Teaching Auditory-Auditory Identity Matching to Persons with Developmental Disabilities and Children with Autism

by

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ABSTRACT

Recognizing that two sounds are the same is a part of accurate vocal imitation, and the teaching of vocal imitation is an important part of language training for persons with developmental disabilities (DD) and children with autism. Researchers have developed an Auditory-Auditory Identity Matching Prototype Task (AAIM PT) to assess whether persons with DD can identify whether two sounds are the same (Harapiak, Martin, & Yu, 1999). Thus far, the one study (Sewell, 2005) that attempted to teach AAIM tasks to persons with DD who failed the AAIM PT had little success in doing so. The purpose of this research was to evaluate several procedures for teaching AAIM tasks to persons with DD and children with autism. In Experiment 1, the trainer said a word, a matching word was played out of one computer speaker, and a non-matching word was played out of another. The participant was required to point to the speaker that played the matching word. In a single-subject alternating-treatments design, volume fading of the non-matching word (from zero to full volume) was compared to the fading out of a pointing prompt to the speaker that played the matching word. Only one of five participants learned an AAIM task, and that participant did not pass the AAIM PT. Three pilot studies were then conducted to explore various prompting and fading strategies for teaching AAIM tasks, and all were unsuccessful. In Experiment 2, I examined a procedure for teaching AAIM in which the participant was actively involved in producing the sample sound and the matching and non-matching comparison sounds. This procedure also incorporated visual cues and sounds from the operation of a toy airplane as a possible natural, built-in reinforcer. In a single-subject AB design with

replication within and across three participants (one person with DD and two children with autism), all three participants learned two AAIM tasks, two participants generalized to a third AAIM task, and one participant passed the AAIM PT. The encouraging results from Experiment 2 provide a promising starting point for future research on teaching AAIM tasks to persons with DD and children with autism.

INTRODUCTION

Some individuals with developmental disabilities (DD, abbreviations are listed in Appendix G, p. 98) are able to learn various tasks relatively quickly but are unable to learn seemingly similar tasks. For example, a person with moderate DD might easily learn to return knives, forks, and spoons to their appropriate place in a utensil drawer, but have great difficulty learning to respond appropriately when someone asks, "Pass the fork (versus the spoon)," at a dining table. In an attempt to explain this finding, Kerr, Meyerson, and Flora (1977) developed the Assessment of Basic Learning Abilities (ABLA) to assess the ease or difficulty with which a testee might learn the types of discriminations needed to perform various tasks.

The ABLA takes approximately 30 minutes to administer and is comprised of six training tasks, which are referred to as levels. The levels are Level 1, a simple imitation; Level 2, a position discrimination; Level 3, a visual discrimination; Level 4, a visual quasi-identity match-to-sample discrimination; Level 5, an auditory discrimination; and Level 6, an auditory-visual combined discrimination. The tester attempts to teach each level, one at a time, using standardized prompting and reinforcement procedures, until a pass or fail criterion is met, whichever comes first.

Research has indicated that the ABLA levels are ordered in terms of difficulty with Level 1 being the least difficult and Level 6 being the most difficult. Kerr et al. (1977) found that, after assessing the highest passed ABLA level for 117 participants with DD, 111 of them could pass every level below it. Martin, Yu, Quinn, and Patterson (1983) found that only 2 out of 135 people with DD deviated from the hierarchy of task difficulty across the levels. Similar results were found with typically

developing children (Casey and Kerr, 1977), individuals with multiple handicaps including hearing impairments (Wacker, 1981), and children with autism (Ward and Yu, 2000).

The ABLA test has proven to be very useful for matching the learning abilities of persons with DD to the difficulty of trainings tasks (Martin, Thorsteinsson, Yu, Martin, and Vause, 2008). In addition, researchers have demonstrated that several additional discriminations may be worthwhile additions to the ABLA test. One such additional task is auditory-auditory identity matching (AAIM) which assesses whether persons with DD are able to identify matching sounds (Harapiuk, Martin, and Yu, 1999). Research on an AAIM Prototype Task (AAIM PT) indicates that it is more difficult than ABLA Level 6, and that the pass/fail performance of participants with DD on the AAIM PT is correlated with various measures of their language ability (Marion et al., 2003). However, thus far, only one study (Sewell, 2005) has attempted to teach AAIM training tasks to persons with DD who failed the AAIM PT, and that study met with very limited success. The purpose of my research was to investigate procedures for teaching AAIM discriminations to persons who failed the AAIM PT. I will first review the ABLA testing procedure, background research on the ABLA, and related research on teaching AAIM training tasks.

The Standardized ABLA Testing Procedure

Level 1 is an imitation task. A red box with black diagonal stripes and an indiscriminate piece of foam are placed on a table in front of the participant and the tester then models the response that the participant must imitate. The correct

response is to imitate the tester by placing the foam into the box. After several trials, this is repeated with a yellow can and the foam.

Level 2 assesses a position discrimination. The participant is presented with the red box and yellow can in a fixed left-right position across trials. The correct response is to place the foam into the container on the right when the tester provides the instruction, “Where does it go?”

Level 3 assesses a visual discrimination. Across trials the left-right position of the red box and yellow can are alternated randomly. The correct response is for the participant to place the foam in the yellow can no matter whether it is in the left or right position when the tester says, “Where does it go?”

Level 4 assesses a visual quasi-identity match-to-sample discrimination. Across trials, the left-right position of the red box and yellow can are alternated randomly. In addition, on each trial, the participant is either given a small red cube or a small yellow cylinder after the containers are presented, and the tester says, “Where does it go?” When given the small red cube, the correct response is to place it into the red box; when given the small yellow cylinder, the correct response is to place it into the yellow can.

Level 5 assesses an auditory discrimination. The red box and yellow can are presented to the participant in fixed left-right positions across trials; the piece of foam is also presented to the participant. On each trial the tester randomly says either, “Yellow can,” (in a low pitched tone of voice) or “Red box,” (in a high pitched tone of voice). The correct response is to place the foam in the container corresponding to the instruction.

Lastly, Level 6 assesses an auditory-visual combined discrimination. This level is identical to Level 5 with the exception that the left-right position of the containers is randomly alternated across trials.

A standardized prompting and reinforcement procedure is used to test each ABLA level. At the beginning of the assessment of a level the tester: (1) demonstrates the correct response, (2) then guides the participant in responding correctly, and (3) then gives the participant an opportunity to respond independently. For example, to test Level 2, on the demonstration trial, while holding the foam the tester gives the instruction, "Where does it go?" and demonstrates the correct response (placing the foam into the container on the right). Then, on the guidance trial, the tester repeats the instruction, gives the foam to the participant, and guides the participant in making the correct response. Finally, on the independent-response trial, the instruction and the foam are given to the participant and the participant is given the chance to independently respond. If the participant responds correctly the tester provides praise and then begins testing. If the participant responds incorrectly, the tester informs the participant of this in a neutral tone of voice and with a neutral facial expression and removes the materials for a brief period of time. The materials are re-presented to the participant in the same configuration and an error correction procedure involving these same three steps (i.e., demonstration, guided trial, and chance for an independent response) are conducted. The participant must achieve one correct independent response before testing of Level 2 can begin. On Levels 3, 4, 5, and 6 two sets of practice trials are done. This is done to practice each possible correct response for the level. On test trials for a level, correct responses are followed

by praise and an edible, and incorrect responses are followed by the three-step error correction procedure described previously.

Each level is tested in sequence. If the participant achieves eight correct consecutive responses on a level, then that level is scored as a "pass", and the participant is tested on the next level. If the participant makes eight cumulative errors (including errors made during the independent response component of the error correction) on a level before they make eight consecutive correct responses, then that level is scored as a "fail".

Research on the ABLA

Inter-Tester Reliability, Test-Retest Reliability, and Predictive Validity

The ABLA has good inter-tester and test-retest reliability (Martin et al., 1983). As described in a recent review by Martin et al. (2008), performance on the ABLA also has good predictive validity for the learning performance of persons with DD on a variety of training tasks. Participant performance at each level of the ABLA has also been shown to predict the learning performance of persons with DD more accurately than experienced staff with direct knowledge of the participant (Stubbings & Martin, 1998; Thorsteinsson et al., 2007). Researchers have also demonstrated that ABLA test performance can be used for predicting the relative efficacy of three presentation modes (objects vs. pictures vs. spoken words) for assessing the consistency of preferences of persons with DD (Conyers et al., 2002; DeVries et al., 2005; Reyer & Sturmey, 2006). Preliminary evidence suggests that the ABLA may also be a useful assessment and training tool for children with autism (Schwartzman et al., 2009; Ward & Yu, 2000).

Teaching a Failed ABLA Level

It is very difficult to teach a failed ABLA level to persons with DD using the standardized testing procedures of the ABLA (described previously), and a failed level being trained often remains unlearned after several hundred training trials (Meyerson, 1977; Witt & Wacker, 1981; Yu & Martin, 1986). Martin and Yu (2000) suggested that mastery of a failed ABLA level in fewer than 100 trials should be considered "rapid learning". Rapid learning of failed ABLA levels has been accomplished with a small number of participants using a multiple component training package (MCTP) which includes several of the following: (1) a within-stimulus prompt fading procedure, (2) a self-discovery reinforcer technique (correct responding directly resulted in access to a reinforcer) contingent on correct responses, (3) an error-interruption procedure, (4) continuous presentation of auditory cues, (5) delayed prompting, and (6) multiple reinforcer preference testing. Hazen, Szendrei, and Martin (1989) and Yu and Martin (1986) both used an MCTP which included components (1), (2), and (3). Out of three participants with DD, one participant passed the previously failed ABLA Level 3, and three participants passed a previously failed ABLA Level 4, in under 100 trials. Walker, Martin, and Graham (1991) used a training package which included all of components (2) through (6) and they taught 3 out of 5 participants, who had previously failed ABLA Level 5, to pass this level in 8, 15, and 95 trials. Conyers, Martin, Yu, and Vause (2000) used the same procedure as Walker et al. (1991) and taught four participants with DD, who had previously failed ABLA Level 6, to pass this level in 20, 21, 23, and 32 trials.

ABLA and Aberrant Behavior

Vause, Martin, and Yu (1999) observed that people with DD emitted increased levels of aberrant behavior when they were presented with training tasks below and above their ABLA level (i.e., the highest-passed ABLA level), as compared to when they were presented with tasks that were at their ABLA level. These aberrant behaviors also generalized to a second training setting. Vause, Martin, and Cornick, et al. (2000) found that 9 out of 13 participants also showed higher levels of aberrant behavior when training tasks were mismatched to their ABLA level than when tasks were matched to their ABLA level. Mismatching between the ABLA level of tasks assigned and the ABLA level of people with DD occurs frequently, especially with direct-care staff with no knowledge of the ABLA (Dewiele & Martin, 1996).

ABLA and Language

The ABLA has proven to be a good predictor of expressive and receptive language skills. Casey and Kerr (1977) tested 42 typically developing children between the ages of 13 and 35 months, the period where rapid growth in speech is seen in this population. The children who passed ABLA Level 6 demonstrated significantly higher performance on mean length utterance, longest utterance, and vocabulary sample than did age-matched children who did not pass Level 6. Children with DD who failed ABLA Levels 5 and 6 also failed the Distar Reading Readiness test while those children who passed these levels passed the reading test (Meyerson, 1977). Also, children with autism who failed Levels 5 and 6 communicated with single words or less, while children with autism who passed Levels 5 and 6 communicated in two or more word phrases or sentences (Ward & Yu, 2000).

Barker-Collo, Jamieson, and Boo (1995) tested 40 individuals with DD on several assessments of language and the ABLA, the communication portion of the Vineland Adaptive Behavior Scales (VABS) (Sparrow, Balla, & Cicchetti, 1984), and Barker-Collo et al.'s (1995) Communication Status Survey (CSS). ABLA performance was significantly correlated with the Vineland receptive and expressive communication scale scores, and aspects of the CSS. Richards, Williams, and Follette (2002) also reported a significant positive relationship between ABLA performance and the VABS scores of persons with DD. They also noted that individuals who failed ABLA Level 6 were not testable on the WAIS-R and demonstrated low and non-equivalent age matching on the VABS.

The ABLA and Two Auditory Matching Tasks

Research (reviewed by Martin and Yu, 2000) has indicated that two auditory matching tasks are more difficult than ABLA Level 6 in the ABLA hierarchy. These two tasks may be worthwhile additions to the ABLA hierarchy. The tasks include AAIM and Auditory-Auditory Non-Identity Matching (AANM).

When assessing an AAIM PT (Harapiak et al., 1999), a participant sits across from the tester and two assistants (sitting on either side of the tester) facing the participant. The ABLA standardized testing procedures are used to assess this task. On a trial the tester provides a sample sound. The tester says,"Pen-pen," quickly in a high-pitched tone of voice on some trials, and, "Block," slowly in a low-pitched tone of voice on other trials. After the tester has provided a sample sound, one assistant provides the matching sound while the other provides the non-matching sound. The position (left or right assistant) of the matching sound is randomly alternated across

trials, and the order of presentation (matching before non-matching or vice versa) is also randomized across trials. The client must learn to point to the assistant who provided the comparison sound that matched the sample sound presented by the tester.

Like the ABLA Level 6, an assessment begins with a demonstration trial, a guided trial, and an opportunity for an independent response with each of the sample sounds. Correct responses resulted in praise and an edible rienforcer and incorrect responses are followed by the error correction procedure used in the ABLA. Testing continues until a participant achieves a pass criterion of eight consecutive correct responses, or a failure criterion of eight cumulative errors (whichever occurs first).

The AANM PT testing procedure is very similar to the AAIM PT procedure. While the AAIM PT assesses whether or not a client is able to recognize that two sounds are the same, the AANM PT assesses whether or not a client can recognize that two words go together even though they are different. On some AANM PT test trials, the tester says, “Ice,” and on other trials the tester says, “Ball.” Across trials, one assistant will say the word, “Rink,” and the other will say the word, “Field.” The correct responses would be to point to the assistant who said the word, “Rink,” when the tester said, “Ice,” and to point to the assistant who said, “Field,” when the tester said, “Ball.” The pass/fail criteria for the AANM PT are the same as those used for the AAIM PT.

Research has demonstrated that: (a) the AAIM PT is more difficult than ABLA Level 6, (b) the AANM PT is more difficult than the AAIM PT; (c) both the AAIM and the AANM PTs have good test-retest reliability; (d) both PTs have good predictive

validity for similar auditory matching tasks; and (e) the ABLA test with the addition of the auditory matching discriminations is more strongly correlated with language performance than just the ABLA alone (Harapiak et al., 1999; Marion et al., 2003; Vause, Harapiak, Martin, & Yu, 2003; Vause, Martin, & Yu, 2000).

Teaching AAIM Discriminations

The ability to recognize that two sounds are the same is a component of vocal imitation, and the teaching of vocal imitation is an important part of language training programs for persons with DD and children with autism. Considering that the AAIM PT assesses a person's ability to identify that two sounds are the same, it may be that the skills needed to pass the AAIM PT are precursors for vocal imitation. Before we are able to assess this possibility a method to teach AAIM must be developed. Thus far, only one study (Sewell, 2005) has attempted to develop a procedure to teach AAIM training tasks to persons with DD who failed the AAIM PT, and no studies have been reported that attempted to teach AAIM training tasks to children with autism.

Sewell (2005) conducted two experiments that compared a prompting and reinforcement (PR) procedure to three forms of a multiple-component training package (MCTP). The PR procedure used in this research included: (1) a preference assessment at the beginning of a training session that identified three edible reinforcers to be used during training sessions; (2) a demonstration, a guided trial, and a chance for an independent response at the beginning of each session; (3) the presentation of an edible reinforcer and praise contingent on correct responding; and (4) the use of pacing prompts as needed. Unlike standard ABLA testing, an error

correction procedure was not implemented if the participant responded incorrectly, instead the response was ignored and the next trial was presented.

The MCTP1 used in Experiment 1 included the PR procedure described above plus: (1) a discovery-reinforcer contingent on correct responding; (2) a response disruption procedure for errors; and (3) within-stimulus auditory prompt fading (the non-matching word was faded in using slowly increasing volume). MCTP2, used in Experiment 2, included the PR procedure described previously plus: (1) a discovery-reinforcer contingent on correct responding; (2) an extinction procedure for incorrect responses; (3) extra-stimulus prompt fading (a pointing prompt that was faded out); (4) within-stimulus auditory prompt fading (fading of the number of repetitions); and (5) extra-stimulus auditory prompt fading (fading of an additional bell sound was played along with one of the words being taught). MCTP3, also used in Experiment 2, included the PR procedure described previously plus: (1) a discovery-reinforcer contingent on correct responding; (2) an extinction procedure (the materials were removed and the tester did not speak with or look at the participant for a brief period of time) for incorrect responses; (3) extra-stimulus visual prompts; (4) extra-stimulus verbal prompts; (5) within-stimulus auditory prompt fading; (6) fading of the extra-stimulus verbal prompts; and (7) within-stimulus fading to exaggerate the difference between the words.

Across the two experiments completed by Sewell (2005), the performance of nine participants with DD were studied. All of Sewell's participants passed ABLA Level 6, failed the AAIM PT, and failed the AAIM training tasks. The research design was an AB design with some participants exposed to an MCTP1 procedure and then

PR in Experiment 1. In Experiment 2 three participants were exposed to PR, then MCPT2, then MCTP3. The other 3 participants were exposed to MCTP2 and then to MCTP3. In both experiments, the goal was to teach an AAIM training task with the tester saying, for example, "Tack-tack," on some trials, and, "Wrench," on other trials, and comparison words were either spoken by assistants or presented through speakers (and a participant pointed to the correct speaker). Across the two experiments, six participants were exposed to PR, and none mastered the discrimination after a mean of 300 training trials. Four participants were exposed to MCTP1 and one participant achieved mastery after a mean of 362 trials (across the four participants). Five participants were exposed to MCTP2, and none achieved mastery after a mean of 255 training trials. Five participants were exposed to MCTP3, and one participant achieved mastery after a mean of 933 trials (across the five participants). Only one of the two participants who met mastery was able to pass the AAIM PT.

Sewell's (2005) results demonstrated that AAIM is extremely difficult to teach to individuals with DD who pass ABLA Level 6 but fail the AAIM PT. In her discussion, Sewell identified several limitations of her research. First, in Experiment 1, for both the PR and the MCTP1, the comparison sounds were recorded on tape recorders and presented through speakers, and Sewell said that the recorders had inherent delays, sounded artificial, and gave noise feedback. Second, for the one participant who learned a training task with MCTP1, and the one who learned a training task with MCTP3, it was not clear what aspects of the multiple-component training package contributed to the participants' learning. Third, the AB experimental design was a

weak design for demonstrating internal validity. Fourth, for MCTP2 and MCTP3, both within-stimulus and extra-stimulus prompt fading were included. Considering that several studies have demonstrated that within-stimulus prompt fading is more effective than extra-stimulus prompt fading for teaching discriminations to children with DD or autism (Schriebman, 1975; Wacker, 1981; Wolfe & Cuvo, 1978), it would be desirable to investigate procedures for teaching AAIM that would compare the relative effectiveness of those prompting strategies.

Statement of the Problem

Since to date no effective method to teach AAIM has been reported the purpose of my research was to investigate procedures for teaching AAIM discriminations, and to conduct the research in a way that would overcome some of the weaknesses described above for Sewell's (2005) research. I conducted a pilot study (referred to in Experiment 1), then Experiment 1, then three more pilot studies, and then Experiment 2 in an attempt to accomplish this goal.

