Standard Prompting and Reinforcement versus a Multiple-Component Strategy for Teaching Visual-Visual Non-Identity Matching

Sara M. Spevack

Department of Psychology

A Thesis Submitted

in Partial Fulfillment of the Master of Arts Degree

at the University of Manitoba

2001

THE UNIVERSITY OF MANITOBA

FACULTY OF GRADUATE STUDIES

*****

COPYRIGHT PERMISSION

STANDARD PROMPTING AND REINFORCEMENT VERSUS A MULTIPLE-COMPONENT STRATEGY FOR TEACHING VISUAL-VISUAL NON-IDENTITY MATCHING

BY

SARA M. SPEVACK

A Thesis/Practicum submitted to the Faculty of Graduate Studies of The University of Manitoba in partial fulfillment of the requirement of the degree

of

MASTER OF ARTS

Acknowledgments

I would like to thank my advisor, Dr. Garry Martin, and the members of my committee, Dr. Dickie Yu and Dr. John Whiteley. I would also like to thank my tireless helpers, Gina Sakko, Shayla Harapiak, Ryan Goodman, Toby Martin, and Lisa Schwartzman. Last but not least, I want to thank my participants for all of their efforts throughout this project. This research was supported by the Sister Bertha Bauman Research Award offered by the St. Amant Centre.

Table of Contents

List of Figures

List of Tables

Abstract

The Assessment of Basic Learning Abilities (ABLA) test can help staff choose training tasks for persons with developmental disabilities (Martin & Yu, 2000). This test assesses the ease or difficulty with which most clients are able to learn six mini-tasks. Most clients who pass level 5 also pass level 6, making level 5 less useful in understanding clients' abilities. A visual-visual non-identity matching (VVNM) task may fall between levels 4 and 6. This study examined whether a VVNM task has one of the qualities of a good milestone task. One quality of ABLA tasks is that a failed ABLA level is difficult to teach using standard prompting and reinforcement procedures. Study 1 examined whether four VVNM tasks could be taught using standard prompting and reinforcement techniques. The participants were two severely and one profoundly developmentally disabled individuals. An attempt was made to teach each participant each of four VVNM tasks, using standard prompting and reinforcement techniques. Two participants learned three tasks, while the third learned two of the four tasks, using this technique. Previous research has also found that, while it is difficult to teach a failed ABLA level using standard prompting and reinforcement techniques, it is possible to do so when using a multiple component technique. Therefore, in Study 2, the multiple component technique was used to teach the participants the tasks that they had failed to learn in Study 1. Participants were the three participants from Study 1, plus a fourth severely developmentally disabled individual. Of the six tasks presented with the multiple component technique, only one was learned. The findings from these two studies suggest that the VVNM task may not be a good milestone task to replace level 5 of the ABLA test.

Introduction

The Assessment of Basic Learning Abilities (ABLA) test is a tool that was designed to assess the ability of persons with developmental disabilities to learn the basic discriminations that underlie many tasks. It is helpful for staff who work with these individuals. Once a client's ABLA level is known, tasks can be designed that the client will be able to learn fairly quickly, and those tasks that the client will have great difficulty in mastering can be avoided. This test takes about half an hour to administer, and provides caregivers with valuable information.

Kerr, Meyerson and Flora (1977) developed this test to help explain why some clients who have developmental disabilities could easily learn to do certain tasks while others (diagnosed at the same level of mental retardation) had great difficulty learning them, even after a long training period. They analyzed the various tasks that clients were given, to see what discrimination skills were needed to successfully perform the tasks. They found that most of the tasks could be categorized into six groups, according to the types of discriminations that were required to complete the task. These are the six levels of the ABLA test: (1) simple imitation; (2) position discrimination; (3) visual discrimination; (4) match to sample discrimination; (5) auditory discrimination; (6) auditory-visual discrimination.

It has been found that the vast majority of clients who pass level five also pass level six. This indicates that this part of the ABLA test is not helpful in understanding most clients, and could be eliminated from the test (Martin & Yu, 2000). One study (Goodman, 2000) found that a visual-visual non-identity matching (VVNM) task falls between level four and level six in difficulty. The present study is a step towards determining whether a VVNM task may be a good task to replace level five of the ABLA

test.

The ABLA Test

Kerr et al. (1977) studied the different kinds of training tasks that developmentally disabled persons were taught, and found that the ability to make six specific discriminations was necessary to be successful at such tasks. These researchers developed the ABLA test (or Auditory-Visual Combined Discrimination test [AVC], as it was called originally) to assess whether or not developmentally disabled persons could readily learn to make a simple imitation and five two-choice discriminations. The ABLA test does not assess the already existing behavioral repertoire of individuals, rather it examines the client's ability to learn new discriminations rapidly. In essence, the ABLA tests some learning-to-learn capabilities in an individual. The only limitations of this test are that the client must be able to hear verbal instructions and have the motor dexterity to put a small object inside a large one (McDonald & Martin, 1993).

The ABLA test was designed to be easy to construct. The task materials are a large yellow can, a red box (with or without dark red stripes), a small yellow cylinder, a small red cube (with or without stripes), and a small irregularly shaped piece of foam that is neither red nor yellow (Martin & Yu, 2000).

The test itself is divided into six tasks. Level one is an imitation task, where the client is asked to imitate the tester by placing the small piece of foam into a container in front of him or her. Level two is a position discrimination task. Here, the client must discriminate between two containers which occupy fixed positions, and consistently place the piece of foam into the one on the left (the can). For this task, the container is not the focus of the task, but is used as a way to operationalize the difference between the two positions that the client must discriminate. The use of two containers, as opposed to

two arbitrary positions on top of a table, also makes it easier for the tester to judge correct versus incorrect responses (Kerr et al., 1977).

Level three is a visual discrimination task, where the positions of two different containers are switched randomly. The client must place the object into the can, regardless of which position it occupies. The fourth level is an identity match-to-sample discrimination task, which includes a small cylinder and cube, instead of the foam. The objects are presented randomly and the client must put the item that he or she is given into the container that is the same colour and shape. The positions of the containers are also switched randomly. Level five tests the client's ability to learn to discriminate between auditory stimuli. The ability to make auditory discriminations is very important because it is a prerequisite for an individual to be able to learn spoken language (Casey & Kerr, 1977). The client is presented with two very different auditory cues on a random basis, and must place the foam in the appropriate container as indicated by the verbal cues. The containers are stationary for this level. The last task is an auditory and visual combined discrimination, where the client is presented with the same situation as for the auditory task, but here the positions of the containers are switched randomly (Kerr et al., 1977).

To begin testing, the teacher first demonstrates the discrimination task to be taught, then guides the client's hand to make the correct response. Next, the client is encouraged to make the correct response independently. After the first correct independent response, scoring for the level itself is begun. When the client responds correctly during the teaching of a task, the teacher delivers positive reinforcement, in the form of praise or occasionally an edible, then moves on to the next trial. If the client makes a mistake, the client is told that the response was incorrect, and an error correction

trial is presented in which the teacher demonstrates the correct response, guides the client to make the same response, and then encourages the client to perform the task independently. If the client again responds incorrectly, then another error correction trial occurs. If the client responds correctly to the error correction procedure, then the client is praised, and the teacher goes on to the next trial (Kerr et al., 1977). The testing for each level continues until the client performs correctly on eight consecutive trials, or makes eight cumulative errors. The reason for these strict learning criteria is that in only one case out of 256 will eight correct responses occur in a row just by chance in a two-choice discrimination in which successive responses are independent.

The different tasks that make up the ABLA test are hierarchically ordered according to the difficulty of the discriminations required to successfully perform them. When a client fails a level of the test, then he or she will be able to easily pass those levels below that first failed level, but will be unable to pass any levels above that. For example, a client whose highest passed level is four will easily be able to pass levels one through three, but be unable to pass levels five and six. Kerr et al. (1977) found this hierarchy to be highly consistent across participants, and the order of these tasks has been successfully replicated by others (Martin, Yu, Quinn, & Patterson, 1983; Wacker, Kerr, & Carroll, 1983).

A client's ABLA test score is highly predictive of the types of work tasks at which he or she is likely to be successful. Tharinger, Schallert and Kerr (1977) found that when predictions were made about whether clients could rapidly learn certain tasks, based on those clients' ABLA levels, 83% of the predictions were confirmed. Tasks can be analyzed according to the discriminations that are required in order to successfully perform them. Then, once a client's ABLA level is known, staff can choose those tasks

that are below or at the level of the client's abilities, and be fairly certain that the client will be able to master those tasks quickly.

The ABLA test is also a good predictor of tasks that will be learned when compared to judgments from experienced staff members. Stubbings and Martin (1998) asked staff to judge which tasks each client would be able to learn quickly. When those predictions were compared to the predictions made based on the client's ABLA level, the ABLA test was significantly more accurate, even though the staff members had been working with each client for at least eight months. The test was also a significantly better predictor of tasks learned when compared to staff members who did not know the client, but had half an hour to interact with that client, using any assessment tool at their disposal (other than the ABLA test).

It has been found that when a client fails a level of the ABLA, teaching him or her a task at that level is very difficult. With the use of standard prompting, extra-stimulus prompt fading and reinforcement techniques, it may take the client hundreds of trials to be able to learn a failed task, if they are able to learn it at all (Meyerson, 1977). This is very important for staff to consider when designing a program for a client. If the staff member chooses a task that is at or below the client's ABLA level, the client should be able to learn it very rapidly. However, if the task is above the client's ability, then he or she may not be able to learn it, even after a great deal of reinforced practice.

