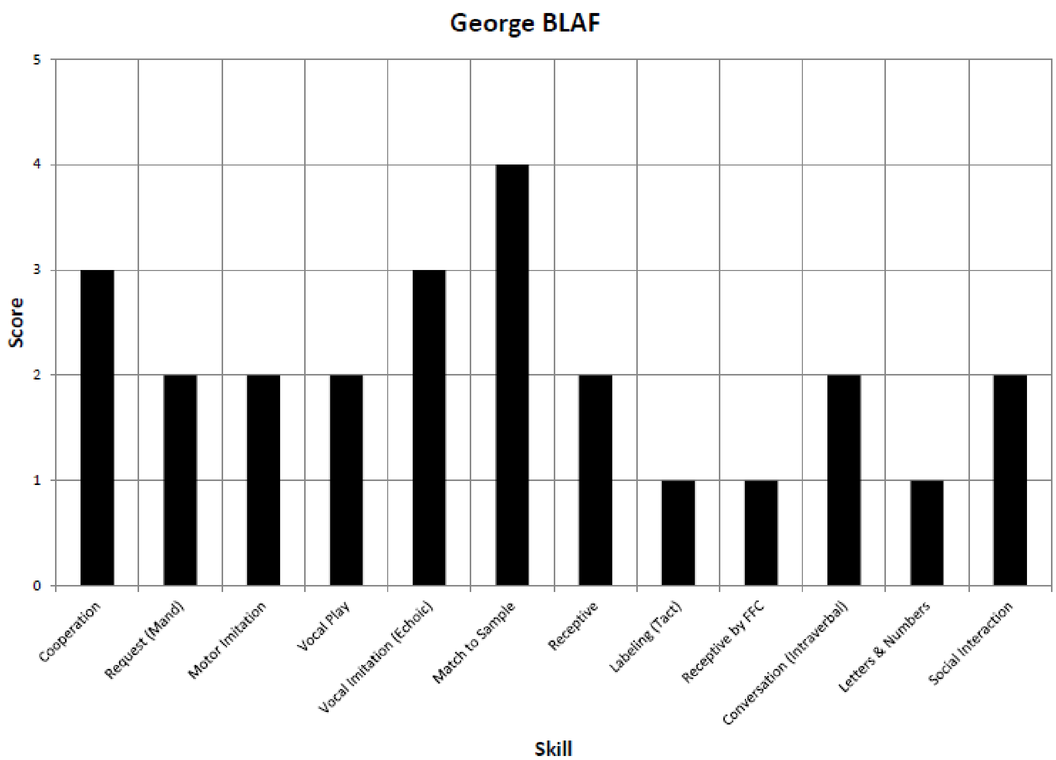

Figure 4. BLAF scores by area of skill for George.

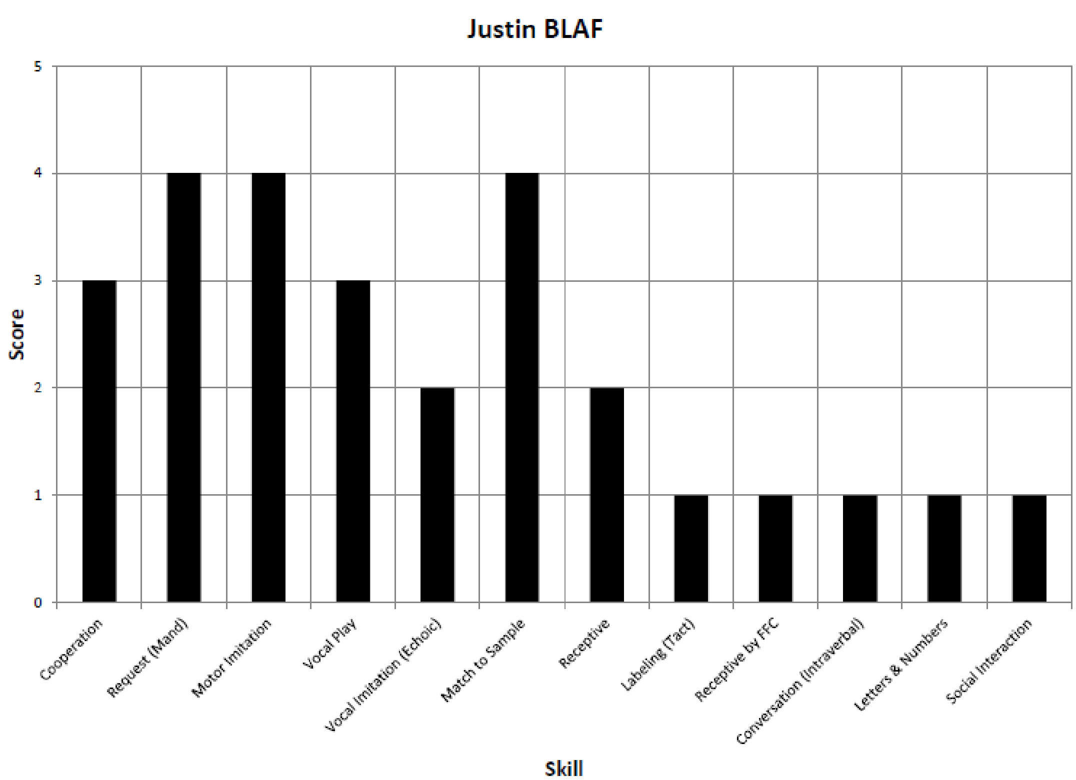

Figure 5. BLAF scores by area of skill for Justin.

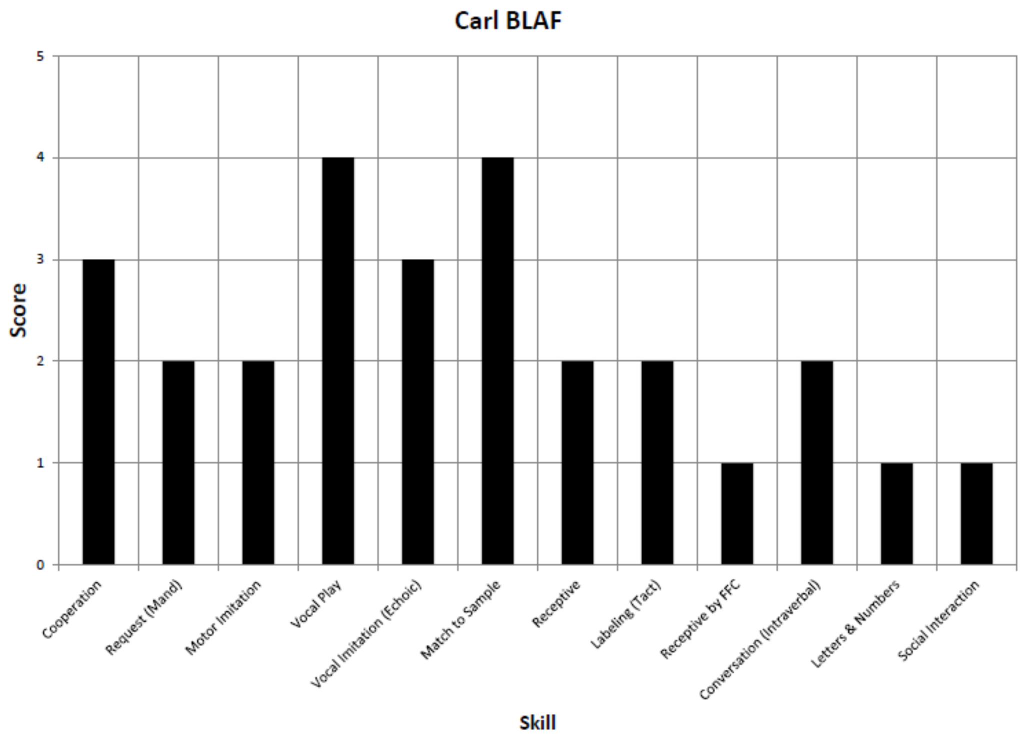

Figure 6. BLAF scores by area of skill for Carl.

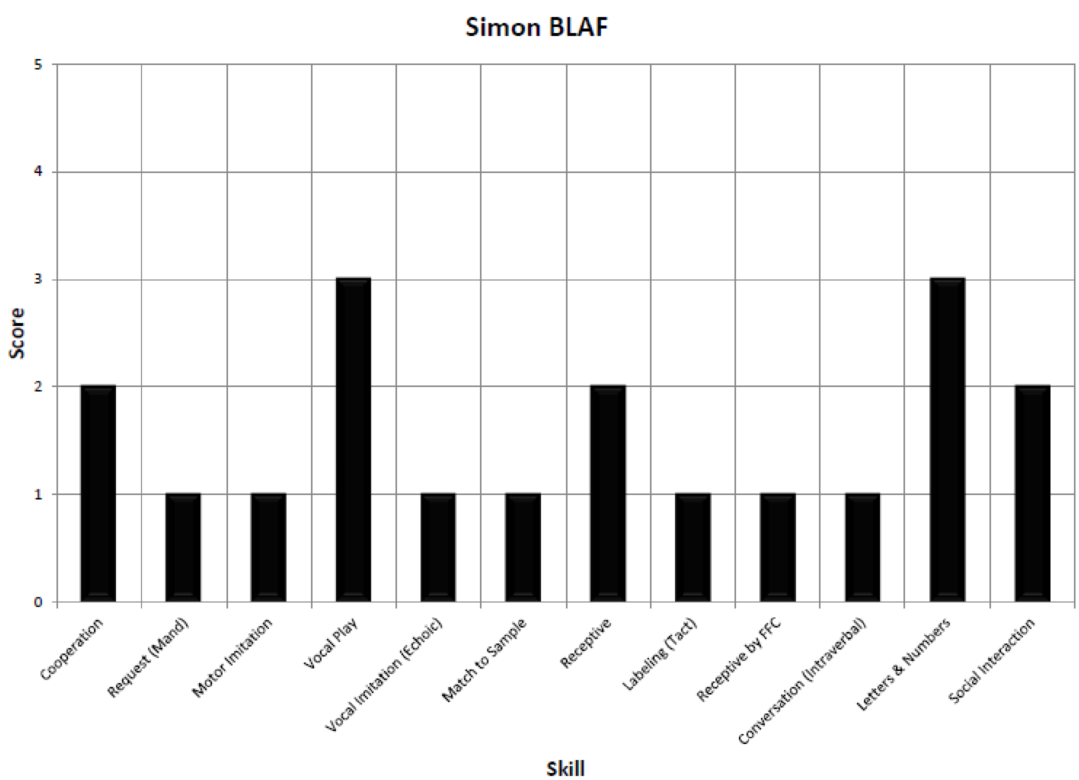

Figure 7. BLAF scores by area of skill for Simon.

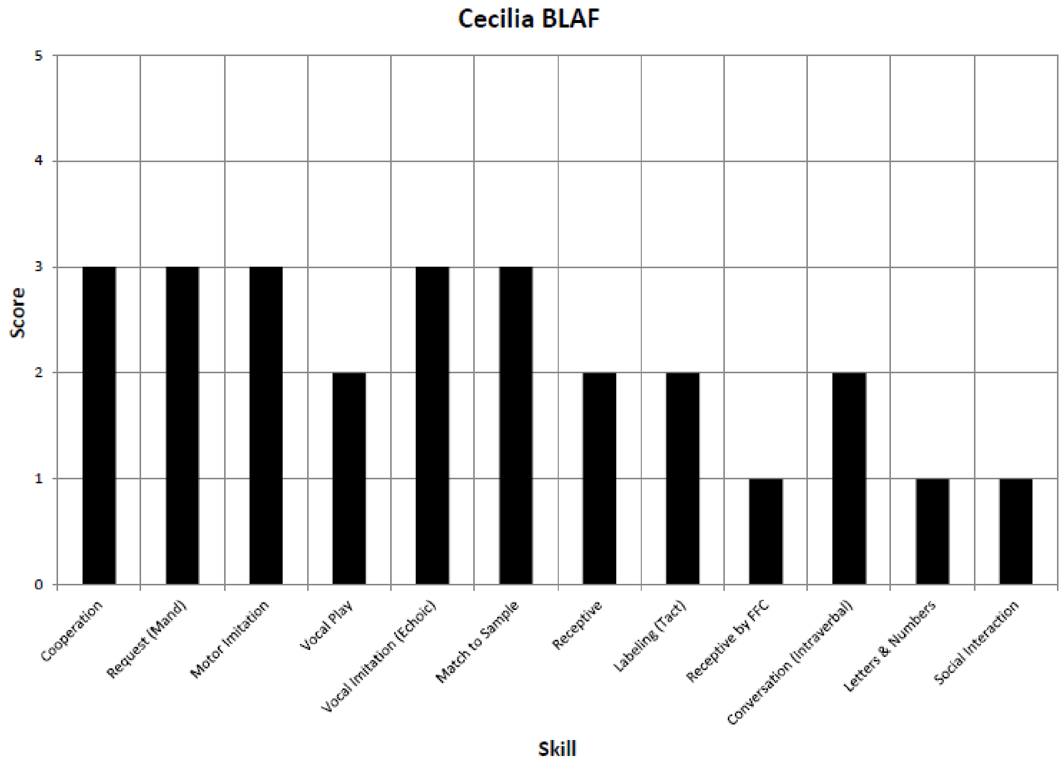

Figure 8. BLAF scores by area of skill for Cecilia.

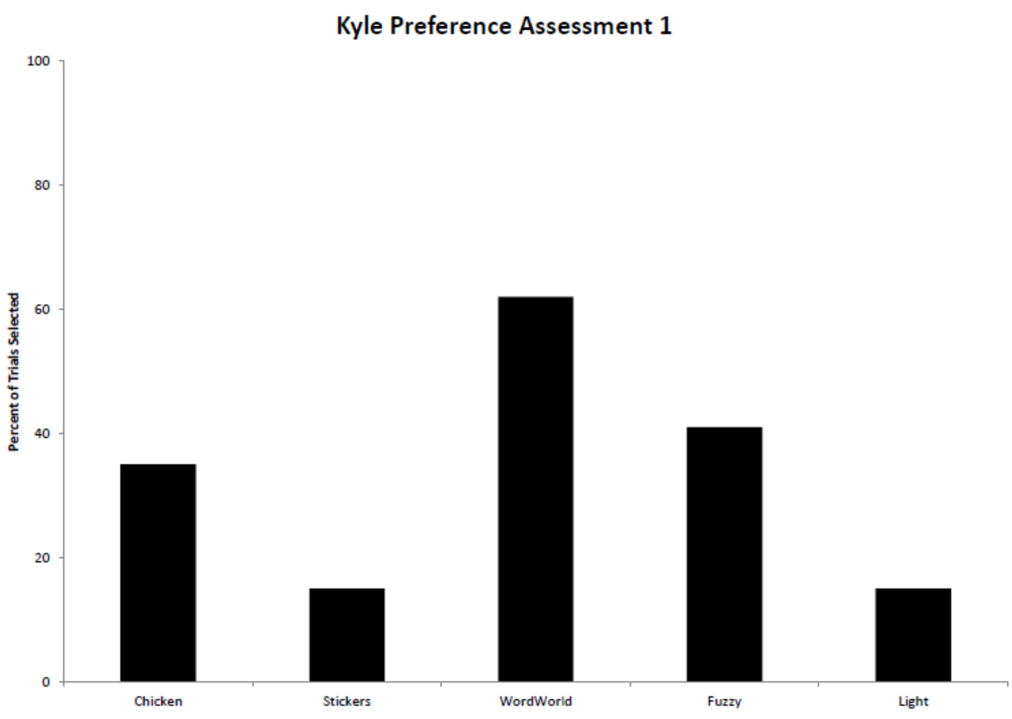

Figure 9. First preference assessment results for Kyle.

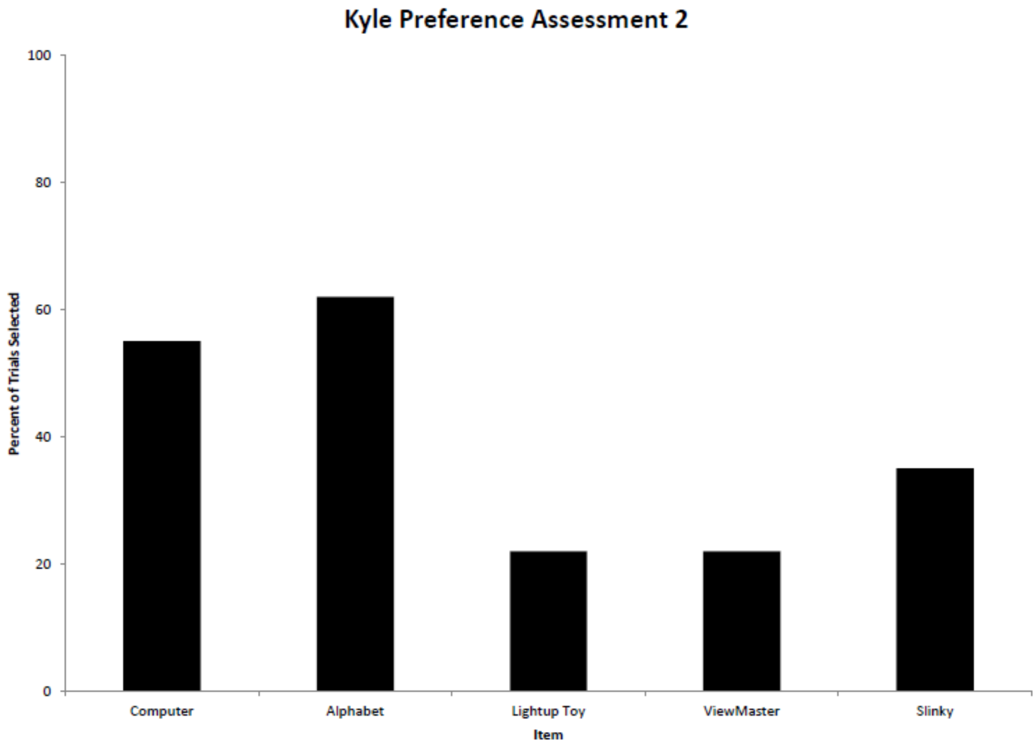

Figure 10. Second preference assessment results for Kyle.

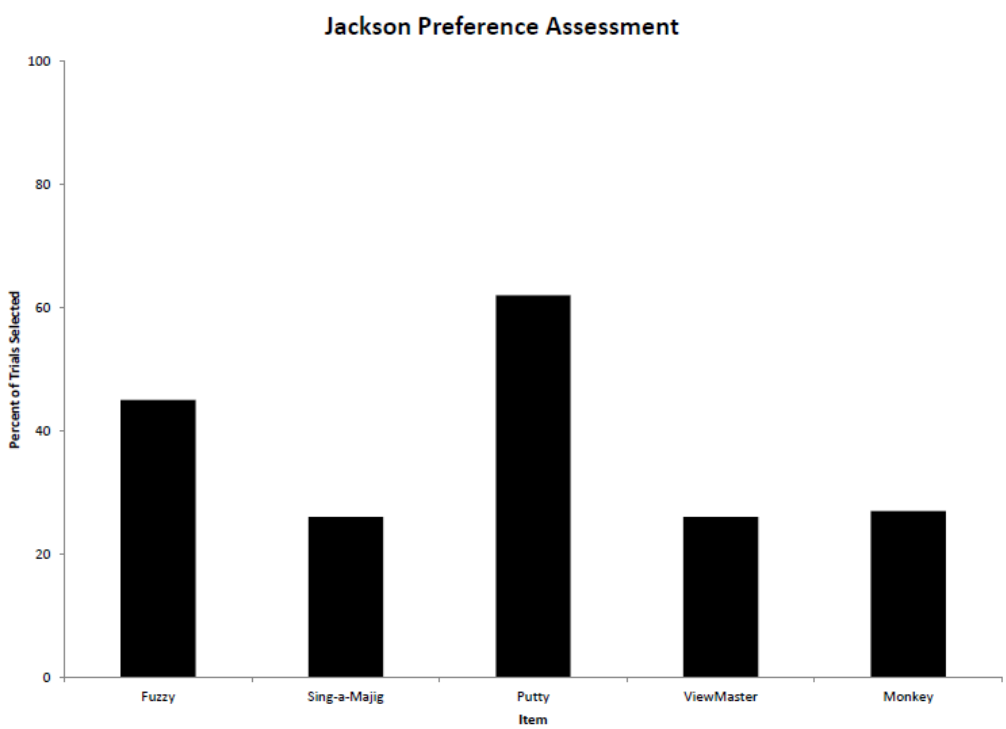

Figure 11. Preference assessment results for Jackson.

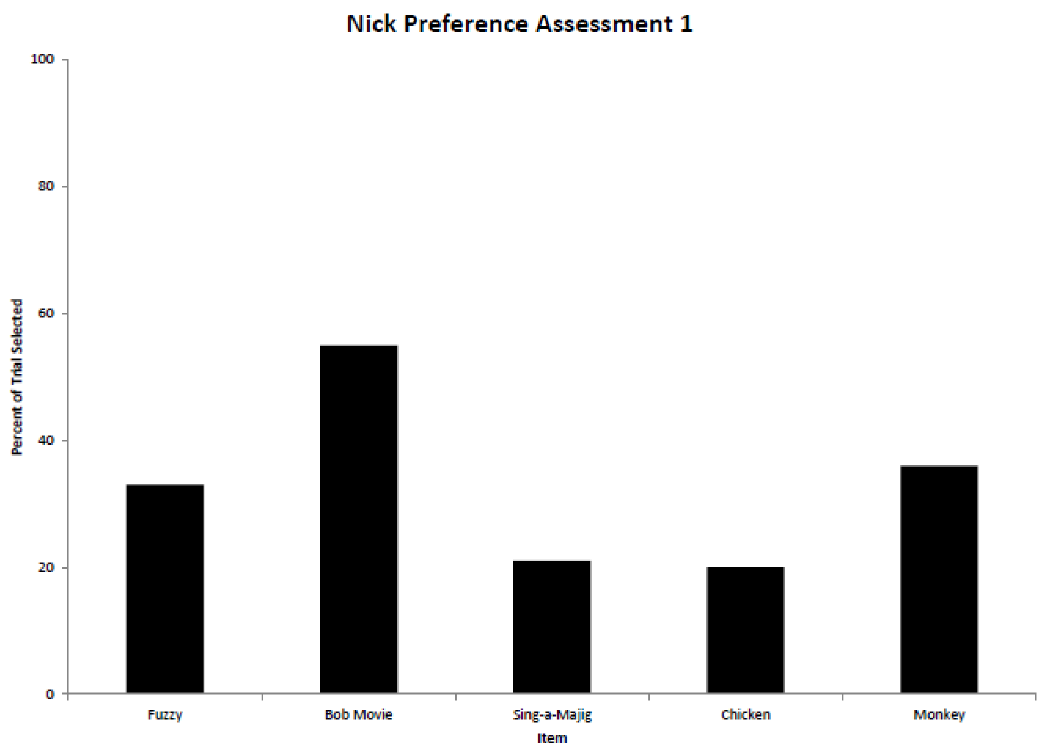

Figure 12. First preference assessment result for Nick.

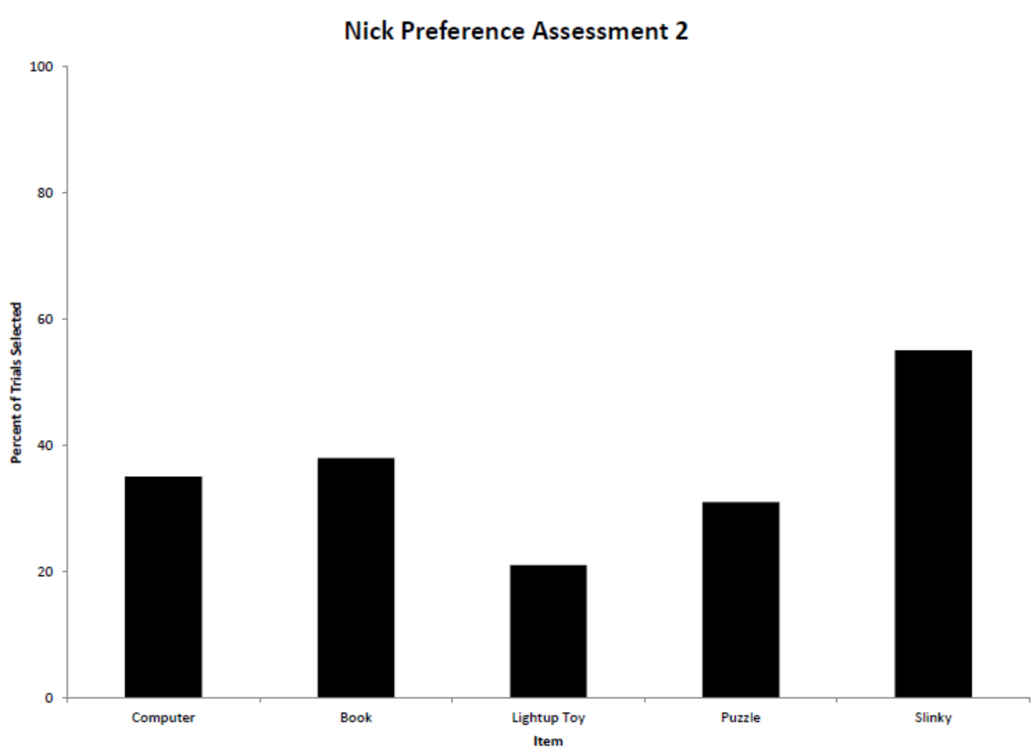

Figure 13. Second preference assessment results for Nick.