EXPERIMENT 1:

A COMPARISON OF TWO PROCEDURES TO TEACH AN AAIM DISCRIMINATION

In Experiment 1, I compared two fading procedures for teaching AAIM training tasks. In both training tasks, instead of two assistants speaking the non-matching and the matching comparison words, the words were presented through computer speakers. In one experimental condition, on initial trials, the tester said a word, the matching word was presented through a speaker at full volume and the non-matching word was presented through a speaker at zero volume, and across trials the volume of the non-matching word was gradually faded in. This was

conceptualized as within-stimulus prompt fading (Martin & Pear, 2011). In the other experimental condition, on initial trials, the tester said a word, the matching word was presented through a computer speaker while the tester pointed to that speaker, and the non-matching word was presented through the other speaker. Across trials the pointing prompt was gradually faded out. This was conceptualized as extra-stimulus prompt fading (Martin & Pear, 2011). Both pointing and volume prompts are often used in personal care facilities. Thus, in Experiment 1, a standardized prompting and reinforcement procedure with volume fading (SPRV) was compared to a standardized prompting and reinforcement procedure with pointing fading (SPRP). Research has shown that within stimulus prompts are more effective then extra stimulus prompts like pointing prompts therefore we decided to compared pointing prompt fading to volume fading (Martin & Pear, 2011).

Method

Participants and Setting

Three participants (P1, P2, and P3) with DD were recruited from St.Amant, a residential and community resource facility devoted to helping and supporting persons with DD in Winnipeg, Manitoba. They were all female and were between 25 to 52 years of age. According to St.Amant records, P1 and P2's level of intellectual disability was in the moderate category and P3's level of intellectual disability was in the severe category. Sessions for these participants were conducted in a quiet assessment room equipped with a table and several chairs.

Two children with autism (P4 and P5) were recruited from the St. Amant Applied Behavior Analysis (ABA) Program for Children with Autism, which provides

ABA services for children with autism in Manitoba. Both of these children were male and were 6 and 10 years of age respectively. Sessions with these children were conducted at their homes, according to parental preference.

One more adult participant with DD (P6) was recruited from St.Amant. P6 did not take part in either Experiment 1 or 2, however he did take part in Pilot Studies 2 and 3, and is referred to in Appendices C and D. P6 was male, 25 years of age, and was severely intellectually disabled.

The goal was to recruit participants who passed ABLA Level 6. P1, P4, and P5 passed this level at the beginning of the study. P2 and P3 did not pass ABLA Level 6 when tested at the beginning of the study. However, they were included because they had passed Level 6 when tested several months previously, and I was unable to recruit other participants. P2 later passed Level 6 following termination of Experiment 1 when she was re-tested at the end of this experiment.

During assessment and training sessions a participant was seated at a table directly across from the tester. During some sessions (as described later) a third and a fourth person were present and seated on either side of the tester facing the participant. During assessment and training sessions an observer was present in the room, in order to conduct inter-observer reliability and procedural integrity assessments. This observer was seated behind the tester so that he/she could observe the tester and participant without seeing what the tester was writing.

Materials

Materials required for ABLA Level 6 included a yellow can, a red box with black diagonal strips, and an irregular shaped piece of white foam. Materials required

for AAIM training included a laptop computer, two computer speakers with surround sound capabilities, and a computer program that could edit and present pre-recorded sound (E-prime). A table, a blue tablecloth (to cover the table) and a hair band (to pull the testers hair into a pony tail) were used in one condition. A pointing chart (as described later) was also used to improve the tester's pointing accuracy during the condition that involved fading of a pointing prompt.

Research Design

I used a single-subject alternating-treatments design to compare the effects of the two training procedures for teaching AAIM training tasks. One procedure consisted of SPRP and the second procedure consisted of SPRV. For each participant, two pairs of words (described later) were identified. One pair of words was randomly assigned to the SPRP condition and the other pair was randomly assigned to the SPRV condition. In randomly alternating sessions, each participant received SPRP to learn one word pair and SPRV to learn the other word pair. In order to minimize the likelihood of generalization between SPRP and SPRV, SPRP training was conducted with a blue tablecloth over the table and my hair held in a ponytail, and SPRV was conducted without a tablecloth and with my hair hanging down.

Mastery of a word pair was set at eight consecutive correct responses within one session on the final fading step. Training continued until a training task was mastered (in one training procedure) or until 200 training trials were reached with each procedure.

Assessments

Preference assessment. Prior to training, the caregivers for each participant were interviewed to determine possible edible reinforcers to use in the study. At the beginning of each session a participant was presented with six different edibles and then asked to, "Pick one." The edible chosen by the participant during this process was then presented following each correct response during that session. Other reinforcers from the remaining five were added within a session if the participant requested them.

ABLA Level 6. I sat across from the participant and presented the materials in front of him/her. The containers used in this assessment were presented approximately 0.3 meters apart centered with the participant's head. If the participant had motor impairments (P2 and P3) the materials were centered around their dominant hand to avoid siding due to ease of response. The foam piece was handed to the participant by passing it to them in between the containers. ABLA Level 6 was tested as described on pages 4-7.

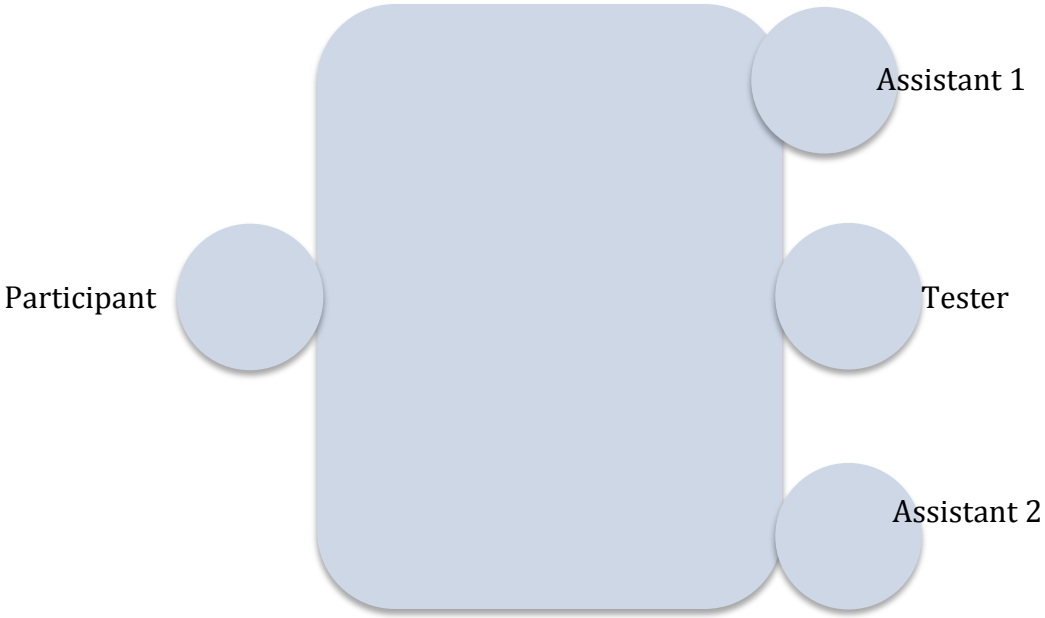
If the participant achieved eight correct responses in a row (excluding correct responses made during the independent response part of error correction), then Level 6 was scored as a pass. If the participant made eight cumulative errors (including errors made during the independent response section of the practice trials) then Level 6 was scored as failed.

AAIM prototype task (AAIM PT). Following assessment of ABLA Level 6, participants were assessed on the AAIM PT. Assessment procedures used in the AAIM PT were the same as those used in the ABLA. For all AAIM PT trials the

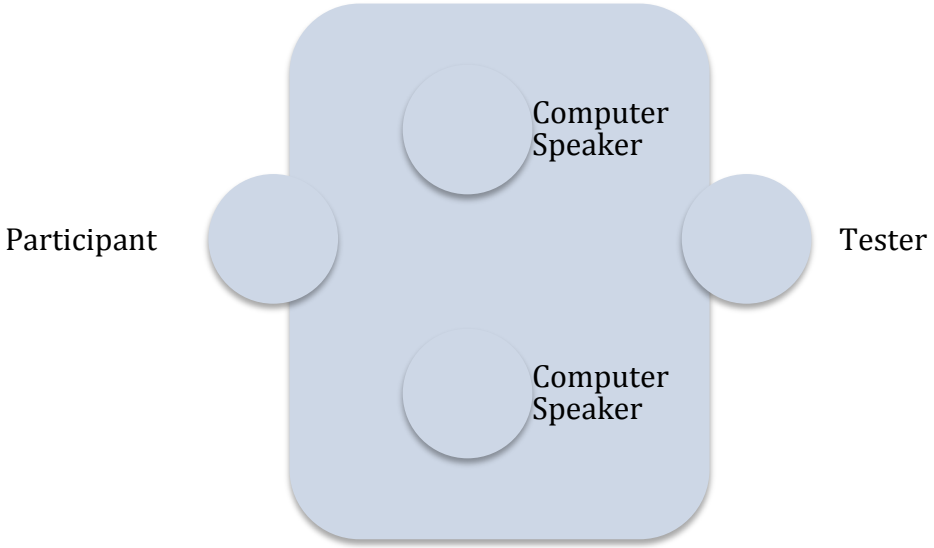
participant sat across from the tester with two assistants seated on either side of the tester facing the participant (see Figure 1 Part A). Across test trials the tester randomly said either, “Pen-pen,” quickly and in a high-pitched tone of voice or, “Block,” slowly and in a low-pitched tone of voice. After the tester presented the sample word, one assistant said the matching word and one assistant said the non-matching word. One assistant spoke at a time; the order in which the assistants spoke, and the words that they spoke were randomized. Before conducting testing trials, the tester completed the demonstration trial, guidance trial, and opportunity for an independent response (as described on page 6 for the ABLA) for both “Pen-pen” and “Block.” For a response to be considered correct the participant had to point to the assistant who said the matching word. Consequences for correct and incorrect responses, and the pass and fail criteria were the same as those used for the ABLA Level 6.

If the participant did not respond within approximately five seconds the tester prompted him/her to respond by saying, “Go ahead.” If the participant still did not respond following this pacing prompt, the response was scored as no response and the next trial was administered. If this happened on two consecutive trials, the session was terminated.

AAIM prototype task with computer speakers (AAIM PTC). This assessment of AAIM was the same as AAIM PT with one difference. Instead of the two assistants speaking the comparison words, computer speakers emitted the words that were pre-recorded in the tester’s voice (see Figure 1 Part B). The tester spoke a sample word before the comparison words were played.



Part A. AAIM PT set-up.



Part B. AAIM PTC set-up.

Figure 1. Participant, tester, assistants, and materials setup for AAIM PT and AAIM PT with computer speakers (AAIM PTC).

AAIM PT with training words. On this assessment, the procedures were the same as AAIM PT except that a pair of training words were used instead of "Pen-pen" and "Block." After choosing two pairs of single-syllable words and randomly assigning (using a coin toss, where heads denoted one pair of words and tails denoted another) each pair to a teaching condition, the tester and two assistants assessed each participant's AAIM skills using these words.

To select the words for each training task, a parent or a direct-care staff member was asked to fill out a form, which required them to rate each word on the form, on a scale from 0 (participant never hears the word) to 4 (participant hears the word more than 7 times a day). The words that were taught were chosen based on the frequency with which the participant heard them. Words that were heard infrequently (a rating of 0-1) were chosen. Also, words were chosen so that across participants the frequency with which the words were heard were similar. For the words within a pair that were to be taught, they were chosen so that they were very different from one another in terms of speech sounds. That is, the beginning, middle, and ending sounds of each word in the pair were different. One word of each pair was randomly designated as the word that was to be spoken quickly, twice, and in a high-pitched tone of voice. The other word was spoken once, slowly, and in a low-pitched tone of voice. Each of the words chosen was one syllable in length. A pair of words was used only if a participant failed the assessment of those words in the AAIM PT with training words and in the assessment of those words when they were presented by computer speakers as described in the next subsection.

AAIM PT with training words and computer speakers. For this AAIM assessment a participant was tested on both pairs of training words, and the comparison words were presented with computer speakers. The procedures used in this test were the same as those used in the AAIM PTC.

Pre-Experiment Training

Participants 1, 2, and 3 were trained to point to a computer speaker when a word (not the word that was to be taught) was played from that computer speaker. The tester said the word first then activated the computer that played the same word out of one of the computer speakers. This was done to address Sewell's (2005) finding that her participants tended not to point to mechanical speakers from which sounds were emitted. Stated differently, many individuals with DD probably have no history of doing so.

Prior to each session in this phase of training, as described previously, a preference assessment was done in order to select at least one edible reinforcer. A correct response was reinforced with praise and an edible. The participant received reinforcement only if he/she pointed to the computer speaker that played the same word spoken by the tester. A response was considered incorrect if the participant pointed to the speaker that remained silent. Following an incorrect response the tester would remove the materials and not speak to or look at the participant for approximately 3-5 seconds.

Training was done using most-to-least graduated guidance that involved four steps, each of which had to be mastered before the next step was attempted. The first step involved a full physical prompt: the tester said the word, the word was played

from one of the computer speakers, and then the tester pointed to the correct speaker while simultaneously guiding (hand-over-hand guidance) the participant's hand to point to the correct speaker. For the second step, the tester said the word, the word was played from one of the computer speakers, and then the tester pointed to the correct speaker while simultaneously lightly holding and guiding the participant's hand towards the correct speaker. For the third step, the tester said the word, the word was played from one of the speakers, and then the tester pointed to the correct speaker and waited for the participant to make the correct response. During the fourth and final step, the tester said the sample word, the word was then played from one of the speakers, and the tester then waited for the participant to point to the correct speaker. For a step to be mastered, the participant must have responded correctly on three consecutive trials. If the participant responded incorrectly a total of two times on one step, prompting and the mastery criterion for the previously mastered step were re-applied. Once all steps in this phase were mastered, the participant was able to move on to SPRV and SPRP training.

This phase was only applied to the adults with DD. This phase was not done with the children with autism because they had more frequent contact with computers and speakers.

AAIM Training Task Procedures

As described previously in the "Research Design" subsection, I attempted to teach one pair of words using SPRP and a second pair of words using SPRV.

Procedures common to both SPRP and SPRV. The participant sat directly across from the tester. Two computer speakers were positioned to the left and right of the

tester, facing the participant. The speakers were placed approximately 0.6 meters apart, equidistant to the participant, and centered between the participant and the tester (see Figure 1 Part B). This placement was clearly marked on the testing table to assist in accurate placement across sessions. During training, after saying the sample word, the tester pressed a button to activate a computer program that played one of the comparison words (in the tester's voice) out of one speaker and the other comparison word from the other speaker sequentially. The matching word was randomly played out of either the right or left speaker (E-prime software randomized the presentation of all the comparison words). The order of presentation of the comparison words (whether the matching word was played before the non-matching word or vice versa) was randomized.

Both SPRP and SPRV included: (1) a short preference assessment (described previously) to select at least 1 out of 6 reinforcers prior to a session; (2) a guided trial with each word at the beginning of every session; (3) praise and an edible reinforcer contingent on correct responding; (4) pacing prompts if required; and (5) a brief time-out following an incorrect response. I will described the details of these components before describing the fading steps for SPRP and SPRV.

At the beginning of every session a preference assessment was conducted, as described previously. After the preference assessment a guided trial for each word was conducted. The tester said the sample word and then pressed a button on the computer to activate the comparison words to be sounded from the speakers. After the two words were sequentially played from the speakers, the tester quickly pointed to the correct speaker and, if necessary, physically guided the participant to respond

correctly and praised the participant. Following the two guidance trials, training trials began with either SPRP or SPRV. If the participant did not respond within approximately 5 seconds, a pacing prompt was used. The pacing prompt consisted of the tester instructing the participant to, "Go ahead." If the participant did not respond within 5 seconds following this pacing prompt, then that trial was scored as no response and the tester started the next trial at the same prompting step. As described previously, all correct responses were reinforced with praise and an edible. If an error was made, the tester removed the materials and ignored (did not speak to or look at) the participant for approximately 5 seconds while recording and preparing for the next trial.

In addition to the preceding components, SPRP and SPRV also included a fading component. In a pilot comparison of SPRP and SPRV for P1, I attempted to fade out the pointing prompt in SPRP in four fading steps, and I attempted to fade in the volume of the non-matching word in SPRV in four fading steps. The results of that comparison are presented in Appendix A. Based on that pilot study, Experiment 1 was conducted with 14 fading steps for SPRP and 14 fading steps for SPRV, as described below.

SPRP. On each trial following the two guidance trials the tester said a word, activated the computer to play the two comparison words (one from each speaker sequentially), and then quickly pointed to the correct speaker. Across trials, the pointing prompt was faded out in 14 steps (see Figure 2). For Step 1, the tester touched the correct speaker with the index finger of her pointing hand and for Step 14 the tester did not provide a pointing prompt. The distance between the tester's

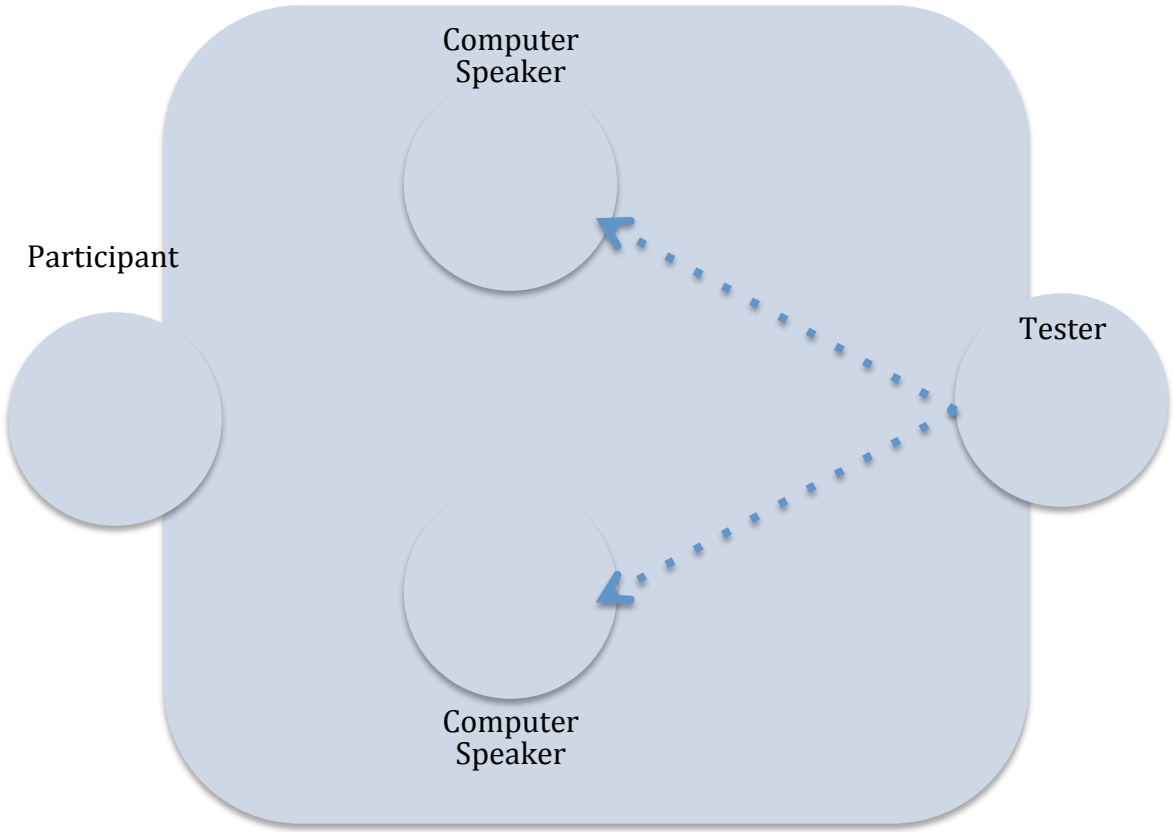


Figure 2. SPRP pointing-prompt fading steps.

pointing finger and the speaker increased with each step. Across steps the pointing prompt was also gradually centralized between the two speakers so that by Step 13 only a slight angling of the pointing finger was apparent. In order to control the location of the tester's pointing finger across fading steps, a large sheet of paper was placed between the tester and each speaker. On the paper was an array of random numbers that would have appeared meaningless to the participant. For the tester, however, the numbers provided prompts to ensure that the tester appropriately faded the pointing prompt.