Visual-Visual Non-Identity Matching

A group of six studies including 197 clients found that 96% of clients who pass level five of the ABLA test also pass level six. Because of this, efforts have been made to find a better task that is more informative for clients who pass level four and fail level six (Martin & Yu, 2000).

One task that has been investigated is a visual-visual non-identity matching (VVNM) task. This is a visual match-to-sample task where the client must match objects that are physically different from each other. Examples of this would be matching a shoe to a sock, or a cup to a plate.

Because the ABLA task materials differ on three dimensions (size, shape and colour), Goodman (2000) designed a prototype VVNM task where the objects (a green star and a blue hourglass) also differed on these three dimensions. These objects were matched to the red box and yellow can from the ABLA test. He found that all the clients who passed level six on the ABLA also passed this prototype VVNM task, but only some of those at level four were able to pass it. Using order analysis, he confirmed that this task is significantly more difficult than level four. However, while there were no disconfirmations, there were not enough clients to determine statistically if the VVNM task is less difficult than level six. More research is needed, but it does seem very likely that the VVNM task that Goodman designed falls between level four and level six.

When he tested the predictive validity of this task, he found that the VVNM task was highly predictive of the clients' performances on other VVNM tasks. There were eight clients who passed the prototype VVNM task, and they also passed most of the predictive validity tasks. There were six clients who failed the prototype VVNM task, and four of those failed most of the other VVNM tasks (Goodman, 2000).

Is a VVNM Task a Worthwhile Addition to the ABLA Test?

For the prototype VVNM task to be a good task to replace level five of the ABLA test, it must conform to three characteristics of the existing ABLA tasks. First, it must fall into a consistent place in the hierarchy of the ABLA tasks. Goodman (2000) demonstrated that it probably falls between levels four and six. Second, it must show

predictive validity for other, similar tasks. Goodman showed this to be the case.

Last, researchers have found that failed ABLA levels are resistant to training, using standard prompting and reinforcement techniques (Meyerson, 1977). It can require hundreds of trials to teach a task at a failed ABLA level, if the client is able to learn it at all (Martin & Yu, 2000). Standard prompting and reinforcement is essentially the method used to assess a level of the ABLA test, and is very similar to how staff members teach clients in their usual program. It starts off with a demonstration, a guided trial, then an opportunity for an independent response. The client receives praise for correct responses, and occasionally an edible reinforcer. If a mistake is made, an error correction procedure occurs where the correct response is demonstrated, followed by a guided trial, and the chance for an independent response. If the client does not respond within five seconds of the teacher asking for a response, then the teacher will point to the correct item. This pointing prompt is faded out across trials. Despite many hundreds of training trials, most clients are unable to learn a previously failed ABLA task using this technique (Martin & Yu, 2000). Therefore, to determine if a VVNM task is a worthwhile addition to the ABLA test, the first purpose of this research was to determine if a VVNM task is also difficult to teach using standard prompting and reinforcement techniques.

Although failed ABLA levels are very difficult to teach using standard prompting and reinforcement procedures, research has shown that it is possible for clients to learn tasks at a failed ABLA level if a multiple component technique is used (Conyers, Martin, Yu, Vause, 2000; Hazen, Szendrei & Martin, 1989; Walker, Martin & Graham, 1991; Yu & Martin, 1986). Yu and Martin (1986) found that a multiple component rapid training package was much more effective than standard training. The first component that they used was within-stimulus prompt fading. Schreibman (1975) found that within-stimulus

prompts were more effective than extra stimulus prompts in teaching autistic children. Therefore Yu and Martin (1986) used within-stimulus prompt fading where the incorrect stimulus started out very small, and as the client responded correctly, it was steadily increased in size until it was the same size as the correct stimulus (e.g., Schreibman, 1975). The second component that they used was a reinforcer-discovery contingency. Instead of handing the client an edible after a correct response, the edible was located beneath the correct stimulus, so that when it was lifted up, the client would discover the reinforcer. It has been found that this functional link between the response and the reward makes it easier for clients to learn a two-choice discrimination (Koegel & Williams, 1980). The third component used by Yu and Martin was error interruption instead of an error correction trial for mistakes (Glenn, Whaley, Ward & Buck, 1980). The incorrect item was glued or held down, so that if the client was in the process of making an error, he or she was immediately aware that they had chosen the wrong container, because it could not be lifted.

Yu and Martin (1986) taught five developmentally disabled persons a previously failed task at ABLA level three (visual discrimination). They found that two out of the five participants were able to learn the task using the standard prompting and reinforcement, but learning was slow, and the clients were unable to generalize what they had learned to similar tasks without additional training. Those participants who received the multiple component technique learned the task rapidly and were more likely to be able to pass the generalization tasks without any further training.

Hazen et al. (1989) used a similar multiple component technique to teach a previously failed match-to-sample task (level four), in which the sample objects were different from each other on three dimensions. All three participants were able to learn

this task rapidly, and two out of three were subsequently able to pass level four on the ABLA test.

Walker et al. (1991) used a multiple component technique, similar to that of Yu and Martin (1986) to teach a previously failed auditory discrimination task (level five) to several persons with developmental disabilities. Three out of the four participants learned the task rapidly. The fourth participant learned the task once a position prompt and an additional auditory prompt were added to the procedure.

Most recently, Conyers et al. (2000) attempted to teach four clients, who could only pass up to level four, a task equivalent to level six of the ABLA test. Using the standard prompting and reinforcement strategy, none of the clients were able to learn the task rapidly. Once they switched to a multiple component strategy, similar to that of Yu and Martin (1986), including reinforcer preference testing and using a variety of preferred reinforcers during each session, all four were able to learn it rapidly.

Considering these studies that have demonstrated that failed ABLA levels can be rapidly taught using a multiple-component training procedure, the second purpose of the present research was to compare standard prompting and reinforcement to a multiple-component training procedure for teaching a failed VVNM task to persons with developmental disabilities.

Some Additional Notes on Technique

Prompts are very important in teaching tasks to persons with disabilities. Very few clients are able to learn a new task without some degree of prompting (Schreibman, 1975). They help the client to learn the association between the task stimuli and the correct response. However, it is equally important to fade the prompts, so that the client is able to perform the task independently. If the prompts are not faded effectively, some

clients may become prompt-dependent, and will only be able to perform at chance levels unless the prompt is present (Schreibman, 1975; Touchette & Howard, 1984; Yu, Martin & Williams, 1989).

Berkowitz (1990) compared two methods of prompt fading in teaching a picture discrimination task to four persons with autism. A prompt-fading technique (where the prompt was faded from full manual guidance to a light physical prompt to a gestural prompt, and finally to no prompt) was compared to a delayed-prompt fading technique (where the prompt became more and more delayed from the onset of each trial as the participant responded correctly). Participants required fewer trials to meet the pass criterion, and made significantly fewer errors with delayed prompting in comparison to the other procedure. Therefore, a delayed prompting component was added to both the standard prompting and reinforcement and the multiple component procedure in the present research.

Touchette and Howard (1984) compared three methods of reinforcing multiply handicapped children when learning to point to letters that the teacher requested. The procedure incorporated a delayed pointing prompt that would get more and more delayed as the client responded correctly. For method A, the clients were reinforced on a continuous reinforcement schedule for correct responses both before and after the prompt was used. For method B, the clients were reinforced on a continuous schedule for correct responses before the prompt was given, but on a fixed-ratio three (FR3) schedule, if the correct response occurred after the prompt was given. Method C used an FR3 schedule of reinforcement for correct responses before the prompt, and continuous reinforcement for correct responses after the prompt was given. They found that method B was the most effective in transferring stimulus control from the prompt to the task materials for two of

the three participants. Essentially, method B increases the participant's motivation to respond correctly and independently, before the pointing prompt is given.

In the standard prompting and reinforcement procedures that compose the ABLA test, when a client makes an error, an error correction procedure is performed, where the tester demonstrates the correct response, guides the client's hand to make that response, then gives the client the opportunity to respond independently (Kerr et al., 1977). In consideration of the results obtained by Touchette and Howard (1984), in Study 1, edible and praise reinforcers were used for correct responses on trials, but only praise was presented as a reinforcer for correct responses that occurred as part of an error correction procedure.

Study 1

Statement of the Problem

This study investigated whether failed VVNM tasks could be learned rapidly using standard prompting and reinforcement techniques. Three clients were chosen who were able to pass ABLA level four, but not level six or the prototype VVNM task designed by Goodman (2000). It was predicted that the clients would be unable to learn VVNM training tasks rapidly using standard prompting and reinforcement techniques.

Method

Participants

This study included three adults with developmental disabilities who resided at the main residential program of the St. Amant Centre. The reason for selecting them was that all three were able to pass level four of the ABLA test, but were not able to pass levels five and six of the ABLA test or the prototype VVNM task.

Participant A was a 43 year old male resident who was diagnosed with seizure

disorder, spastic quadriplegia and severe mental retardation secondary to anoxia. Participant A was the only one who needed the use of a wheelchair; the other two participants were ambulatory. Participant B was a 28 year old male resident who was diagnosed with autism and severe mental retardation. Participant C was a 33 year old female resident who was diagnosed with partial blindness, microcephaly, spastic diplegia, seizure disorder and profound mental retardation.