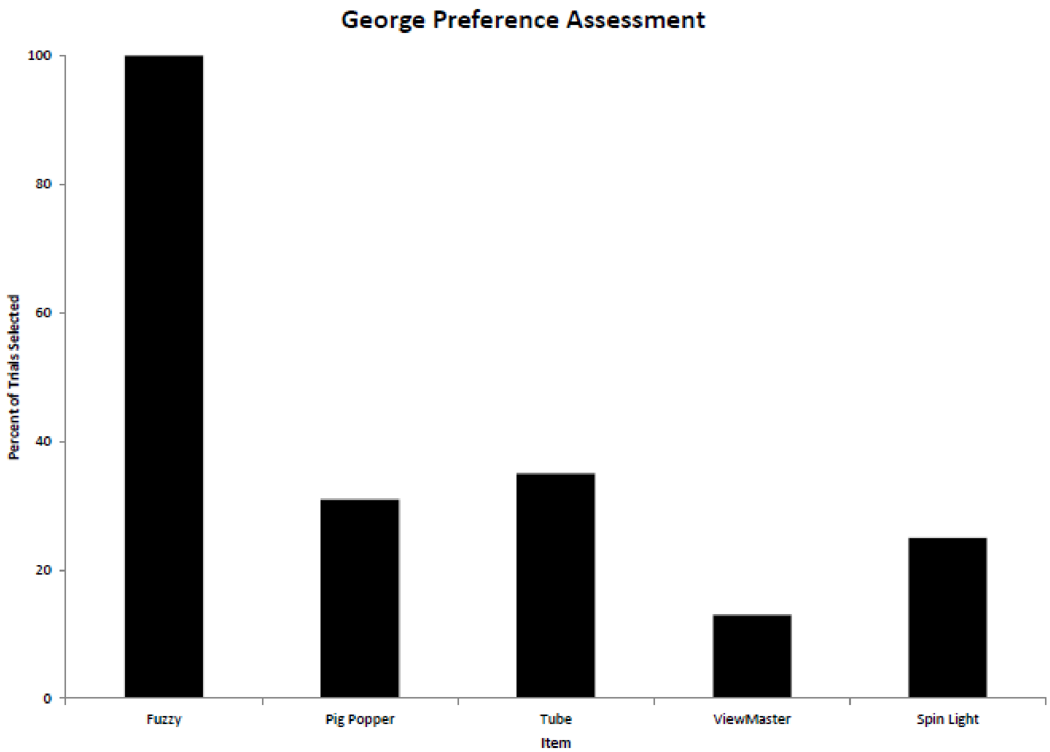

Figure 14. Preference assessment results for George.

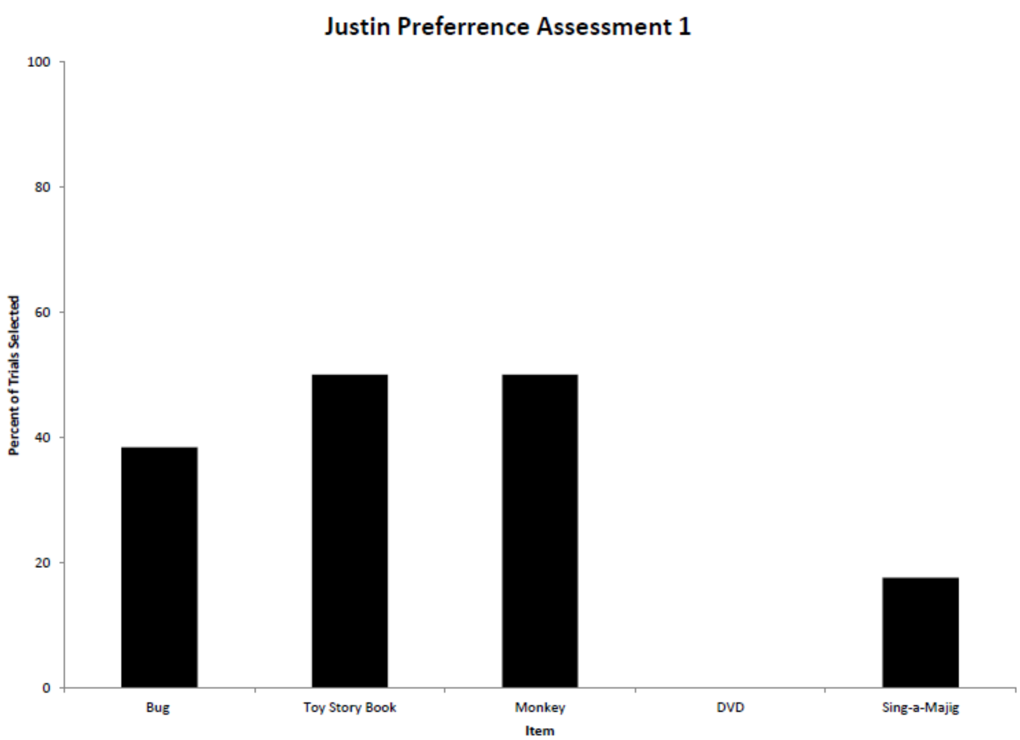

Figure 15. First preference assessment results for Justin.

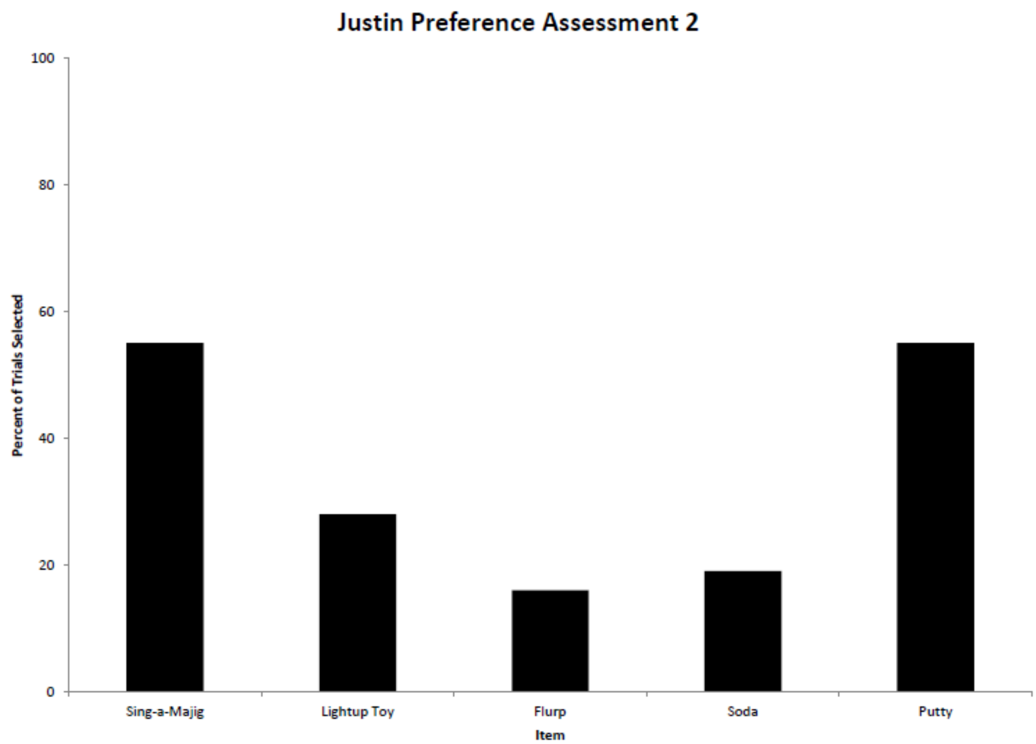

Figure 16. Second preference assessment results for Justin.

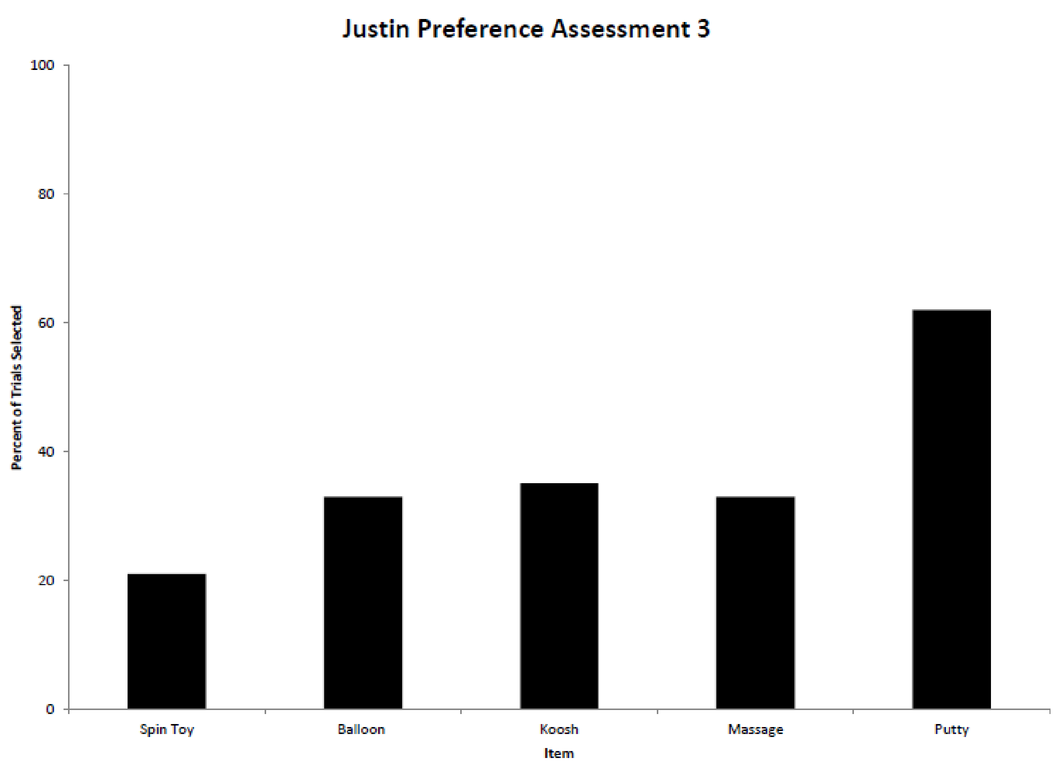

Figure 17. Third preference assessment results for Justin.

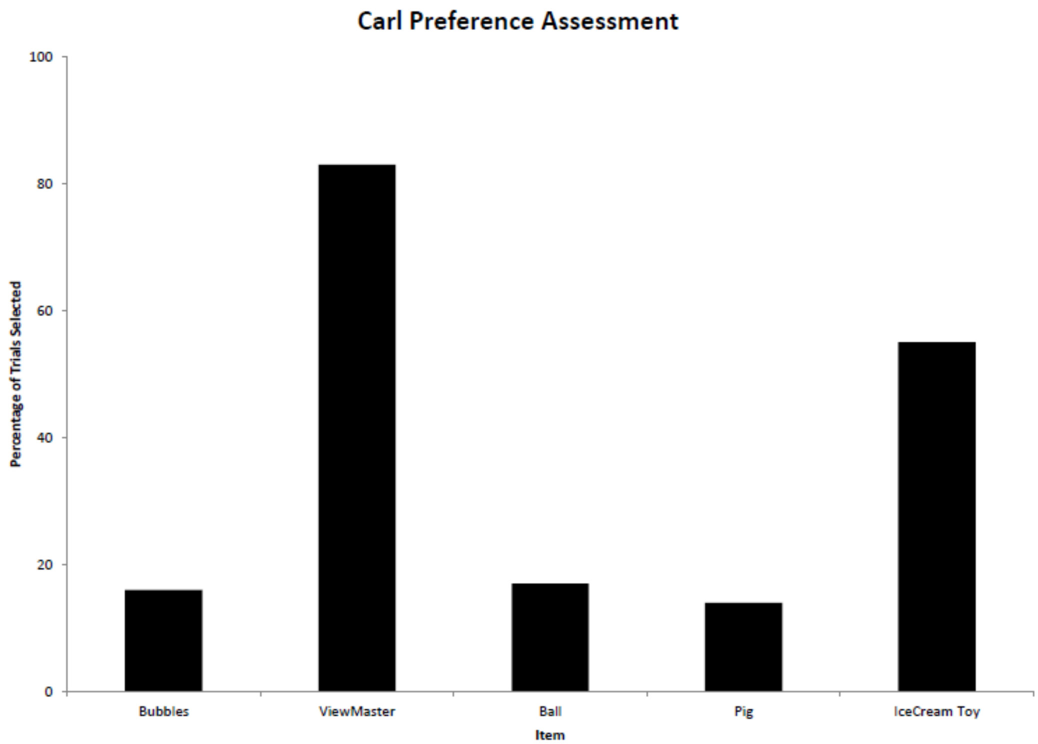

Figure 18. Preference assessment results for Carl.

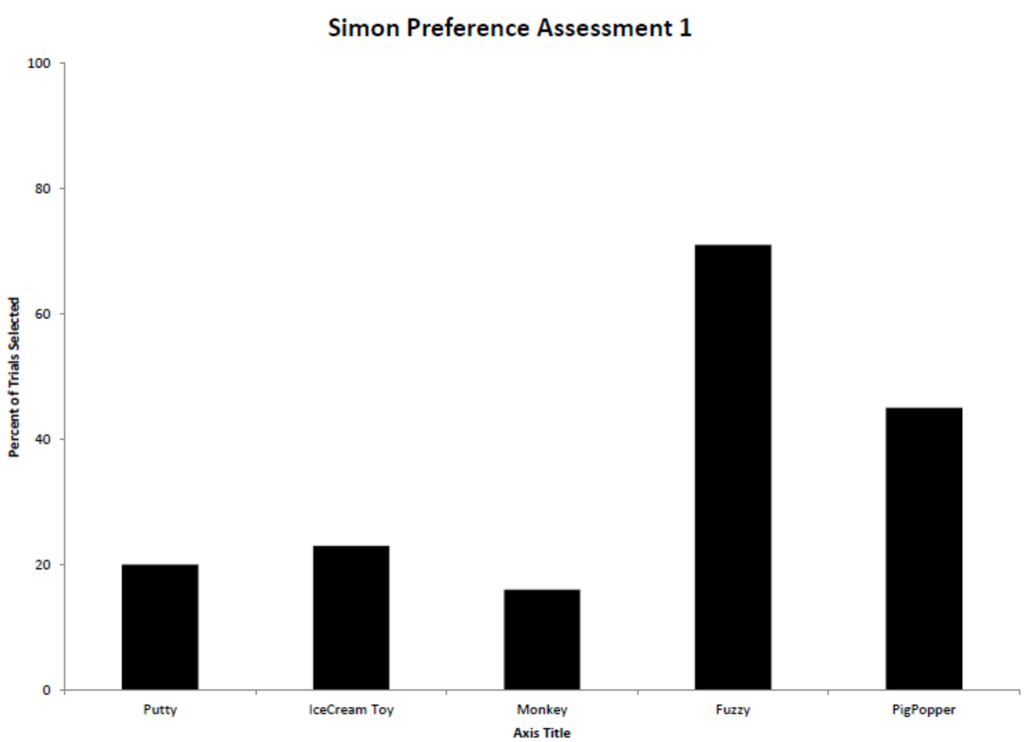

Figure 19. First preference assessment results for Simon.

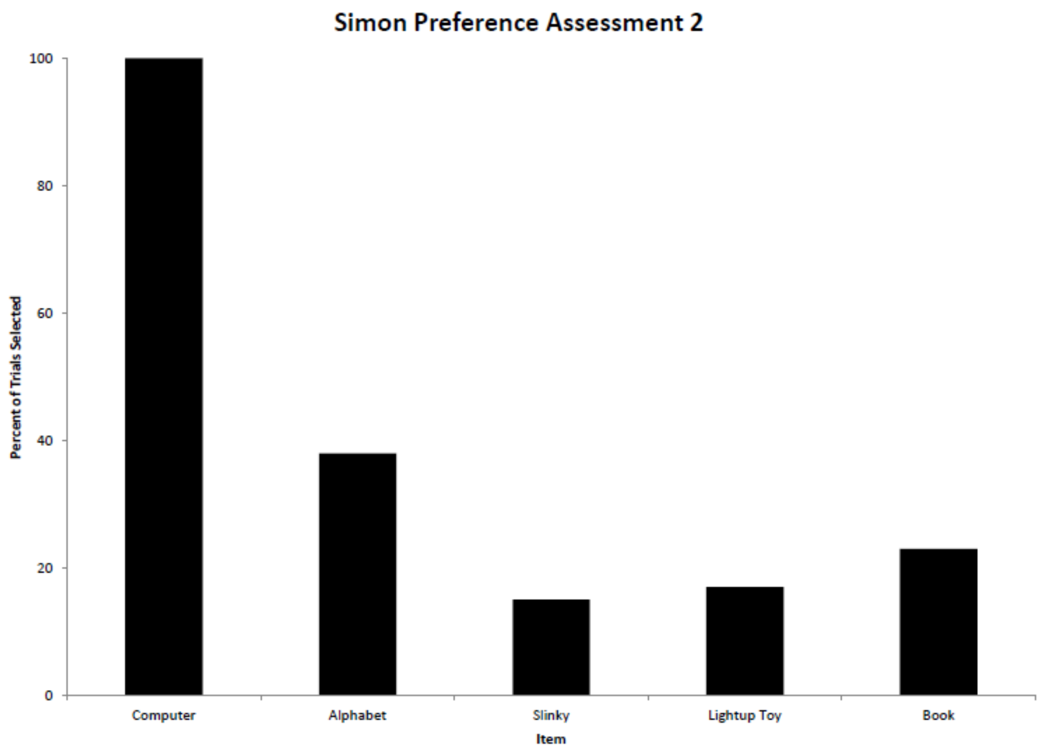

Figure 20. Second preference assessment results for Simon.

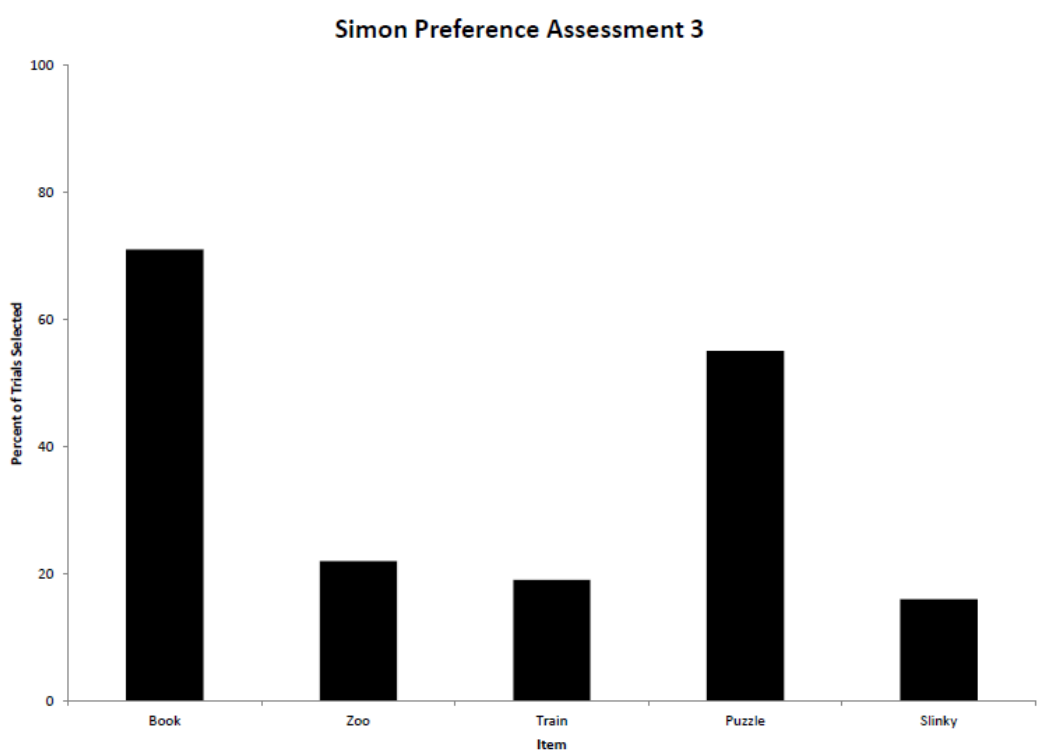

Figure 21. Third preference assessment results for Simon.

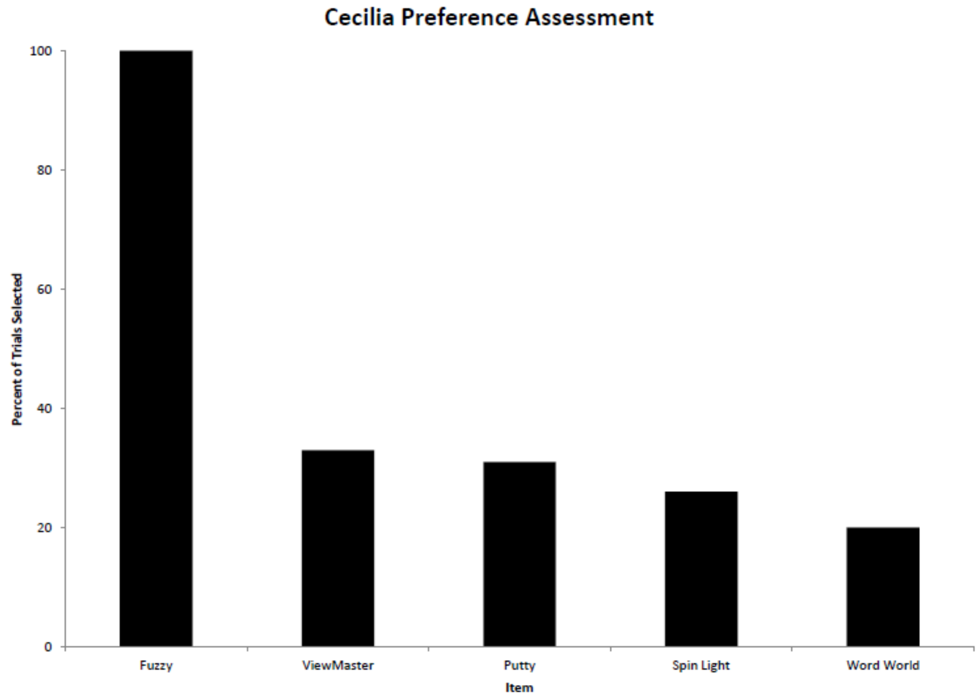

Figure 22. Preference assessment results for Cecilia.

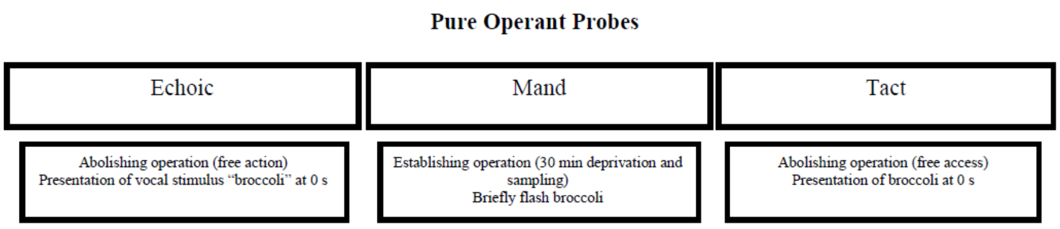

Figure 23. Pure operant probes procedure.