To progress through Steps 1 to 13, the participant had to correctly respond once at each step. If a participant responded incorrectly on any step between Steps 1 and 13, training regressed to the previously mastered step. Mastery of the task was defined as eight consecutive correct responses on Step 14 (no prompting). If a participant incorrectly responded a total of 3 times on Step 14 then training regressed to Step 13.

SPRV. The presentation of the sample and comparison words as well as the set up of the materials for SPRV, was described previously in the subsection "Procedures common to both SPRP and SPRV." The SPRV procedure included the training components 1, 2, 3, 4, and 5 listed previously. In addition to these a volume prompt was used. The volume of the incorrect comparison word was slowly faded in across 14 fading steps.

Initially following the presentation of the sample word (spoken by the tester), the correct comparison was sounded at full volume from one of the speakers, and the incorrect comparison was not sounded (the order of word presentation was

randomized across trials). Then, across trials, the volume of the incorrect comparison was gradually increased until both the correct and incorrect words were presented at full volume. Mastery, regression, and progression criteria were the same as described for SPRP.

On fading Step 1 following the presentation of the sample word (which was spoken by the tester) either the correct comparison word was presented from one of the speakers (no sound was played from the other speaker), or the correct comparison word was played following a brief time lapse (during which the incorrect comparison word would have been played on Steps 2 to 4). For each subsequent step, the volume of the incorrect comparison word was increased by 3-decibel increments until Step 14 was reached. On Step 14 both comparison words were played at the same volume. At each step, the order in which the comparison words were played was randomized. Also, the speaker that played the correct comparison word was alternated randomly across trials.

Procedure following mastery. Following the mastery of one of the word pairs by a participant, that participant was reassessed on the AAIM PT, AAIM PTC, and the AAIM PT with training words for both pairs of words. If the participant was able to pass all of these assessments, that participant's training was considered complete. If the participant was not able to pass all of these assessments, then that participant was retrained using the same procedures as described previously, using two new pairs of words.

Once mastery was achieved in one condition, in this replication, the participant was reassessed on the AAIM PT, AAIM PTC, and the AAIM PT with

training words (using the new word pairs). At this point, that participant's participation in Experiment 1 was terminated, whether or not he/she was able to pass these tasks.

Inter-Observer Reliability and Procedural Integrity

Inter-observer reliability (IOR) assessments were collected for 65% of the sessions and procedural integrity (PI) data was collected for 62% of the sessions. IOR for a session on the dependent variable was calculated by comparing data taken by the tester and an observer, each of whom scored each trial independently. The number of agreements and disagreements on the data sheets were noted. An IOR was calculated by dividing the number of agreements by the total number of agreements and disagreements and then multiplying this dividend by 100% (Martin & Pear, 2011). The average IOR score across all participants was 99%. The scores ranged from 98% to 100%.

PI scores were completed by an observer. The observer was given a checklist of steps (see Appendix B) that the tester attempted to follow during a session while conducting the experiment, and the observer recorded those steps that were followed correctly, and those that were not followed correctly. A PI score for a session was calculated by dividing the number of steps performed correctly by the total number of steps and multiplying this dividend by 100%. The average PI score across all participants was 99.7%. The scores ranged from 99% to 100%.

Results

Pre-Experiment Training

P1, P2, and P3 were taught to point to a computer speaker that produced a

sound before the SPRP-SPRV comparison. P1 mastered this task in 9 trials, and P3 achieved mastery in 89 trials. P2 achieved mastery quickly (within 13 trials), however she did not maintain her accuracy. Several trials were conducted with just 1 speaker that was moved closer to P2's left hand. P2 was required to point to the speaker when it played a word. Prompts were the same as those described previously. Following this, both speakers were re-introduced and the pre-experiment prompting and fading was continued with a new word. Mastery of this was achieved in 28 trials. For P2, pre-experiment training lasted for a total of 181 trials.

P4 and P5 started formal training on SPRP and SPRV immediately following pre-training assessments.

Pre-Training Assessments

All the participants trained in this experiment failed the AAIM PT, AAIM PTC, the AAIM PT with training words and the AAIM PT with training words and computer speakers before training began.

Training Results

Participant 1. The SPRP training words for P1 for Task 1 were "Bridge" and "Sheep-sheep" and SPRV training words for Task 1 were "Star" and "Drum-drum." P1 progressed through the steps for both conditions rapidly (see Figure 3). She met the mastery criterion of eight consecutive correct responses on Step 14 in the SPRV condition in 39 trials. Mastery was not met for SPRP even after conducting 20 extra trials. On SPRP she regressed from Step 14 three times before teaching was terminated. Two of the three times she regressed to Step 12 before progressing back

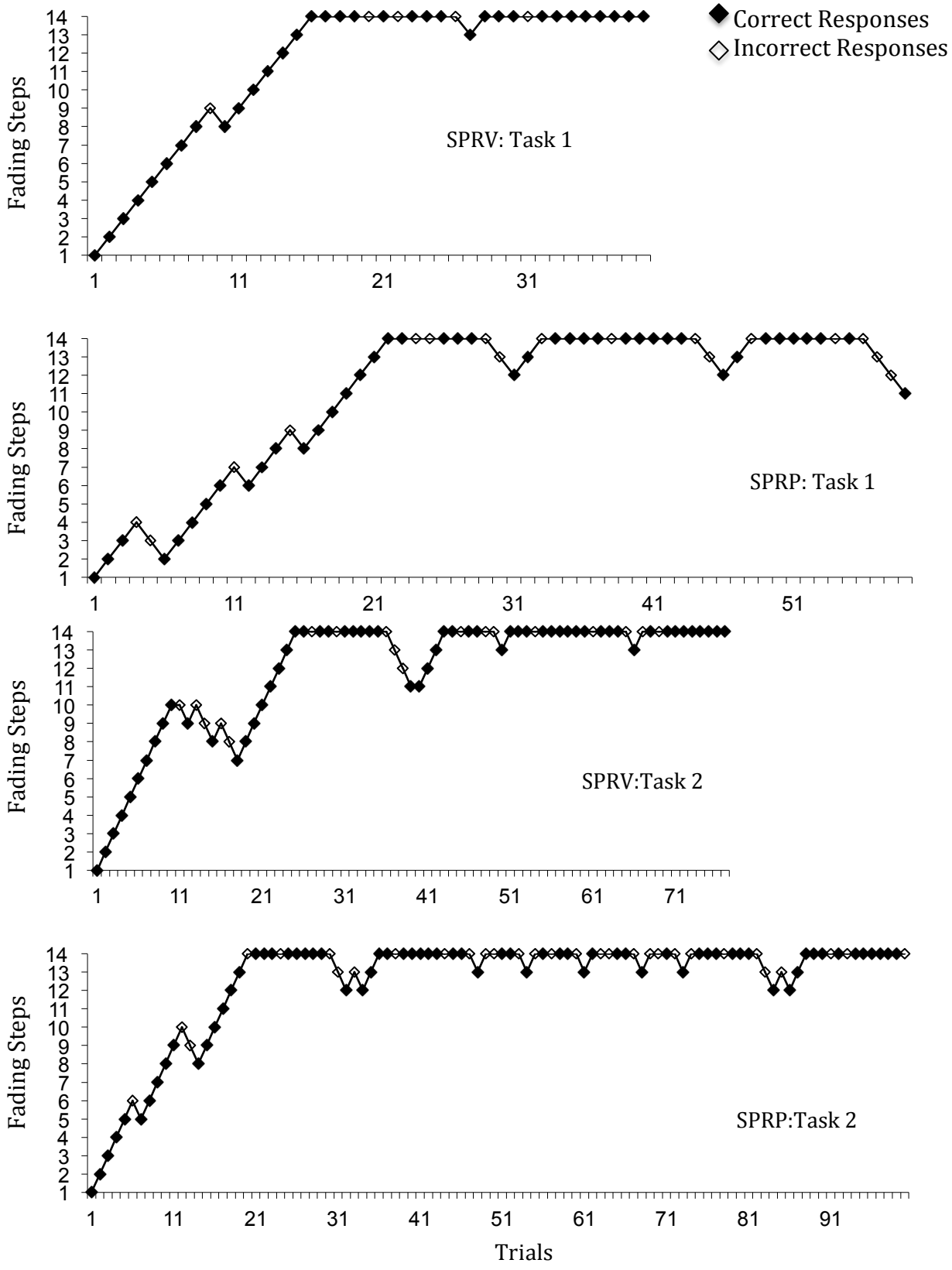


Figure 3. Experiment 1, SPRV and SPRP step progression across trials for P1.

up to Step 14. Following her final attempt and failure at Step 14 she regressed to Step 11 before finally responding correctly.

After the first training task was mastered in the SPRV condition P1 was reassessed on the AAIM PT, AAIM PTC, and the AAIM PT with training words that were mastered. P1 failed all of the above assessments (see Table 1).

Experiment 1 was replicated with one more set of tasks for P1. The training words for Task 2 for SPRP were "Broom" and "Paints-paints," and for Task 2 for SPRV were "Swing" and "Frog-frog." P1 mastered Task 2 in the SPRV condition in 77 trials and did not achieve mastery in the SPRP condition even after an added 23 trials (see Figure 3).

P1 was reassessed on the AAIM PT, AAIM PTC, and the AAIM PT with training words after mastering SPRV Task 2. She failed every assessment except the AAIM PTC (see Table 1).

Participant 2. The SPRP training words for P2 for training task 1 were "Barn" and "Truck-truck," and for SPRV were "Horn-horn" and "Slide." An analysis of P2's progression through the steps in the SPRV condition (see top graph in Figure 4) shows that P2 progressed from Step 1 to Step 11 within the first 31 trials. P2 then regressed to Step 1 within the next 24 trials and oscillated between Steps 1 and 4 for 21 trials. In the SPRP condition, P2 proceeded rapidly through the first 13 fading steps (see second graph in Figure 4). Thereafter, P2's performance bounced back and forth between fading Steps 13 and 14. Teaching was terminated for SPRV after 76 trials and for SPRP after 62 trials because of several factors. P2 had a lack of progress on both SPRP and SPRV, and participating in the experiment appeared to be aversive

Table 1
Pre-and Post-training assessment results for Experiment 1

	Participant	Task	SPRP PTTWs*	SPRV PTTWs*	PT*	PTC*
Pre-Assessment	1	1	Fail	Fail	Fail	Fail
		2	Fail	Fail	Fail	Fail
	2	1	Fail	Fail	Fail	Fail
	3	1	Fail	Fail	Fail	Fail
	4	1	Fail	Fail	Fail	Fail
	5	1	Fail	Fail	Fail	Fail
Post-Assessment	1	1	Fail	Fail	Fail	Fail
		2	Fail	Fail	Fail	Pass
	2	1	N/A	N/A	N/A	N/A
	3	1	N/A	N/A	N/A	N/A
	4	1	N/A	N/A	N/A	N/A
	5	1	N/A	N/A	N/A	N/A

Notes: *PTTWs = AAIM PT with training words
*PT = AAIM PT
*PTC = AAIM PTC

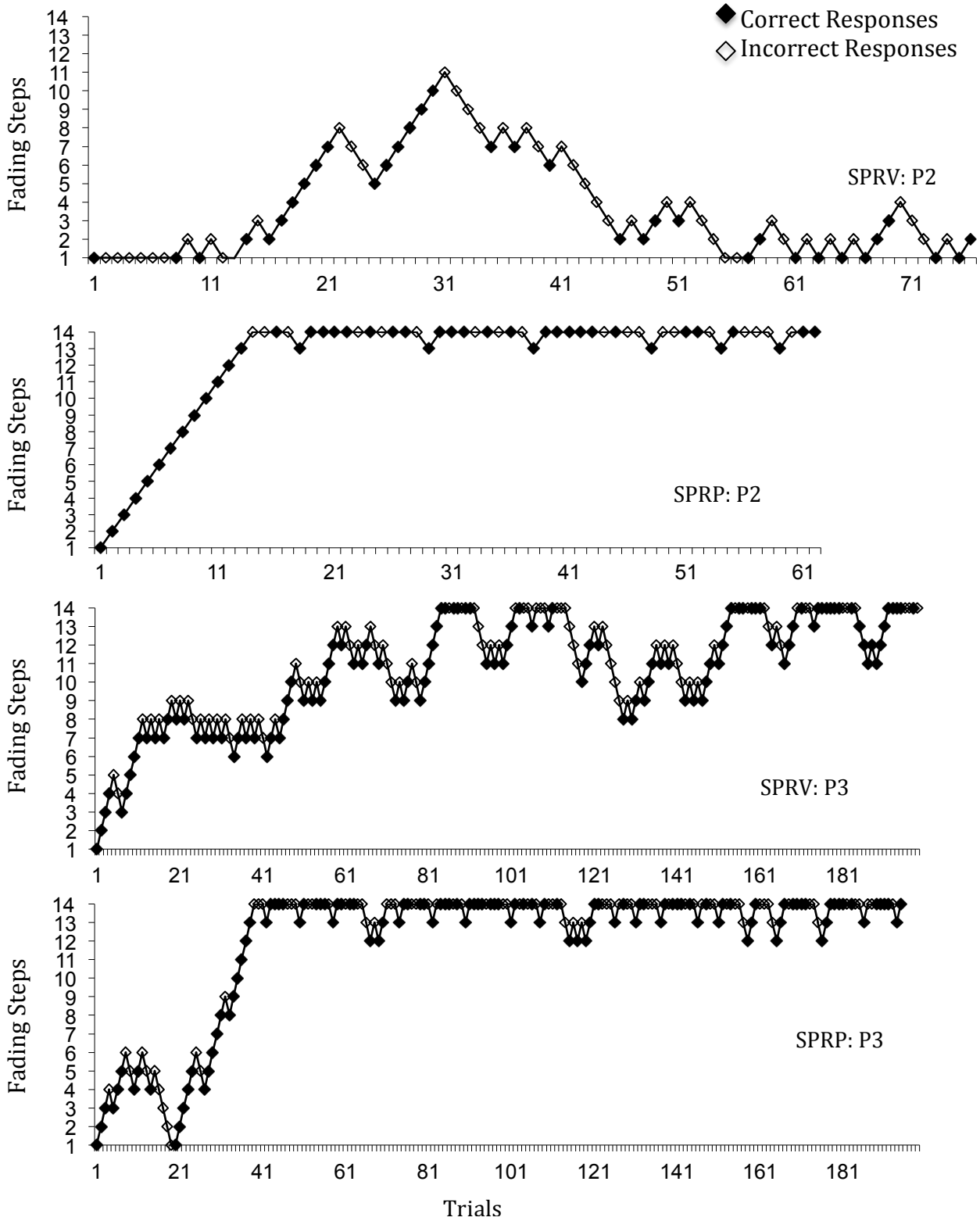


Figure 4. Experiment 1, SPRV and SPRP step progression across trials for P2 and P3.

for P2. P2 often refused to attend sessions and when she did agree to come often she would decline to complete training for both conditions.

Participant 3. The training words for Task 1 for SPRP were "Bridge-bridge" and "Pour," and for SPRV were "Sheep-sheep" and "Truck." Mastery was not reached for either SPRV or SPRP even after 200 trials (see the 3rd and 4th graphs in Figure 4). Progression through the steps in the SPRV condition was slower then that for SPRP. In the SPRV: a) it took 84 trials to reach Step 14; b) for the next 116 trials P3 oscillated between Step 14 and Step 8 without ever mastering Step 14; and c) P3 attempted Step 14 eight times. Progression to Step 14 was quicker in the SPRP condition. It took 41 trials to reach Step 14 in this condition. This is a little more than half the number of trials it took to reach this step in the SPRV condition. On SPRP, P3 oscillated between Step 14 and Step 12 for 186 trials. Training was discontinued in SPRP after the 200th trial and after P3 had attempted and regressed from Step 14 twenty times (see Figure 4).

Participant 4. The training words for task 1 for SPRP were "Broom" and "Paints-paints," and for SPRV were "Bridge" and "Sheep-Sheep." In the SPRV condition P4 never reached Step 14 even after 200 trials were taught (see top graph in Figure 5). The highest step passed by P4 was Step 11. This occurred after 168 trials, and by the 200th trial P4 had regressed to Step 4. In the SPRP condition he reached Step 14 within 36 trials and oscillated between Step 14 and Step 11 for the next 132 trials (see second graph in Figure 5). P4 attempted Step 14 fifteen times in total in SPRP, and had regressed to Step 12 by the 200th trial.

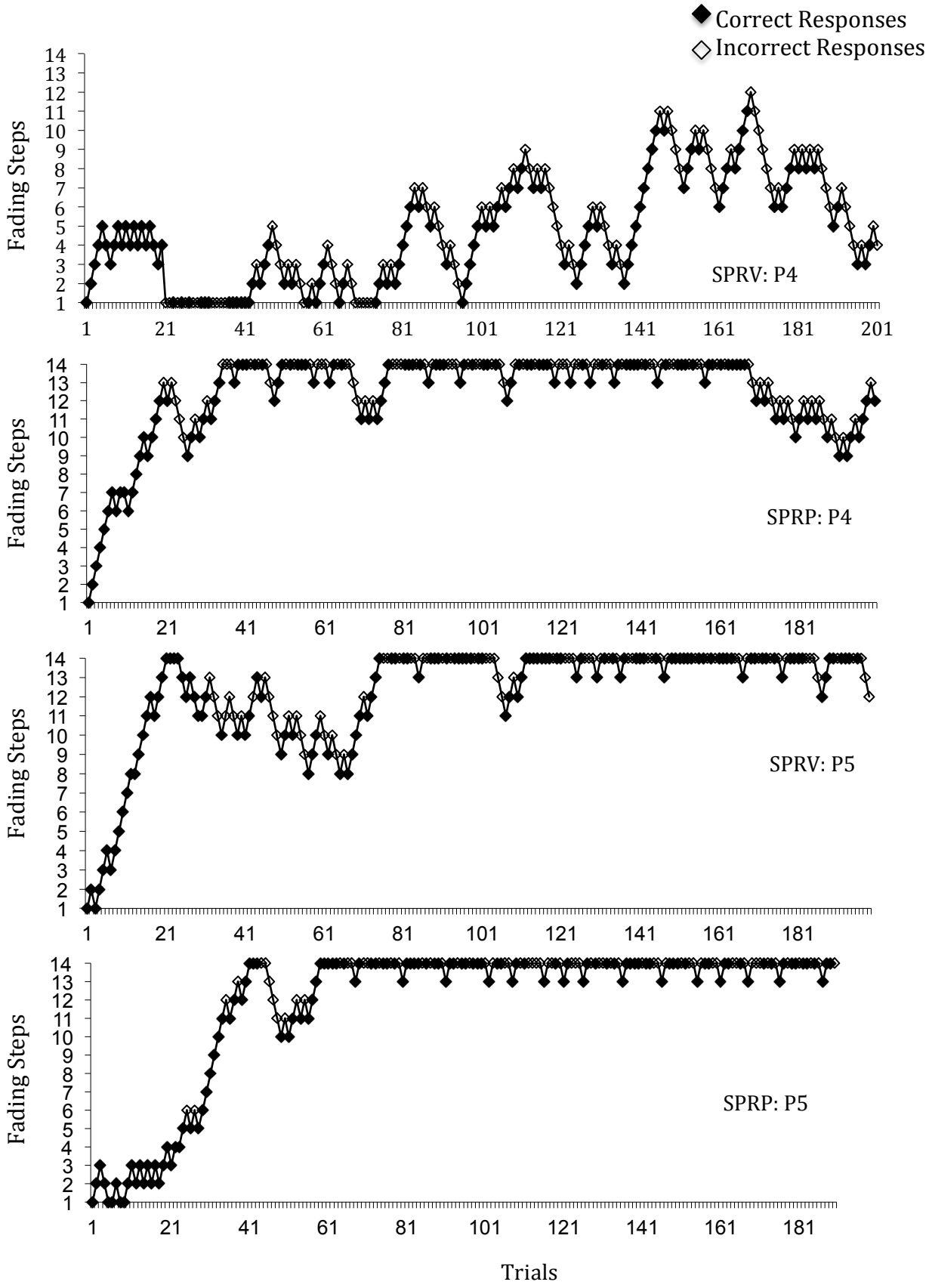


Figure 5. Experiment 1, SPRV and SPRP step progression across trials for P4 and P5.