Materials

Four VVNM tasks were constructed. Task 1 was designed so that the objects differed from each other on three dimensions (size, shape and colour). Task 1 was composed of a small wooden bowl (10.2 x 10.2 x 3.2 cm), a black plastic mug with white lettering (9 x 7.5 cm), a purple triangular block (9 cm per side), and an orange hexagonal block (8.5 x 8.5 cm). The triangle was matched with the bowl, and the hexagon with the mug. The two containers were placed upside down on a tray which measured 35 x 25 cm. The bottoms of the (upside down) containers and the undersides of the shapes were covered with velcro, so that when correctly paired, the objects would stick together, but would not stick together when paired incorrectly (see Figure 1). The reason that the containers were placed upside down, and the containers and objects were velcroed, was to facilitate training in Study 2, which will be described later.

The items for Task 2 were designed to differ from each other on only 1 dimension - shape. The task was composed of four cards which measured 12.6 x 8.8 cm. A card which had the word "disk" typed on it in lower case letters was matched to a card with a black line drawing of a computer disk on it. A card with the word "CACTUS" typed on it in upper case letters was matched to a card with a black line drawing of a cactus (see Figure 2). These items were chosen because it was likely that the clients would not have

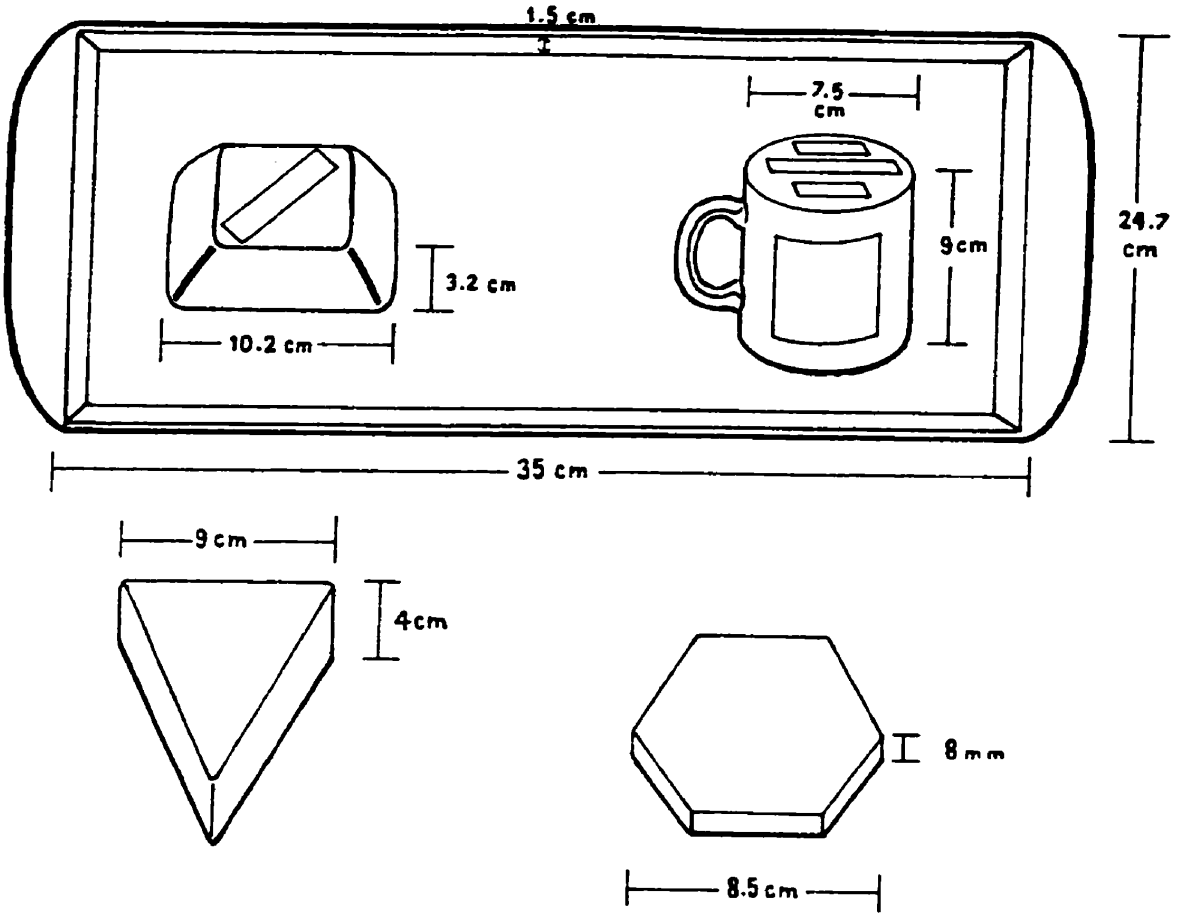

Figure 1. Task 1.

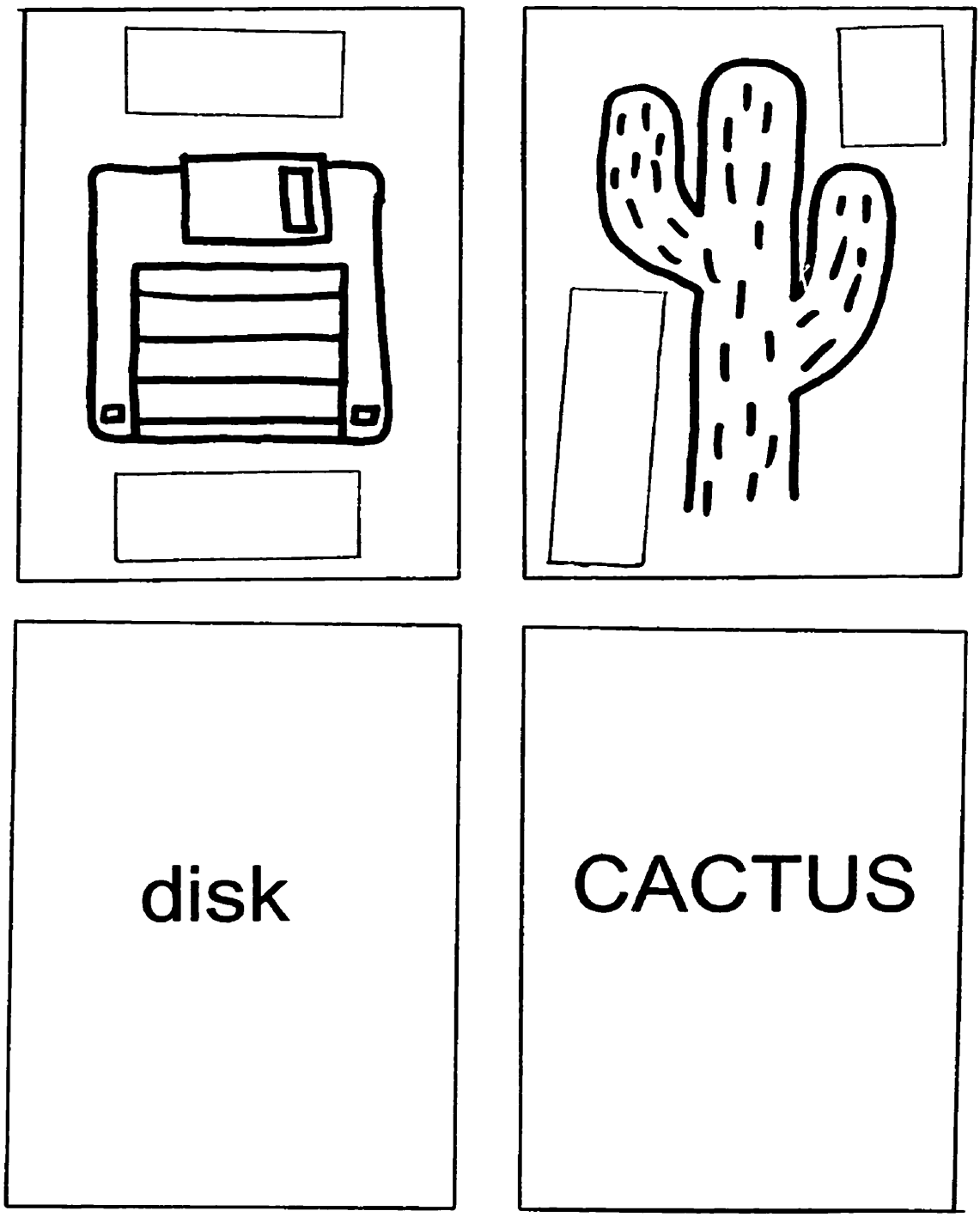

Figure 2. Task 2.

had extensive experience with those objects. The face of the cards with the drawings (not covering the drawings) and the undersides of the cards with the words had velcro on them, in the same fashion as Task 1. The drawings of the cactus and the disk were placed on a raised platform that measured 26 x 15.2 x 5.3 cm.

A second task in which items differed only in shape was constructed to test for generalization for clients who learned Task 2. A card with the word "HORSE" written in upper case letters was matched to a card with a line drawing of a horse, and a card with the word "saw" written on it in lower case letters was matched to a card with a line drawing of a saw (see Figure 3). These task materials did not have any velcro on them, and they were presented directly on the table top.