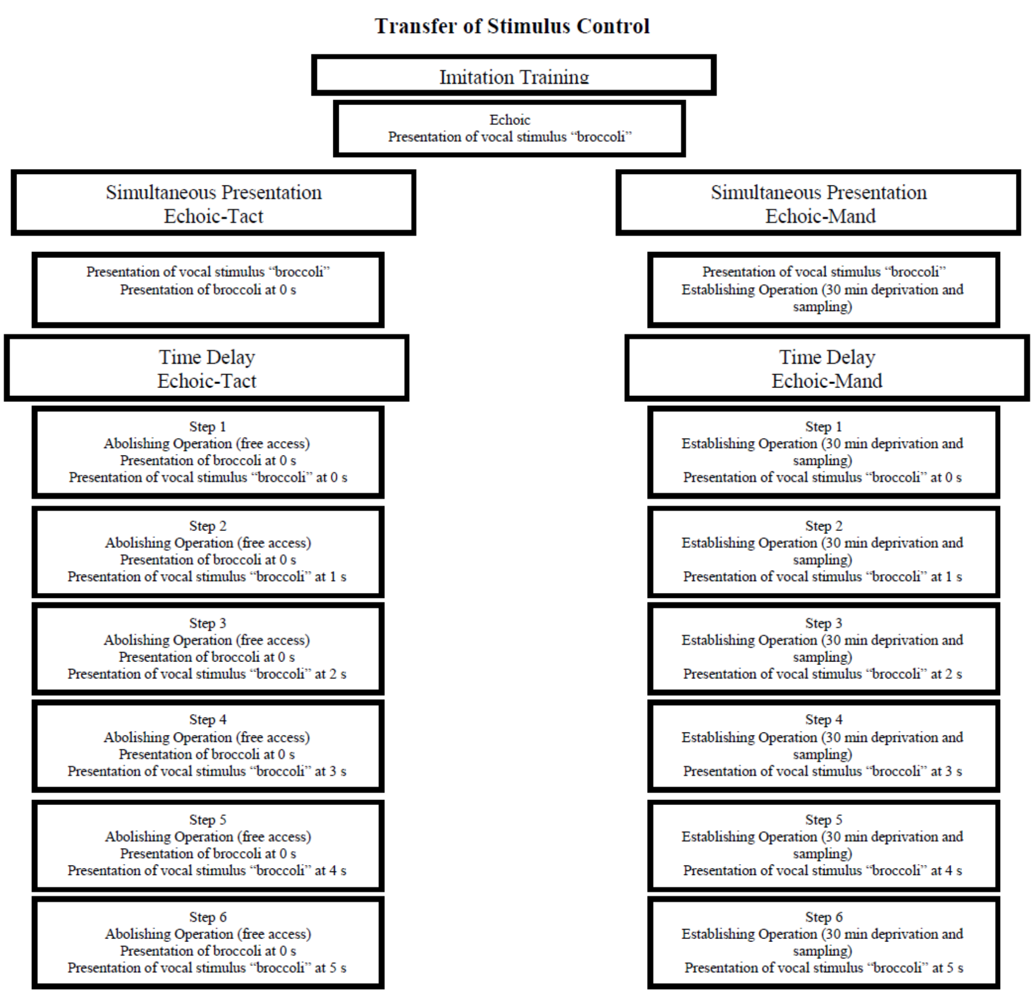

Figure 24. Transfer of stimulus control procedure.

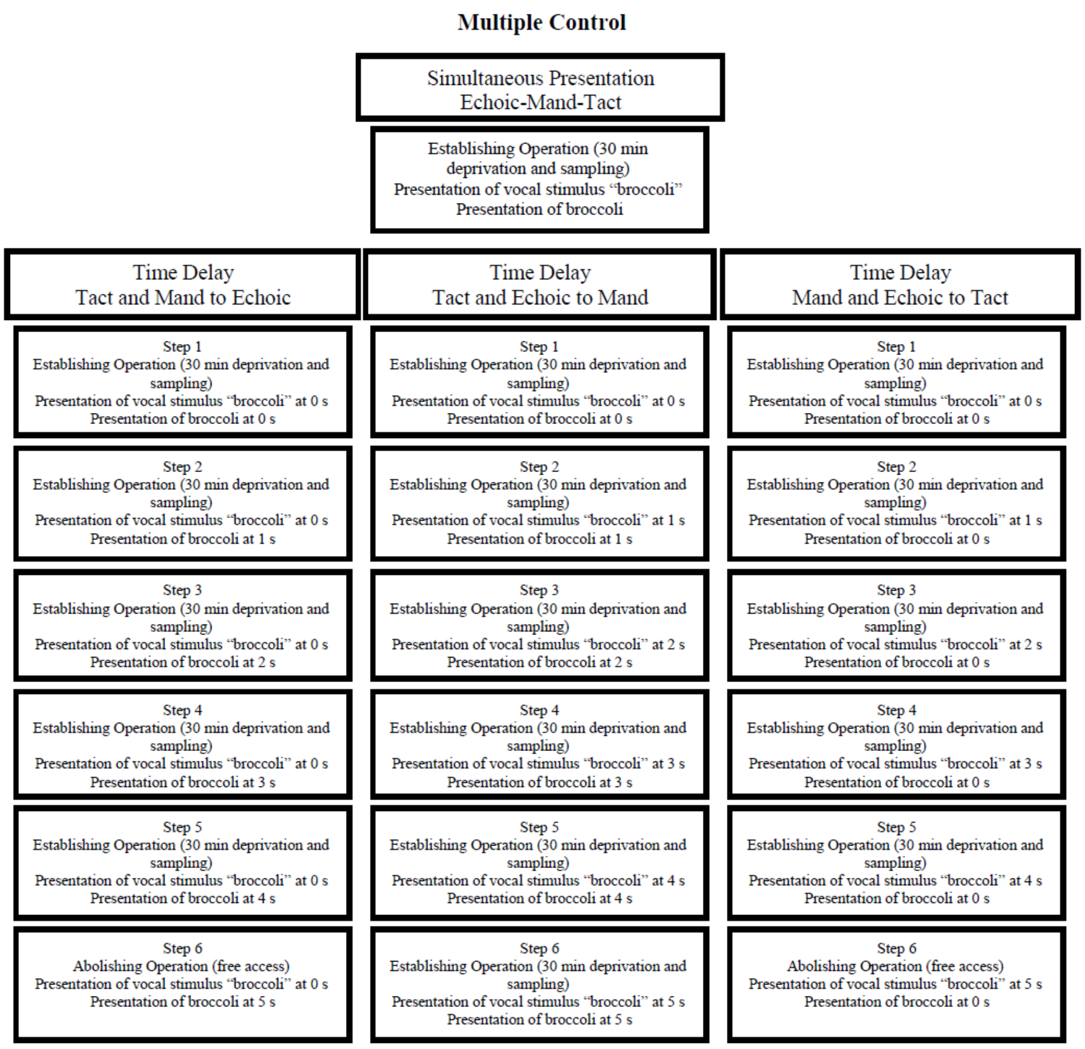

Figure 25. Multiple control procedure.

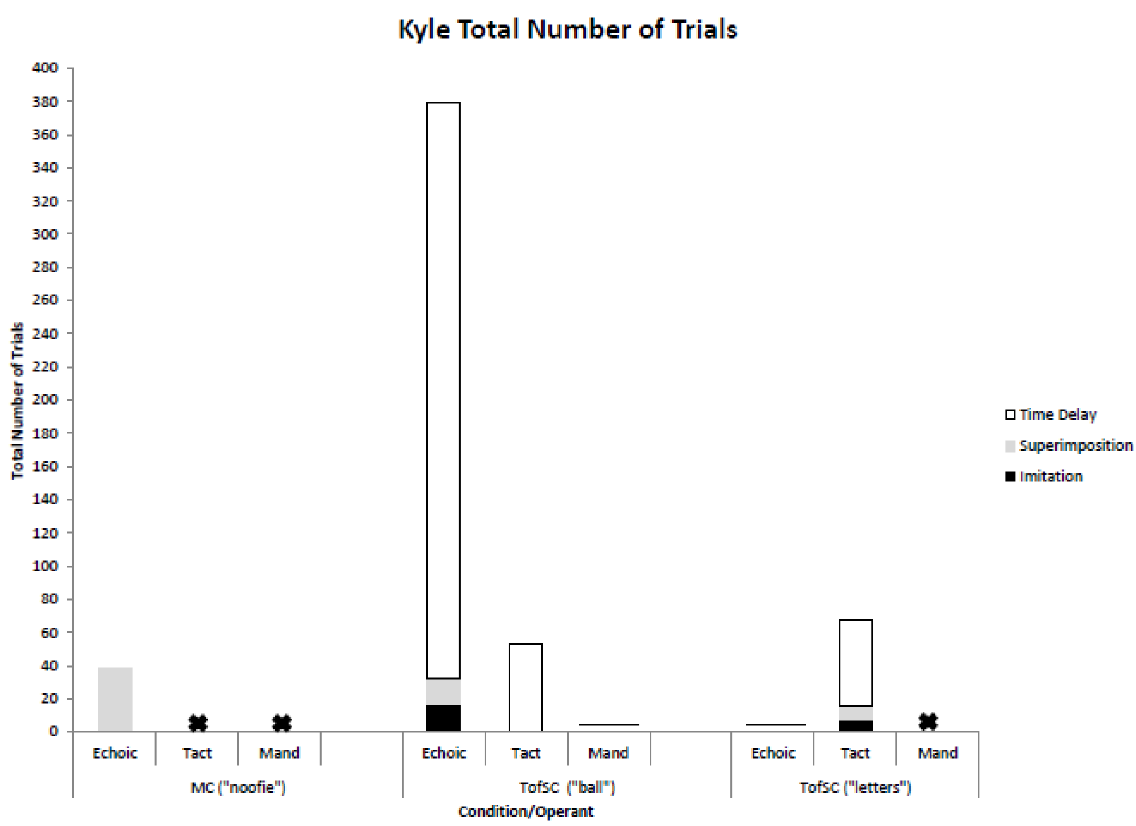

Figure 26. Total number of teaching trials by verbal operant for each condition for Kyle. The first three bars represent the target operants in the multiple control condition (topography "noofie").The first (grey) bar represents total trials in the superimposition phase after which the echoic response was demonstrated. The tact response was targeted next. The two black x's indicate that the tact and mand responses were not demonstrated prior to the end of the study. The next three bars represent the target operants in the transfer of stimulus control condition (topography "ball"). The first bar (black, grey, and white) represents the total trials in the

imitation, superimposition, and time delay phases after which the echoic response was demonstrated. The second bar (white) represents the total trials in the time delay phase after which the tact response was demonstrated. The black horizontal line shown next represents that the mand response emerged without specific training. The last three bars represent the target response for the second topography ("letters") in the transfer of stimulus control condition. The black horizontal line represents that the echoic response was demonstrated during the baseline probes. The next bar (black, grey, and white) represents the total trials in the imitation, superimposition, and time delay phases after which the tact response (targeted first) was demonstrated. The black x indicates that the mand response was not demonstrated prior to the end of the study.

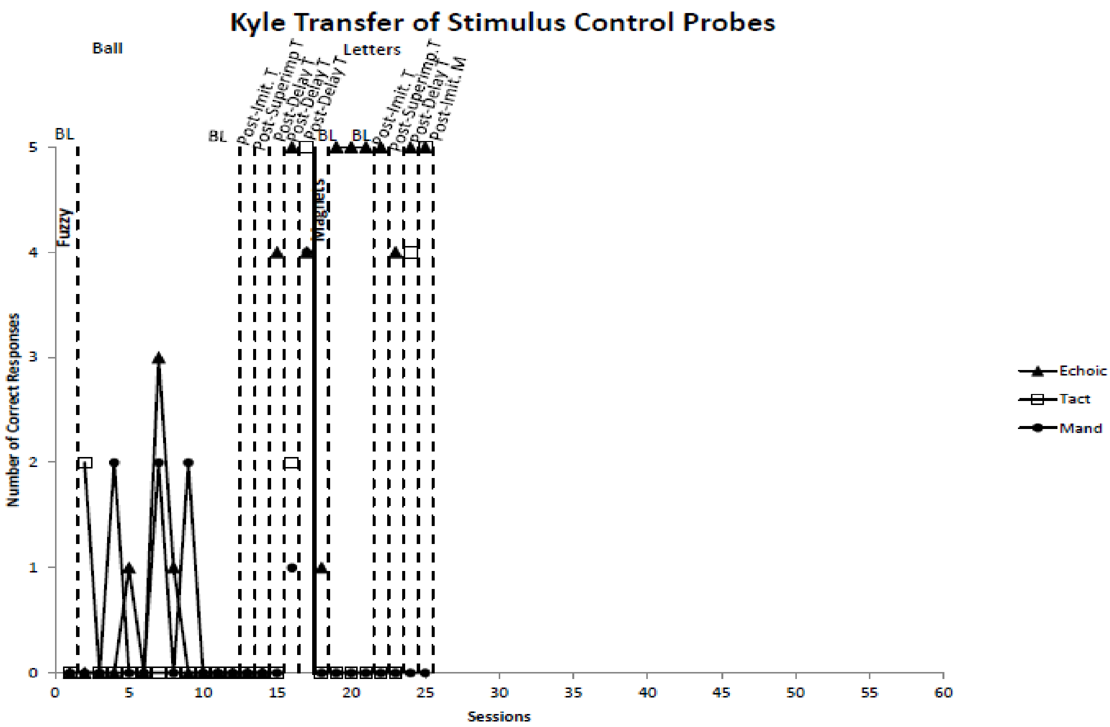

Figure 27. Probe data in transfer of stimulus control condition for Kyle. Closed triangles represent the number of correct responses in the echoic trials. Open squares represent the number of correct responses in the tact trials. Closed circles represent the number of correct responses in the mand trials. The bolded words at the top represent response topographies.

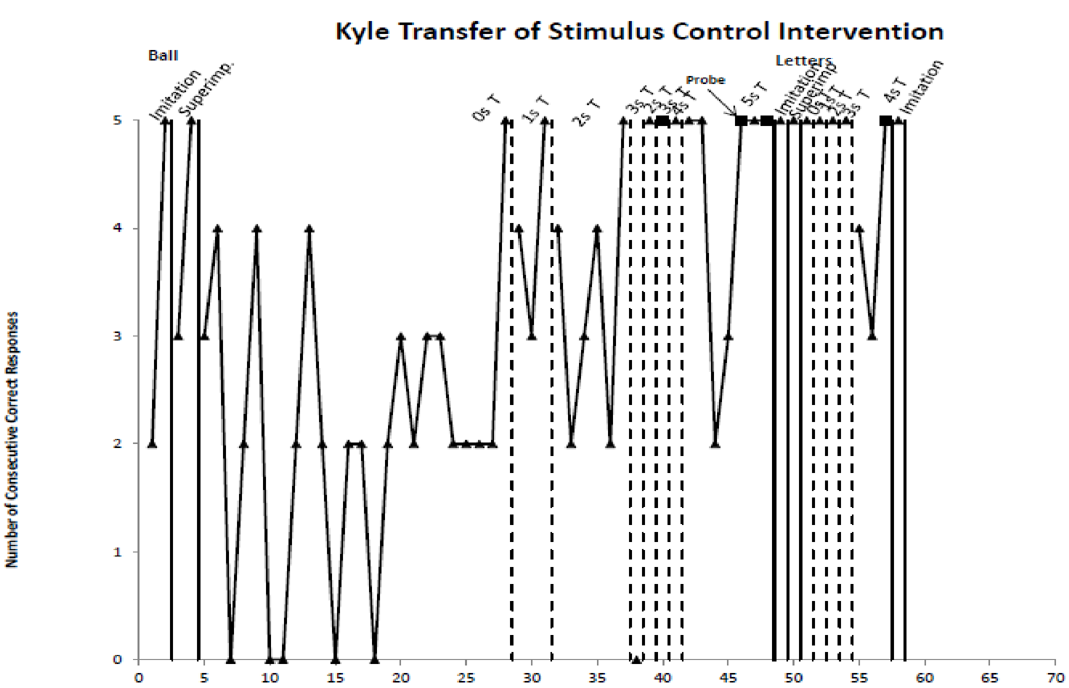

Figure 28. Intervention data in transfer of stimulus control condition for Kyle. Closed triangles represent the number of consecutive correct responses for each session. Closed squares represent sessions with 4 independent correct responses out of 5 consecutive correct responses, following which a probe session was conducted.

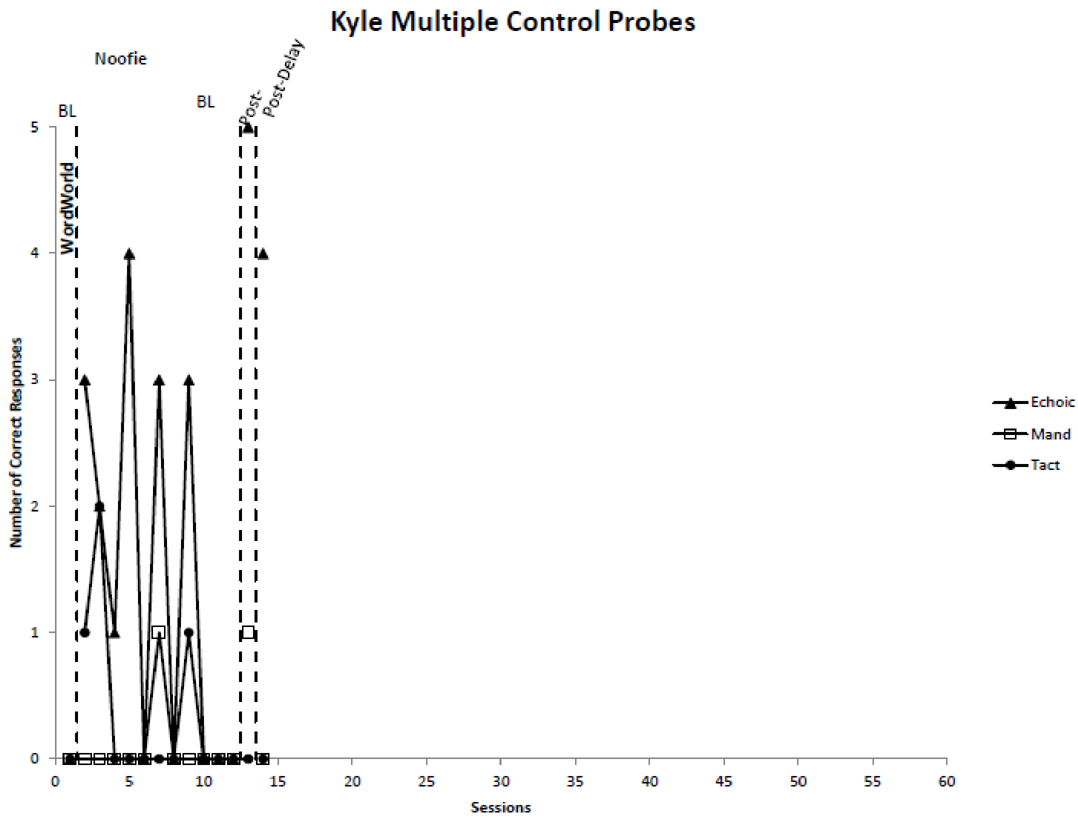

Figure 29. Probe data in multiple control condition for Kyle. Closed triangles represent the number of correct responses in the echoic trials. Open squares represent the number of correct responses in the tact trials. Closed circles represent the number of correct responses in the mand trials. The bolded words at the top represent response topographies.

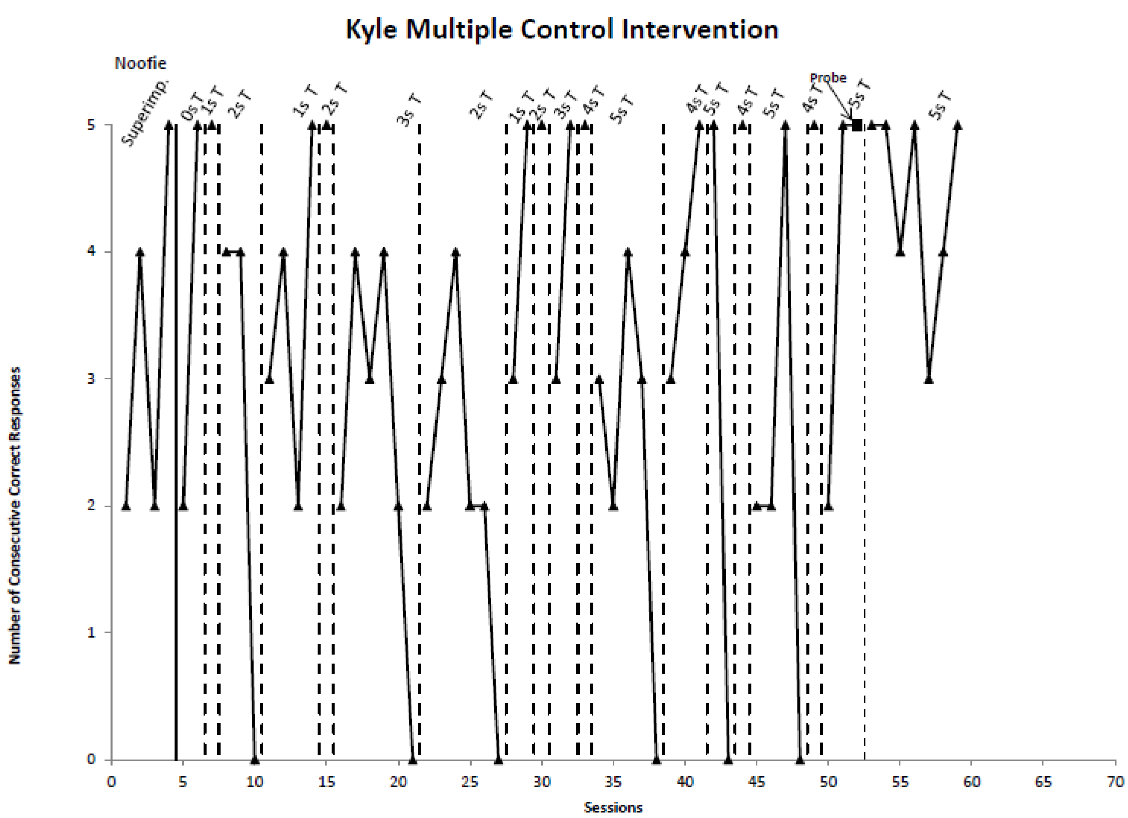

Figure 30. Intervention data in multiple control condition for Kyle. Closed triangles represent the number of consecutive correct responses for each session. Closed squares represent sessions with 4 independent correct responses out of 5 consecutive correct responses, following which a probe session was conducted.

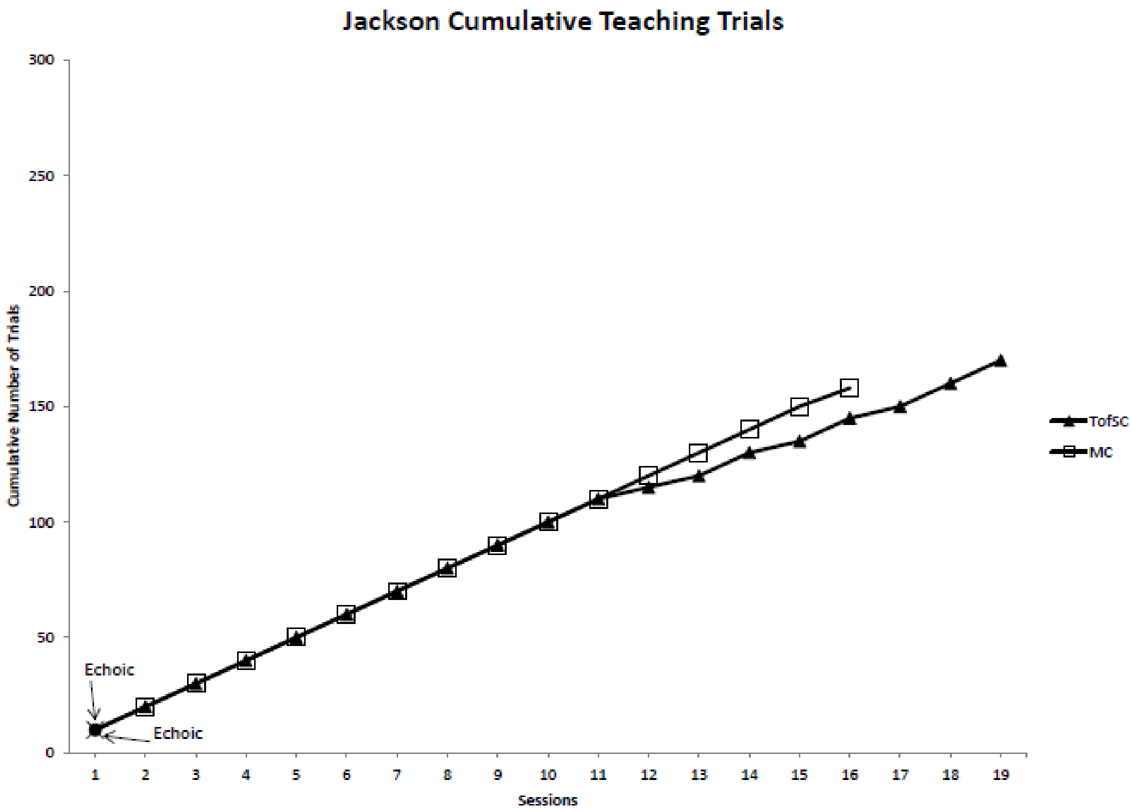

Figure 31. Cumulative number of teaching trials for each response by condition for Jackson. Closed triangles represent the number of trials in the transfer of stimulus control condition. The closed circle indicates where the echoic response was demonstrated in the transfer of stimulus control condition. Open squares represent the number of trials in the multiple control condition. The x indicates when the echoic response was demonstrated in the multiple control condition.