Participant 5. The SPRP training words for Task 1 were "Clown-clown" and "Slide," and for SPRV were "Sheep-sheep" and "Frog." P5 did not master Step 14 in 200 trials in either condition (see third and fourth graph in Figure 5).

P5 reached Step 14 in the SPRV condition relatively quickly, but he regressed to Step 8 within 33 trials (he attempted four trials at Step 14 before the regression criterion applied, see third graph in Figure 5). P5 reached Step 14 nineteen trials later. At this point he oscillated between Steps 14 and 11 for the next 123 trials. He attempted Step 14 ten times and when teaching was terminated he had just failed Step 12.

It took longer for him to reach Step 14 in the SPRP condition (41 trials) than in the SPRV condition (22 trials). He seemed to have some difficulty with the first several steps of the SPRP condition. After reaching Step 14 in the SPRP condition P5 regressed to Step 10 within four trials, but soon progressed back to Step 14. P5 then oscillated between Step 14 and Step 13 for 131 trials and attempted Step 14 eleven times in the span of 132 trials.

Post-Training Assessments

Table 1 shows the results of post-training assessments. Since P2, P3, P4, and P5 did not master any task, the post-training assessments were not completed.

Discussion

Although P1 was able to reach the mastery criterion on two sets of AAIM training tasks when exposed to an auditory fading procedure, she was unable to pass the AAIM PT. After between 60 and 80 training trials for P2 and after 200 training trials on each of the two fading procedures for P3, P4, and P5, none of them were able

to master an AAIM training task. Even though the first experiment was unsuccessful for 4 out of 5 participants, patterns of responding within the SPRP and the SPRV conditions were informative.

The first thing that is of note is the difficulty P2 and P4 had in reaching Step 14 in the SPRV condition. It took more trials for them to reach this step in the SPRV condition than it did in the SPRP condition. This may have been due to the fact that the participants historically came into contact with pointing prompts more often than volume prompts. A second observation is that, for 4 of the 5 participants, there were a larger number of opportunities to try mastering Step 14 in SPRP than in SPRV. Also, generally the oscillations did not span as many steps in SPRP than in SPRV. These results suggested that SPRV might not be an effective prompting strategy (with P1 being the exception to that generalization).

A third observation is that two participants (P3 and P5) reached Step 14 on volume fading rather quickly, but were unable to meet the mastery criterion at that step before training was terminated in that condition. These results suggest that these two participants initially came under the stimulus control of the differential volume of the matching and non-matching sounds, rather than the auditory sameness of the match-to-sample comparison, and when the volume of the matching and non-matching sounds was the same then the discrimination was lost. Analysis of these results raised questions as to the nature of a within-stimulus prompt. Martin and Pear (2011) defined a within-stimulus prompt as an alteration of the S^D or the S^{Δ} to make the characteristics more noticeable and therefore easier to discriminate. At face value volume fading seemed to be fading of a within-stimulus prompt because

volume is a characteristic of sound and AAIM requires sound discrimination. Thus, fading in the volume of the non-matching word seemed like fading in the S^{Δ}; however, because AAIM as assessed by the AAIM PT is based on the topography of two sounds, and not their volume, perhaps volume fading might best be conceptualized as extra-stimulus prompt fading. If the goal was to teach a participant to match two sounds based on their loudness, even though they were topographically different, then volume fading might be conceptualized as within-stimulus prompt fading.

Most of the participants responded consistently and easily to the initial pointing prompts provided in the SPRP condition. This may be because they have come into contact with this type of prompt frequently. All of the participants progressed to Step 14 in the SPRP condition, however they oscillated between Step 14 and previous steps for quite a long time without mastering Step 14. It seemed that the participants could consistently respond to pointing prompts when they involved small changes in finger position, however they could not respond with more than 50% accuracy once the prompt was totally removed. This suggests prompt dependence had developed and stimulus control was not transferred to the sameness of the sounds.

Four of the five participants in Experiment 1 did not learn an AAIM discrimination with training words presented through speakers. P1 met the mastery criterion on each of two sets of AAIM training words, but was unable to pass the AAIM PT. I then conducted three pilot studies in order to explore additional methods for teaching an AAIM task. In Experiment 1 I used electronic presentation of sounds.

In Pilot Studies 2, 3, and 4 (Pilot Study 1 preceded Experiment 1), computerized presentation of comparison sounds were replaced with live presentation of comparison sounds (i.e., two assistants presented the comparisons sounds by speaking). This was done in an attempt to rule out synthetic sound presentation and lack of contact with these materials as the factors standing in the way of learning AAIM tasks.

The procedures and results for Pilot Studies 2, 3, and 4, are briefly described in Appendices C, D, and E respectively. In spite of considerable exploration of various prompting and fading strategies for teaching AAIM discriminations in Experiment 1 and Pilot Studies 2 through 4, none of the procedures were effective. I then developed a procedure for teaching AAIM in which the participant would be actively involved in producing the sample sound and the matching and non-matching comparison sounds, and which would incorporate visual cues and sounds from the operation of a toy airplane as a possible natural, built-in reinforcer. Experiment 2 investigated the potential of that procedure for teaching AAIM discriminations.

EXPERIMENT 2:

EXAMINATION OF A NOVEL PROCEDURE TO TEACH AAIM DISCRIMINATIONS

Method

Participants and Setting

P1, an adult with DD who had participated in Experiment 1, also participated in Experiment 2. Sessions were conducted with P1 in a quiet assessment room at St.Amant. P4 and P5, both of the children with autism who participated in Experiment 1, also participated in Experiment 2. All three participants failed the

AAIM PT at the end of Experiment 1, and none of them were able to learn an AAIM task during the pilot studies. For Experiment 2, I also attempted to recruit P3 (who also participated in Experiment 1), but was unable to do so. Because of physical impairments, P2 was unable to manipulate the apparatus (described later) and so she was not included in Experiment 2.

Sessions with P4 and P5 were conducted in their homes. P4 and P5 were enrolled in classrooms, and none of their educational programs included tasks taught in this study. During all sessions, participants were seated at a table across from the tester. If an assistant was present he/she was seated near the participant and was oriented in such a way so as to be able to see both tester and participant responses without being able to see what the tester recorded.

Materials

A small recording device was used to record and produce sounds. The recording device used for this study was called "Build-A-Sound." This device was approximately 2.5 cm in diameter and allowed the user to record any sound. A recording could be played back as many times as needed by pressing a button located in the center of the device.

After the appropriate sounds were recorded, the recording devices were covered in cotton stuffing and sewn within a black or white fleece sack. This was done to help protect the devices from rough use, reduce the likelihood that the sound would be recorded over, and help color code the containers of the sounds for use within the study. A fleece sack with a recording device in it will be referred to as a sound sack.

The sounds used during the first training task were a tugboat whistle and a telephone ring. The sounds used during the second training task were "Pen-pen" spoken rapidly at a high pitch and "Block" spoken slowly at a low pitch (the words from the AAIM PT). During the Visual Matching Phase (described later) two black sound sacks carried devices with tugboat whistle recordings and one white sound sack carried a device with a telephone ringer recording (see Figure 6). Another two white sound sacks carried devices with telephone ringer recordings and another black sound sack carried a device with a tugboat whistle recording (see Figure 6). During the Auditory Matching Phase, all the sound recording devices were put into sound sacks of the same color (see Figure 7).

A small "Wiggles" airplane was used as a receptacle for the sound sacks (see Figures 6 and 7). The airplane had two indentations on its dorsal side, each of which was large enough to hold one sound sack. The plane had a spinning propeller, a pull cord, and three wheels. If the cord was pulled and released, then the plane would vibrate and the propeller would spin.

Research Design

A single-subject AB design with replication within and across three participants was used.

Procedure

Phase 1, Baseline of Airplane Task with Sounds

The Baseline Phase was conducted with the apparatus shown in Figure 7. On test trials in the initial assessment of the Airplane Task with sounds, the participant was presented with a sample sound sack and given the instruction, "Make it sound."

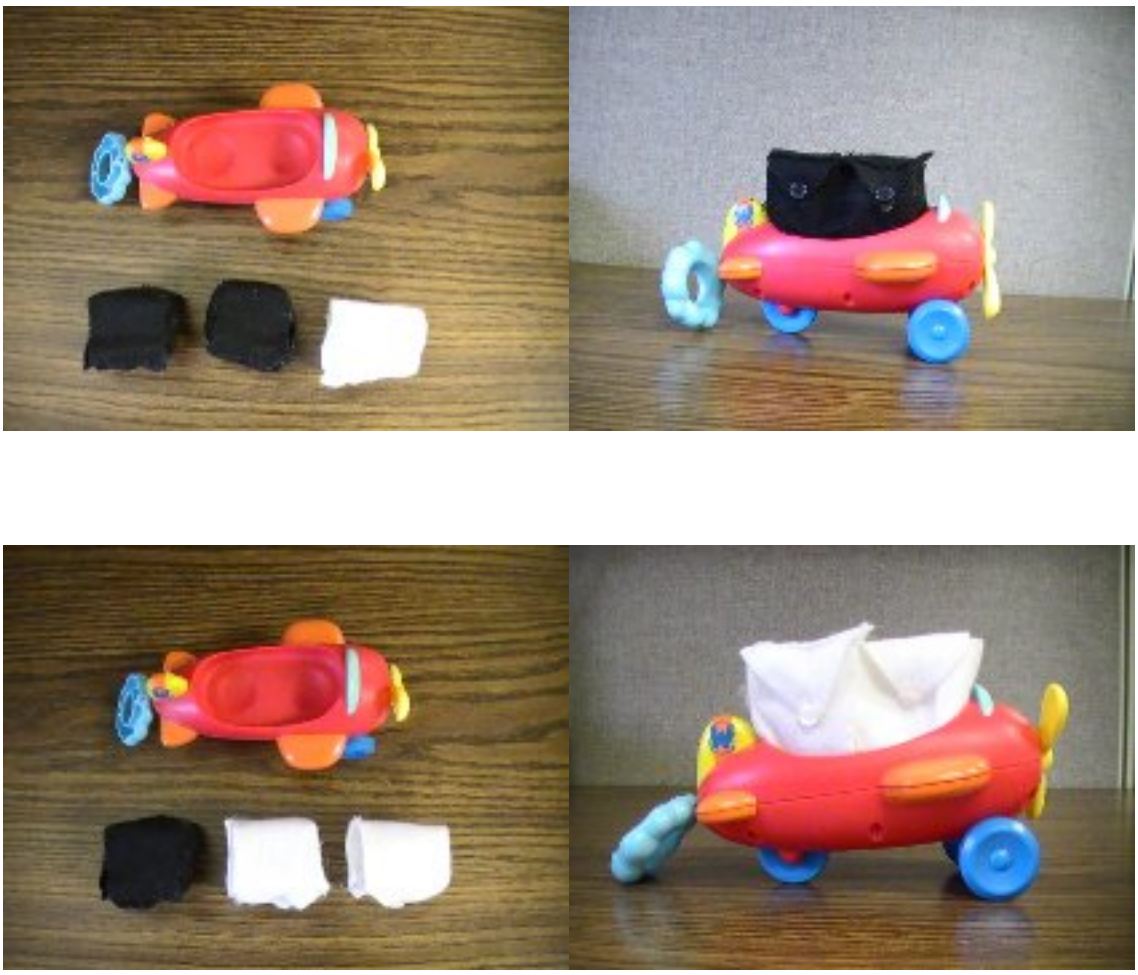


Figure 6. Experiment 2 materials for visual matching.

Figure 7. Experiment 2 materials for auditory matching.

After the participant activated the sound sack (either the tugboat whistle or the telephone ring would play) by squeezing it, then the airplane was presented and the participant was instructed to place the sound sack into the airplane (the tester tapped the airplane and physically guided the participant to place it into the airplane if needed). Two comparison sound sacks were then presented to the participant. The sound played out of one of the comparison sound sacks would match the sound played out of the sample sound sack, and the sound played out of the other comparison sound sack would not match the sound played out of the sample sound sack. The left-right positions of the correct comparison sound sack was randomly alternated across trials. The participant was then instructed to, "Find the same."

The participant was required to pick up one of the comparison sound sacks, activate it and then either place it into the airplane (if the sound matched the sample) or put it down (if the sound didn't match the sample). He/she could activate a comparison sound sack as many times as he/she wanted, however he/she had to activate it before he/she was allowed to place it into the airplane. Once the participant activated a comparison sound sack, the tester would activate the sample sound sack. A correct response was defined as the participant placing the comparison sound sack that matched the sample sound sack into the airplane after activating it. After activating a comparison sound sack, if it was the correct sound sack and if the participant put the correct sound sack into the airplane, then he/she was allowed to pull its pull cord (which made it vibrate and spin it's propeller). He/she was also given an edible and praise.

After activating the incorrect comparison sound sack, if the participant attempted to put it into the airplane the receptacle was covered (the response was interrupted) and the tester removed the airplane and all the sound sacks while saying, “That’s not the same.” The tester did not speak to or look at the participant for 8-10 seconds following this verbal statement.

If the participant attempted to place both of the comparison sound sacks into the airplane simultaneously the tester removed the airplane and all the sound sacks. The airplane (with the sample inside it) and both of the comparison sound sacks (outside of the airplane) were then returned and the participant was instructed to, “Pick one.” If the participant attempted to place both comparison sound sacks into the airplane again, all the materials were removed and the trial was not scored.

At the beginning of the baseline assessment, the ABLA procedures of a demonstration trial, a guidance trial, and an opportunity-for-an-independent-response trial were conducted for each sound being trained.

Test trials in the Baseline Phase continued until a participant met a pass criterion of eight consecutive correct responses, or a failure criterion of eight cumulative errors.

Phase 2, Teaching Airplane Task with Sounds

Visual matching. The teaching of the Airplane Task with sounds began with a visual matching phase using the apparatus shown in Figure 6. On some trials, the sample phone ring was presented in a white sound sack, the matching phone ring was in another white sound sack, and the non-matching tugboat whistle was in a black sound sack. On other trials, a sample tugboat whistle was presented in a black

sound sack, the matching tugboat whistle was presented in another black sound sack and the non-matching phone ring was presented in a white sound sack. The participant could respond by matching either based on the colour of the sound sacks or the sounds they made. The procedure for this phase was the same as the Baseline procedure in Phase 1, except that the apparatus was different. This phase was included in order to help the participants understand what to do with the materials.

Training in the visual matching phase continued until the participant met a pass criterion of eight consecutive correct responses.

Auditory matching. This part of training began after a participant met the mastery criterion for visual matching. During auditory matching training, the apparatus in Figure 7 was used, and a participant was taught to match two tugboat whistle sounds, and two phone ringer sounds, with all sounds coming from identical black sound sacks.

The procedures used to teach auditory matching were the same as those described for the Baseline Phase. The mastery criterion for auditory matching was set at eight correct responses out of ten trials.

Phase 3, Post-Phase 2 Assessments

Following mastery of Phase 2 the participants were assessed on the AAIM PT and using the procedure for the AAIM PT that was previously described on page 19. They were also tested on a modified AAIM PT called AAIM PT with sound sacks. In this assessment the words were presented with sound sacks, rather than being spoken by the tester and assistants. That is, the words “Pen-pen” and “Block” were each recorded in separate sound sacks. The procedure for testing the AAIM PT with

sound sacks was the same as AAIM PT except that, instead of saying, “Pen-pen,” or saying, “Block,” the tester and the assistants produced the sample and comparison words by squeezing the corresponding sound sacks, all of which were black in color.

Phase 4, Teaching Airplane Task with PT Words

The participants were taught the airplane task using the same procedures as those described in Phase 2, under the subheading “Auditory matching,” except that instead of the sound sacks emitting the tugboat whistle and the phone ring when squeezed, they emitted the spoken word “Pen-pen” (said at a high pitch rapidly) and “Block” (said at a low pitch slowly).

Phase 5, Post-Phase 4 Assessments

Following mastery of Phase 4 the participants were assessed on the AAIM PT and the AAIM PT with sound sacks as described for Phase 3. They were also given an Auditory Matching Generalization Assessment.

The procedure used for the Auditory Matching Generalization Assessment was the same as that described for Phase 1, Baseline of Airplane Task with Sounds, with one exception, the sound sacks emitted the words “Cat-cat” said quickly and in a high pitched tone of voice and “Dog” said slowly and in a low pitched tone of voice, instead of the tugboat whistle and telephone ring sounds.

Phase 6, Repeat of Phase 4 with a more Stringent Mastery Criterion

As will be described in the Results section, the participants failed the Post-Training assessments conducted in Phase 5. In Phase 4, Teaching Airplane Task with PT words, the mastery criterion was set at eight correct responses out of ten trials. On the possibility that this criterion might have been met by chance, Phase 6 was a

repeat of Phase 4 but with a more stringent mastery criterion. Specifically, in Phase 6, the participants were re-taught the task from Phase 4 until they correctly responded for at least 80% of the trials within a session for two consecutive sessions, with each session consisting of 20 trials.

Phase 7, Post-Phase 6 Assessments

In this phase I repeated the three assessments that had been previously conducted in Phase 5, which included the AAIM PT, the AAIM PT with sound sacks, and the Auditory Matching Generalization Assessment. The assessment procedures were the same as in Phase 5.

Inter-Observer Reliability and Procedural Integrity

IOR data was collected for 70% of the sessions and PI data was collected for 66% of the sessions. Both IOR and PI scores were completed as described for Experiment 1. The average IOR score across all participants was 99%. The scores were all 100% except for 1 instance of 89%. All PI scores across all participants were 100%. See Appendix F for the PI datasheet.

Results

Experiment 2 was initially conducted with P4, then with P5, and then with P1. The results will be described for the participants in the order in which they were exposed to the contingencies.

Participant 4

Phase 1, Baseline of Airplane Task with Sounds. P4 failed the assessment of the Airplane Task with Sounds in 22 trials.