Task 3 was designed so that the objects differed on three dimensions - size, shape and colour. It was composed of a wooden heart-shaped box (8 x 3.7 cm), a grey rectangular box (8.5 x 6.6 x 3.6 cm), a white plastic star with bumps on top (9 x 9 cm), and a thick pink popsicle stick (15 x 1.8 x 1.4 cm). The heart was matched with the star, and the box was paired with the popsicle stick. Similar to Task 1, the containers were presented upside down on a tray, and the bottoms of the containers and the two objects were velcroed (see Figure 4).

Task 4 was the prototype VVNM task used by Goodman (2000; see Figure 5). The yellow can and red box from the ABLA test were matched with a green star-shaped block, and a blue hourglass-shaped block of wood, respectively. It was tested and taught with the containers right side up, without velcro, and directly on the table surface.

Research design

Once each client had been tested on the prototype VVNM task and the ABLA test, training sessions began, using standard prompting and reinforcement techniques to

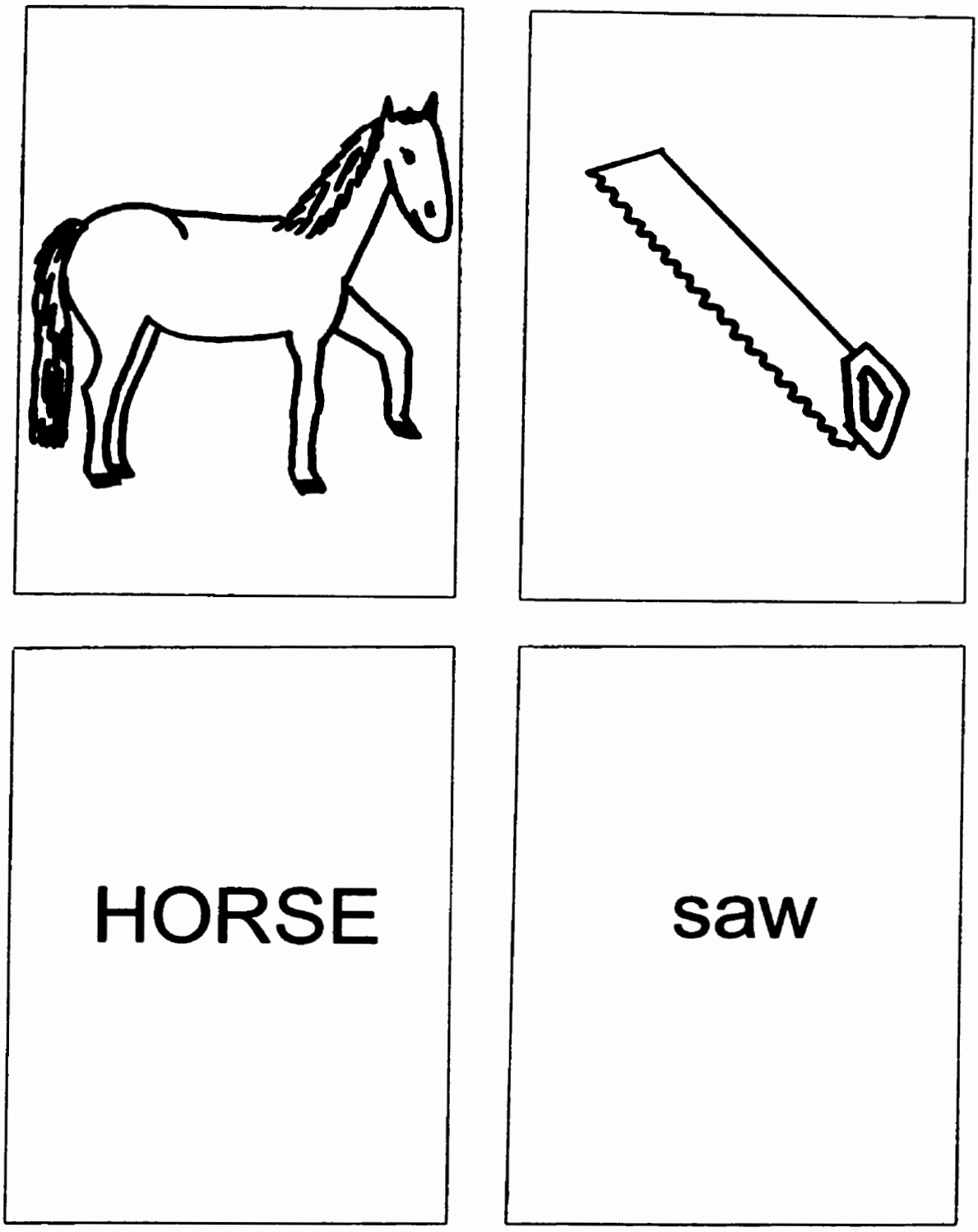

Figure 3. Generalization Task 2.

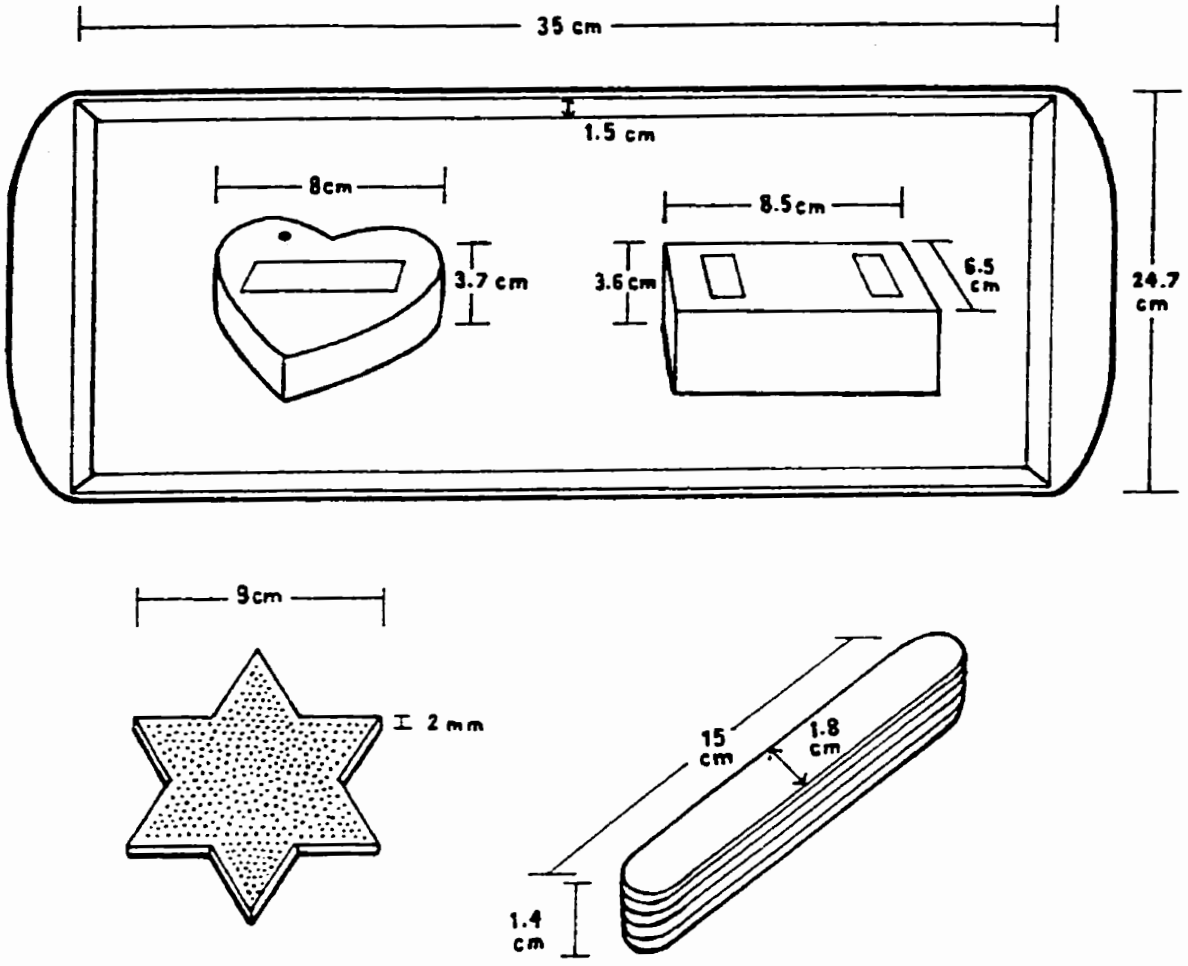

Figure 4. Task 3.