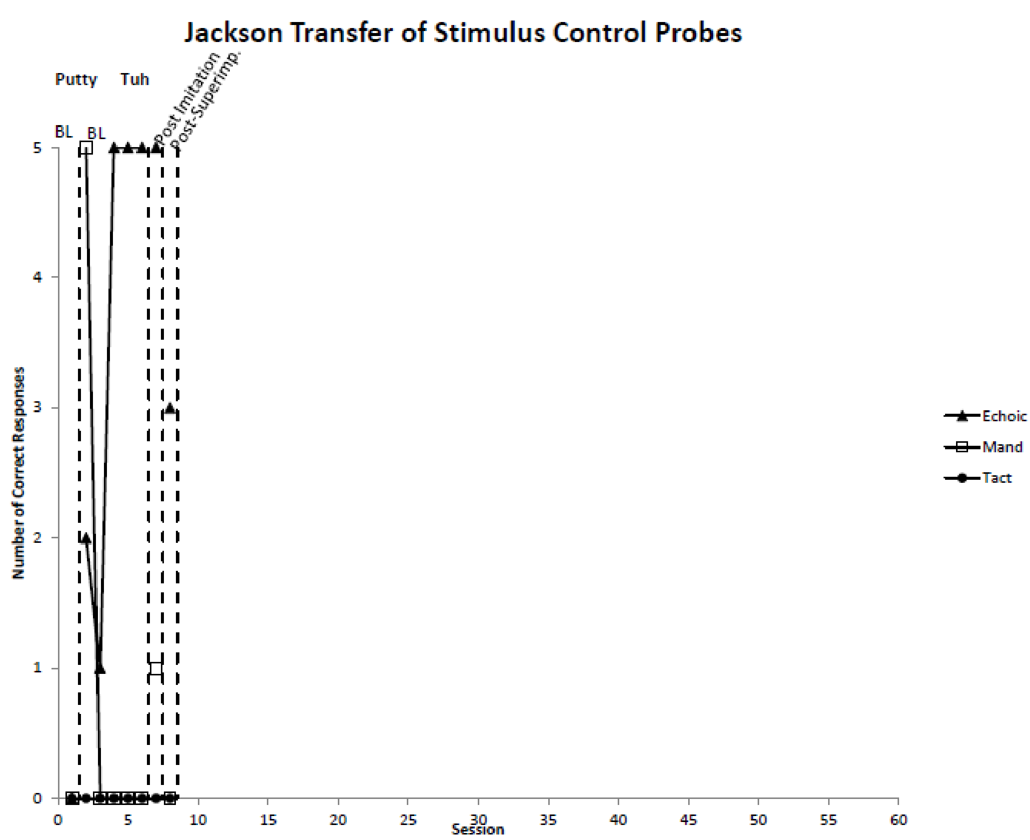

Figure 32. Probe data in transfer of stimulus control condition for Jackson. Closed triangles represent the number of correct responses in the echoic trials. Open squares represent the number of correct responses in the tact trials. Closed circles represent the number of correct responses in the mand trials. The bolded words at the top represent response topographies.

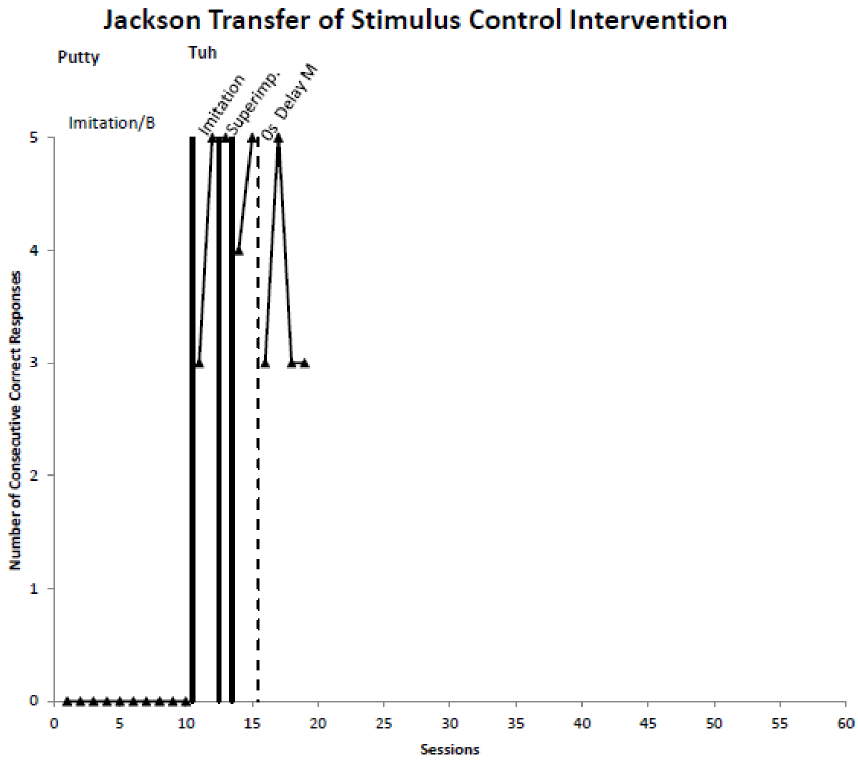

Figure 33. Intervention data in transfer of stimulus control condition for Jackson. Closed triangles represent the number of consecutive correct responses for each session.

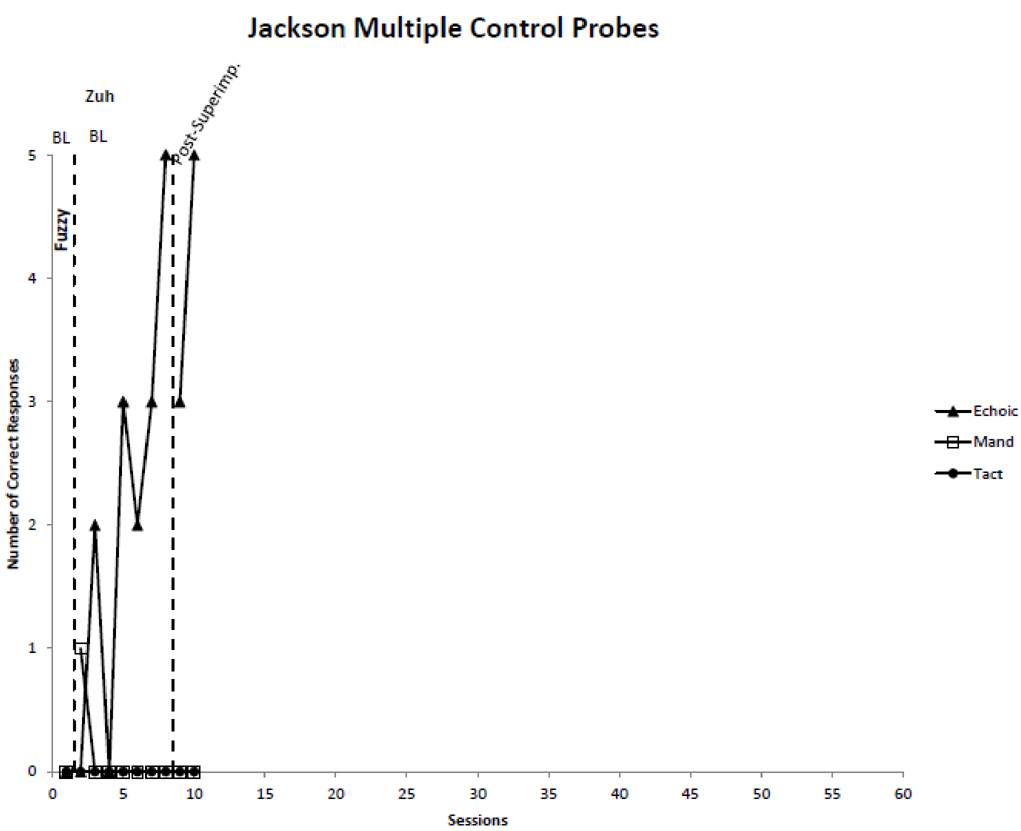

Figure 34. Probe data in multiple control condition for Jackson. Closed triangles represent the number of correct responses in the echoic trials. Open squares represent the number of correct responses in the tact trials. Closed circles represent the number of correct responses in the mand trials. The bolded words at the top represent response topographies.

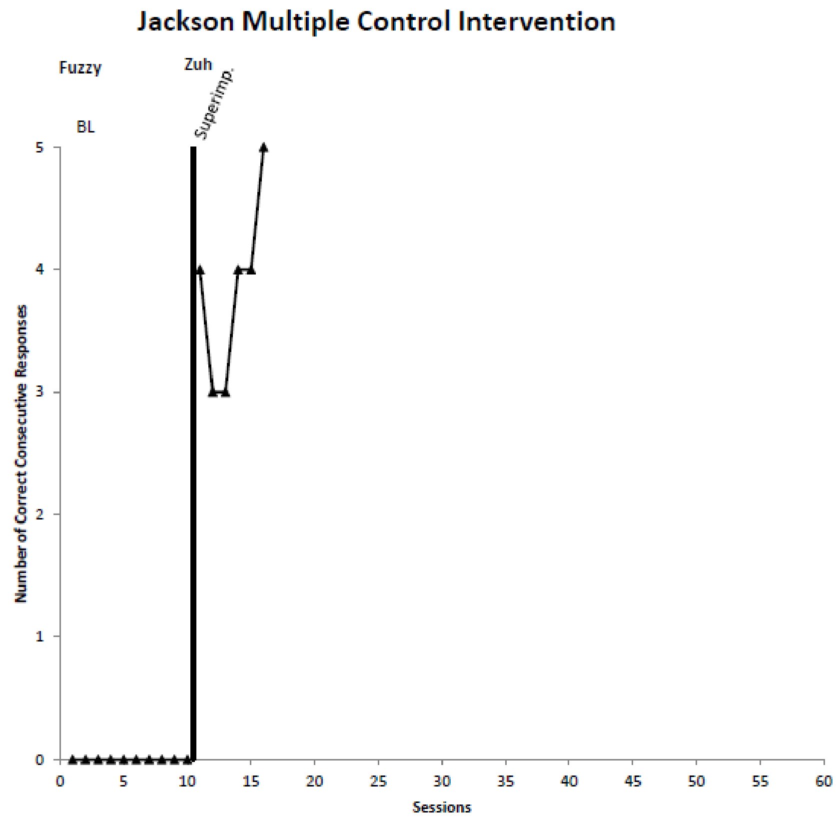

Figure 35. Intervention data in multiple control condition for Jackson. Closed triangles represent the number of consecutive correct responses for each session.

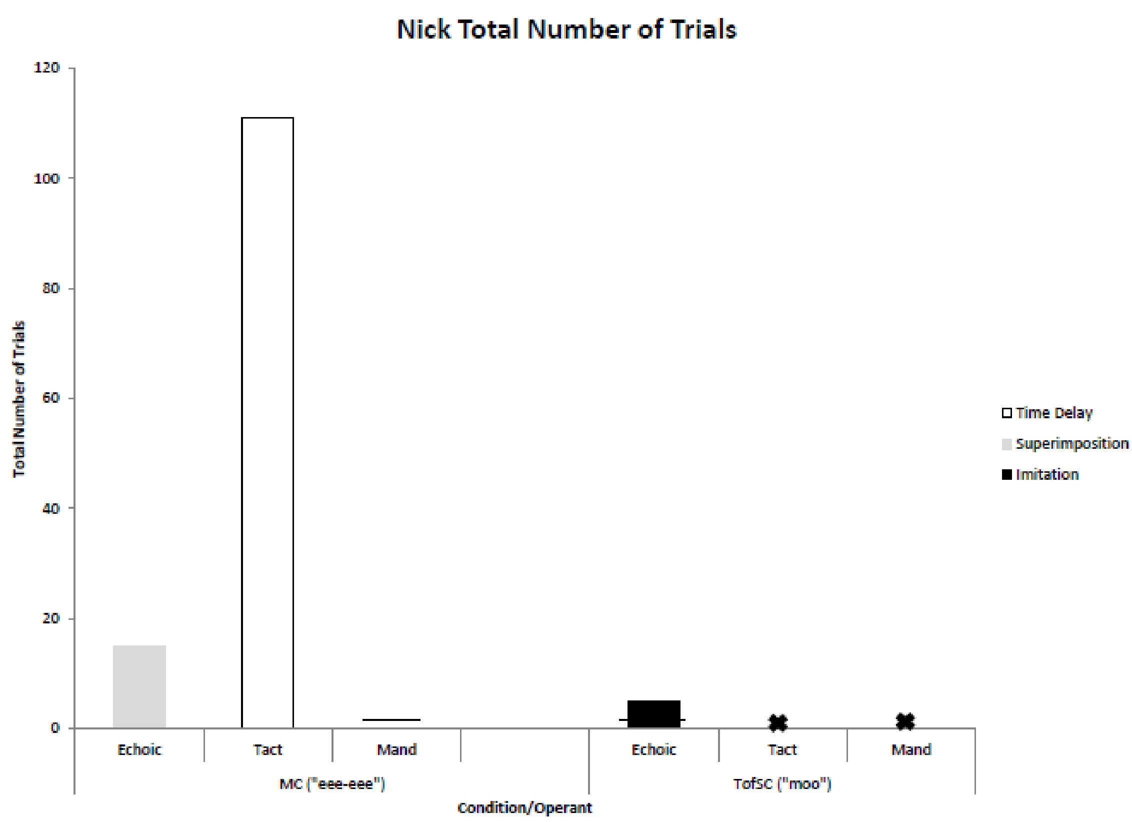

Figure 36. Total number of teaching trials by verbal operant for each condition for Nick. The first three bars represent the target operants in the multiple control condition (topography "eee-eee").The first (grey) bar represents total trials in the superimposition phase after which the echoic response was demonstrated. The second (white) bar represents the trials in the time delay phase after which the tact response (targeted first) was demonstrated. The black horizontal line shown next represents that the mand operant emerged without specific training following the time delay phase for transfer to the tact response. The next three sections represent the target operants in the transfer of stimulus control condition (topography "moo"). The black bar represents the total trials in the imitation phase and the black horizontal line represents that the echoic response was demonstrated during baseline probes. The tact response was targeted next. The two black x's indicate that the tact and mand responses were not demonstrated prior to the end of the study.

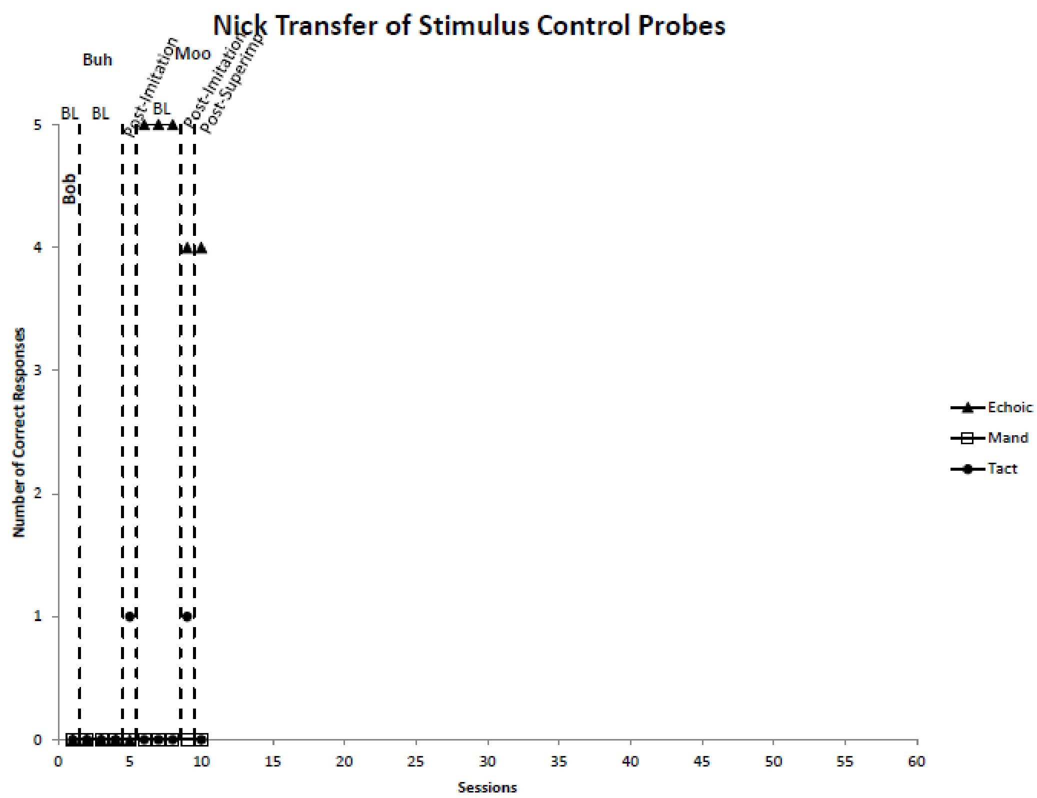

Figure 37. Probe data in transfer of stimulus control condition for Nick. Closed triangles represent the number of correct responses in the echoic trials. Open squares represent the number of correct responses in the tact trials. Closed circles represent the number of correct responses in the mand trials. The bolded words at the top represent response topographies.

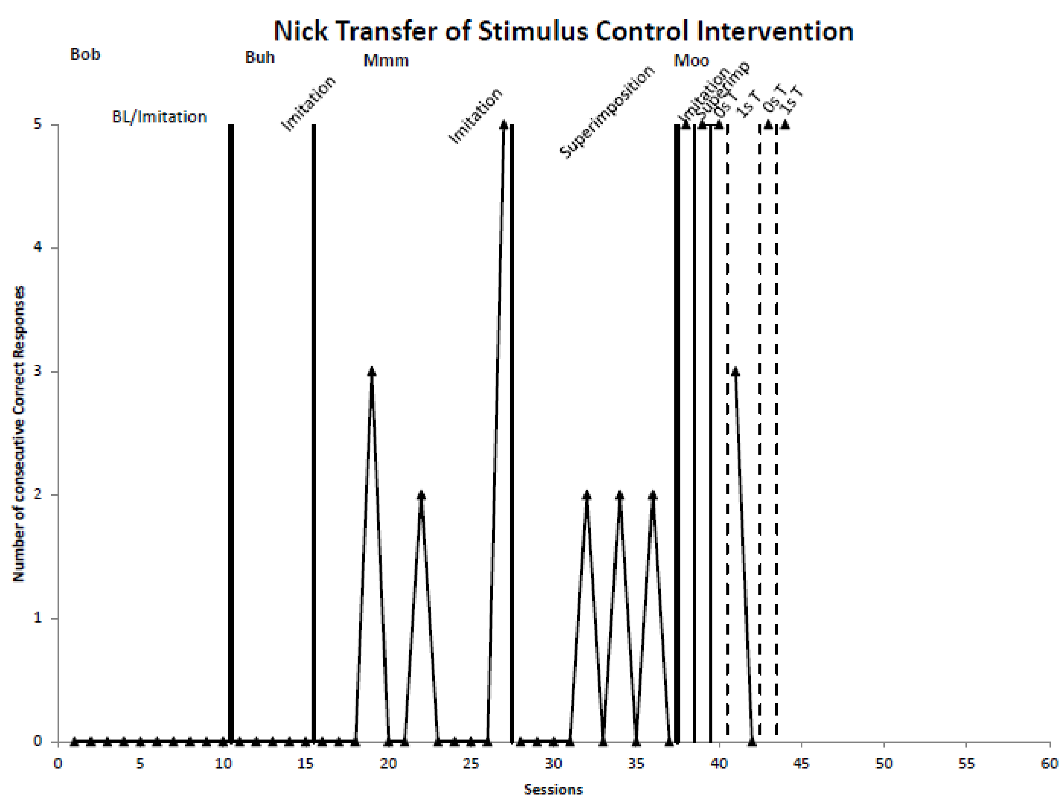

Figure 38. Intervention data in transfer of stimulus control condition for Nick. Closed triangles represent the number of consecutive correct responses for each session. Closed squares represent the sessions with 4 independent correct responses out of 5 consecutive correct responses, following which a probe session was conducted.

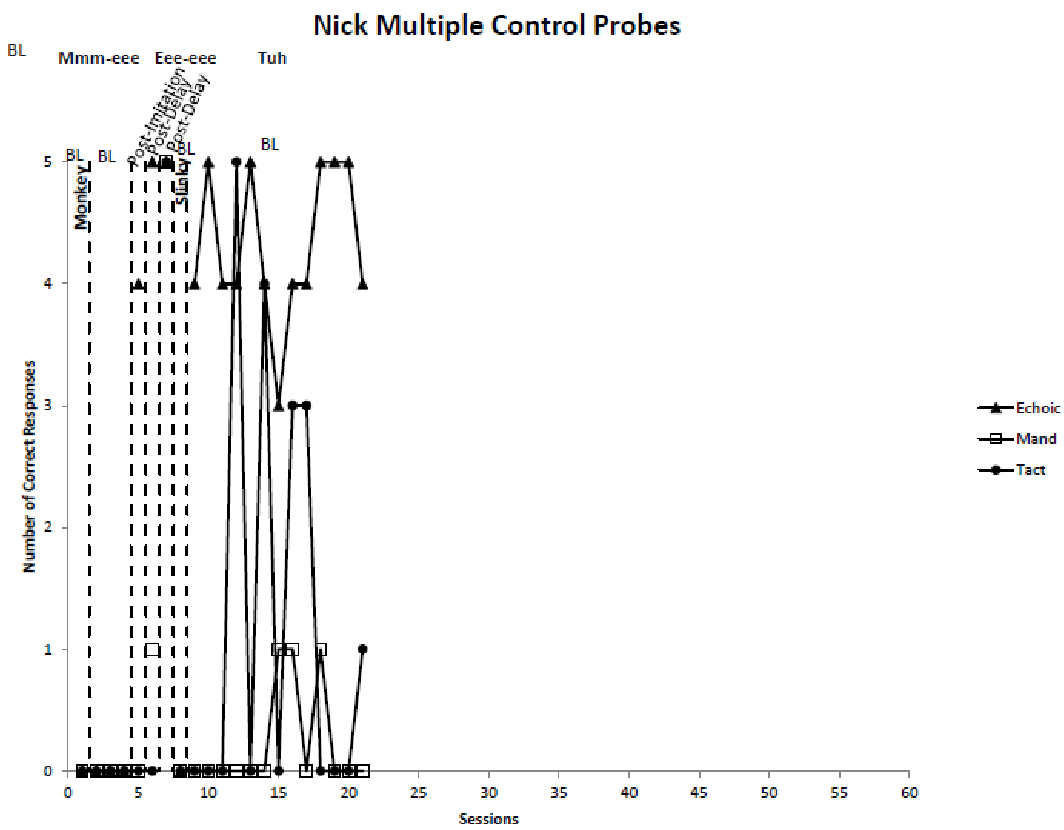

Figure 39. Probe data in multiple control condition for Nick. Closed triangles represent the number of correct responses in the echoic trials. Open squares represent the number of correct responses in the tact trials. Closed circles represent the number of correct responses in the mand trials. The bolded words at the top represent response topographies.

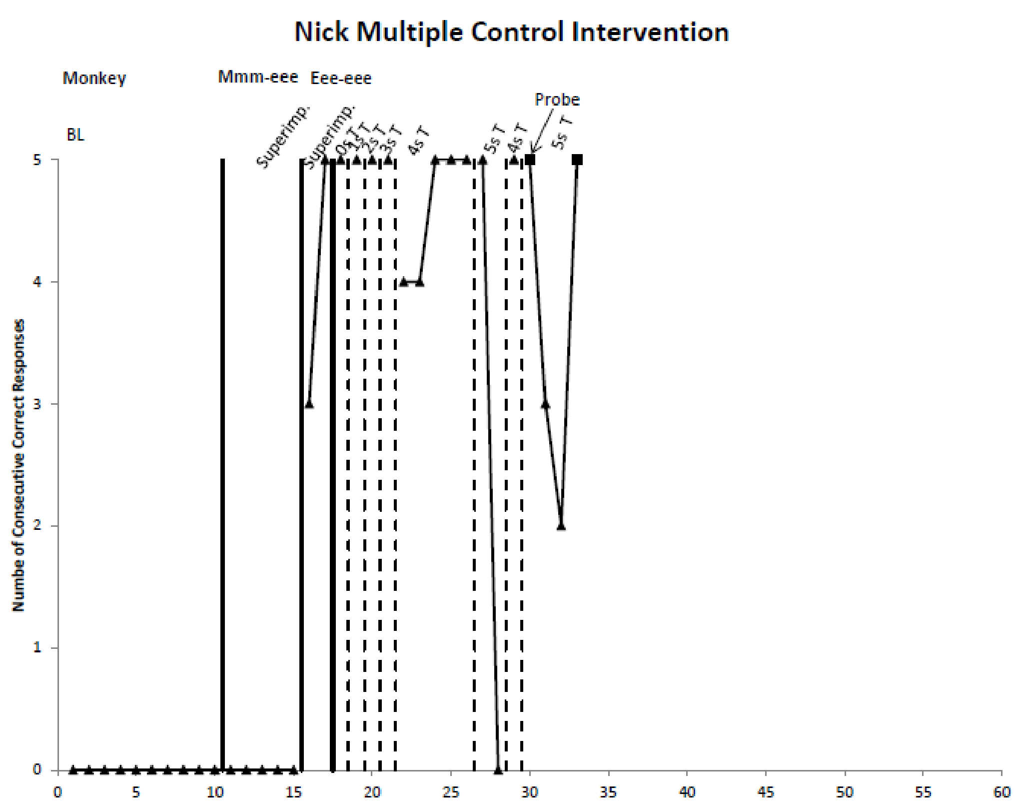

Figure 40. Intervention data in multiple control condition for Nick. Closed triangles represent the number of consecutive correct responses for each session. Closed squares represent the sessions with 4 independent correct responses out of 5 consecutive correct responses, following which a probe session was conducted.