Phase 2, Teaching Airplane Task with Sounds. P4 mastered the visual matching part of training in 91 trials. P4 met the mastery criterion (eight correct responses in ten trials) for the auditory matching part of training in 18 trials within the first session, and 72% of his responses were correct in this session. Responding at the beginning of the session (the first 10 trials) was close to chance levels of accuracy. The last eight trials had no errors (see Figure 8).

Phase 3, Post-Phase 2 Assessments. P4 failed both the AAIM PT and the AAIM PT with sound sacks. He responded correctly on 47% of the trials for AAIM PT and 56% of the trials for AAIM PT with sound sacks (see Figure 9).

Phase 4, Teaching Airplane Task with PT Words. P4 mastered the Airplane Task with PT words in 97 trials over four sessions. For the first 15 trials P4 performed at chance levels, for the next 20 trials there was an increased angle in the cumulative correct responses graph. This denoted that performance improved. Between trials 35 and 80 he responded at chance levels again. However, from trial 80 until mastery, the accuracy of his responses improved (see Figure 8).

Phase 5, Post-Phase 4 Assessments. P4 failed the AAIM PT in this phase. He responded correctly 50% of the time for the AAIM PT (see Figure 9). Accuracy on this assessment increased slightly in Phase 5 as compared to Phase 3 (47%). P4 failed the AAIM PT with sound sacks in Phase 5. He responded correctly for 40% of the trials. Accuracy on this assessment decreased from Phase 3 (56%) to Phase 5 (see Figure 9). P4 failed the Auditory Matching Generalization Assessment. He responded correctly for 60% of the trials (see Figure 9).

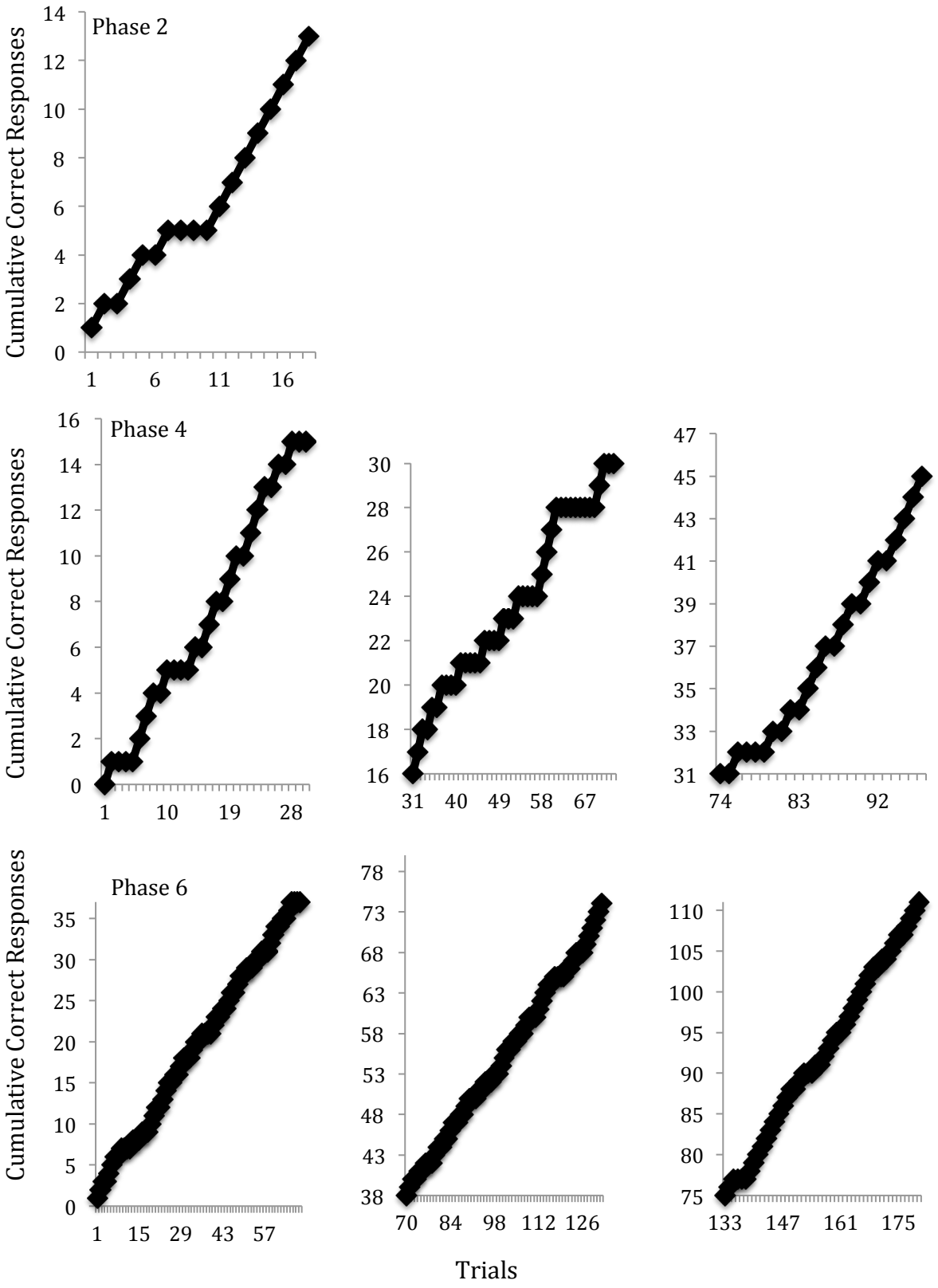


Figure 8. Cumulative correct responses during training for P4 in Phases 2, 4, and 6.

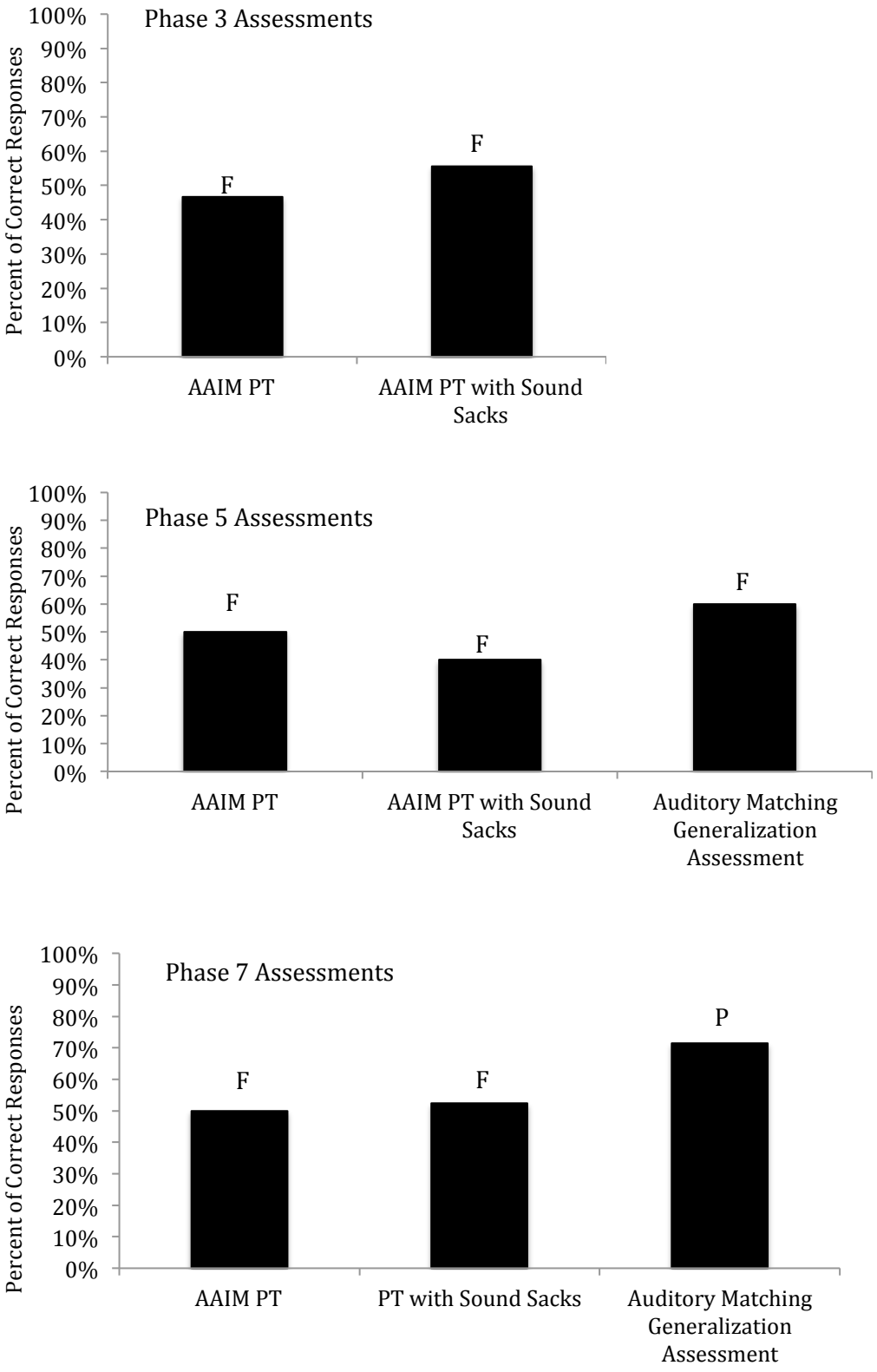


Figure 9. Percent correct responses for assessments for P4 in Phases 3, 5, and 7.

Phase 6, Repeat of Phase 4 with a Stronger Mastery Criterion. P4 re-mastered the Airplane Task with PT words in nine sessions (180 trials). He responded at chance levels of accuracy for the first 100 trials. At this point it was noted that P4 had chosen the sound sack on the right only ten times, and had a strong tendency to choose the left sound sack over the right. A priming task was added at the beginning of each subsequent session in order to increase his tendency to choose the sound sack on the right as well as the sound sacks on the left.

In the priming task, P4 was presented with two of the sound sacks, one that played "Pen-pen" and one that played "Block." The sound sacks were presented in random left-right positions. I instructed P4 to, "Give it to me," and I held my hand out. P4 was reinforced (praise and an edible were provided) if he selected the sound sack on the right, activated it, and then handed it to me, no matter what sound it made. If P4 activated and handed me the left sound sack, I said, "No," and remove both sound sacks. I then re-present both sound sacks, re-present the instruction and prompt him to hand me the sound sack on the right by touching it with my free hand. I then provide him with praise and an edible. The priming task was done before sessions 6 to 9 (from trials 100-180) and it was done until P4 responded correctly and independently for three consecutive trials at the beginning of each session. Following the introduction of this priming task P4's choosing of the sound sack on the right increased until it equaled that of choosing the sound sack on the left. Mastery was achieved within four sessions (80 trials) after introducing the priming procedure. This can be seen in the increased angle of the cumulative correct graph (see Figure 8). He reached mastery criterion by the 180th trial.

Phase 7, Post-Phase 6 Assessments. P4 failed the AAIM PT. His scores on the AAIM PT remained at 50% accuracy. P4 failed the AAIM PT with sound sacks. His accuracy in this assessment was 50%, compared to 40% in Phase 5. P4 passed the Auditory Matching Generalization Assessment and had a sessional accuracy of 71%. This was an 11% improvement from his score in Phase 5 (see Figure 9).

Participant 5

Phase 1, Baseline of Airplane Task with Sounds. P5 failed the Airplane Task with Sounds in 11 trials.

Phase 2, Teaching Airplane Task with Sounds. P5 mastered the visual matching part of training in 91 trials. P5 mastered the auditory matching part of training in 169 trials. Although mastery was achieved, his responding remained at chance levels until the very last 20 trials. In the last 20 trials an increase in the angle of incline can be seen in the cumulative correct responses graph (see Figure 10).

Phase 3, Post-Phase 2 Assessments. P5 failed both the AAIM PT and the AAIM PT with sound sacks. He performed with 60% accuracy on each of these assessments (see Figure 11).

Phase 4, Teaching Airplane Task with PT Words. P5 mastered (eight correct responses out of ten trials) the Airplane Task with PT words in 80 trials (four sessions). Responding remained at approximately chance levels until the last 10 trials (see Figure 10).

Phase 5, Post-Phase 4 Assessments. P5 failed the AAIM PT (see Figure 11). He responded with 60% accuracy. This score did not differ from his accuracy on this assessment in Phase 3. P5 failed the AAIM PT with sound sacks. He responded with

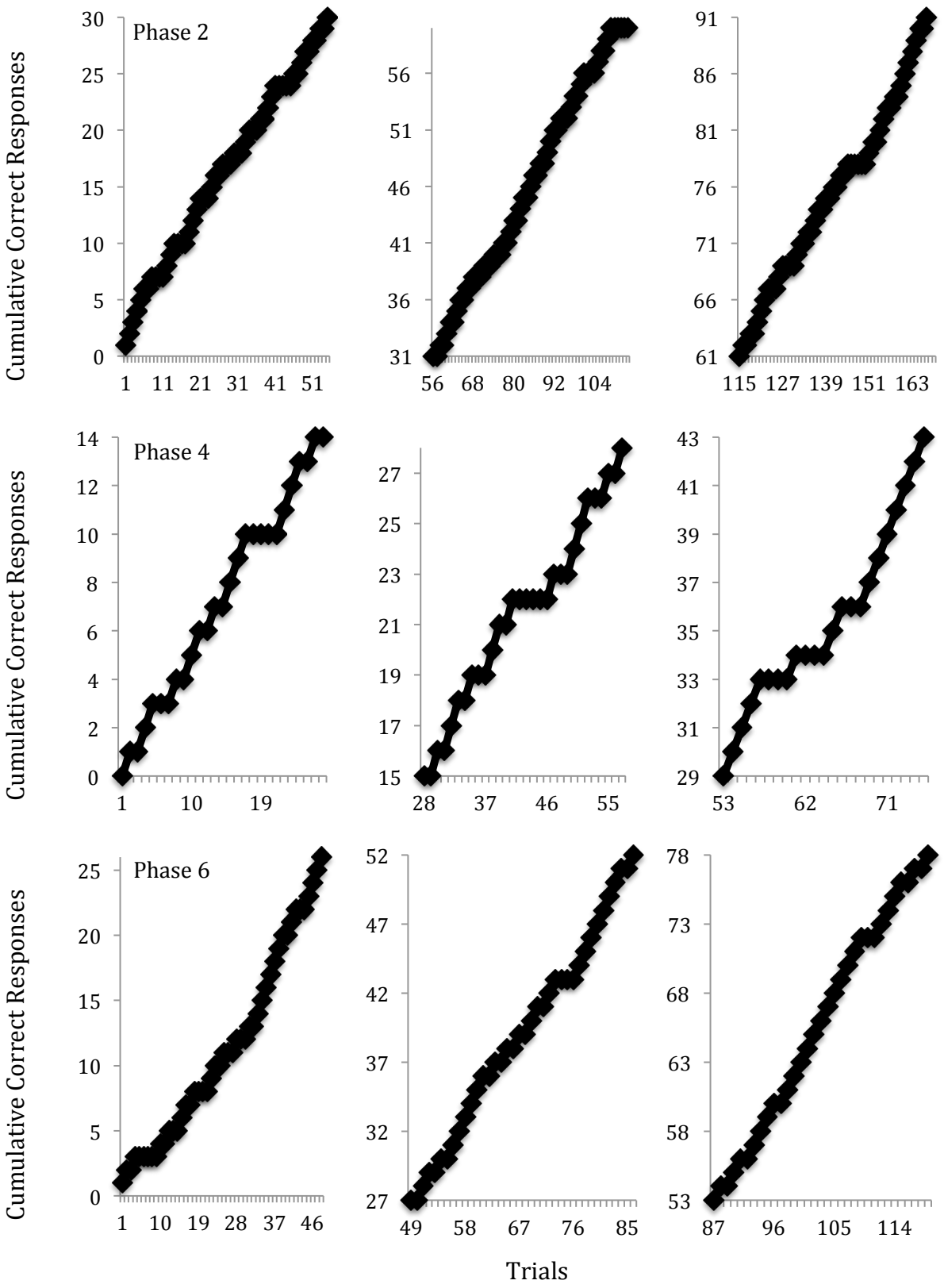


Figure 10. Cumulative correct responses during training for P5 in Phases 2, 4, and 6.

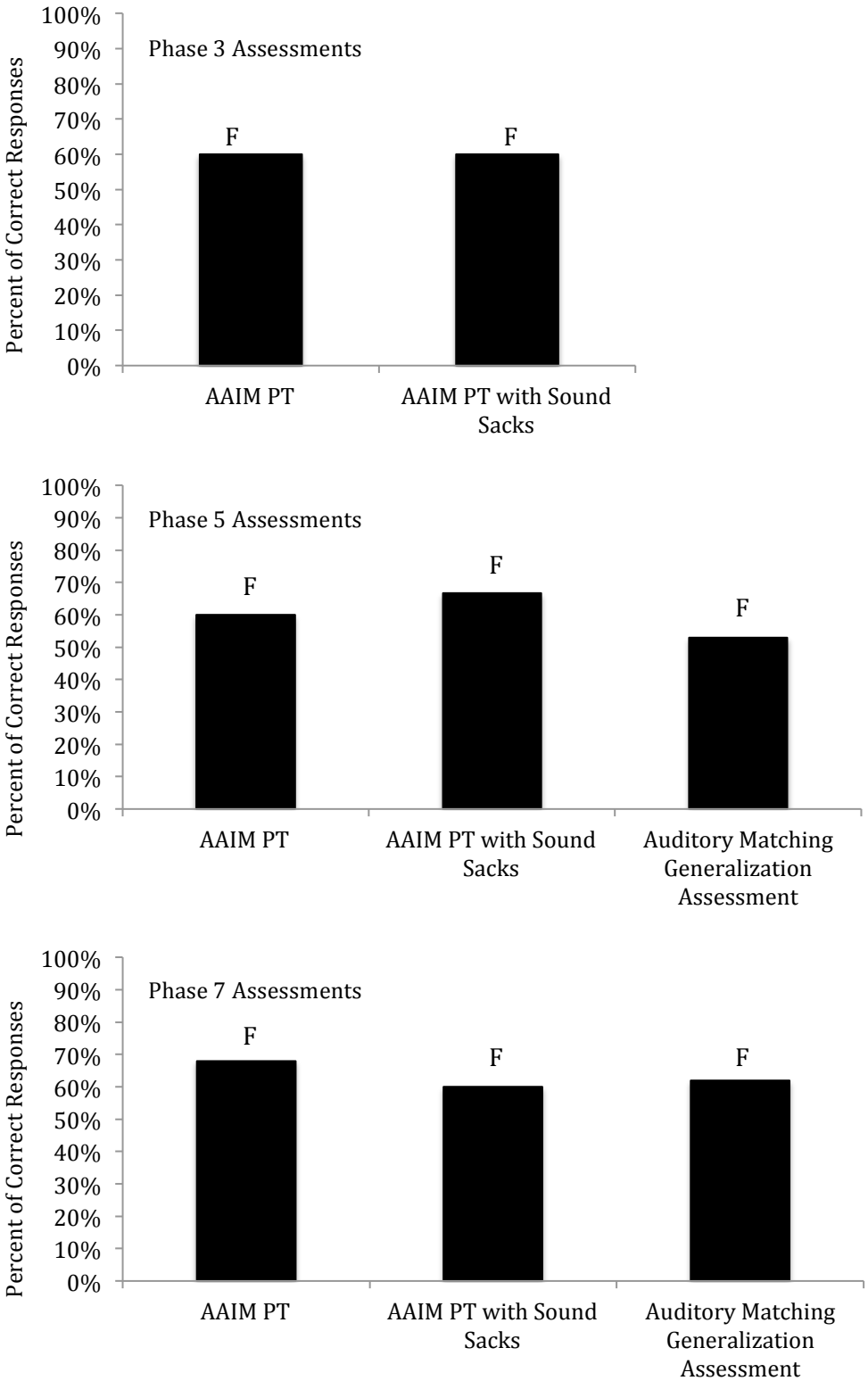


Figure 11. Percent correct responses for assessments for P5 in Phases 3, 5, and 7.