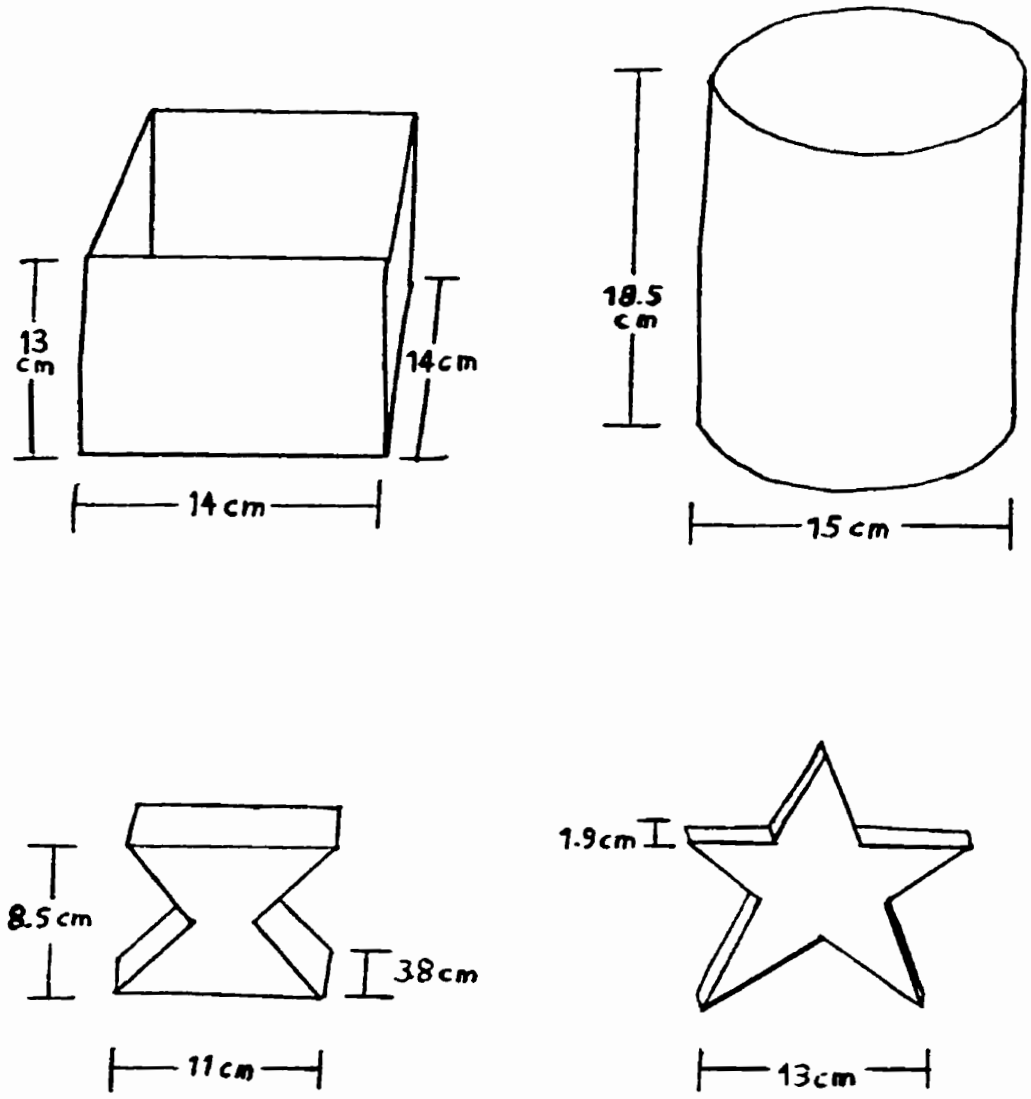

Figure 5. VVNM Prototype Task (Task 4).

attempt to teach Task 1 to each participant. The pass criterion was eight consecutive correct independent responses, just as for the ABLA test. If a participant passed the task in less than 180 trials, he/she was tested for generalization to the VVNM prototype task, then went on to the next task. If the participant did not reach the pass criterion in less than 180 trials, and in some cases more, he/she went on to the next task without generalization testing. Eventually, an attempt was made to teach all four tasks to each of the three participants using standard prompting and reinforcement.

There were several exceptions to the above sequence. First, Participant A learned Task 1 very rapidly using standard prompting and reinforcement, but did not generalize in that Participant A was still unable to pass the VVNM prototype task. Participant A was therefore given training on Task 1 a second time, using standard prompting and reinforcement, to see if further training would increase the likelihood of generalization. After reaching criterion a second time on Task 1, Participant A still failed the VVNM prototype task. Participant A then went on to Task 2 with standard prompting and reinforcement.

Second, before receiving training on Task 2 using standard prompting and reinforcement, all participants were pretested on generalization Task 2, and the participants who passed Task 2 were subsequently retested on the generalization Task 2. The participants were also pretested on Task 3 before training began.

Third, Participant A failed to learn Task 2 and Participant C failed to learn Task 3 using standard prompting and reinforcement. Both participants were given training on a multiple component training package (described in Study 2) on the tasks that they failed to learn via standard prompting and reinforcement, before continuing with standard prompting and reinforcement on the next task. Thus, Participant A received a multiple

component training package on Task 2 before going on to standard prompting and reinforcement with Task 3, and Participant C received a multiple component training package on Task 3 before going on to standard prompting and reinforcement with Task 4 (the VVNM prototype task).

Data sheets for presenting test objects, arranging the positions of containers, and recording results for ABLA assessments, VVNM prototype assessments, and Tasks 1, 2 and 3 are presented in Appendices B through J.

Procedure

The teaching sessions occurred in one of two rooms in the St. Amant Centre. The rooms were approximately 4 x 7 meters in size, with a table in the center, and chairs around the table.

Staff familiar with each client were consulted to choose edible reinforcers that the clients liked, and to be sensitive to any dietary restrictions or allergies that the client may have had. The participants chose from: pretzels, salt and vinegar potato chips, cheesies, popcorn twists, rockets, Sweet Tarts, M&M's, and jelly beans. Part way through teaching Task 2 to Participant A, his staff requested that he no longer be given edibles as reinforcers due to a change in his diet. Instead bubbles, stamps and several types of stickers were used in their place.

Standard prompting and reinforcement technique. Standard prompting and reinforcement included five components:

(A). At the beginning of each session, the client was given the choice of one out of six edible reinforcers. The first one that the client chose was the edible reinforcer used throughout the session. The non-edible reinforcers given to Participant A were also presented in this manner.

(B). An arbitrary response-reinforcer relationship was used, where the edible was handed to the client for correct responses. Clients were also praised for correct responses. There was a differential reinforcement program in effect, where the client received edibles and praise for correct initial responses, but only praise for correct responses after an error correction.

(C). Training sessions began with a demonstration of the correct response, a prompted trial, where the teacher pointed to the correct response, and the opportunity for an independent response. The ABLA protocol calls for a guided trial as the second step, with the teacher using hand-over-hand physical prompting to show the client which response is the correct one (Kerr et al., 1977). Two out of the three clients in this study did not respond well to the physically prompted trials, so a pointing prompt was used in its place, for all clients.

(D). On each trial, a delayed pointing prompt was used if needed (as recommended by Touchette & Howard, 1984). It was originally intended that, if the client did not respond within five seconds of the teacher presenting the sample object to the client while concurrently requesting the client to choose, the teacher would point to the correct container. However, Participants A and B responded very quickly, and so received no pointing prompts. Because of Participant C's tendency to respond slowly, the pointing prompt began with a 15 second delay after the presentation of the sample object. After three correct responses, the prompt delay was increased to 20 seconds, then to 25 seconds, and so on, up to a maximum of 55 seconds, according to the guideline of a five second increase after three correct responses at a particular delay. Prompted trials were not counted toward the pass criterion.

(E). When the client made an error, an error correction procedure was used. This

consisted of a demonstration, a prompted trial and an opportunity for an independent response. After a correct independent response, the next trial began. If the client again made a mistake, another error correction trial was performed.

There were 20 trials per block. In most instances, two trial blocks were completed in one session.

Reliability assessments

Inter-observer reliability checks and procedural reliability checks were done for 54% of the sessions in Study 1. Another person observed the teacher and participant, and recorded the client's responses as well as whether the teacher performed all the parts of the procedure correctly (see Appendix K). These data were then compared to the data recorded by the teacher. An inter-observer reliability (IOR) score for a session was calculated by dividing the number of trials where the teacher and observer agreed on the client's response during a session, by the number of agreements plus disagreements, then multiplying by 100%. Acceptable IOR scores fall between 80-100% (Martin and Pear, 1996). Procedural reliability (PR) was checked by both the tester and the observer recording whether the tester followed all of the parts of the procedure correctly, including placing the items in the correct left-right position, performing the delayed pointing prompt correctly, and delivering the edible reinforcer when appropriate. A PR score for a session was calculated by dividing the number of trials in which the observer recorded that the procedure was followed correctly, by the total number of trials during a session, then multiplying by 100%. Acceptable PR scores also fall above 80%. The IOR scores averaged 99.88% for Study 1, with a range of 95-100%. The PR scores averaged 99.74%, with a range of 95-100%.

IOR checks were conducted for 41% of the ABLA and VVNM tests done during

Study 1. They all demonstrated 100% agreement.

Results

The results are presented in Figure 6. As can be seen in Figure 6, Participant A learned Tasks 1, 3, and 4, Participant B learned Tasks 1, 2, and 3, and Participant C learned Tasks 1 and 2, all using standard prompting and reinforcement. For the tasks that were passed, the mean number of trials to reach passing criterion across the three participants was 60, with a range of 8 (Participant A, Task 3) to 145 (Participant C, Task 1). All three participants passed at least one task in fewer than 100 trials.

In all but one instance, the participants did not generalize to novel tasks, after mastering these VVNM training tasks using standard prompting and reinforcement techniques. Participant A was tested on the VVNM prototype task after he met the pass criterion for Tasks 1 and 3, and on the second generalization task after passing Tasks 3 and 4, but did not pass either task at any time. Participant B passed the VVNM prototype task, when tested after passing Task 1. However, he was unable to do so after meeting the pass criterion for Tasks 2 or 3, and did not learn the VVNM prototype task during later training sessions. He was tested on the second generalization task after meeting the pass criterion for Tasks 2 and 3, but was unable to pass. Participant C was tested on the VVNM prototype task after meeting the pass criterion for Tasks 1 and 2, and on the second generalization task after passing Task 2, but was unable to pass either generalization task.