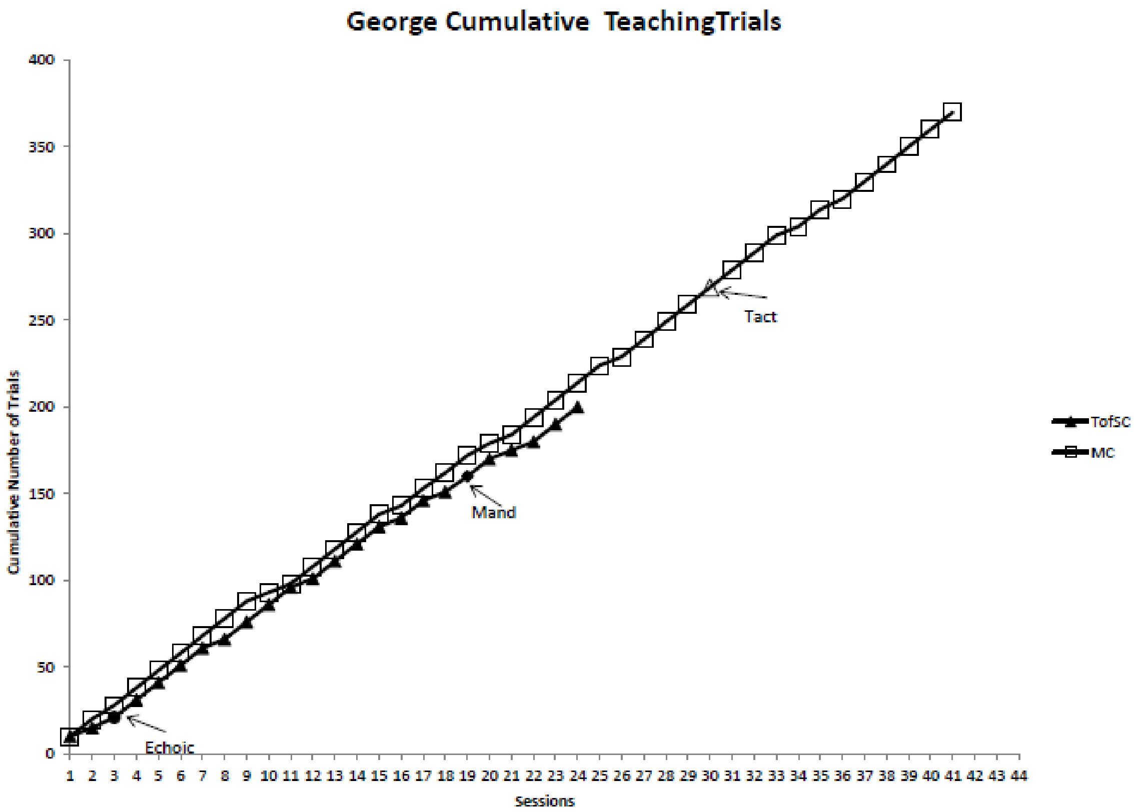

Figure 41. Cumulative number of teaching trials by condition for George. Closed triangles represent the number of trials in the transfer of stimulus control condition. The closed circle indicates where the echoic response was demonstrated in the transfer of stimulus control condition. The closed rhombus indicates where the mand response was demonstrated in the transfer of stimulus control condition. Open squares represent the number of trials in the multiple control condition. The open triangle represents where the tact response was demonstrated in the multiple control condition.

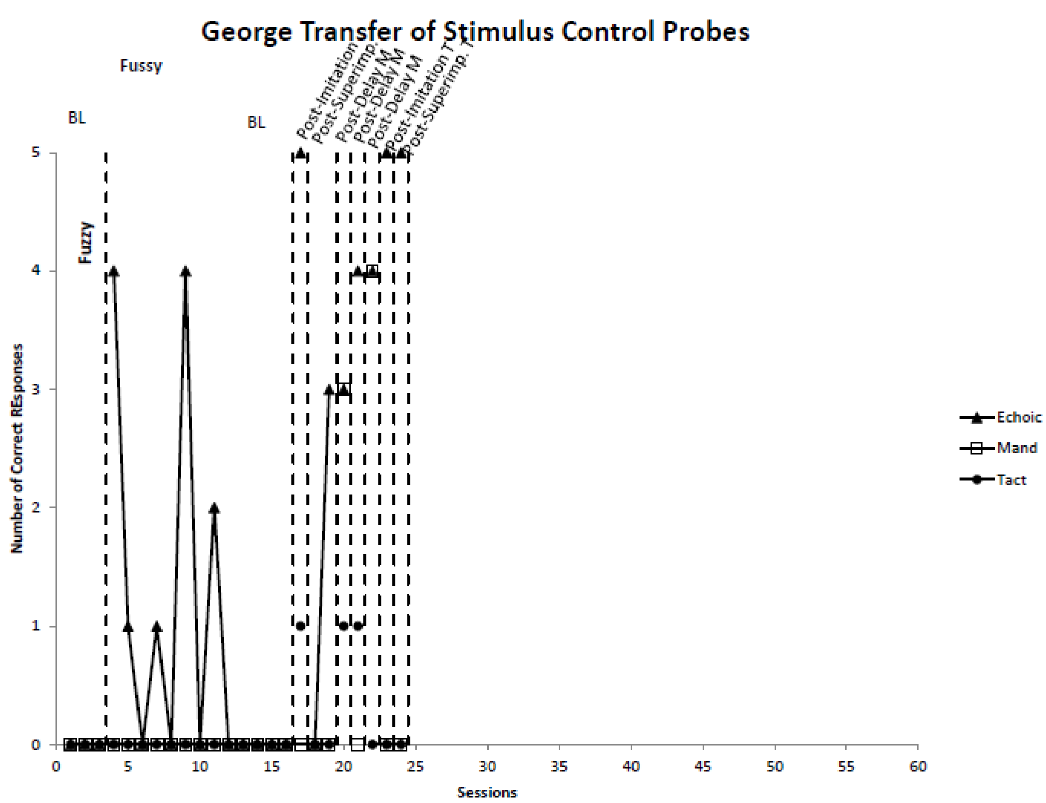

Figure 42. Probe data in transfer of stimulus control condition for George. Closed triangles represent the number of correct responses in the echoic trials. Open squares represent the number of correct responses in the tact trials. Closed circles represent the number of correct responses in the mand trials. The bolded words at the top represent response topographies.

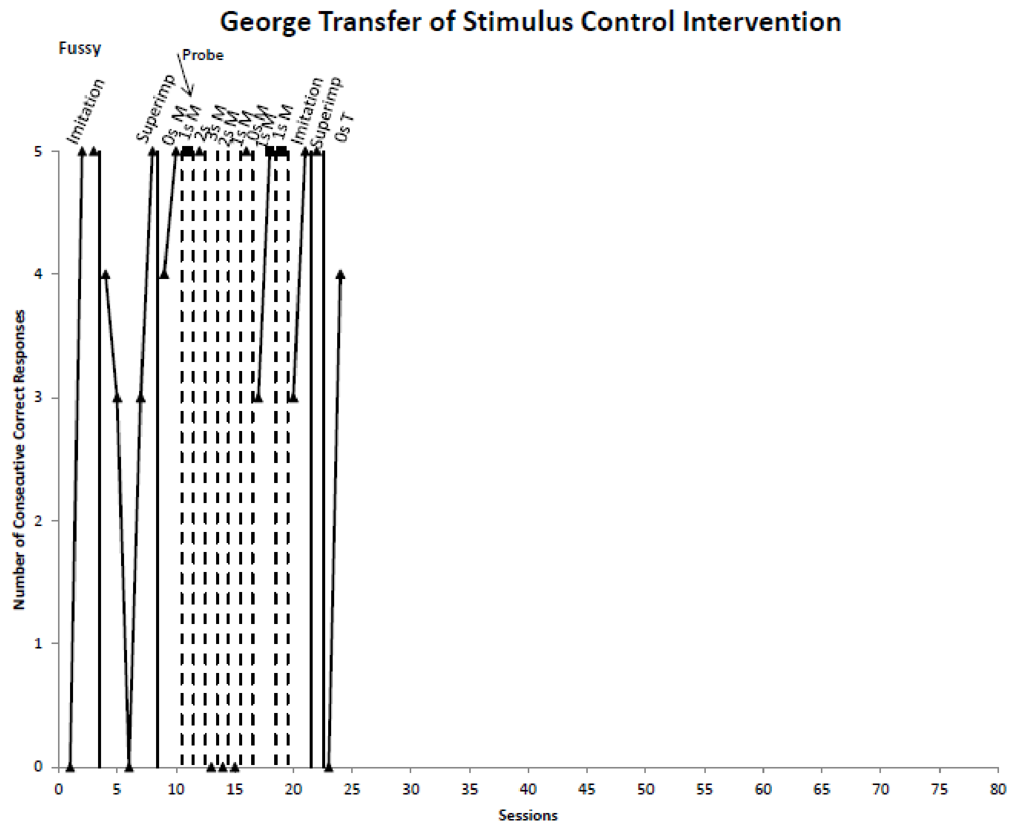

Figure 43. Intervention data in transfer of stimulus control condition for George. Closed triangles represent the number of consecutive correct responses for each session. Closed squares represent the sessions with 4 independent correct responses out of 5 consecutive correct responses, following which a probe session was conducted.

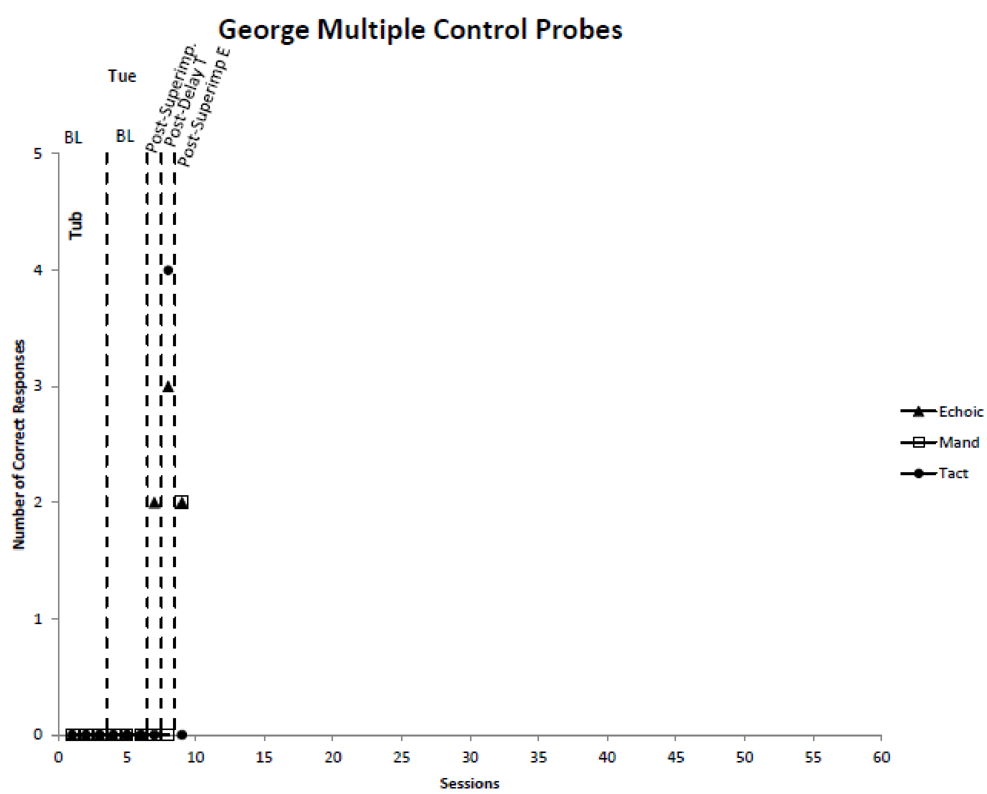

Figure 44. Probe data in multiple control condition for George. Closed triangles represent the number of correct responses in the echoic trials. Open squares represent the number of correct responses in the tact trials. Closed circles represent the number of correct responses in the mand trials. The bolded words at the top represent response topographies.

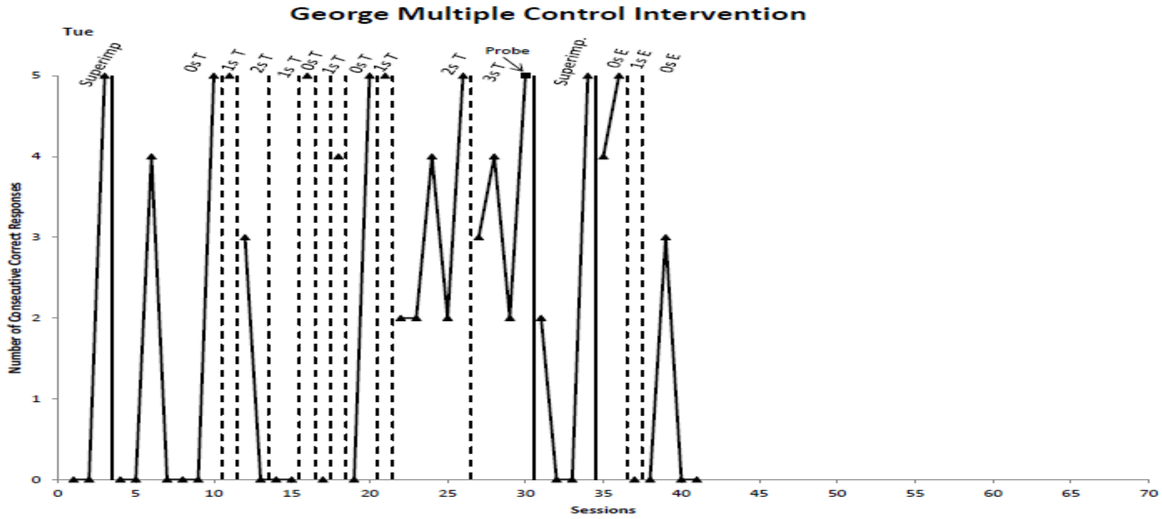

Figure 45. Intervention data in multiple control condition for George. Closed triangles represent the number of consecutive correct responses for each session. Closed squares represent the sessions with 4 independent correct responses out of 5 consecutive correct responses, following which a probe session was conducted.

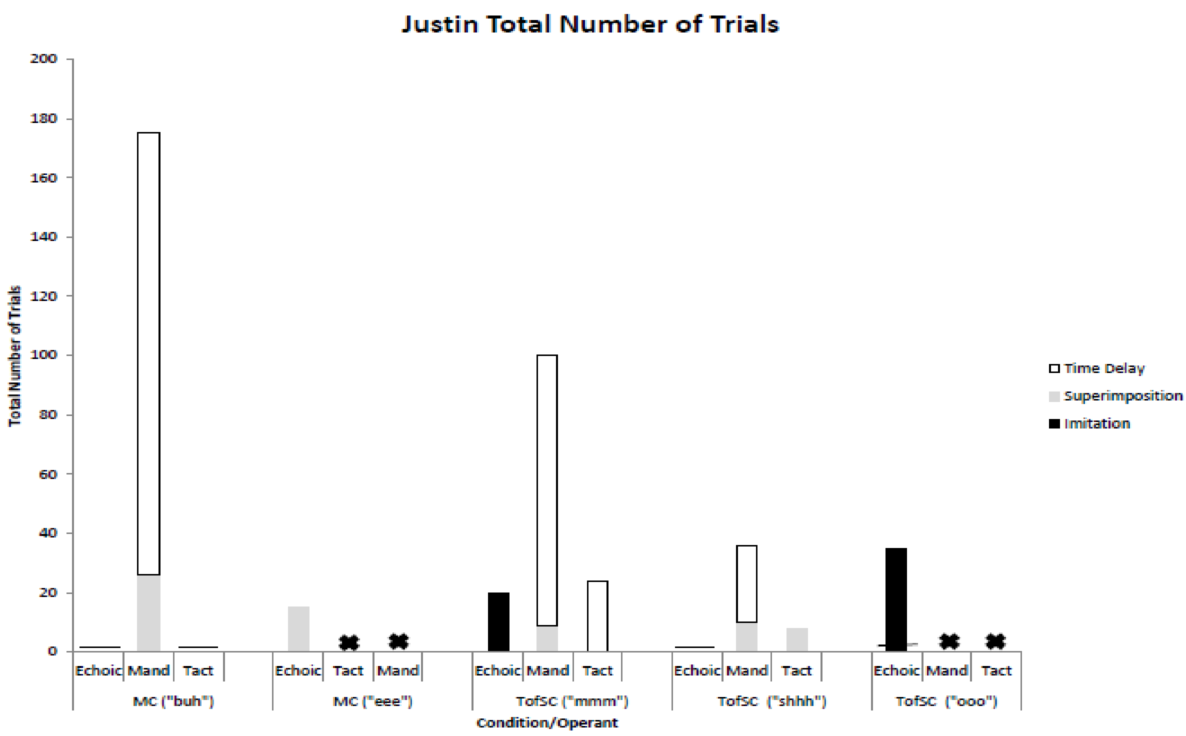

Figure 46. Total number of teaching trials by verbal operant for each condition for Justin. The first three bars represent the target operants in the multiple control condition (topography “buh”). The black horizontal line shows that the echoic response was demonstrated during baseline. The next (grey and white) bar shows the trials in superimposition and time delay after which the mand response was demonstrated. The next black horizontal line shows that the tact response emerged without specific training. The next three bars represent the target responses for the second multiple control topography (“eee”). The gray bar represents the trials in superimposition when the echoic response was demonstrated. The two x’s indicate that the tact and mand responses were not demonstrated. The next bars represent the target responses in transfer of stimulus control (“mmm”). The black bar represents the trials in imitation after which the echoic response was demonstrated. The next bar (gray and white) shows the trials in superimposition and time delay when the mand response was demonstrated. The white bar shows the trials in time delay after which the tact response was demonstrated. The next bars represent the target responses for the second transfer of stimulus control topography (“shhh”). The black horizontal line shows that the echoic response was demonstrated during baseline. The grey and white bar shows the trials in superimposition and time delay after which the mand response was demonstrated, while the next bar (grey) shows the trials in superimposition after which the tact response was demonstrated. The last bars represent the target responses for the third response topography (“ooo”) in transfer of stimulus control. The black bar shows the number of trials in imitation while the black horizontal line indicated that the echoic response was demonstrated during baseline. The next two x’s indicated that the tact and mand responses were not acquired.

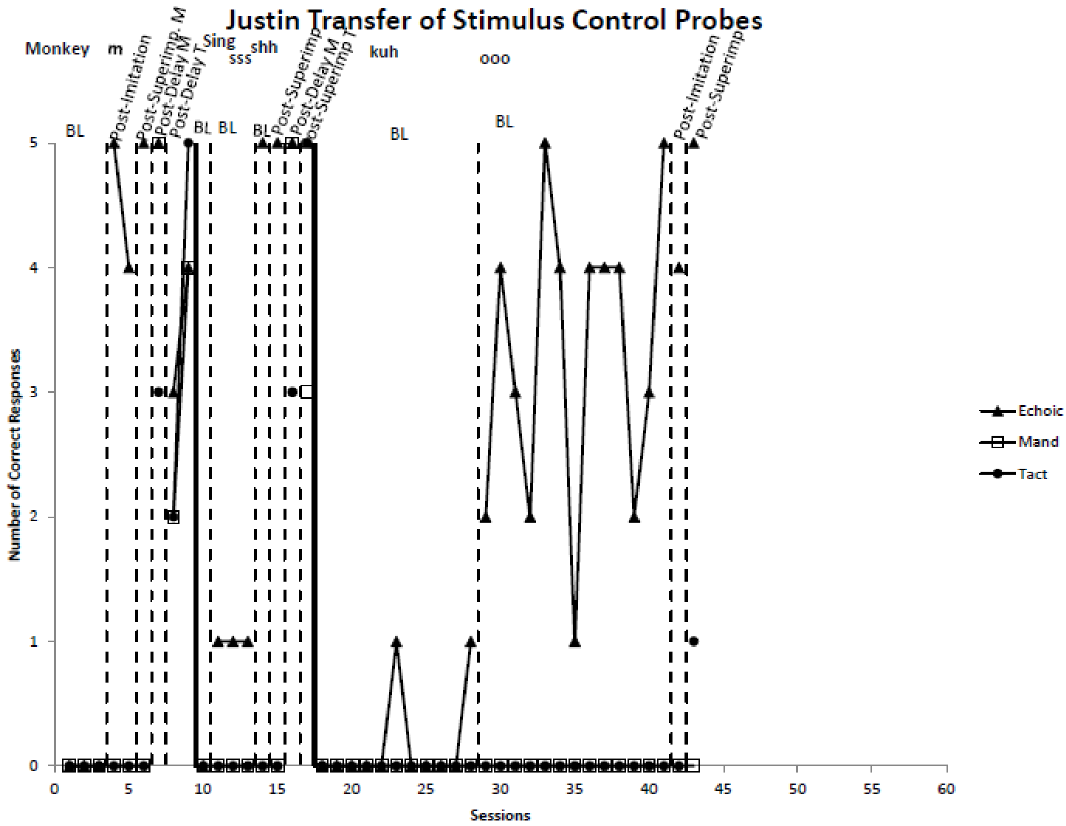

Figure 47. Probe data in transfer of stimulus control condition for Justin. Closed triangles represent the number of correct responses in the echoic trials. Open squares represent the number of correct responses in the tact trials. Closed circles represent the number of correct responses in the mand trials. The bolded words at the top represent response topographies.

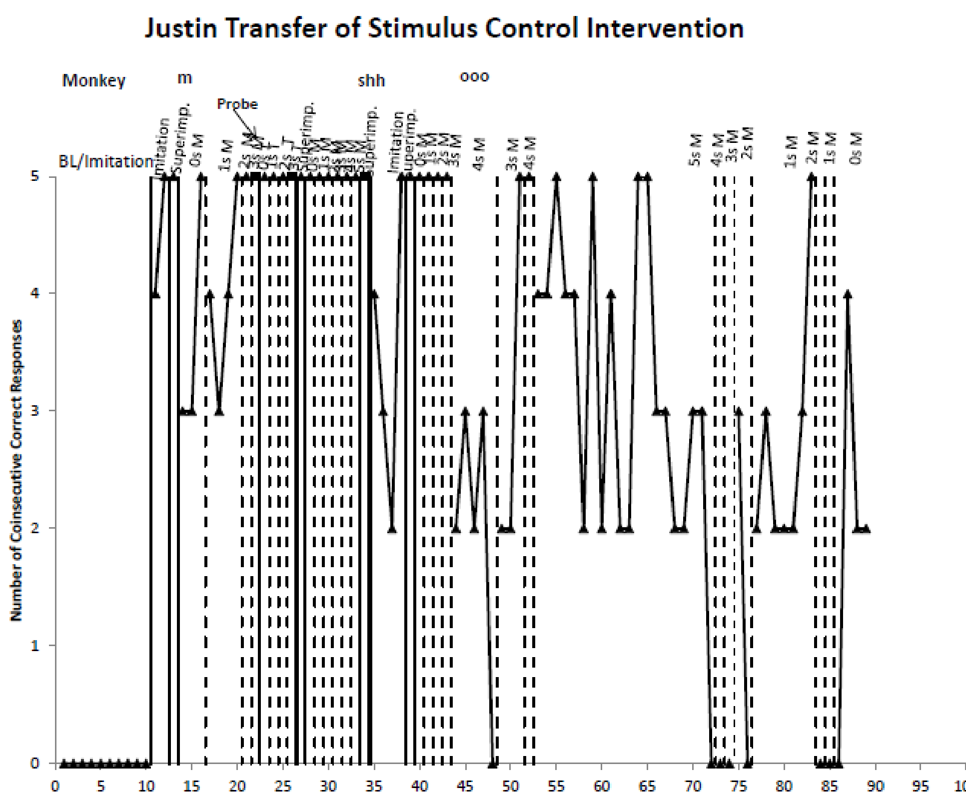

Figure 48. Intervention data in transfer of stimulus control condition for Justin. Closed triangles represent the number of consecutive correct responses for each session. Closed squares represent the sessions with 4 independent correct responses out of 5 consecutive correct responses, following which a probe session was conducted.