67% accuracy in this assessment. This was a 7% increase from the assessment done in Phase 3. P5 failed the Auditory Matching Generalization Assessment. He responded correctly on 53% of the trials.

Phase 6, Repeat of Phase 4 with a Stronger Mastery Criterion. P5 re-mastered the Airplane Task with PT words in six sessions (120 trials, see Figure 10). He responded at chance levels for the first 30 trials. After that P5's responding was above 50%. For the last 30 trials his responding increased in accuracy as can be seen in the increasing angle of the cumulative correct responses graph (see Figure 10).

Phase 7, Post-Phase 6 Assessments. P5 failed the AAIM PT. His accuracy on the AAIM PT increased from 60% in Phase 5 to 68% in Phase 7. P5 failed the AAIM PT with sound sacks. His accuracy on the AAIM PT with sound sacks decreased from 67% in Phase 5 to 60% in Phase 7. P5 failed the Auditory Matching Generalization Assessment. His accuracy in this assessment increased from 53% in Phase 5 to 62% in Phase 7.

Participant 1

Phase 1, Baseline of Airplane Task with Sounds. P1 failed the Airplane Task with sounds assessment in 23 trials.

Due to the large gap of time between Experiment 1 and Experiment 2 for P1, and due to the fact the P1 was the last participant to be trained in Experiment 2, some additional assessments were included in this phase. P1 was assessed on the AAIM PT, AAIM PT procedure with the Phase 2 training sounds (tugboat whistle and telephone ring) being emitted from sound sacks when the tester or assistants activated them, and the Auditory Matching Generalization Assessment. She failed

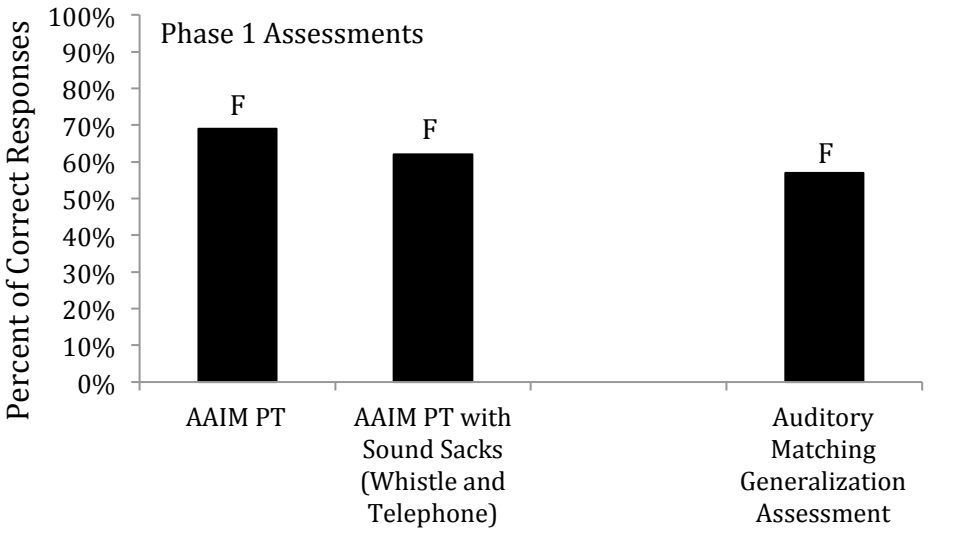
each of these assessments. She responded with 69% accuracy on the AAIM PT, 62% accuracy on the AAIM PT procedure with sound sacks and the training sounds, and 57% accuracy on the Auditory Matching Generalization Assessment (see Figure 12).

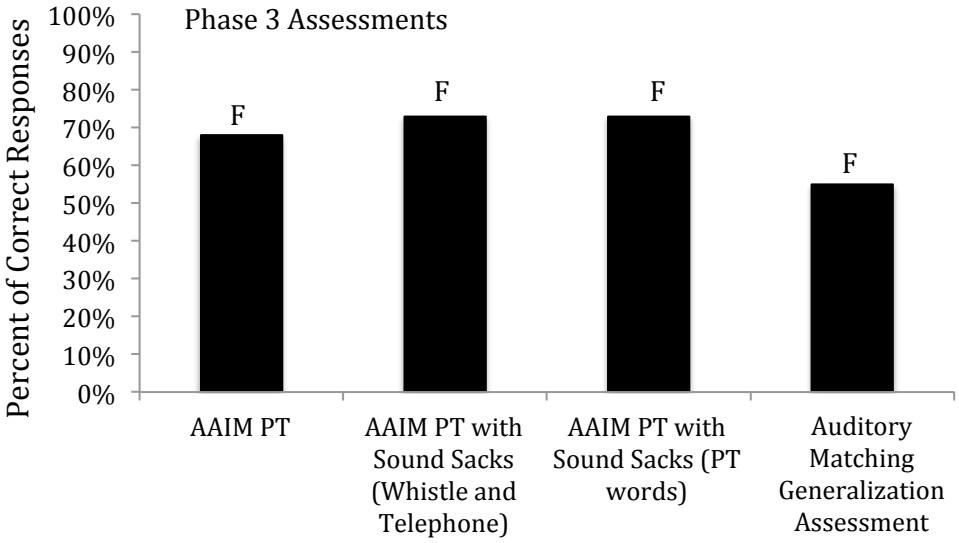
Phase 2, Teaching Airplane Task with Sounds. P1 mastered the visual matching part of training in 20 trials. In order to increase the likelihood that P1 did not pass the auditory matching part of training by chance, the stronger mastery criterion (80% correct responses per session across two consecutive sessions) that was applied to Phase 6 for P4 and P5 was applied to Phase 2 for P1.

P1 mastered the auditory matching part of training in 180 trials. P1 responded with high levels of accuracy for the first 40 trials of this training task. This can be seen in the steep incline shown in the cumulative correct responses graph (see Figure 13). She responded at chance levels from trial 40 to 140. Between the 140th and 180th trial, P1 responded with more accuracy (steeper incline in the cumulative correct responses graph, see Figure 13).

Phase 3, Post-Phase 2 Assessments. P1 failed the AAIM PT. She responded with 68% accuracy on this assessment, which was a 1% decrease from Phase 1. P1 failed the AAIM PT procedure with the whistle and telephone sounds. She responded with 73% accuracy on this assessment, which was an 11% increase from Phase 1. P1 failed the AAIM PT with sound sacks. She responded with 73% accuracy on this assessment (see Figure 12). On the Auditory Matching Generalization Assessment, P1 responded with 55% accuracy, but failed the assessment (see Figure 12).

Phase 4, Teaching Airplane Task with PT Words. P1 passed this task in 21 trials, using the stronger mastery criterion (80% correct responses per session across two





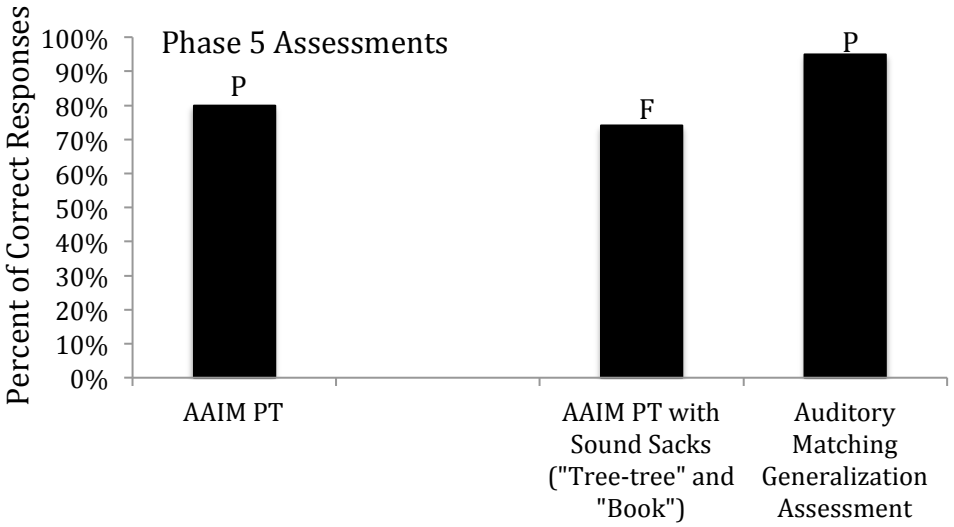


Figure 12. Percent of correct responses for assessments for P1 in Phases 1, 3, and 5.

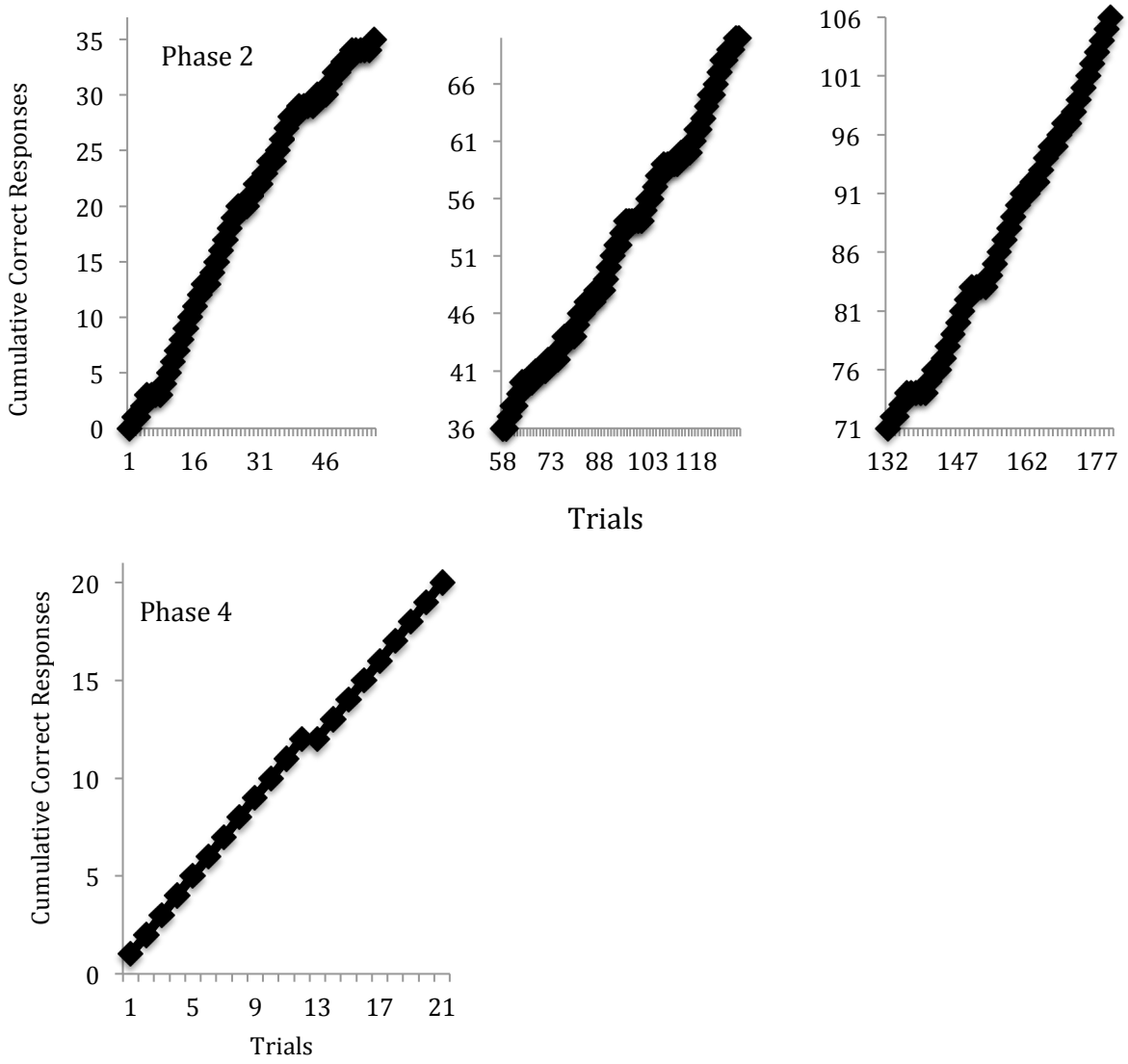


Figure 13. Cumulative correct responses per trial for training for P1 in Phases 2 and 4.

consecutive sessions) and responded with 95% accuracy (see Figure 13).

Phase 5, Post-Phase 4 Assessments. P1 passed the AAIM PT assessment, and responded with 80% accuracy on it. P1 also passed the Auditory Matching Generalization Assessment (she responded with 95% accuracy). Because P1 passed the AAIM PT assessment, I also tested her on the AAIM PT procedure but with the words "Tree-tree" and "Book." She failed the AAIM PT with "Tree-tree" and "Book" (she responded with 74% accuracy, see Figure 12).

Discussion

On test trials in the AAIM PT procedure, a tester says a word, one of the two assistants says the same word and the other assistant says a different word, and a participant must learn to point to the assistant who says the matching word. Prior to Experiment 2, the three participants had failed the AAIM PT at the end of Experiment 1, and none of the participants were able to learn an AAIM task during three pilot studies. In Experiment 2 I taught the three participants to perform an AAIM task in which the participants were actively involved in producing a sample sound and matching and non-matching sounds by squeezing sound sacks. The sounds of a tugboat whistle and a telephone ring were used instead of words. A participant could place the sample sound sack and the matching comparison sound sack into a toy airplane, pull a string to make the airplane vibrate and the propeller turn, and receive an edible reinforcer. After an initial phase was mastered in which the two sound sacks that made the same sound were also the same color (the non-matching comparison sound sack was a different color) so that the correct response could be made based on visual matching, participants were taught to accurately use the

apparatus to demonstrate auditory matching. P4, P5, and P1 met mastery criterion for auditory matching with the apparatus in 18 trials, 169 trials, and 180 trials respectively. However, none of them were able to then pass the AAIM PT. Participants were then taught to perform the Airplane Task but with the sound sacks producing the words "Pen-pen" and "Block" (the words used in the AAIM PT). P4, P5, and P1 learned this auditory matching task in 97 trials, 80 trials, and 21 trials respectively. After doing so P1 passed the AAIM PT, but P4 and P5 failed the AAIM PT. P1 also passed the Auditory Matching Generalization Assessment that used the airplane apparatus but with different words ("Cat-cat" and "Dog"). P4 and P5 were then re-taught the Airplane Task with the sound sacks producing the words (as described above) but with a more stringent mastery criterion, and they re-learned the task in 180 trials and 120 trials respectively. At that point P4 and P5 were still unable to pass the AAIM PT. However, P4 was able to pass the Auditory Matching Generalization Assessment. P5 was unable to do so. In summary, with the new apparatus, P4, P5, and P1 learned two AAIM training tasks, and two of the participants were able to pass a generalization assessment (the Airplane task with different words for P4 and P1 and the AAIM PT for P1).

I previously described the research design for Experiment 2 as a single-subject AB design with replication within and across the three participants. I used that descriptor because each participant was exposed to a Baseline of the Airplane Task with the tugboat and telephone sounds (the A phase), then a training phase for that task (the B phase), and then a training phase with the Airplane task but with the sound sacks producing the words "Pen-pen" and "Block" instead of the two previous

sounds (a replication of the B phase). Although this design is weak on internal validity, the internal validity of Experiment 2 needs to be considered in light of previous attempts to teach AAIM tasks to participants with DD or children with autism who failed the AAIM PT. Specifically: a) Sewell (2005) was unsuccessful in teaching an AAIM discrimination to 7 of 9 participants with DD; b) in Experiment 1, I was unable to teach an AAIM discrimination to 2 of 3 participants with DD and 2 of 2 participants with autism; and c) in three pilot studies, I was unsuccessful in teaching an AAIM discrimination to two persons with DD and two children with autism. Given this background, the fact that I was able to teach two AAIM discriminations to each of the three participants in Experiment 2 suggests that the novel procedure with the airplane apparatus was responsible for each participant's mastery of the AAIM discriminations. Nevertheless, future research should examine the training procedure in a research design with stronger internal validity, such as a multiple-baseline design across participants.

Another limitation of Experiment 2 is that it included only three participants. In order to clearly establish the external validity of the training procedure in Experiment 2, it should be replicated with additional participants with DD and additional children with autism.

An additional finding of Experiment 2 is that P4 and P5 mastered two auditory matching tasks, but were still unable to pass the AAIM PT. This finding will be discussed further in the General Discussion.

GENERAL DISCUSSION

In Experiment 1 I attempted to teach an AAIM training task in which the tester

said a word, a matching word was presented through one computer speaker, and a non-matching word was presented through another computer speaker, and the participant was required to point to the speaker that sounded the matching word. A single-subject alternating-treatments design was used to compare two conditions, both of which used standard prompting and reinforcement procedures. In one condition (referred to previously as SPRV) the matching word was presented through a speaker at full volume and the non-matching word was presented through another speaker at zero volume, and across trials the volume of the non-matching word was gradually faded in. In the other condition (referred to previously as SPRP) the matching and non-matching words were presented through speakers at full volume, the tester pointed to the speaker that presented the matching word, and across trials the pointing prompt was gradually faded out. P1, an adult with DD, mastered two AAIM training tasks with SPRV, but was unable to pass the AAIM PT. The other four participants (two adults with DD and two children with autism) were unable to learn an AAIM training task with either procedure.

I then conducted three pilot studies in which computerized presentation of comparison sounds in AAIM training tasks were replaced with live presentation of comparison sounds by two research assistants. Across the three pilot studies, I examined several variations of training procedures with P2, P3, and P4 from Experiment 1, and an additional participant with DD who did not participate in Experiment 1. None of the procedures in the pilot studies were effective.

In Experiment 2 I examined a procedure for teaching AAIM in which the participant was actively involved in producing the sample sound and the matching

and non-matching sounds (by squeezing sound sacks), and which involved the placement of the two sound sacks that produced the matching sounds into a toy airplane, the operation of which I assumed was a possible natural reinforcer. As previously stated, 3 of 3 participants from Experiment 1 (P1, P4, and P5) each mastered two AAIM training tasks with this procedure, and P1 subsequently passed the AAIM PT. The fact that P4 and P5 did not pass the AAIM PT after mastering two AAIM tasks in Experiment 2 raises several possibilities. First, P4 and P5 were children with autism and P1 was an adult with DD. The difference in diagnosis and the difference in age may both have been contributing factors. Second, P1 mastered two AAIM training tasks in Experiment 1 and two more AAIM training tasks in Experiment 2 before passing the AAIM PT. P4 and P5 passed only the two AAIM training tasks in Experiment 2. Perhaps if P4 and P5 had been trained on additional exemplars of AAIM tasks, then they would have passed the AAIM PT. A third possibility is to consider the differences in the procedural aspects of AAIM PT as compared to the Airplane Training Task in Experiment 2. Future research might examine ways of slowly adjusting the Airplane Training Task until it more closely resembles the characteristics of the AAIM PT, as a strategy for producing generalization of AAIM from the airplane task to the AAIM PT.