Discussion

Study 1 examined whether, like ABLA tasks, failed VVNM tasks are difficult to teach using standard prompting and reinforcement. This raises the question: How quickly should a new task be acquired by a client in order to conclude that the task is not difficult

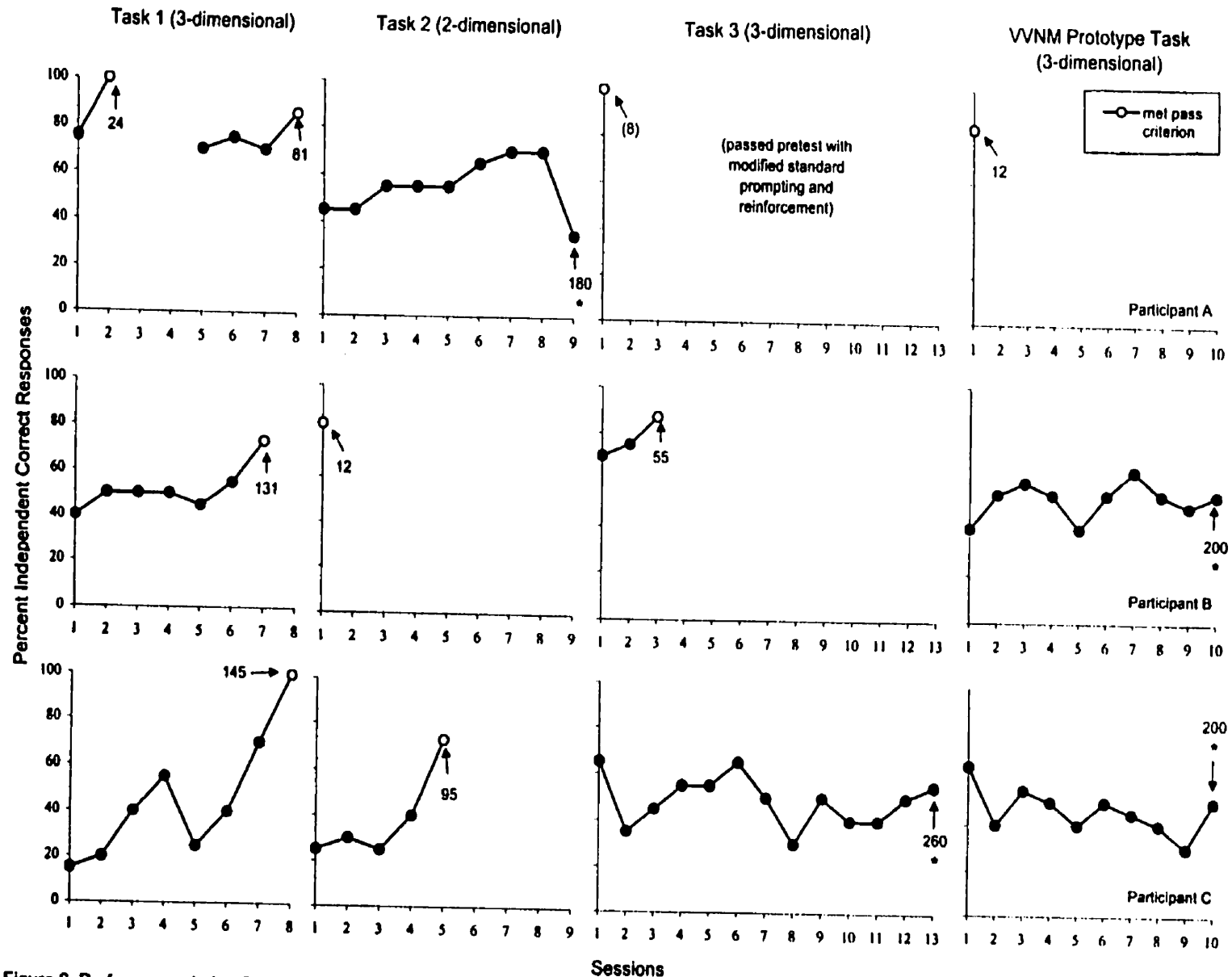

Figure 6. Performance during Standard Prompting and Reinforcement. Note: * indicates the multiple component technique was also used (see Study 2).

to teach? Martin and Yu (2000) examined several studies that attempted to teach failed ABLA levels using standard prompting and reinforcement procedures. In those studies, from 120 to 500 training trials were insufficient to teach failed ABLA levels using standard prompting and reinforcement procedures. With these results in mind, Martin and Yu suggested that acquisition of a failed ABLA level in fewer than 100 training trials might be considered reasonably rapid; whereas, more than 100 training trials might be interpreted as slow. Applying this criterion to the present study, one of the three participants learned the initial task rapidly, and two of the three participants learned a subsequent task rapidly. Thus, based on this very small sample, VVNM tasks might not be as difficult to teach, using standard prompting and reinforcement, as failed ABLA levels.

However, not all of the participants learned all of the tasks with ease. Participants A and B experienced one task and Participant C experienced two tasks that were not learned after 180 to 260 trials, using standard prompting and reinforcement techniques. Study 2 compared the standard prompting and reinforcement technique to a multiple component technique, to discover which would be more effective in teaching VVNM tasks.

Study 2

Statement of the Problem

In Study 1, there were four instances where a participant did not learn a VVNM task rapidly using standard prompting and reinforcement. This second study was conducted to compare the effectiveness of standard prompting and reinforcement versus a multiple component procedure for these cases. A fourth participant was added, who met the criteria of having passed ABLA level four, but not level six or the VVNM prototype

task. It was predicted that the multiple component procedure would be the more effective procedure for teaching a failed VVNM task.

Method

Participants

The same three individuals who participated in Study 1 also participated in Study 2. Participant D was a 29 year old male resident who was diagnosed with hyperactivity, autism, and phenylketonuria with severe mental retardation.

Materials

Tasks 1 and 3 were made of the same items as in Study 1. Here, however, there were several trays prepared so that the incorrect inverted container for each trial could be affixed to the tray on which the containers were presented. The containers remained upside down, so that the reinforcer could be hidden beneath the correct container. The velcro remained on the objects, so that when an object was correctly matched to a container, the two items could be lifted together to reveal the reinforcer beneath the container.

For Task 2, four identical platforms were made (26 x 15.2 x 5.3 cm), so that the incorrect card for each trial could be affixed to the platform, and remain right side up to the participant in both left and right positions. A hole smaller than the card was located in the platform, and was covered up by the correct card. This hole had three vertical sides, with the side closest to the client angled, to make it easier for the client to see and remove the reinforcer from the hole. The back side of each platform (which the client could not see) was marked with letters representing the card positions as written on the data sheets, to help ensure procedural accuracy (see Figure 7).

For the multiple component portion of this study, the VVNM prototype task

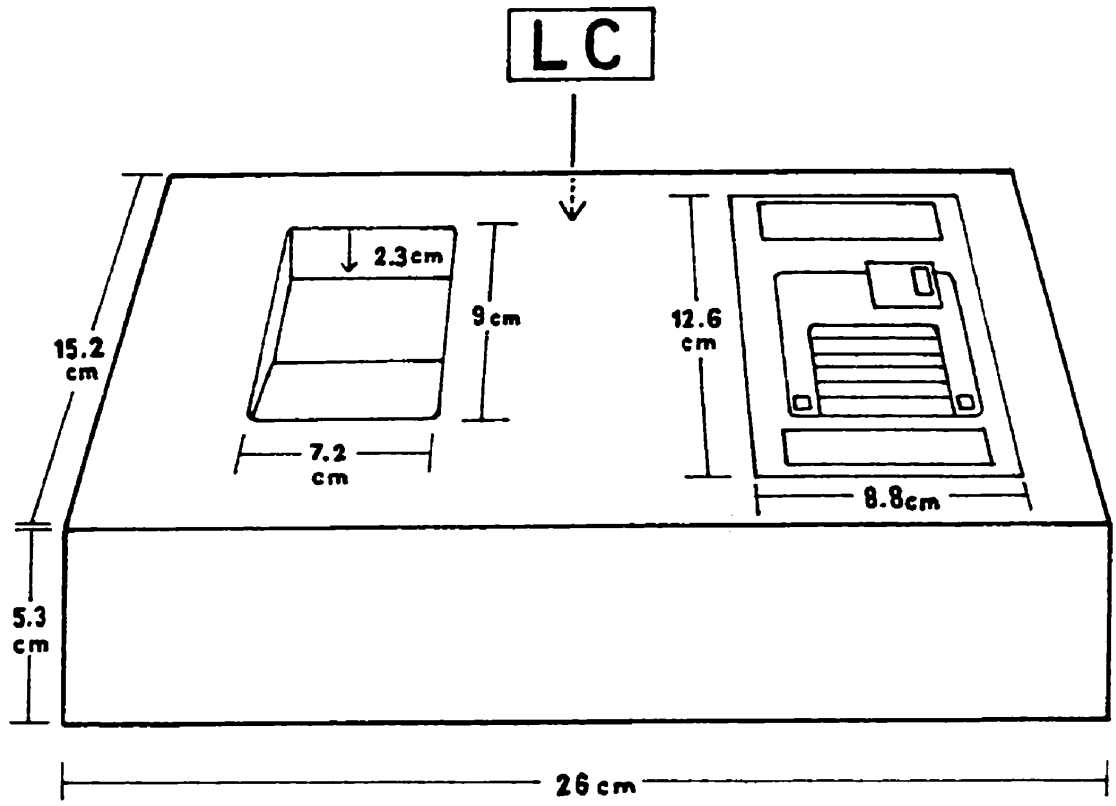

Figure 7. The Platform for Teaching Task 2 with the Multiple Component Technique

(Task 4) was presented on a tray measuring 58 x 30 cm. The containers were placed upside down, with velcro on their bottoms, and velcro was placed on the undersides of the matching star and hourglass blocks. Several trays were prepared so that the incorrect container for each trial could be affixed to the tray (see Figure 8).