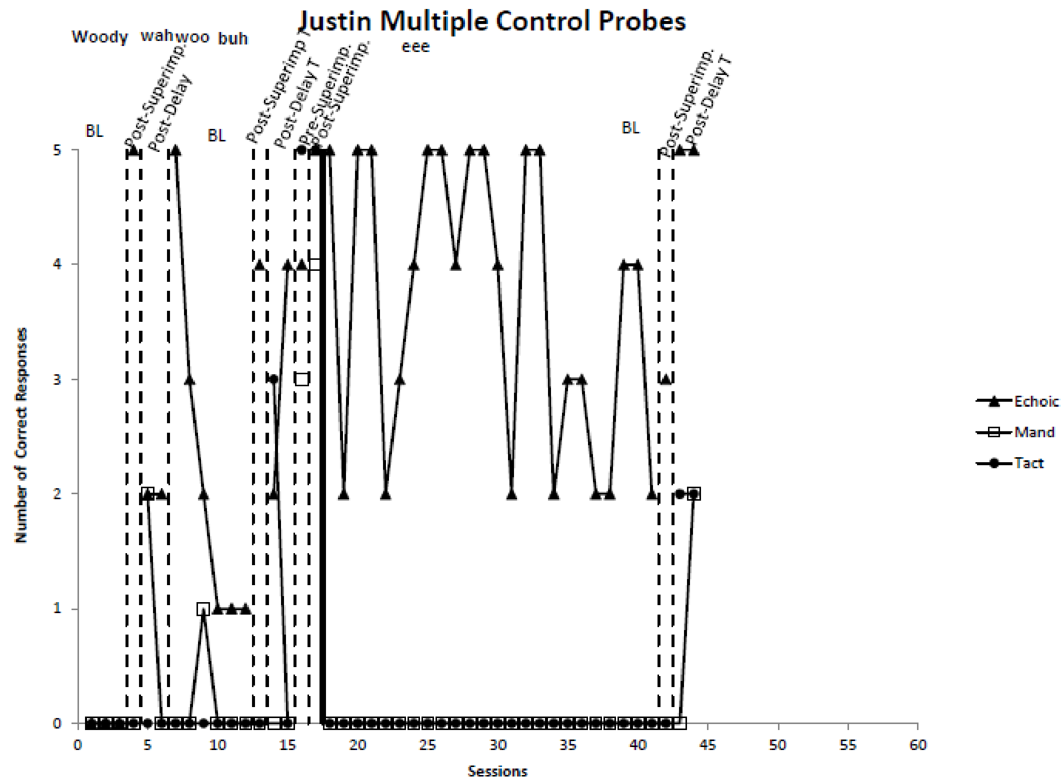

Figure 49. Probe data in multiple control condition for Justin. Closed triangles represent the number of correct responses in the echoic trials. Open squares represent the number of correct responses in the tact trials. Closed circles represent the number of correct responses in the mand trials. The bolded words at the top represent response topographies.

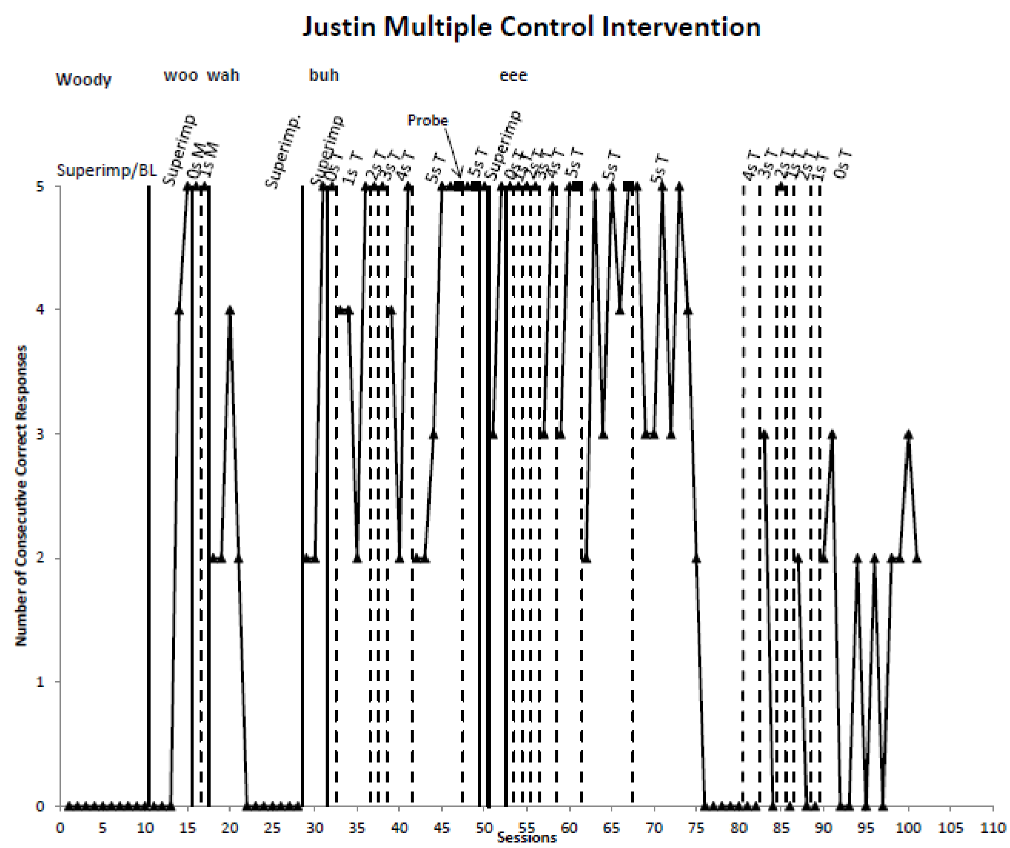

Figure 50. Intervention data in multiple control condition for Justin. Closed triangles represent the number of consecutive correct responses for each session. Closed squares represent the sessions with 4 independent correct responses out of 5 consecutive correct responses, following which a probe session was conducted.

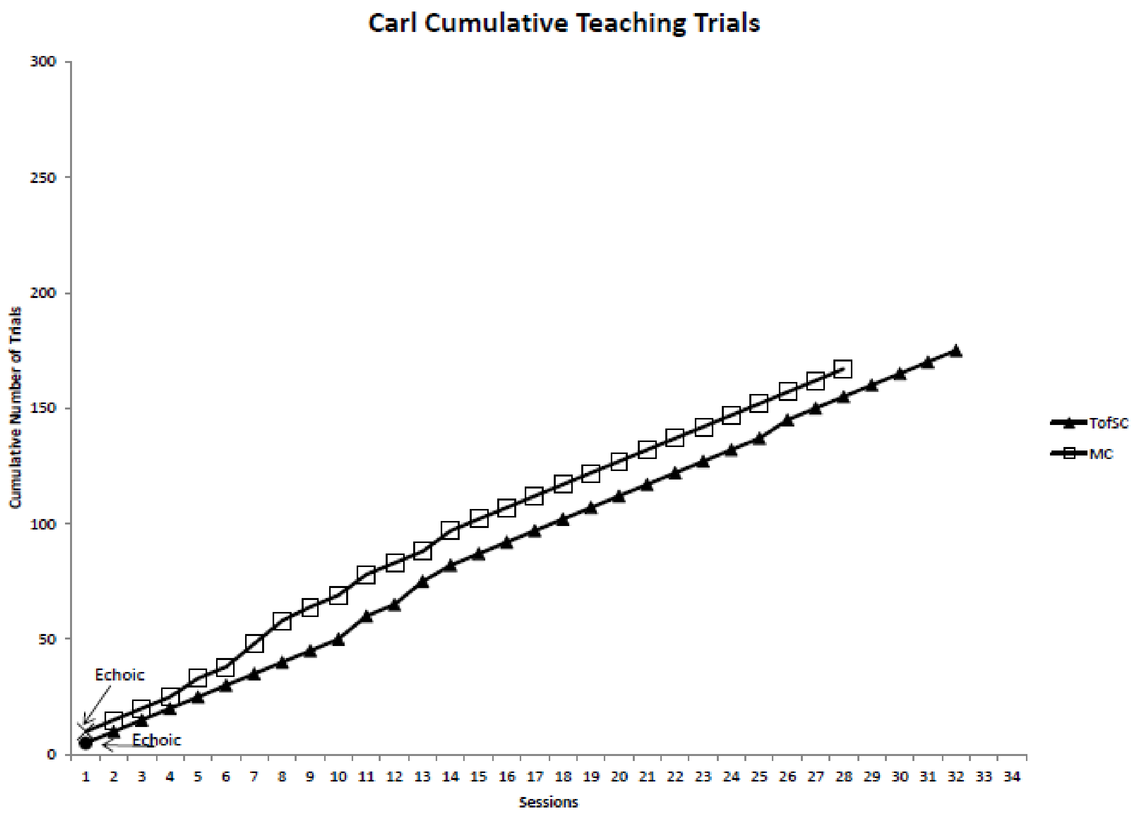

Figure 51. Cumulative number of teaching trials for each response by condition for Carl. Closed triangles represent the number of trials in the transfer of stimulus control condition. The closed circle indicates where the echoic response was demonstrated in the transfer of stimulus control condition. Open squares represent the number of trials in the multiple control condition. The x indicates when the echoic response was demonstrated in the multiple control condition.

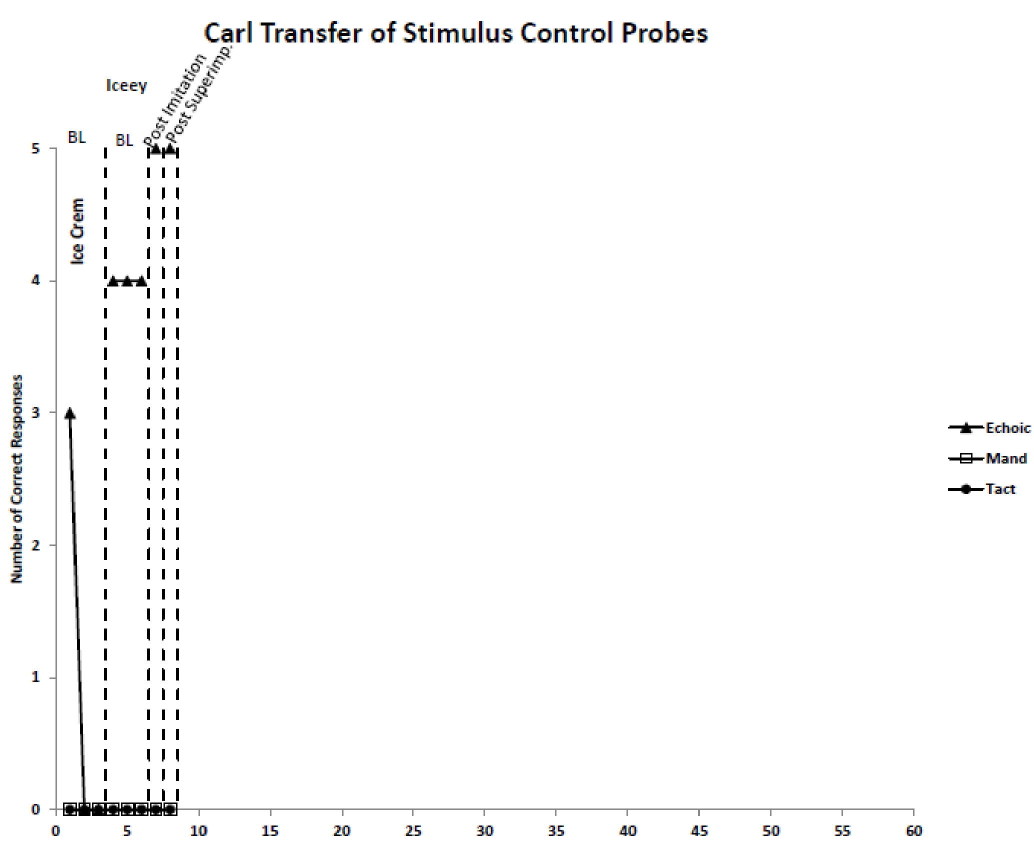

Figure 52. Probe data in transfer of stimulus control condition for Carl. Closed triangles represent the number of correct responses in the echoic trials. Open squares represent the number of correct responses in the tact trials. Closed circles represent the number of correct responses in the mand trials. The bolded words at the top represent response topographies.

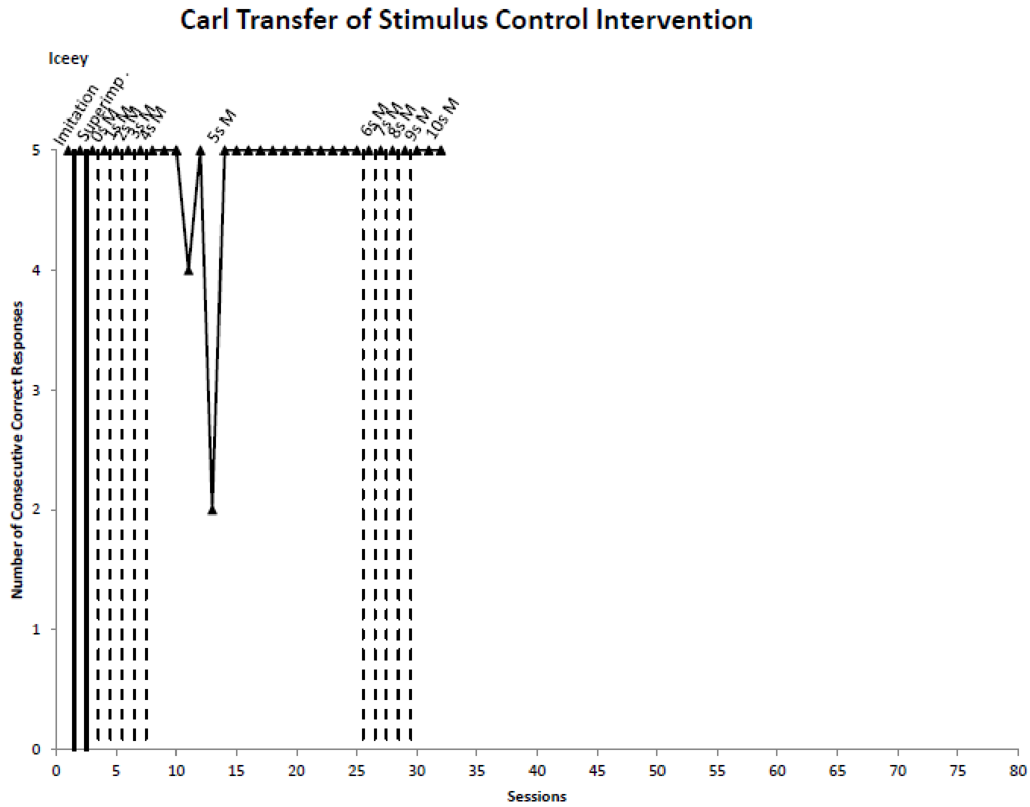

Figure 53. Intervention data in transfer of stimulus control condition for Carl. Closed triangles represent the number of consecutive correct responses for each session.

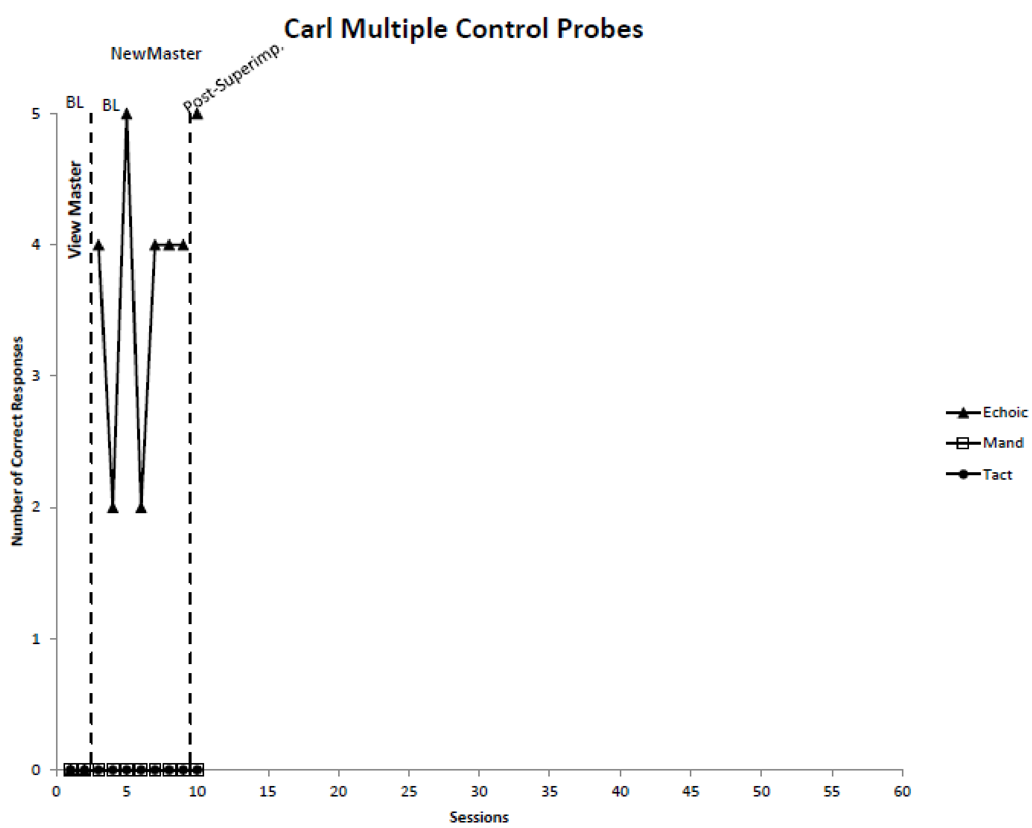

Figure 54. Probe data in multiple control condition for Carl. Closed triangles represent the number of correct responses in the echoic trials. Open squares represent the number of correct responses in the tact trials. Closed circles represent the number of correct responses in the mand trials. The bolded words at the top represent response topographies.

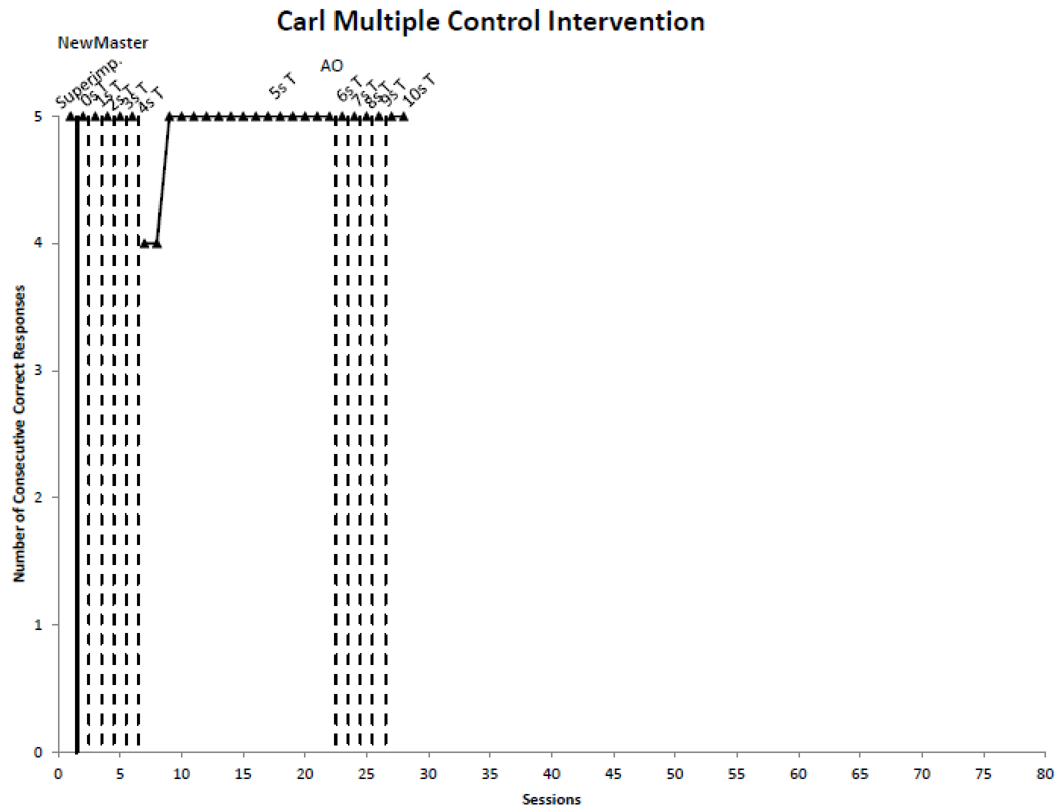

Figure 55. Intervention data in multiple control condition for Carl. Closed triangles represent the number of consecutive correct responses for each session.

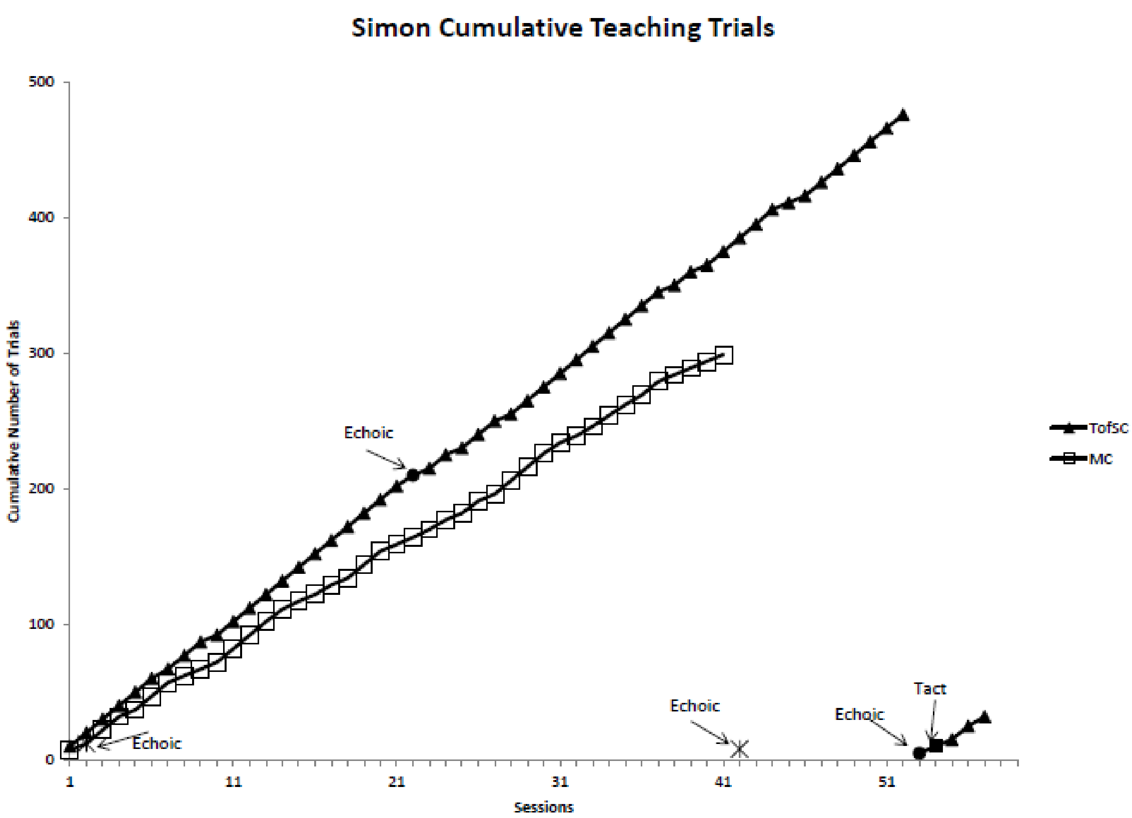

Figure 56. Cumulative number of teaching trials for each response topography by condition for Simon. Closed triangles represent number of trials in the transfer of stimulus control condition. The closed circle shows where the echoic response was demonstrated in the transfer of stimulus control condition. The closed square shows where the tact response was demonstrated in the transfer of stimulus control condition. The open squares represent the number of trials in the multiple control condition. The x’s show where the echoic responses were demonstrated in the multiple control condition.

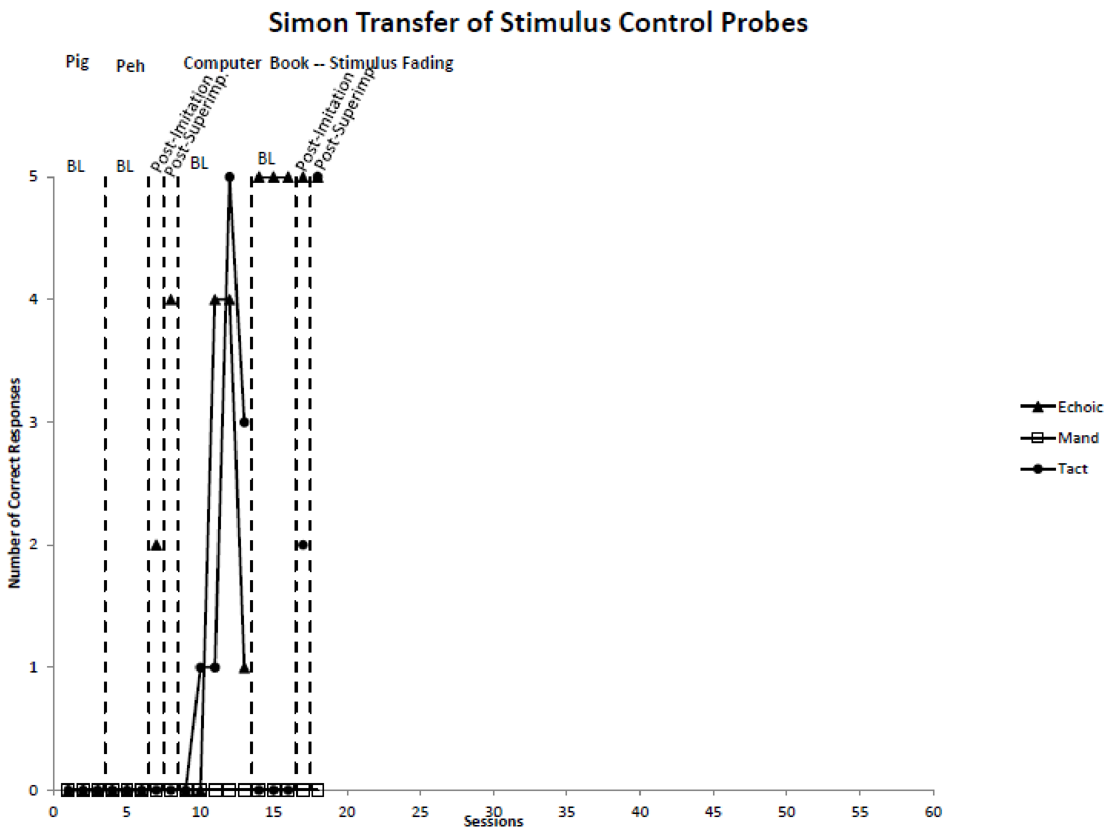

Figure 57. Probe data in transfer of stimulus control condition for Simon. Closed triangles represent number of correct responses in the echoic trials. Open squares represent the number of correct responses in the tact trials. Closed circles represent the number of correct responses in the mand trials. The bolded words at the top represent response topographies.