Another consideration is that the AAIM PT may not be the best prototype for assessing the ability of persons with DD and children with autism to readily learn an AAIM discrimination. That is, persons with DD and children with autism likely don't often sit opposite a tester and two assistants, are not often required to listen to them sequentially, and are not often required to somehow recognize an auditory match

versus a non-match based on what was said. Nevertheless, as stated in the Introduction, pass/fail performance on the AAIM PT has good test-re-test reliability, is correlated with measures of three verbal operants among individuals with DD (Marion et al., 2003), and has good predictive validity for everyday VVNM tasks (Harabiuk et al., 1999; Vause et al., 2003). If a new AAIM PT is to be developed, considerable research would be necessary to demonstrate its reliability and predictive validity.

In summary, the research of Sewell (2005) and the results of Experiment 1 and the three pilot studies demonstrate that AAIM discriminations are extremely difficult to teach to persons with DD and children with autism who fail the AAIM PT. However, the results of Experiment 2 suggest that a training procedure in which a participant is actively involved in producing a sample sound and matching and non-matching sounds, that involve everyday sounds (e.g., a tugboat whistle and telephone ring), and which incorporates natural, built-in reinforcers (e.g., the operation of a toy airplane) into the training procedure, has considerable potential for teaching AAIM discriminations to persons with DD and children with autism.

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Appendix A

Pilot Study 1

In the first comparison of SPRP and SPRV for P1, the training words for SPRP were "Truck-truck" and "Barn", and the training words for SPRV were "Horn-horn" and "Slide." This was the first task taught to any participant and as originally proposed I used four large fading steps (instead of 14 smaller steps) for SPRP and SPRV. On SPRP P1's responding fluctuated the first time that she reached the fourth fading step (see Figure 14). After having to re-master Step 3 the participant reached the regression criteria on Step 4 for the second time. At this point I decided to introduce Step 3.5. This pointing step required the tester to point mid-way between the area indicated for Step 3 and Step 4. After having mastered Step 3.5 in SPRP in eight trials, the participant mastered Step 4 in 18 trials. P1 achieved the mastery criteria of eight consecutive correct responses on the final step in SPRP in 101 trials (see Figure 14).

On SPRV P1 reached Step 3 on the 27th trial. However she then met the regression criterion for Step 3. She soon regressed to Step 1 and had to re-master this step. She met the regression criterion for Step 2 once more. At this point I introduced Step 1.5. In this step the volume setting of the incorrect sound was set half way between Step 1 and 2. P1 met the regression criteria for this step two times before the 101st trial. Step 3.5 was never introduced in the SPRV condition because P1 never passed Step 3 (see Figure 14). P1 did not reach the mastery criterion in the SPRV condition when the criterion was achieved in the SPRP condition. In fact, P1 was at Step 1.5 when mastery was achieved for SPRP. Figure 15 shows the

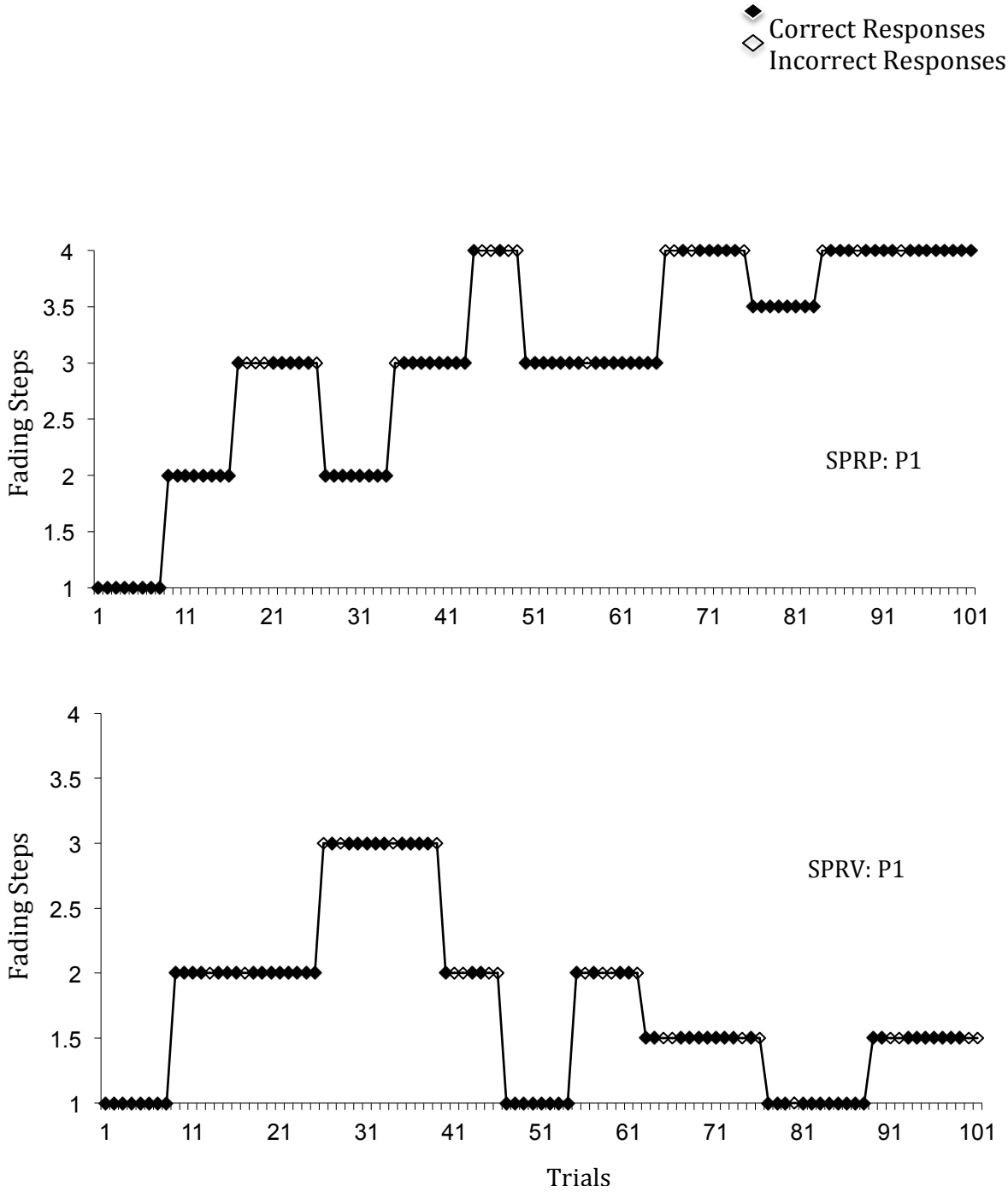

Figure 14. Pilot Study 1, SPRV and SPRP step progression for P1.

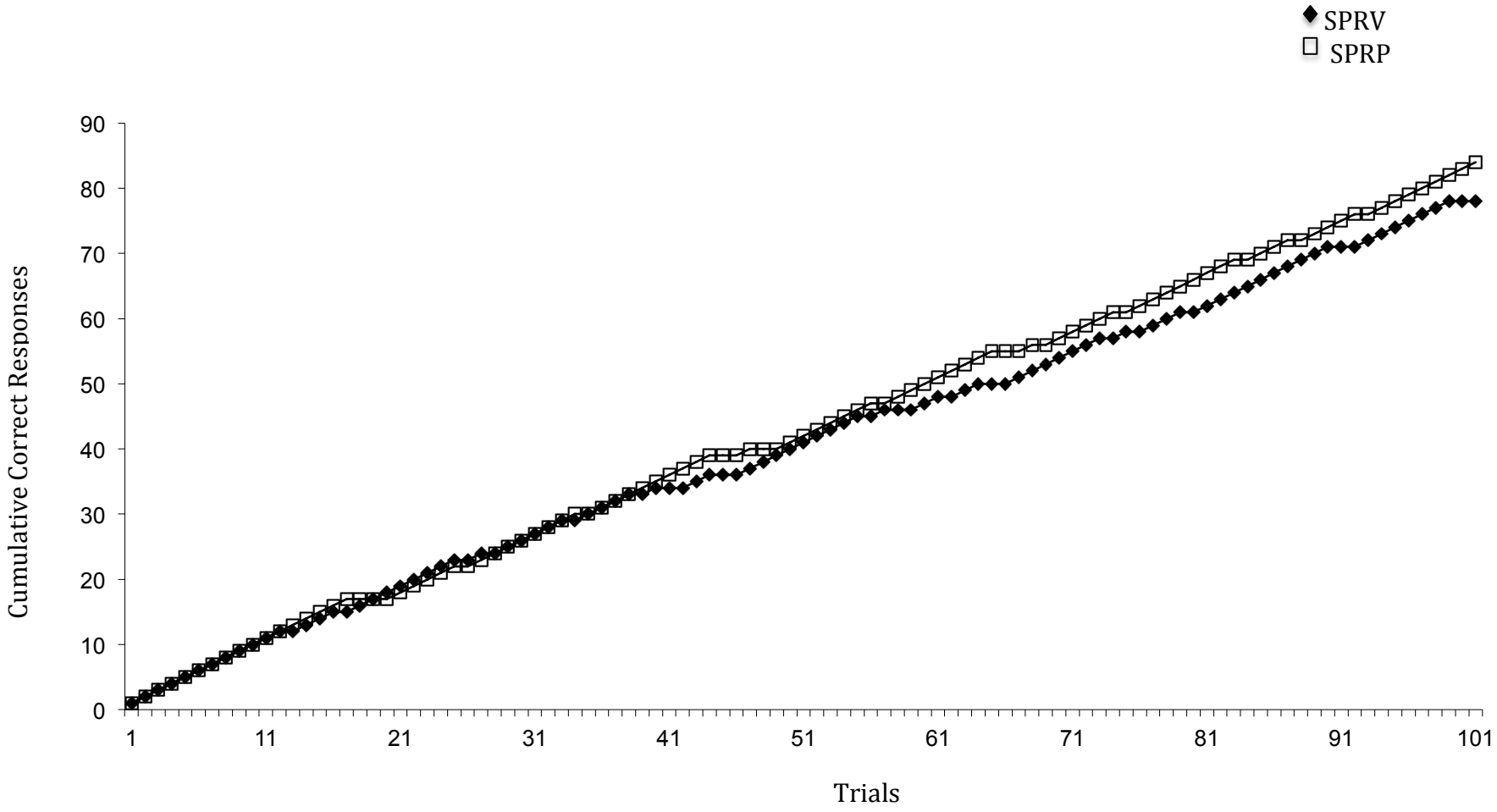

Figure 15. Pilot Study 1, SPRV and SPRP cumulative correct responses across trials for P1.

cumulative number of correct responses for P1 for both SPRV and SPRP for Task 1. Performance on both SPRP and SPRV conditions was very close and greater then 50% accuracy. Clear differentiation in responding was not noted.

Following mastery of the training task in SPRP, a post-training assessment was conducted for AAIM PT, AAIM PTC, AAIM PT with training words, AAIM PT with training words and computer speakers and all assessments were failed (see Table 3).

Table 2
Pre-and Post-training assessment results for P1 for Pilot Study 1

	ABLA Level 6	SPRP PTTWs*	SPRV PTTWs*	SPRP PTTWsC*	SPRV PTTWsC*	PT*	PTC*
Pre-Training	Pass	Fail	Fail	Fail	Fail	Fail	Fail
Post-Training	N/A	Fail	Fail	Fail	Fail	Fail	Fail

*Notes:**PTTWs = AAIM PT with training words
* PTTWsC = AAIM PT with training words and computer speakers
*PT = AAIM PT
*PTC = AAIM PTC

Appendix B

Procedural Integrity Checklist for Experiment 1

Procedural Reliability - Training

Date _____ Tester _____ Participant _____

Task _____ Observer _____ Session: _____

	Demo 1	Demo2	Trial	Trial	Trial	Trial	Trial	Trial	Trial	Trial	Trial	Trial	Trial	Trial	Trial	Trial
New Session:																
Speakers in correct Position																
Table cloth/hat																
Reinforcer Assessment																
Guided Trial																
Praise																

	Trial	Trial	Trial	Trial	Trial	Trial	Trial	Trial	Trial	Trial	Trial	Trial	Trial	Trial	Trial	Trial
Steps of task:																
Correct sample																
Correct Fading																
Consequence Correctly Applied																

	Trial	Trial	Trial	Trial	Trial	Trial	Trial	Trial	Trial	Trial	Trial	Trial	Trial	Trial	Trial	Trial
Steps of task:																
Correct Sample																
Correct Fading Step																
Consequence Correctly Applied																

Correct = +
Incorrect = -
Not applicable = N/A

Appendix C

Pilot Study 2

In Pilot Study 2 I tried to teach the participants an AAIM task by starting with a simple auditory discrimination of same versus different, and then slowly adjusting the task to more closely resemble the AAIM PT procedure. I decided to conduct training in Pilot Study 2 with words presented by myself and two assistants rather than via computer speakers because: (1) four of the five participants did not learn the AAIM training task in Experiment 1 when sounds were presented through computer speakers, (2) participants may not have had much of a history of responding to computer speakers in conjunction with direction from a tester that involved a complex conditional discrimination, (3) P1 did not generalize to the AAIM PT (with words and non-matching words presented by assistants) after passing two training tasks with words presented via computer speakers.

The goal of Pilot Study 2 was to take participants through four training steps, with the hope that a mastery criterion of eight consecutive correct responses would be met at each training step. The seating arrangement for training was similar to the top panel of Figure 1 (see page 20) except that there was just one assistant sitting beside the tester for training Steps 1 and 2, and two assistants (one on either side of the tester) for Steps 3 and 4.

Several procedures common to each of the training steps were used. (1) The tester placed her hand on top of the participant's hands before a trial began, and removed her hand once all the sounds were presented. This was done in order to

prevent the participant from responding before all the sounds were presented. (2) The tester and one assistant in Steps 1 and 2, and two assistants in Steps 3 and 4, each had one hand in front of the participant (about a hands width apart). The participant was to touch the hand belonging to the person who said the same word twice in Steps 1 and 2, and the hand belonging to the assistant who said the same word as the tester in Steps 3 and 4. (3) No word was repeated within a session. (4) ABLA testing procedures were used (i.e., demonstration, guided trial, chance for an independent response at the beginning of each session and after each error, and praise and edible reinforcement for correct responses).

In Step 1, one of the two trainers (either the tester or the assistant) sitting opposite the participant would say a word twice, and the other trainer would say nothing. The participant had to learn to point to the trainer who said the same word twice when the other trainer said nothing. In Step 2, one of the two trainers would say a word twice and the other trainer would say two completely different words (alternating as to who spoke first and who spoke second). The participant had to learn to point to the trainer who said the same word twice as opposed to the trainer who said two completely different words. In Steps 3 and 4 there was now a tester and two assistants. In Step 3 the tester said the sample word, an assistant said the same word as the tester and another assistant said two non-matching words. The participant had to point to the assistant who said the same word as the tester. The tester may have spoken before or after the non-matching word, however the assistant that said the same word as the tester always spoke directly after the tester. In Step 4, the procedure was the AAIM PT procedure.

P2, P3, and P6 were trained in this study. Characteristics of these participants were presented on page 16. P2 spent 55 trials on Step 1 before mastering it. P3 mastered Step 1 in 371 trials, and P6 mastered Step 1 in 167 trials. P6 mastered Step 2 in 88 trials; P3 completed 7 trials on Step 2 before her training was put on hold and the study was terminated. P2 had a difficult time passing Step 2 so four fading steps were introduced. Those fading step included: a) the incorrect words were not spoken but were mouthed, b) the incorrect words were whispered (no tonal variation but a durational variation was noticeable), c) incorrect words were said softly (tonal and durational variation were audible but soft), and d) full volume was used for every word. The mastery criteria across fading steps were: a) 5 in a row correct, b) 6 in a row correct, c) 7 in a row correct, and d) 8 in a row correct. Finally P2 mastered Step 2 in a total of 454 trials.

None of the participants passed Step 3. Steps a to d (listed above) were added to Step 3. P2 mastered up to Step 3c however she could not pass Step 3d even after mastering Step 3c twice. P6 passed up to Step 3c however he could not pass Step 3d even after 169 trials on that step. P3 was not trained on Step 3.

Several adjustments to seating and sound presentation were attempted to test if they had an effect on learning for P2 on Step 3. Different seating configurations (the tester and assistants were seated in different ways around the participant) and changes in sound presentation were tested over several days until improvement in responding was noted. In the new configuration the two assistants sat one on either side of the participant. They spoke at ear level to the participant and sat far enough behind the participant so that they were difficult to see in the

periphery of vision. In the new sound presentation each of the assistants said either one word (normal tone and duration) or two words (completely different from each other and from the other assistant's words in terms of phonics, tone, and the duration each word was spoken). Either word could have been correct. The tester then presented the sample word in the form of a question. "Who said ___?" No change in accuracy was noted as a function of these adjustments.

Appendix D

Pilot Study 3

In Pilot Study 3 I attempted to teach P2 (from Experiment 1) an AAIM task using multiple extra-stimulus prompts. I assumed that the multiple extra-stimulus prompts would increase the probability of correct responding on early training steps, and that, after a history of correct responding on early fading steps, I might be able to successfully fade out the extra-stimulus prompts.

In this study the tester was seated to the left and slightly behind the participant, and two assistants sat across a table from the participant. For the first training step the assistants sat facing the participant and began by sitting close together (arms touching). Following the first training step the assistants were seated approximately 0.6 meters apart.

In addition to the use and fading of multiple visual prompts (described later), the following procedures were used. First, on each trial, the tester would say the sample word, then one assistant would say one comparison word and the other assistant would say the other comparison word. One of the comparison words was the same as the sample word. While an assistant said a comparison word she would lean away from the other assistant and hold that position until the participant responded. The assistants then returned to an erect position before the next trial began. The purpose of this movement was to try to get the participant to attend more closely to the assistant who was speaking.

Second, the participant was guided in the correct response for each of the words taught, at the beginning of each session. During these guided trials the

assistants provided prompts equal to the last step passed during the previous session. The tester always provided a full physical prompt during these trials.

Third, each trial began by the tester directing the participant to attend to the assistants by instructing the participant to, "Watch them," while pointing to each assistant. This was done to increase the probability that the participant was attending to the assistants. The tester then said, "Who says ___?" (either the word "Seek," said at either a normal speed or a low pitch; or the word "Doom," said at either a normal speed or a low pitch). The word spoken by the tester was randomly alternated across trials. Following the sample word spoken by the tester, one of the assistants said either "Seek" or "Doom" and the other assistant said the remaining word. The tester and assistants spoke the sample and comparison words at the pitches and speeds described previously. The "correct" assistant tried to emulate the pitch and speed of the tester. The words spoken by the assistants were randomly alternated across trials and counterbalanced in terms of which assistant spoke first and which assistant said the matching word. The words were phonologically dissimilar in terms of consonants, vowels, and where they are said within the mouth. They also differed in terms of the pitch used when they were spoken. These prompts were not faded out as this type of prompting is also used within the AAIM PT.

Multiple types of visual prompts were used and faded out in an attempt to increase the proportion of correct responding at the beginning of training. The prompts that were used included: the tester physically guided the participant on some steps; the tester pointed to the "correct" assistant on some steps; the

"incorrect" assistant shook her head from side-to-side on some steps; the "incorrect" assistant frowned (eyebrows drawn in and lips tightened) on some steps; the "correct" assistant looked happy (smile and eye brows raised) on some steps; the "correct" assistant nodded her head up-and-down on some steps; the non-matching word would always be spoken in a low tone of voice while the matching word would be spoken at a natural tone; and the "correct" assistant pointed to herself on some steps. The fading steps and mastery criteria for each step can be seen on Table 3.