Research Design

When Participants A, B, and C, did not initially pass a task using standard prompting and reinforcement, they were then given the multiple component technique for those tasks. For Participant D, for Tasks 1 and 2, the conditions were reversed, and he experienced the multiple component technique first. This was done to control for the order in which the techniques were used. If a participant did not pass a task in 180-260 trials, the experimenter switched methods, and used the other technique that the client had not yet experienced. In this way, the relative effectiveness of the two methods were compared.

The pass criterion remained at 8 consecutive correct independent responses, regardless of the method used. If a client met the pass criterion, then he or she was tested for generalization (see Study 1), then went on to the next task. If a participant was unable to pass a task in 180-260 trials, training on that task was ended, and he or she went on to the next task without generalization testing.

Across participants, Participant A received the comparison on Task 2 (after passing Task 1 with standard prompting and reinforcement), Participant C received the comparison on Tasks 3 and 4 (the VVNM prototype task) (after meeting the pass criterion for Tasks 1 & 2 with standard prompting and reinforcement), Participant B received the comparison on Task 4 (after learning the first 3 tasks with standard prompting and reinforcement), and Participant D received the comparison on Tasks 1 and

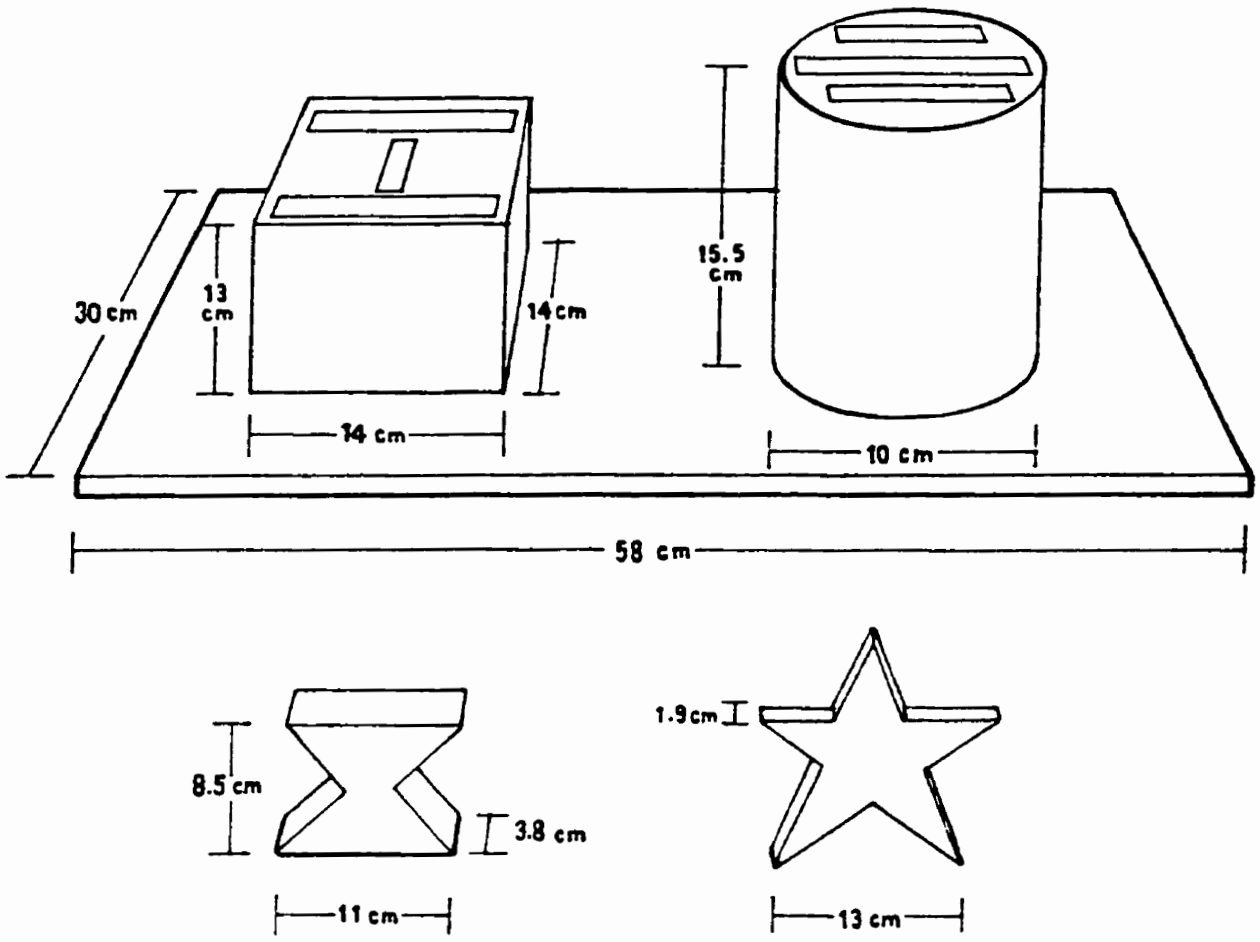

Figure 8. Teaching the VVNM Prototype Task with the Multiple Component Technique

2.

Procedure

The sessions were conducted in the same rooms as in Study 1, except for Participant D, who was taught in the kitchen of his living unit. The reinforcers remained the same as in Study 1.

Standard prompting and reinforcement technique. This procedure was performed as described for Study 1.

Multiple component training technique. The multiple component training technique had five components:

(A). The client was asked to choose three of six edible reinforcers at the beginning of each session. Those three edibles were used as reinforcers for that session, and were rotated sequentially throughout the session (Egel, 1980). The nonedible reinforcers for Participant A were also presented in this manner.

(B). A discovery response-reinforcer relationship was used, where the reinforcer was hidden beneath the correct container out of the client's view. When the client made a correct response, he or she was prompted to lift up the container, and discover the reinforcer beneath it (see Saunders & Sailor, 1979). Clients were also praised for correct responses.

(C). Sessions started with a demonstration of the correct response, a prompted trial and the opportunity for an independent response.

(D). On each trial, a delayed pointing prompt was used. They were implemented and faded out as described in Study 1. Correct responses on prompted trials were not counted toward the pass criterion.

(E). Error interruption was used contingent on the client making errors. The

containers were presented on a tray or platform, and the incorrect container was affixed to the tray. When the client attempted to lift the incorrect object, he or she was prevented from completing the error because it was not possible to lift the wrong container. This gave the participant immediate feedback that the object he or she chose was incorrect. Once the client had attempted to pick up the incorrect container, the teacher removed the tray from the table (to prevent the client from switching to the other container), and paid attention to the data recording sheet for five seconds. Then, the teacher went on to the next trial (see Glenn et al., 1980).

There were 20 trials per block. In most instances, two trial blocks were completed in one session.

Reliability Assessments

The IOR and PR scores (see Appendix L) were determined as described for Study 1. IOR and PR checks were done for 45% of sessions in Study 2. The IOR scores averaged 99.91% for Study 2, with a range of 95-100%, and the PR scores averaged 99.90%, with a range of 95-100%.

IOR checks were performed for 73% of all ABLA and VVNM tests conducted during Study 2. They all demonstrated 100% agreement.

Results

The results from Study 2 are presented in Figure 9. As can be seen in Figure 9, the multiple-component training procedure was not more effective than standard prompting and reinforcement.