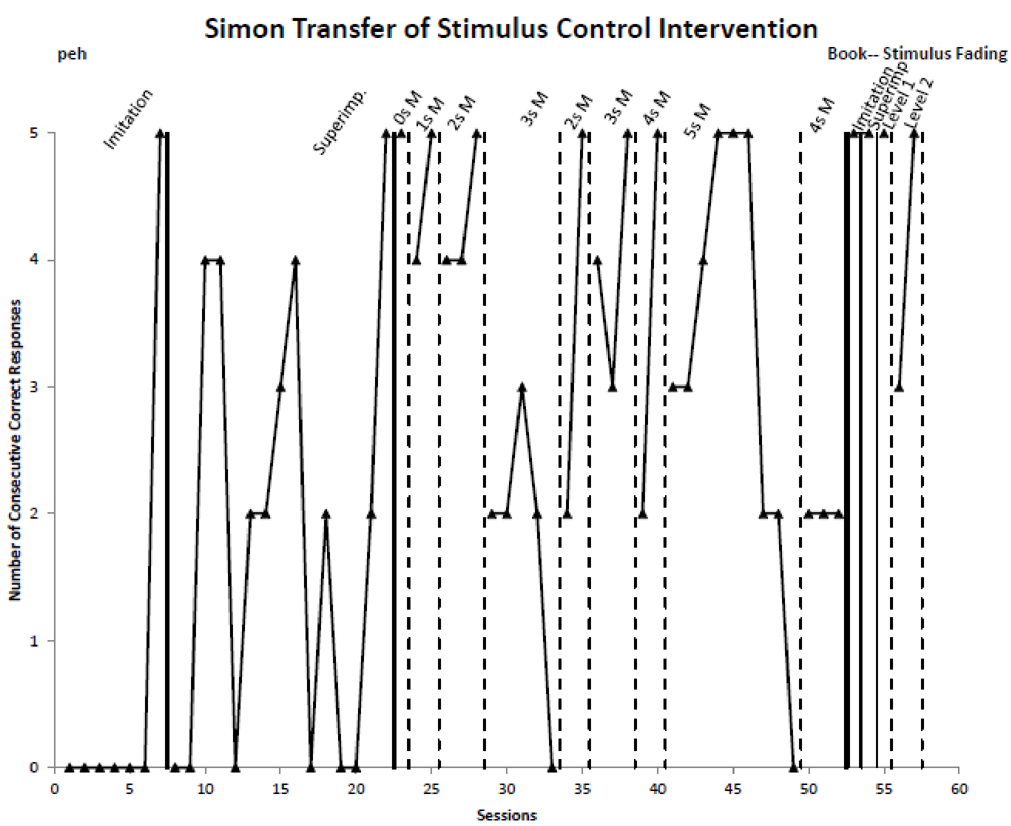

Figure 58. Intervention data in transfer of stimulus control condition for Simon. Closed triangles represent number of consecutive correct responses for each session.

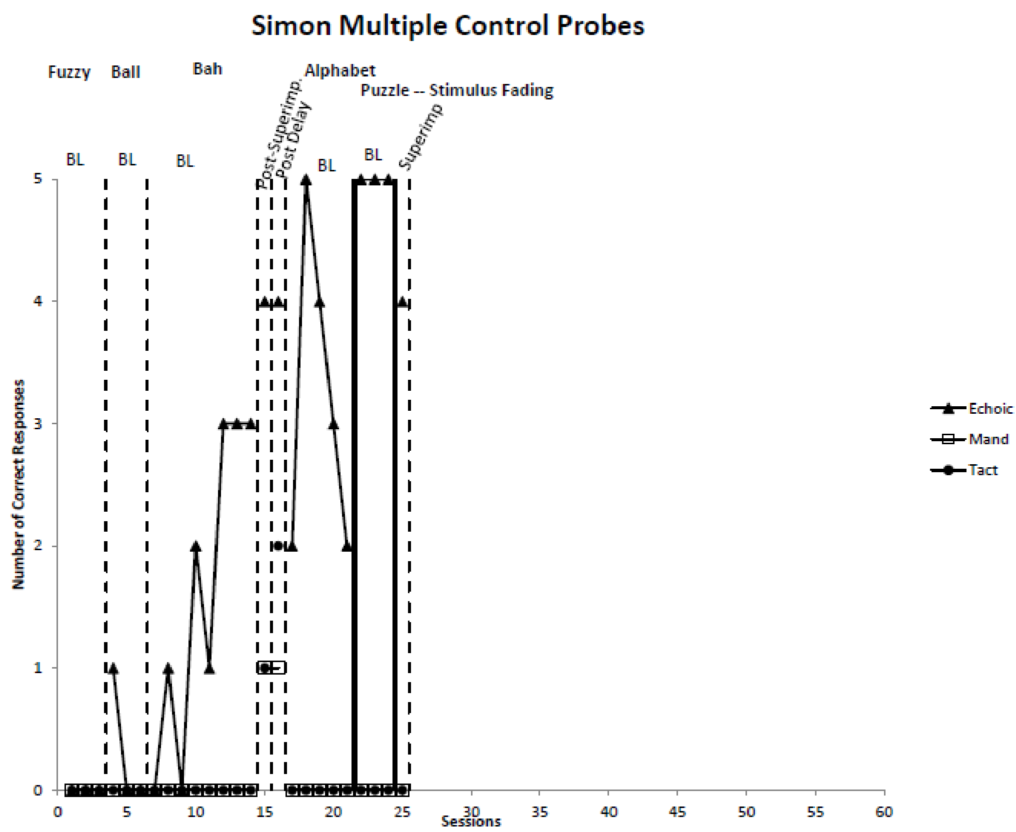

Figure 59. Probe data in multiple control condition for Simon. Closed triangles represent the number of correct responses in the echoic trials. Open squares represent the number of correct responses in the tact trials. Closed circles represent the number of correct responses in the mand trials. The bolded words at the top represent response topographies.

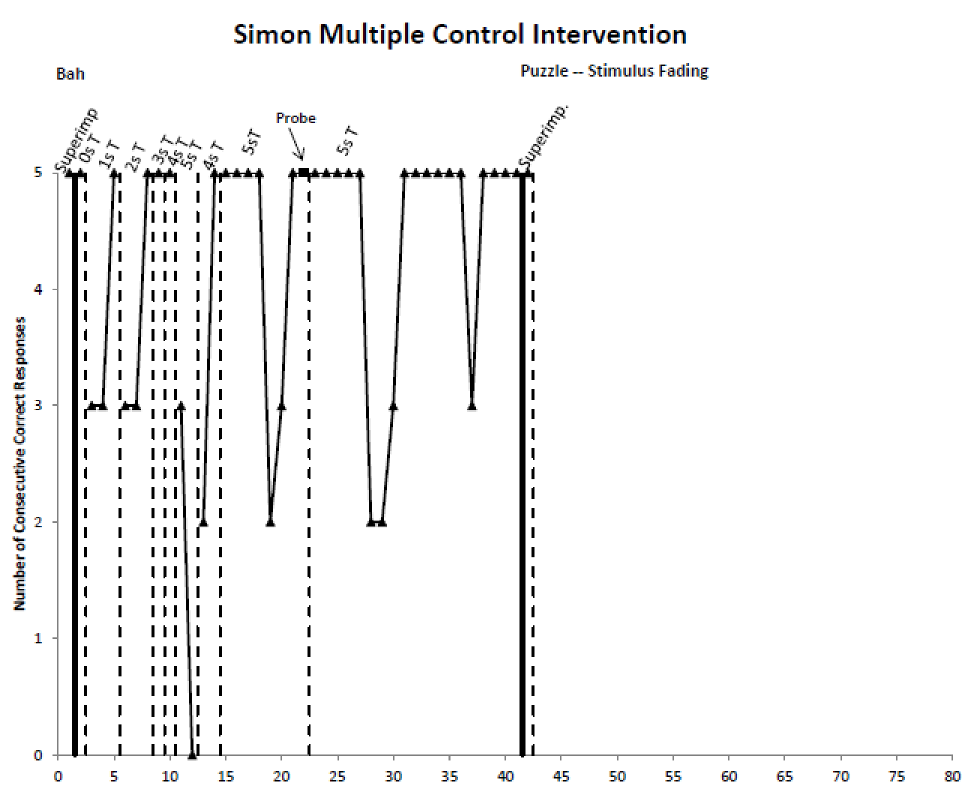

Figure 60. Intervention data in multiple control condition for Simon. Closed triangles represent the number of consecutive correct responses for each session. Closed squares represent the sessions with 4 independent correct responses out of 5 consecutive correct responses, following which a probe session was conducted.

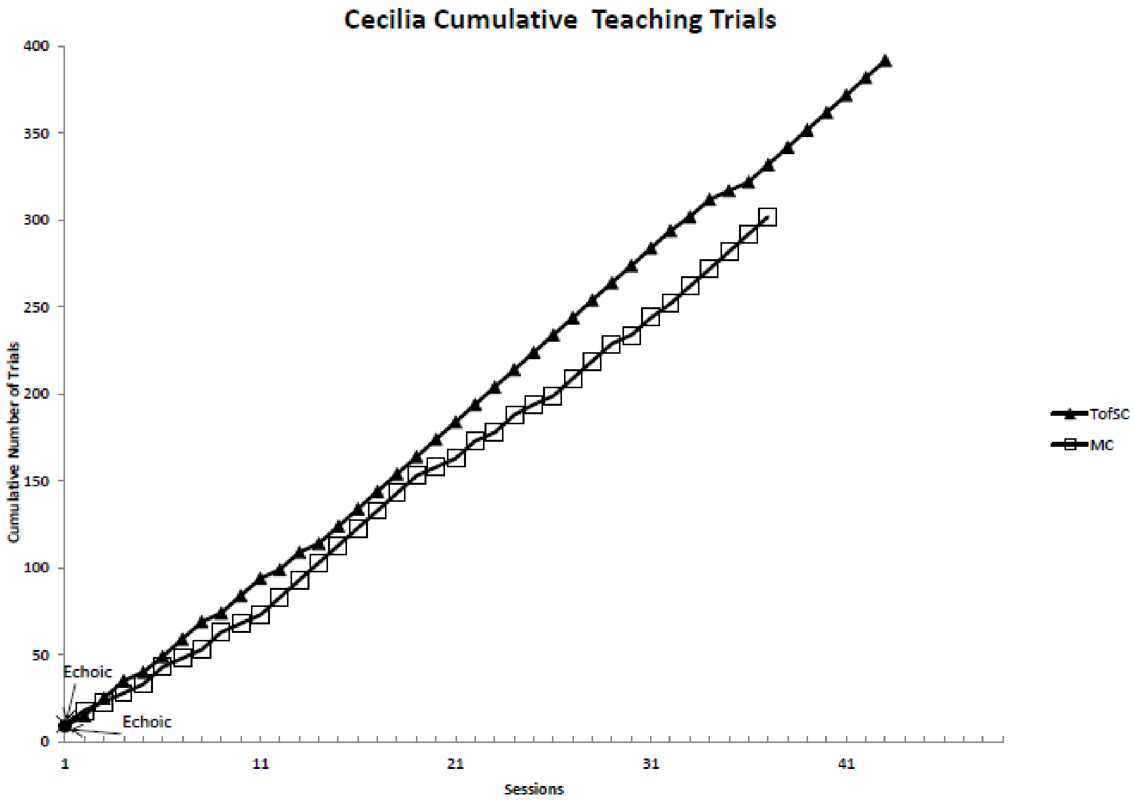

Figure 61. Cumulative number of teaching trials for each response by condition for Cecilia. Closed triangles represent the number of trials in the transfer of stimulus control condition. The closed circle indicates where the echoic response was demonstrated in the transfer of stimulus control condition. Open squares represent the number of trials in the multiple control condition. The x indicates when the echoic response was demonstrated in the multiple control condition.

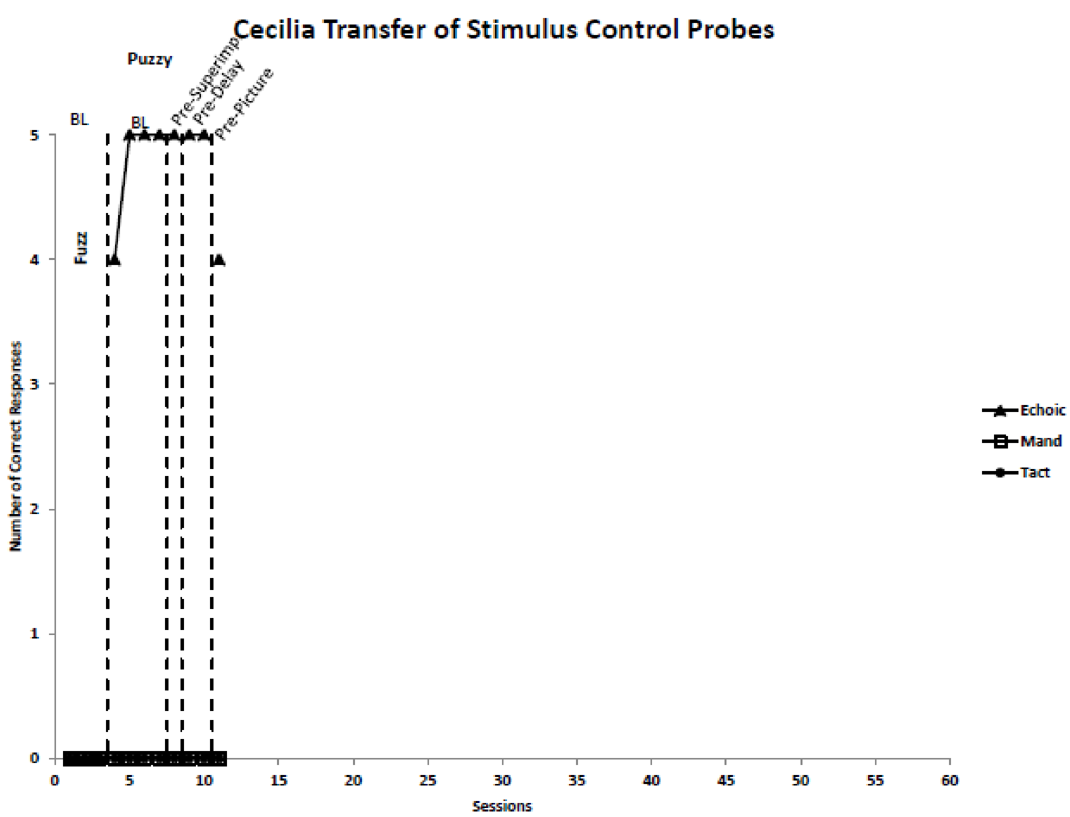

Figure 62. Probe data in transfer of stimulus control condition for Cecilia. Closed triangles represent the number of correct responses in the echoic trials. Open squares represent the number of correct responses in the tact trials. Closed circles represent the number of correct responses in the mand trials. The bolded words at the top represent response topographies.

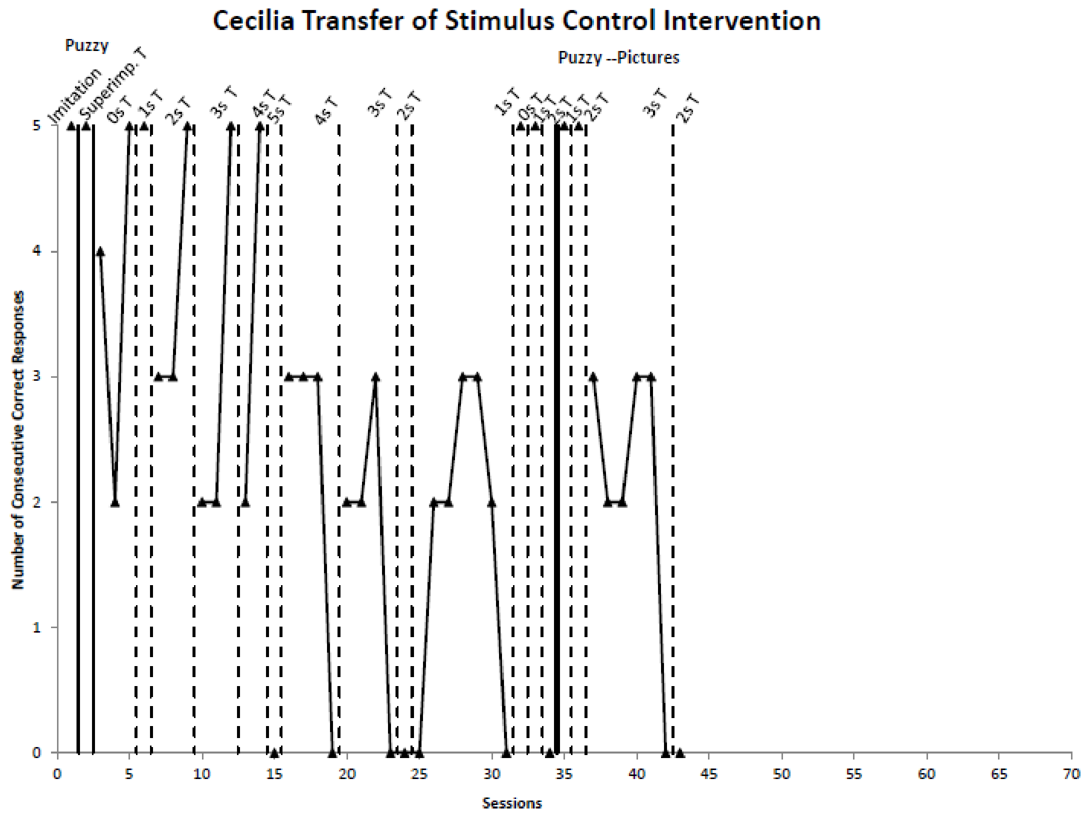

Figure 63. Intervention data in transfer of stimulus control condition for Cecilia. Closed triangles represent the number of consecutive correct responses for each session.

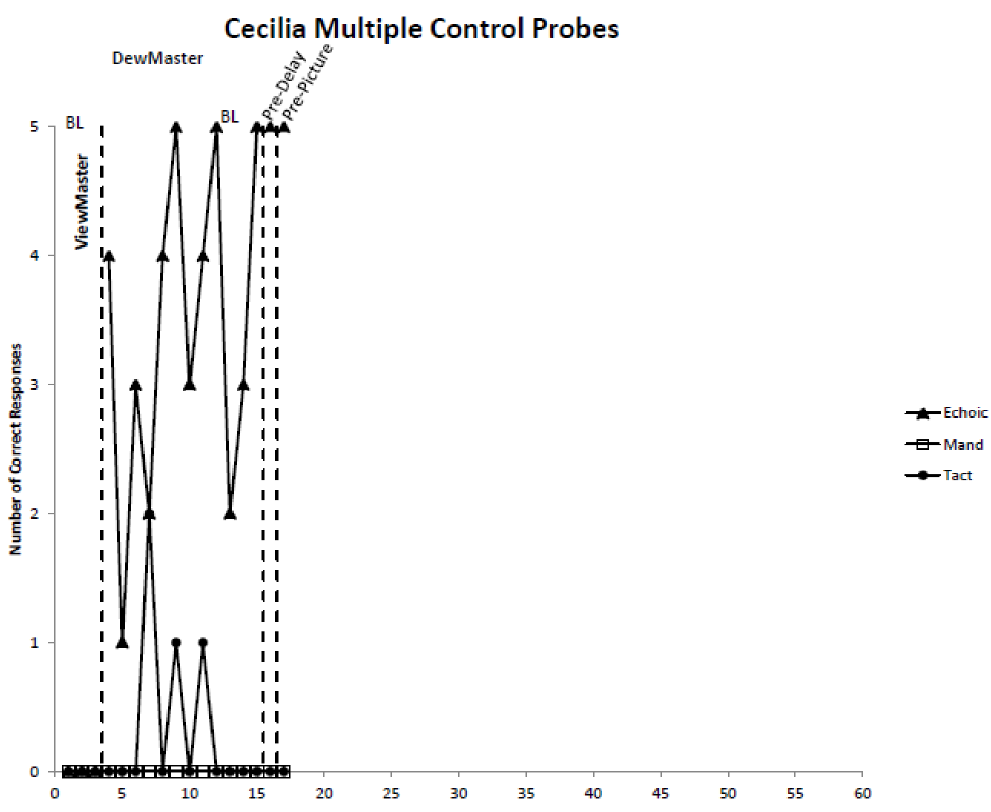

Figure 64. Probe data in multiple control condition for Cecilia. Closed triangles represent the number of correct responses in the echoic trials. Open squares represent the number of correct responses in the tact trials. Closed circles represent the number of correct responses in the mand trials. The bolded words at the top represent response topographies.

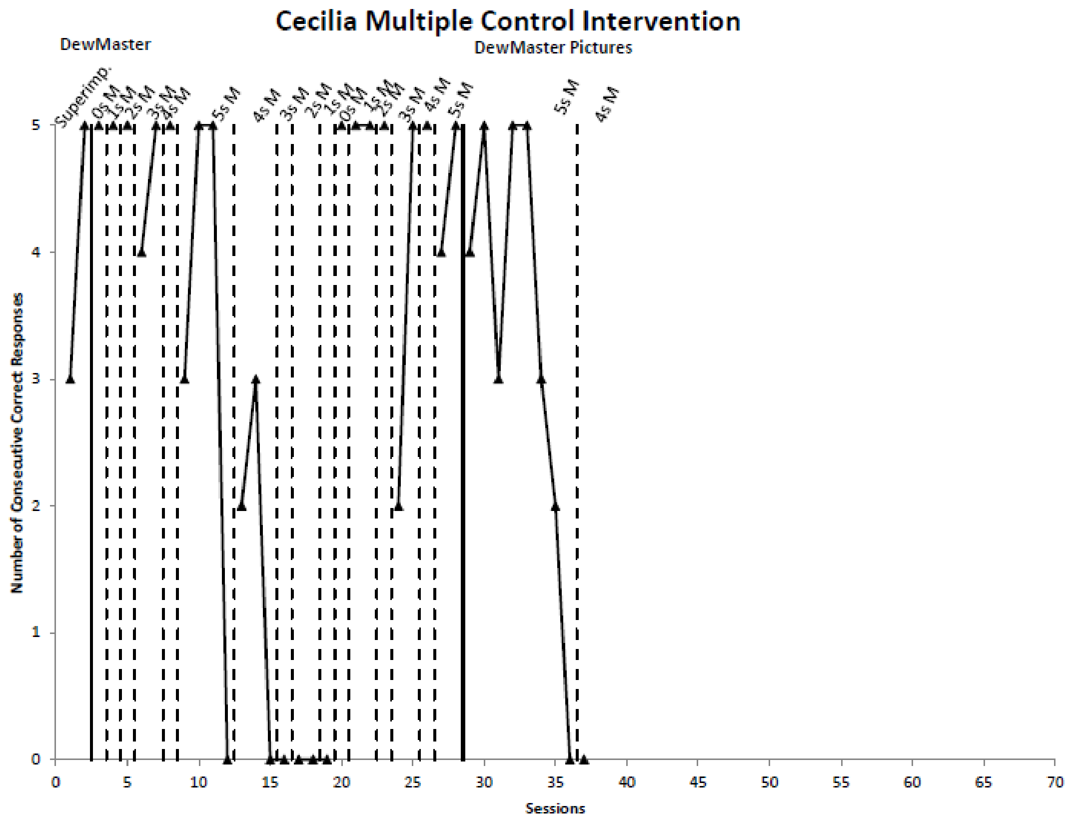

Figure 65. Intervention data in multiple control condition for Cecilia. Closed triangles represent the number of consecutive correct responses for each session.

APPENDIX A

INFORMED CONSENT FORM

University of North Texas Institutional Review Board

Informed Consent Form

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

Title of Study: Examining the Effects of Educational Techniques Based on the Principles of Behavior Analysis on Acquisition, Fluency, & Generalization of Academic, Daily Living, or Communication Skills for Individuals with Developmental Disabilities

Principal Investigator: Dr. Traci M. Cihon, BCBA-D, University of North Texas (UNT), Department of Behavior Analysis.