When the tester provided a prompt, this occurred following the presentation of the final comparison word. When the assistants provided prompts this occurred while they were each speaking their word. The prompt provided by the assistant only occurred while she said the comparison word.

Following an incorrect response the tester and the assistants ignored the participant for approximately 3-5 seconds while they recorded data. Following a correct response the tester provided the participant with an edible reinforcer and social praise. The "correct" assistant also provided the participant with social praise at this time. This assistant smiled, raised her eyebrows, and nodded while doing this. The "incorrect" assistant remained neutral (a neutral facial expression and provide no reinforcement) during this process.

To progress from Steps 1-15 the participant must have correctly responded three times consecutively. To master training the participant must have mastered Step 16. To do this she had to have responded correctly eight times consecutively. To regress from one step to another the participant must have made a total of 3 errors on that step within the session.

Table 3
Pilot Study 3 Fading Steps

Step	Mastery Criteria	T Physical Guidance	T Pointing	A's movement	A_{NM} Head Shakes + Frown (Volume)	A_M Smiles (Volume)	A_M Nods	A_M Points to Self
1	3	Full	Full	Touching + Lean	3 + Frown (Mouth word	Full + eyebrows up (Very loud)	3	Yes
2	3	Partial	Full	0.22 m apart + lean	3 + Frown (Mouth word)	Full + eyebrows up (Very loud)	3	Yes
3	3	Elbow Touch	Full	0.45 m apart no lean	3 + Frown (Mouth word)	Full + eyebrows up (Very loud)	3	Yes
4	3	No	Full	0.45 m apart no lean	3 + Frown (Mouth word)	Full + eyebrows up (Very loud)	3	Yes
5	3	No	Half way	0.45 m apart no lean	3 + Frown (Mouth word)	Full + eyebrows up (Very loud)	3	Yes
6	3	No	Quarter way	0.45 m apart no lean	3 + Frown (Mouth word)	Full + eyebrows up (Very loud)	3	Yes
7	3	No	No	0.45 m apart no lean	3 + no frown (Mouth word)	Full + eyebrows up (Very loud)	3	Yes

Table 3 Continued								
8	3	No	No	0.45 m apart no lean	2 + no frown (Mouth word)	Full + eyebrows up (Very loud)	3	Yes
9	3	No	No	0.45 m apart no lean	1 + no frown (Mouth word)	Full + eyebrows up (Very loud)	3	Yes
10	3	No	No	0.45 m apart no lean	No (Mouth word)	Full + eyebrows up (Very loud)	3	Yes
11	3	No	No	0.45 m apart no lean	No (Mouth word)	Half + eye brows up (Very loud)	3	Yes
12	3	No	No	0.45 m apart no lean	No (Mouth word)	No (Very loud)	3	Yes
13	3	No	No	0.45 m apart no lean	No (Mouth word)	No (Very loud)	2	Yes
14	3	No	No	0.45 m apart no lean	No (Mouth word)	No (Very loud)	1	Yes
15	3	No	No	0.45 m apart no lean	No (Mouth word)	No (Very loud)	No	Yes
16	3	No	No	0.45 m apart no lean	No (Mouth word)	No (Very loud)	No	No
17	3	No	No	0.45 m apart no lean	No (Mouth word)	No (Loud)	No	No
18	3	No	No	0.45 m apart no lean	No (Mouth word)	No (Normal)	No	No

Table 3 Continued								
19	3	No	No	0.45 m apart no lean	No (low volume)	No (Normal)	No	No
20	8	No	No	0.45 m apart no lean	No (Normal volume)	No (Normal)	No	No

Notes: A is the assistant; A_{NM} is the assistant who says the non-matching word, and A_M is the assistant who says the matching word.

As stated previously, I attempted to teach P2 using these procedures. The highest step passed was Step 15. P2 passed up to Step 15 within the first 60 trials and then oscillated between Step 10 and 16 for the next 275 trials. Even after 325 trials this participant did not master this task. Due to the participant's lack of progress and because this oscillating pattern was similar to the patterns seen in Experiment 1, I decided to terminate this study.

Appendix E

Pilot Study 4

In this study I attempted to incorporate behavioral strategies that have been demonstrated to be effective in teaching a variety of skills and discriminations to persons with DD and children with autism. First I tried to use what Martin and Pear (2011) described as a reinforcer-discovery contingency, which previous authors described as a direct reinforcement contingency (Koegel & Williams, 1980; Thomson & Iwata, 2000). Second, I started training with the last component of the AAIM sequence, like an approximation of backward training (Martin & Pear, 2011).

During training sessions, the participant sat on one side of a table and the tester sat next to the participant. The assistants sat next to each other across the table from the participant. The materials used for this study included a clear small glass, a clear small cup with a handle, a tray to place them on, and two identical opaque containers. The cup was placed under one inverted container and the glass was placed under the other inverted container so that the containers hid the cup and glass. The containers were light and also had handles on them to help in lifting them.

The goal of training was to teach an AAIM discrimination involving the words "Cup" and "Glass." First I will describe the last step in a series of eight training steps. At the final step of training, the tester would place an edible in the cup or the glass (out of sight of the participant), cover the cup and glass with the two inverted containers and place them on the tray, and place the tray in front of the two assistants. The item (cup or glass) that coinciding with the sample word would have

been placed underneath the container in front of the assistant who would say the comparison word that matched the sample word. Each assistant sat directly in front of a container. The chosen edible would have been placed inside the object that coincided with the sample word.

At the last step of training the tester would indicate that a new trial would begin by saying, "Okay, let's try another one." The tester then instructed the participant to place his/her hands on the table. The tester then rested her hand on top of the participant's hands in order to effectively block any movement until all the sounds had been presented. The tester would then say, "Where's the (cup or glass)?" the assistant who sat in front of the container hiding the object corresponding with the sample word would say, "Here's the (matching word)," and the other assistant would then say, "Here's the (non-matching word)," and the two assistants would alternate who spoke first and who said the matching word across trials. A response was defined as the participant attempting to lift one of the containers. Once the participant grabbed the handle and started lifting, whether the response was correct or incorrect, the corresponding assistant would assist the participant in lifting that container. If the participant chose the correct container, the tester and the "correct" assistant provided the participant with praise, the tester and the "correct" assistant repeated the words they said, and the tester then assisted the participant in consuming the reinforcer. If the participant chose the incorrect container all the materials were removed and the participant was ignored while the tester set up for the next trial.

Table 4
Training Steps for Pilot Study 4

	Order of Events	First	Second	Third	Fourth	Fifth	Sixth
Step 1	AM	Touch the corresponding container	"Here's the X"		"You're right, here's the X" + Reinforce Participant		
	ANM	Touch the corresponding container					
	Tester	Set up the tray, say "let's try again," block the participant's hands		Release Block	reinforce participant		
	Participant			Pick's up a container			
Step 2	AM	Touch the corresponding container		"Here's the X"		"X" + Reinforce Participant	
	ANM	Touch the corresponding container					
	Tester	Set up the tray, say "let's try again," block the participant's hands	"Where's the X"		Release Block	"X" + reinforce participant	
	Participant					Pick's up a container	

Table 4 Continued							
Step 3	AM	Touch the corresponding container			"Here's the X"		"X" + reinforce participant
	ANM	Touch the corresponding container	"Y"				
	Tester	Set up the tray, say "let's try again," block the participant's hands		"Where's the X"		Release Block	"X" + reinforce participant
	Participant					Pick's up a container	
Step 4	AM	Touch the corresponding container			"Here's the X"		"X" + reinforce participant
	ANM	Touch the corresponding container	"Here's the Y"				
	Tester	Set up the tray, say "let's try again," block the participant's hands		"Where's the X"		Release Block	"X" + reinforce participant
	Participant					Pick's up a container	
Step 5	AM	Touch the corresponding container		"Here's the X"			"X" + reinforce participant
	ANM	Touch the corresponding container			"Y"		
	Tester	Set up the tray, say "let's try again," block the participant's hands	"Where's the X"			Release Block	"X" + reinforce participant
	Participant					Pick's up a container	

Table 4 Continued							
Step 6	AM	Touch the corresponding container		"Here's the X"			"X" + reinforce participant
	ANM	Touch the corresponding container			"Here's the Y"		
	Tester	Set up the tray, say "let's try again," block the participant's hands	"Where's the X"			Release Block	"X" + reinforce participant
	Participant					Pick's up a container	
Step 7	AM	Touch the corresponding container			"Here's the X"		"X" + reinforce participant
	ANM	Touch the corresponding container		"Y"			
	Tester	Set up the tray, say "let's try again," block the participant's hands	"Where's the X"			Release Block	"X" + reinforce participant
	Participant					Pick's up a container	
Step 8	AM	Touch the corresponding container			"Here's the X"		"X" + reinforce participant
	ANM	Touch the corresponding container		"Here's the Y"			
	Tester	Set up the tray, say "let's try again," block the participant's hands	"Where's the X"			Release Block	"X" + reinforce participant
	Participant					Pick's up a container	

Notes: X is one training word Y is the other. AM is the assistant who says the matching word and ANM mean the assistant who says the non-matching word.

The above describes the last step in a series of eight training steps used to teach the glass/cup task. These eight steps are explained in Table 4. In the table and in the explanation below X denotes the sample and comparison words that matched and Y denotes the comparison word that did not match the sample. At the beginning of each session the participant was lead in the correct response for each word. The words were presented using the prompting level of the last step passed in the previous session.

In Step 1, only the assistant, who sat behind the container that hid the edible, spoke. More specifically in Step 1, the assistant who was supposed to say the matching word (AM) said "Here's the X." The tester then released the participant's hands and allowed him/her to choose a container. If the participant chose the correct container the AM would say, "You're right, here's the X," and she would reinforce the participant along with the tester. This step was designed to teach a participant to discover the reinforcer by responding to the assistant who spoke.

Step 2 was the first step towards auditory matching. In Step 2, the tester would say, "Where's the X?" Then the AM would say, "Here's the X." The tester would then release the participant's hands so she/he could choose a container. If the participant responded correctly the AM and tester would repeat the words and reinforce the participant. Step 3 was identical to Step 2 except the assistant who was supposed to say the non-matching word (ANM) said the non-matching word ("Y") before the tester said, "Where's the X?" Step 4 was identical to Step 3 except that the ANM said, "Here's the Y," instead of just "Y." Step 5 was similar to Step 3, the difference was in who spoke first. In Step 5 the tester said, "Where's the X," the AM

would then say, “Here’s the X,” and the ANM would then say, “Y.” Step 6 was identical to Step 5 except the ANM said, “Here’s the Y.” Step 7 was identical to Step 3 except that the ANM said, “Y” after the tester said, “Where’s the X?” and before the AM said, “Here’s the X.” Step 8 was the same as Step 7 except that the ANM said, “Here’s the Y.”

P2 and P3 were trained using these procedures. Neither participant was able to master all eight steps. P2 passed Steps 1 to 3 and attempted Step 4. Her training was terminated after a total of 483 trials. P3 passed Steps 1 to 4 but did not pass Step 5. After 272 trials of training, four fading steps were added to Step 5 for P3. After 49 additional trials using these four additional fading steps P3 still could not pass Step 5, and training was terminated after a total of 321 trials.

Appendix F

Procedural Integrity Checklist for Experiment 2

Procedural Reliability - Training

Date _____ Tester _____ Participant _____

Task: Visual matching/ Auditory matching Observer _____ Session: _____

	Demo 1	Demo2	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Trial 7	Trial 8	Trial 9	Trial 10	Trial 11
New Session:													
Samlpe Provided													
Plane brought forward													
Comparisons randomized and presented in front of the plane													
Correct Instructions													
Guided Trial													
Correct Consequence													

	Trial 12	Trial 13	Trial 14	Trial 15	Trial 16	Trial 17	Trial 18	Trial 19	Trial 20
Steps of task:									
Samlpe Provided									
Plane brought forward									
Comparisons randomized and presented in front of the plane									
Correct Instructions									
Correct Consequence									

Appendix G

Abbreviation Index

Abbreviation	Meaning of Abbreviation
ABLA	Assessment of Basic Learning Abilities
AAIM	Auditory-Auditory Identity Matching
AAIM PT	Auditory-Auditory Identity Matching Prototype Task
AAIM PTC	Auditory-Auditory Identity Matching with Computer Speakers
AANM	Auditory-Auditory Non-Identity Matching
CSS	Communication Status Survey
DD	Developmental Disabilities
MCTP	Multiple Component Training Package
PR	Prompting and Reinforcement
PT	Prototype Task
PTTW	Auditory-Auditory Identity Matching Prototype Task with Training Words
SPRV	Standard Prompting and Reinforcement with Volume Fading
SPRP	Standard Prompting and Reinforcement with Pointing Fading
VABS	Vineland Adaptive Communication Scale

Appendix H
Project Description and Consent to Participation Form

Research Project Title:	A Comparison of Two Methods to Teach Persons with Developmental Disabilities or Autism to Recognize Spoken Words That Are the Same
Student Researcher:	Sandra Salem, M.A., PhD. Candidate
Supervisor:	Dr. Garry L. Martin, PhD.
Affiliations:	St. Amant Research Centre and University of Manitoba

This description, a copy of which will be left with you for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

What is the purpose of the project?

Our study will compare two methods for teaching students with developmental disabilities or autism to recognize that two sounds are the same. This skill seems to be important for learning vocal imitation, which is an important part of language instruction programs. Existing methods of teaching the skill are often unsuccessful, however, or require many trials and a long time to produce mastery.

What are the project procedures and how long will the project take?

Participation begins with an Assessment of Basic Learning Abilities and an assessment of auditory matching skill. Both assessments involve sitting across from the experimenter and selecting among visual and auditory choice options that the experimenter presents.

Participants who are initially unable to recognize when two sounds are the same will receive the two teaching methods for this skill. The training tasks involve the participant sitting across from two sound sources, with the experimenter as a third sound source sitting between the other two sources. On each trial, the experimenter speaks one of two words. The other two sources produce each of the word options, in succession. The correct response from the participant is to point toward the speaker that produced the same word as the experimenter. In all cases correct responses will be met with praise and a small edible item. Incorrect responses will be briefly ignored.

In one teaching condition (a traditional method) the experimenter will say a word, then activate a laptop computer to emit the two comparison words (one from each audio speaker), and then quickly point to the correct speaker. So long as the participant is responding correctly, the pointing prompt will be faded across trials by making smaller and smaller pointing gestures, until not pointing at all. Incorrect responding will lead to the pointing prompts becoming larger until correct responding resumes.

In the other teaching condition (a novel method) the experimenter will say a word and activate the computer to emit the comparison words. However, teaching starts with zero volume for the incorrect comparison word. So long as the participant is responding correctly, the incorrect

comparison word's volume will gradually increase across trials until it is equal to the correct comparison word. Incorrect responding will lead to the volume difference becoming greater until correct responding resumes.

This study requires approximately four 45-minute sessions a week and we expect that sessions will continue for approximately 3 to 6 months.

Will the participant's personal information be kept confidential?

All information obtained about the participant will be handled in compliance with Section 24 of the Personal Health Information Act (PHIA). All information will be kept confidential and stored in a locked office. Only the research staff will have access. Any presentations, reports, or publications about the project will not contain any identifying information. The information will be kept no longer than five years following completion of the project (i.e. until Dec. 31, 2016) and will then be destroyed in a confidential manner.

Videotaping

With your consent, sessions may be videotaped to facilitate reliable observation. Participation in the study will not, however, be affected if you choose to not consent to the videotaping of sessions. Videotapes will stored securely and destroyed in a confidential manner as described above.

What if abuse is discovered during the course of this project?

All researchers and assistants working on this project have a legal responsibility to immediately report any instance of abuse to the appropriate authority, as specified by The Child Protection Act and The Vulnerable Persons Living with a Mental Disability Act of Manitoba. We would report abuse even if doing so conflicted with our confidentiality obligations.

What are the risks and benefits in taking part in the project?

The procedures of this project present no risks to the participant beyond what he/she might encounter in everyday activities.

Direct benefits of participation include learning to match the training task words, and possibly to generalize this skill to other words. The project's findings may be helpful for improving teaching of auditory recognition tasks, for example in the context of early intensive behavioural intervention programs.

Will I receive the results of the project?

If you wish to be informed of the results, please check YES in the appropriate box at the end of this form and we will send you a summary of the findings by approximately June 2011.

Is there any payment or cost for participating?

No, there is no payment or cost for participating.

Is participation voluntary?

Participation is voluntary. Whether you give consent for the participant to take part in the project will in no way affect any services you or the participant may be receiving now or in the future from St. Amant or from the University of Manitoba.

Moreover, even after you give consent, you can stop any time and for any reason by simply calling the principal investigator listed at the end of the consent form. Again, your decision to stop will not affect any services you or the participant may be receiving now or in the future from St. Amant or the University of Manitoba.

Lastly, the cooperation of the participant to continue in this project (e.g., their willingness to come to a session and to work with the research project staff) will be monitored throughout the project. If at any time the participant is unwilling to come to the session or wishes to leave during a session, that decision will be respected and the session will be cancelled/rescheduled. If this happens on a continual basis (e.g., several times in a row),

we will accept this as a possible indication that the person does not wish to continue and discontinue his/her participation from the project. We will discuss this with you before the decision is made.

Will I be contacted in the future for other studies?

The results of this research may lead to other related studies in the future that may be beneficial to the participant. Please check the appropriate box at the end of this form if you would like to be contacted directly by the researchers in the future about other studies.

Signing the Consent Forms

Signing the following page of this *Project Description and Consent Form* indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to participate. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the project at any time, and/or refrain from answering any questions you prefer to omit, without prejudice or consequence. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation.

Principal Investigator:	Sandra Salem
Supervisor:	Dr. Garry Martin
St.Amant Research Centre Manager:	Dr. Toby Martin

The Psychology/Sociology Research Ethics Board has approved this research. If you have any concerns or complaints about this project, you may contact any of the above-named persons or Margaret Bowman, Human Ethics Secretariat. A copy of this Project Description and Consent Form has been given to you to keep for your records and reference.

Signatures

I

,

_____ here by consent to:

(*please print your name*)

_____ 's participation in the project, *A Comparison of Two Methods to Teach Persons with Developmental Disabilities or Autism to Recognize Spoken Words That Are the Same*.

(*please print participant's name*)

By giving consent I allow the research project staff to:

- Obtain personal health information, including: age, diagnosis, level of functioning, previous intellectual and adaptive behavior assessments, and physical and sensory difficulties from the health records at St. Amant. This information will be used to ensure that the participant meets the project's inclusion/exclusion criteria, and to help the researchers work with the participant in a manner appropriate to his/her abilities.
- Include the participant's results in publications, reports, and talks, so that others may learn from this project. The identity of the participant, however, *will not* be disclosed.

I understand that I can revoke or amend this consent at any time and for any reason.

Please check YES or NO for the following items:	**YES**	**NO**
• I would like to receive the results of this project.		
If you responded Yes to the previous question, please write your mailing address here:		
• I allow the researchers to make confidential video records of sessions to improve the reliability of their observations.		
• I allow the researchers to share the participant's results with authorized St. Amant staff.		
• I allow the researchers to share the participant's results with another individual or individuals (e.g. family members). *Please attach name and mailing address for each individual.*		
• The researchers may contact me directly for possible future related studies.		

_____ _____

Signature of Consenting Individual **Date**

_____ _____ _____

Name of Researcher/Delegate **Signature of Researcher/Delegate** **Date**

Please return all pages of this *Project Description and Consent to Participation Form* in the enclosed stamped envelope to the researcher. An extra copy has been enclosed for your records. Thank you.