Purpose of the Study: You are being asked to allow your child to participate in a research study that involves the exploration of behavior analytic strategies to help your child learn new things or improve how s/he performs the skills s/he already knows. We are interested in helping your child to learn new things faster and to do them more often. Some of the things might teach your son/daughter include talking or communicating with others, reading and comprehending what s/he reads, completing math problems, or improving his/her independence with self-help skills such as dressing or grooming.

Study Procedures: First, we will ask your child's teachers to tell us a little bit about your child. They might tell us some of the things your child likes, what you child is good at, and what your child needs more help to learn. Your child will be asked to complete some short activities to help us to identify what s/he likes and what s/he can already do.
Based on what we find out about your child's needs, we will devise an individualized teaching strategy based on the principles of behavior analysis to teach your child new things or expand what s/he already knows. For example, if you child is really good at asking for things s/he wants, but is not very good at answering questions, we might help them to answer questions about things s/he likes. If you child is good at getting dressed, but it takes them a long time to get dressed, we might teach them how to get dressed faster. We will always used the things your child likes as rewards for learning new skills or for participating in the study. We will record the number of things your child does correctly and incorrectly, what types of help your child needs to complete certain tasks, and how long it takes your child to do these tasks. The study will generally last between 3 and 8 weeks and each session will typically last no longer than 20 minutes.

Foreseeable Risks: The potential risks involved in this study are minimal. The procedures may increase your child's stress or frustration due to a change in his/her daily routine or schedule. However, the primary investigator will try to minimize these risks by learning about the things your child likes and letting your child earn these things during the experiment. In addition, the experimenter will provide lots of praise statements during the experiment. The primary investigator understands that sometimes children who are not good at communicating with their words might engage in problem behavior. If you child engages in problem behavior during an experimental session, the primary investigator will immediately contact you to discuss how we might address the problem behavior and to determine if you still want your child to participate in the study.

Benefits to the Subjects or Others: We expect the project to benefit your child by helping him/her to access to preferred items and activities (after asking for them), to earn better grades in school, to make more friends, or to learn new things. We will also share our findings with your child's school personnel in order to help them to select the best teaching strategies for your child.

Compensation for Participants: Your child will not receive any payment or compensation for participating in the study.

Procedures for Maintaining Confidentiality of Research Records: Data will be safely stored up to 3 years after the study has been completed (at which point it will be destroyed). The confidentiality of your child's individual information will be maintained in any publications or presentations regarding this study.

Questions about the Study: If you have any questions about the study, you may contact Dr. Traci M. Cihon, BCBA-D at (940) 565-3318 or traci.cihon@unt.edu.

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

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

- Dr. Traci M. Cihon, BCBA-D has explained the study to you and answered all of your questions. You have been told the possible benefits and the potential risks and/or discomforts of the study.

- You understand that you do not have to allow your child to take part in this study, and your refusal to allow your child to participate or your decision to withdraw him/her from the study will involve no penalty or loss of rights or benefits. The study personnel may choose to stop your child's participation at any time.

- You understand why the study is being conducted and how it will be performed.

- You understand your rights as the parent/guardian of a research participant and you voluntarily consent to your child's participation in this study.

- You have been told you will receive a copy of this form.

____
Printed Name of Parent or Guardian

___________________________________ Signature of
Parent or Guardian

____
Date

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

____ Signature of
Principal Investigator or Designee ________
Date

University of North Texas Institutional Review Board

Informed Consent Form

Before agreeing to participate in this research study, it is important that you read and understand the following explanation of the purpose, benefits and risks of the study and how it will be conducted.

Title of Study: Examining the Effects of Educational Techniques Based on the Principles of Behavior Analysis on Acquisition, Fluency, & Generalization of Academic, Daily Living, or Communication Skills for Individuals with Developmental Disabilities

Principal Investigator: Dr. Traci Cihon, BCBA-D, University of North Texas (UNT), Department of Behavior Analysis.

Purpose of the Study: You are being asked to participate in a research study involves the exploration of behavior analytic strategies to help your child learn new things or improve how s/he performs the skills s/he already knows. We are interested in helping your child to learn new things faster and to do them more often. Some of the things might teach your son/daughter include talking or communicating with others, reading and comprehending what s/he reads, completing math problems, or improving his/her independence with self-help skills such as dressing or grooming. We would also like to assess your opinion about the treatments we use and the effects of those treatments in helping your child to learn new skills.

Study Procedures: You will be asked to fill out a short questionnaire that contains questions regarding whether or not you thought your child benefited from participating in the study, what new skills your child might have learned from participating in the study, and whether or not you would let your child participate in a similar study in the future. It should take no longer than 20 minutes of your time to fill out the short questionnaire.

Foreseeable Risks: No foreseeable risks are involved in this study.

Benefits to the Subjects or Others: We expect the project to benefit you by helping us to make recommendations regarding the acceptability of the treatments we used to your child's educational team. We expect the project to benefit other children, parents, and behavior analysts by allowing us to collect information regarding how well liked and how useful our treatments might be.

Compensation for Participants: You will not receive compensation for your participation.

Procedures for Maintaining Confidentiality of Research Records: You will be given a paper copy of the questionnaire and an addressed, stamped envelope to return your responses to the primary investigator. You will not be asked to put any identifying information on the questionnaire and your response will not be directly linked to your child's name in any way. Questionnaires will be safely stored up to 3 years after the study has been completed (at which point it will be destroyed). Your confidentiality will be maintained in any publications or presentations regarding this study.

Questions about the Study: If you have any questions about the study, you may contact Dr. Traci Cihon, BCBA-D at telephone number (940) 565-8813.

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

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

- Dr. Traci Cihon, BCBA-D has explained the study to you and answered all of your questions. You have been told the possible benefits and the potential risks and/or discomforts of the study.
- You understand that you do not have to take part in this study, and your refusal to participate or your decision to withdraw will involve no penalty or loss of rights or benefits. The study personnel may choose to stop your participation at any time.
- You understand why the study is being conducted and how it will be performed.
- You understand your rights as a research participant and you voluntarily consent to participate in this study.
- You have been told you will receive a copy of this form.

____
Printed Name of Participant

____
Signature of Participant

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

____
Signature of Principal Investigator or Designee

____________Date

APPENDIX B

DATA SHEETS & TREATMENT INTEGRITY SHEETS

Student: ________________________ Date: ___________________
Time: __________________________

Multiple Stimulus Without Replacement Data Sheet

Session #

Session #

Session #

Session #

Session #

Items

1.

2.

3.

4.

5.

Data Summary

1. Record item selection each trial.
2. Item selection is defined as physical contact with one of the presented items.
3. Calculate the number of times an item was selected by the number of trials during which the item was presented (percentage of trials selected).

Item 1 ________________________
Number of trials selected / number of trials presented X 100 =
_______ / _______ X 100 = ____________% of trials selected

Item 2 _______________________
Number of trials selected / number of trials presented X 100 =
_______ / _______ X 100 = ____________% of trials selected

Item 3 ______________________
Number of trials selected / number of trials presented X 100 =
_______ / _______ X 100 = ____________% of trials selected

Item 4 ______________________
Number of trials selected / number of trials presented X 100 =
_______ / _______ X 100 = ____________% of trials selected

Item 5 ________________________
Number of trials selected / number of trials presented X 100 =
_______ / _______ X 100 = ____________% of trials selected

PROBE Data Collection

Participant: ______________________ **Response topography:** ________________

EO/AO	DATE					EO/AO	DATE					EO/AO	DATE				
Echoic						MAND						TACT					
Trial 1						Trial 1						Trial 1					
Trial 2						Trial 2						Trial 2					
Trial 3						Trial 3						Trial 3					
Trial 4						Trial 4						Trial 4					
Trial 5						Trial 5						Trial 5					

EO/AO	DATE					EO/AO	DATE					EO/AO	DATE				
Echoic						MAND						TACT					
Trial 1						Trial 1						Trial 1					
Trial 2						Trial 2						Trial 2					
Trial 3						Trial 3						Trial 3					
Trial 4						Trial 4						Trial 4					
Trial 5						Trial 5						Trial 5					

EO/AO	DATE					EO/AO	DATE					EO/AO	DATE				
Echoic						MAND						TACT					
Trial 1						Trial 1						Trial 1					
Trial 2						Trial 2						Trial 2					
Trial 3						Trial 3						Trial 3					
Trial 4						Trial 4						Trial 4					
Trial 5						Trial 5						Trial 5					

EO/AO	DATE					EO/AO	DATE					EO/AO	DATE				
Echoic						MAND						TACT					
Trial 1						Trial 1						Trial 1					
Trial 2						Trial 2						Trial 2					
Trial 3						Trial 3						Trial 3					
Trial 4						Trial 4						Trial 4					
Trial 5						Trial 5						Trial 5					

EO/AO	DATE					EO/AO	DATE					EO/AO	DATE				
Echoic						MAND						TACT					
Trial 1						Trial 1						Trial 1					
Trial 2						Trial 2						Trial 2					
Trial 3						Trial 3						Trial 3					
Trial 4						Trial 4						Trial 4					
Trial 5						Trial 5						Trial 5					

Beside the trial, under the specific date write either a plus sign for an independent correct response or a minus sign for no response, an incorrect response, or a partial response.

Treatment Integrity Checklist: Probe Trials

Participant: ______________________ Date: __________ Target response: ________________

Check if experimenter behavior occurs					Behavior for Mand Probes
1	2	3	4	5	
☐	☐	☐	☐	☐	30 min state of deprivation (no access to stimulus) of response topography stimulus has occurred
☐	☐	☐	☐	☐	Experimenter allows brief access to the response topography stimulus (reinforcer sampling)
☐	☐	☐	☐	☐	Experimenter quickly flashes the response topography item to signal availability
☐	☐	☐	☐	☐	Experimenter does not presents a vocal verbal stimulus
☐	☐	☐	☐	☐	If the participant responds (e.g., water) in 3 s, the experimenter presents reinforcement specific to the response form and moves to the next trial
☐	☐	☐	☐	☐	If the participant makes no response in 3 s emits, a partial response, or emits an incorrect response, the experimenter terminates the trial and moves to the next trial
					Behavior for Tact Probes
1	2	3	4	5	
☐	☐	☐	☐	☐	Participant had access to stimulus prior to session
☐	☐	☐	☐	☐	The experimenter presents the response topography item
☐	☐	☐	☐	☐	Experimenter does not presents a vocal verbal stimulus
☐	☐	☐	☐	☐	If the participant responds (e.g., water) in 3 s, the experimenter presents a generalized conditioned reinforcer (e.g., that's right, you said water) and moves to the next trial
☐	☐	☐	☐	☐	If the participant makes no response in 3 s, emits a partial response, or emits an incorrect response, the experimenter terminates the trial and moves to the next trial
					Behavior for Echoic Probes
1	2	3	4	5	
☐	☐	☐	☐	☐	Participant had access to stimulus prior to session
☐	☐	☐	☐	☐	The response topography item is not present
☐	☐	☐	☐	☐	Experimenter presents a vocal verbal stimulus (e.g., water)
☐	☐	☐	☐	☐	If the participant repeats the vocal verbal stimulus (e.g., water) in 3 s, the experimenter presents a generalized conditioned reinforcer (e.g., that's right, you said water) and moves to the next trial
☐	☐	☐	☐	☐	If the participant makes no response in 3 s, emits a partial response, or emits an incorrect response, the experimenter terminates the trial and moves to the next trial

Transfer of Stimulus Control Teaching Trial Data Collection

Participant: ______________________ **Response topography:** ________________

IMITATION Echoic	EO AO					SUPERIMPOSITION Mand transfer	EO AO					TIME DELAY Mand control	EO AO				
DATE						**DATE**						**DATE**					
DELAY						**DELAY**						**DELAY**					
Trial 1						Trial 1						Trial 1					
Trial 2						Trial 2						Trial 2					
Trial 3						Trial 3						Trial 3					
Trial 4						Trial 4						Trial 4					
Trial 5						Trial 5						Trial 5					
Trial 6						Trial 6						Trial 6					
Trial 7						Trial 7						Trial 7					
Trial 8						Trial 8						Trial 8					
Trial 9						Trial 9						Trial 9					
Trial 10						Trial 10						Trial 10					

IMITATION Echoic	EO AO					SUPERIMPOSITION Tact transfer	EO AO					TIME DELAY Tact control	EO AO				
DATE						**DATE**						**DATE**					
DELAY						**DELAY**						**DELAY**					
Trial 1						Trial 1						Trial 1					
Trial 2						Trial 2						Trial 2					
Trial 3						Trial 3						Trial 3					
Trial 4						Trial 4						Trial 4					
Trial 5						Trial 5						Trial 5					
Trial 6						Trial 6						Trial 6					
Trial 7						Trial 7						Trial 7					
Trial 8						Trial 8						Trial 8					
Trial 9						Trial 9						Trial 9					
Trial 10						Trial 10						Trial 10					

Beside the trial, under the specific date write either a plus sign for a correct response, a circled plus sign for an independent correct response given during the delay, or a minus sign for no response, an incorrect response, or a partial response.
Circle EO (establishing operation) or AO (abolishing operation) to indicate which is in effect.

Treatment Integrity Checklist:
Echoic Teaching Trials
Imitation Training

Participant: ___________________________ Date: ___________________________
Target response: ______________________

Check when the experimenter behavior occurs, if applicable.

☐ N/A -- Participant had free access to response topography stimulus prior to the session

Check if experimenter behavior occurs for each trial	Behavior
1 2 3 4 5 6 7 8 9 10	
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	Item representative of response topography is not present
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	Experimenter presents a vocal verbal stimulus (e.g., water)
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	If the participant repeats the vocal verbal stimulus in 3 s (e.g., water), the experimenter presents a generalized conditioned reinforcer (e.g., that's right, you said water) and moves to the next trial (+)
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	If the participant makes no response, emits a partial response, or emits an incorrect response, the experimenter terminates the trial and moves to the next trial (-)
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	If the participant responds correctly 5 consecutive time, the experimenter terminates the session

Treatment Integrity Checklist: Simultaneous Presentation
Mand Transfer Trials

Participant: ___________________________ Date: ___________________________
Target response: ______________________

Check when the experimenter behavior occurs, if applicable.

☐ N/A – 30 minutes of deprivation (no access) of response topography stimulus has occurred

☐ N/A – Experimenter allows brief access to the response topography stimulus (reinforcer sampling)

Check if experimenter behavior occurs for each trial	Behavior
1 2 3 4 5 6 7 8 9 10	
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	Experimenter quickly flashes the response topography stimulus to indicate availability
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	Experimenter presents a vocal verbal stimulus (e.g., water)
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	If the participant repeats the vocal verbal stimulus (e.g., water) in 3 s, the experimenter presents a generalized conditioned reinforcer (e.g., that's right, you said water) plus the item characteristic of the response (e.g., a sip of water) and moves to the next trial (+)
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	If the participant makes no response in 3 s, emits a partial response, or emits an incorrect response, the experimenter terminates the trial and moves to the next trial (-)
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	If the participant responds correctly 5 consecutive time, the experimenter terminates the session

Treatment Integrity Checklist: Simultaneous Presentation
Tact Transfer Trials

Participant: ______________________ Date: ______________________
Target response: __________________

Check when the experimenter behavior occurs, if applicable.

☐ N/A -- Participant had free access to response topography stimulus prior to the session

Check if experimenter behavior occurs for each trial										Behavior
1	2	3	4	5	6	7	8	9	10	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Item representative of response topography is present
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Experimenter presents a vocal verbal stimulus (e.g., water)
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	If the participant repeats the vocal verbal stimulus (e.g., water) in 3 s, the experimenter presents a generalized conditioned reinforcer (e.g., that's right, you said water) and moves to the next trial (+)
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	If the participant makes no response in 3 s, emits a partial response, or emits an incorrect response, the experimenter terminates the trial and moves to the next trial (-)
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	If the participant responds correctly 5 consecutive time, the experimenter terminates the session

Treatment Integrity Checklist:
Echoic Transfer to Mand Control
Time Delay

Participant: ___________________________ Date: ___________________________
Target response: ______________________ Delay: ___________________________

Check when the experimenter behavior occurs, if applicable.

☐ N/A – 30 minutes of deprivation (no access) of response topography stimulus has occurred

☐ N/A – Experimenter allows brief access to the response topography stimulus (reinforcer sampling)

Check if experimenter behavior occurs for each trial	Behavior
1 2 3 4 5 6 7 8 9 10	
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	Experimenter quickly flashes the response topography stimulus to indicate availability
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	Experimenter presents a vocal verbal stimulus (e.g., water) ___ sec after the beginning of the trial
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	If the participant responds (e.g., water) prior to the vocal verbal stimulus, the experimenter presents the item characteristic of the response (no praise) and moves to the next trial (+ circled)
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	If the participant repeats the vocal verbal stimulus (e.g., water) in 3 s after the presentation of the vocal verbal stimulus, the experimenter presents the item characteristic of the response (no praise) and moves to the next trial (+)
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	If the participant makes no response in 3 s after the presentation of the vocal verbal stimulus, emits a partial response, or emits an incorrect response, the experimenter terminates the trial and moves to the next trial (-)
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	If the participant responds correctly 5 consecutive time, the experimenter terminates the session

Treatment Integrity Checklist:
Echoic Transfer to Tact Control
Time Delay

Participant: ____________________________ Date: ____________________________
Target response: _______________________ Delay: ____________________________

Check when the experimenter behavior occurs, if applicable.

☐ N/A -- Participant had free access to response topography stimulus prior to the session

Check if experimenter behavior occurs for each trial										**Behavior**
1	2	3	4	5	6	7	8	9	10	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Item representative of response topography is present
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Experimenter presents a vocal verbal stimulus (e.g., water) ___sec after the beginning of the trial
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	If the participant responds (e.g., water) prior to the vocal verbal stimulus, the experimenter delivers generalized conditioned reinforcement and moves to the next trial (+ circled)
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	If the participant repeats the vocal verbal stimulus (e.g., water) in 3 s after the presentation of the vocal verbal stimulus, the experimenter delivers generalized conditioned reinforcement and moves to the next trial (+)
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	If the participant makes no response in 3 s after the presentation of the vocal verbal stimulus, emits a partial response, or emits an incorrect response, the experimenter terminates the trial and moves to the next trial (-)
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	If the participant responds correctly 5 consecutive time, the experimenter terminates the session

Multiple Control Teaching Trial Data Collection

Participant: ______________________ **Response topography:** ________________

SUPERIMPOSITION Echoic, Mand, Tact		EO		AO		TIME DELAY Echoic & Tact to Mand Control		EO		AO	
DATE						**DATE**					
DELAY						**DELAY**					
Trial 1						Trial 1					
Trial 2						Trial 2					
Trial 3						Trial 3					
Trial 4						Trial 4					
Trial 5						Trial 5					
Trial 6						Trial 6					
Trial 7						Trial 7					
Trial 8						Trial 8					
Trial 9						Trial 9					
Trial 10						Trial 10					

SUPERIMPOSITION Echoic, Mand, Tact		EO		AO		TIME DELAY Tact & Mand to Echoic Control		EO		AO	
DATE						**DATE**					
DELAY						**DELAY**					
Trial 1						Trial 1					
Trial 2						Trial 2					
Trial 3						Trial 3					
Trial 4						Trial 4					
Trial 5						Trial 5					
Trial 6						Trial 6					
Trial 7						Trial 7					
Trial 8						Trial 8					
Trial 9						Trial 9					
Trial 10						Trial 10					

SUPERIMPOSITION Echoic, Mand, Tact		EO		AO		TIME DELAY Echoic & Mand to Tact Control		EO		AO	
DATE						**DATE**					
DELAY						**DELAY**					
Trial 1						Trial 1					
Trial 2						Trial 2					
Trial 3						Trial 3					
Trial 4						Trial 4					
Trial 5						Trial 5					
Trial 6						Trial 6					
Trial 7						Trial 7					
Trial 8						Trial 8					
Trial 9						Trial 9					
Trial 10						Trial 10					

Beside the trial, under the specific date write either a plus sign for a correct response, a circled plus sign for an independent correct response given during the delay, or a minus sign for no response, an incorrect response, or a partial response.
Circle EO (establishing operation) or AO (abolishing operation) to indicate which is in effect.

Treatment Integrity Checklist: Simultaneous Presentation
Multiple Control Trials

Participant: ___________________________ Date: ___________________________
Target response: ______________________

Check when the experimenter behavior occurs, if applicable.

☐ N/A – 30 minutes of deprivation (no access) of response topography stimulus has occurred

☐ N/A – Experimenter allows brief access to the response topography stimulus (reinforcer sampling)

Check if experimenter behavior occurs for each trial	Behavior
1 2 3 4 5 6 7 8 9 10	
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	Item representative of response topography is present
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	Experimenter presents a vocal verbal stimulus (e.g., water)
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	If the participant repeats the vocal verbal stimulus (e.g., water) in 3 s, the experimenter presents a generalized conditioned reinforcer (e.g., that's right, you said water) plus the item characteristic of the response (e.g., a sip of water) and moves to the next trial (+)
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	If the participant makes no response in 3 s, emits a partial response, or emits an incorrect response, the experimenter terminates the trial and moves to the next trial (-)
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	If the participant responds correctly 5 consecutive times, the experimenter terminates the session.

Treatment Integrity Checklist:
Transferring Echoic and Mand to Tact Control

Participant: ____________________________ Date: ____________________________
Target response: _______________________ Delay: ____________________________

Check when the experimenter behavior occurs, if applicable.

☐ N/A -- Participant had free access to response topography stimulus prior to the session (step 6)

☐ N/A – 30 minutes of deprivation (no access) of response topography stimulus has occurred (steps 1-5)

☐ N/A – Experimenter allows brief access to the response topography stimulus (reinforcer sampling) (steps 1-5)

Check if experimenter behavior occurs for each trial	Behavior
1 2 3 4 5 6 7 8 9 10	
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	Item representative of response topography is present
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	Experimenter presents a vocal verbal stimulus (e.g., water) ___sec after stimulus presentation
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	If the participant responds (e.g., water) prior to the vocal verbal stimulus, the experimenter presents generalized conditioned reinforcement and moves to the next trial (+ circled)
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	If the participant repeats the vocal verbal stimulus (e.g., water) in 3 s after the presentation of the vocal verbal stimulus, the experimenter delivers generalized conditioned reinforcement and moves to the next trial (+)
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	If the participant makes no response in 3 s after the presentation of the vocal verbal stimulus, emits a partial response, or emits an incorrect response, the experimenter terminates the trial and moves to the next trial (-)
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	If the participant responds correctly 5 consecutive time, the experimenter terminates the session

Treatment Integrity Checklist:
Transferring Tact and Mand to Echoic Control

Participant: ___________________________ Date: ___________________________
Target response: ______________________ Delay: ___________________________

Check when the experimenter behavior occurs, if applicable.

☐ N/A -- Participant had free access to response topography stimulus prior to the session (step 6)

☐ N/A – 30 minutes of deprivation (no access) of response topography stimulus has occurred (steps 1-5)

☐ N/A – Experimenter allows brief access to the response topography stimulus (reinforcer sampling) (steps 1-5)

Check if experimenter behavior occurs for each trial	**Behavior**
1 2 3 4 5 6 7 8 9 10	
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	Experimenter presents a vocal verbal stimulus (e.g., water) at the beginning of the trial
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	Item representative of response topography is present ___sec after stimulus presentation
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	If the participant responds (e.g., water) after the presentation of the vocal verbal stimulus and before to the presentation of the response topography item, the experimenter presents generalized conditioned reinforcer and moves to the next trial (+ circled)
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	If the participant repeats the vocal verbal stimulus (e.g., water) in 3 s after the presentation of the response topography item, the experimenter presents generalized conditioned reinforcer and moves to the next trial (+)
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	If the participant makes no response in 3 s after the presentation of the vocal verbal stimulus, emits a partial response, or emits an incorrect response, the experimenter terminates the trial and moves to the next trial (-)
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	If the participant responds correctly 5 consecutive times, the experimenter terminates the session.

Treatment Integrity Checklist:
Transferring Echoic and Tact to Mand Control

Participant: ______________________ Date: ______________________
Target response: ___________________ Delay: ______________________

Check when the experimenter behavior occurs, if applicable.

☐ N/A -- Participant had free access to response topography stimulus prior to the session

☐ N/A – 30 minutes of deprivation (no access) of response topography stimulus has occurred

☐ N/A – Experimenter allows brief access to the response topography stimulus (reinforcer sampling)

Check if experimenter behavior occurs for each trial	Behavior
1 2 3 4 5 6 7 8 9 10	
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	Experimenter briefly flashes the response topography item to signal availability
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	Item representative of response topography is present ___sec after stimulus presentation
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	Experimenter presents a vocal verbal stimulus (e.g., water) ___sec after stimulus presentation
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	If the participant responds (e.g., water) prior to the vocal verbal stimulus, the experimenter presents the item characteristic of the response (e.g., a sip of water) and moves to the next trial
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	If the participant repeats the vocal verbal stimulus (e.g., water) in 3 s, the experimenter presents the item characteristic of the response (e.g., a sip of water) and moves to the next trial
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	If the participant makes no response in 3 s, emits a partial response, or emits an incorrect response, the experimenter terminates the trial and moves to the next trial
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	If the participant responds correctly 5 consecutive times, the experimenter terminates the session.

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