Participant A failed to meet the pass criterion for Task 2 using standard prompting and reinforcement techniques after 180 trials. He was still unable to pass after receiving the multiple component technique for 240 trials. Participant B received 200

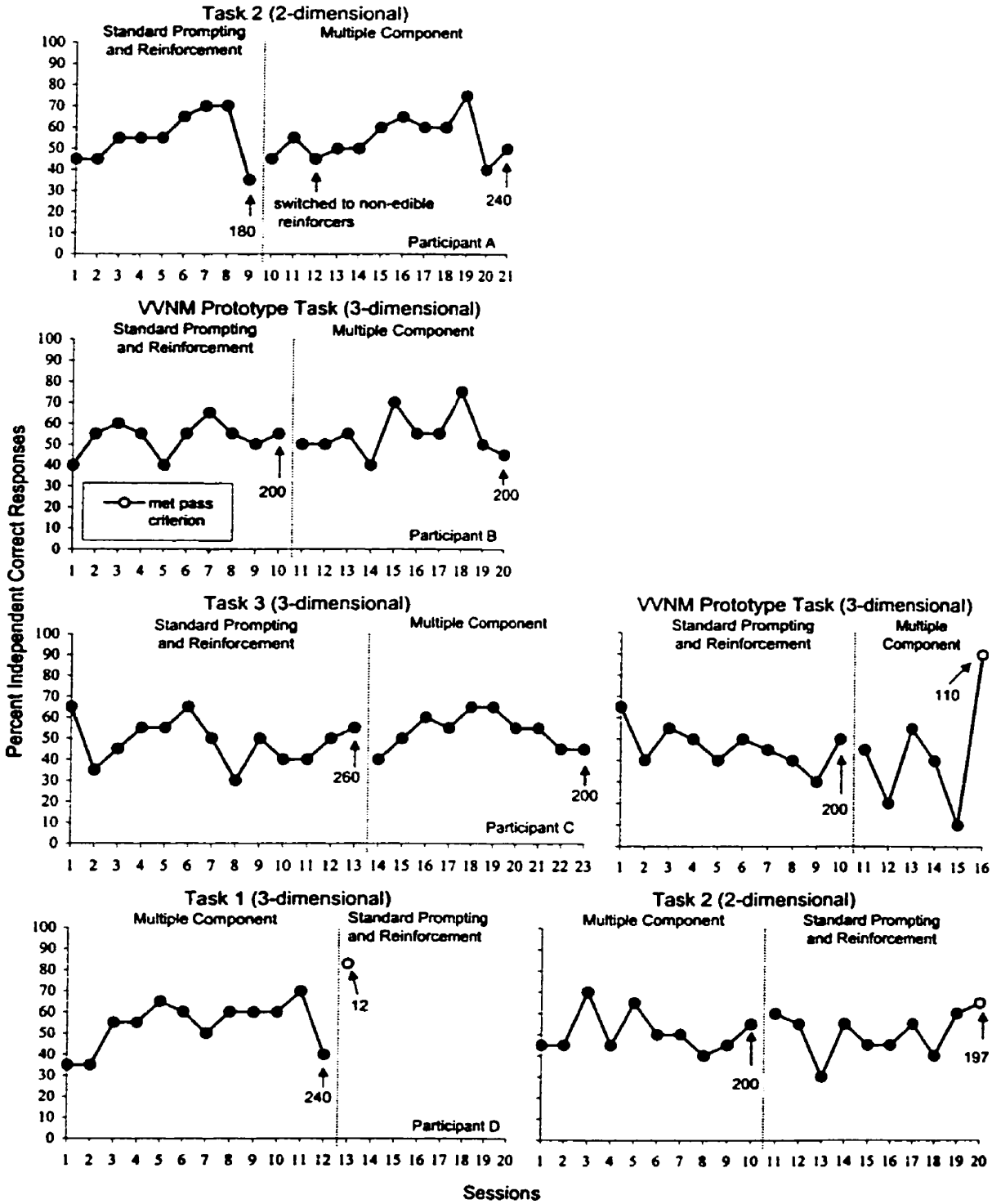

Figure 9. Performance during Standard Prompting and Reinforcement versus a Multiple Component Technique.

trials with the standard prompting and reinforcement technique, and was unable to pass the VVNM prototype task. He was trained for 200 trials with the multiple component technique, but was still unable to learn it. Participant C received the standard prompting and reinforcement technique for Task 3 and the VVNM prototype task, but was unable to meet the pass criterion after 260 and 200 trials, respectively. With the multiple component technique, she was unable to pass Task 3 after 200 trials, but did learn the VVNM prototype task in 110 trials.

Participant D experienced the multiple component technique first, to control for the order in which the methods were presented. On Task 1, he was unable to meet the pass criterion after 240 trials, but with the standard prompting and reinforcement technique, he learned it in 12 trials. For Task 2, he was unable to learn it in 200 trials, but met the pass criterion with standard prompting and reinforcement after 197 trials.

Once the participants learned the various VVNM tasks, they failed to generalize to novel VVNM tasks, regardless of the method that was used. Participant C learned the VVNM prototype task using the multiple component procedure, but she did not generalize to the second generalization task. Participant D learned Tasks 1 and 2, after switching to the standard prompting and reinforcement technique, and also failed to generalize to the VVNM prototype task or the second generalization task.

Following completion of Study 2, an attempt was made to teach Participant D to perform tasks 3 and 4 using standard prompting and reinforcement (see Figure 10). Participant D met the passing criteria for Task 3 after 110 trials, and met the passing criteria for Task 4 after 51 trials. He was unable to pass the VVNM prototype task after meeting the pass criterion for Task 3, and was unable to pass the second generalization task after learning Tasks 3 or 4.

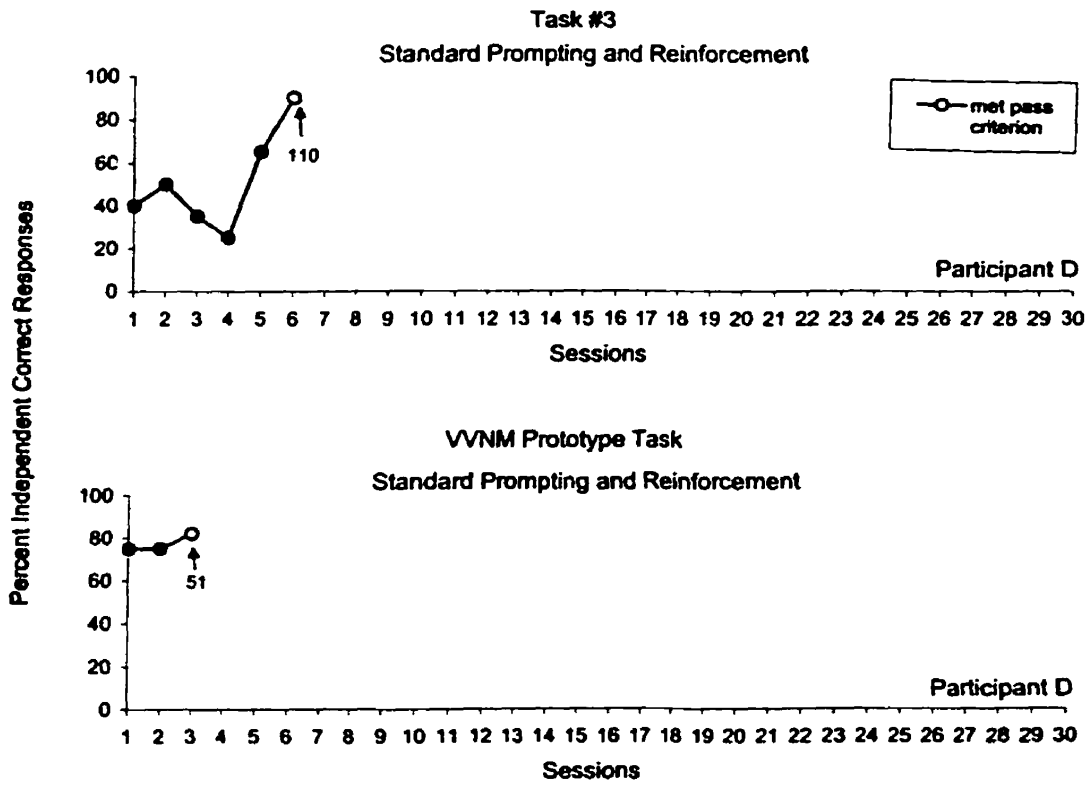

Figure 10. Participant D's Performance on Tasks 3 and 4 using Standard Prompting and Reinforcement.

General Discussion

Study 1 assessed whether VVNM tasks could be taught with the standard prompting and reinforcement technique to participants who had initially failed the VVNM prototype task. Only one of the three participants learned the first VVNM training task in fewer than 100 training trials, the criterion for rapid learning. However, the other two participants both learned a second training task in fewer than 100 trials. Considering that Participant D from Study 2 learned to perform Task 1 in 12 trials of standard prompting and reinforcement, after failing to learn Task 1 after 240 trials of the multiple component training procedure, the results suggest that a failed VVNM task may not be as difficult to teach using standard prompting and reinforcement procedures as failed ABLA levels.

The standard prompting and multiple component procedures used in this study differed from the procedures used in previous studies (see Table 1). This may help account for the relative effectiveness of the standard prompting and reinforcement techniques in this study, and relative ineffectiveness of the multiple component procedure.

The major difference between the standard prompting and reinforcement procedure used in this study from that in previous studies is the differential reinforcement procedure. For this procedure, initial correct responses were reinforced with an edible and praise, where correct responses that occurred after an error correction were only praised. It is possible that, in the previous studies, during phases of standard prompting and reinforcement, the clients were able to receive the edible reinforcer for correct responding during error corrections (Conyers et al., 2000; Yu & Martin, 1986). This would mean that the client may have had had less incentive to respond correctly

Table 1

Comparing the Techniques used to Teach Failed ABLA Levels

	Level 3 Yu & Martin (1986)	Level 4 Hazen et al. (1989)	Level 5 Walker et al. (1991)	Level 6 Conyers et al. (2000)	VVNM Spevack (2001)
Choice of 1 out of 6 edibles at start of session			MCP	SPR	SPR
Edible handed to client	SPR			SPR	SPR
Begin session with demonstration, guided trial, and opportunity for independent response			MCP	SPR MCP	SPR MCP
Extra-stimulus prompt fading	SPR				
ABLA correction procedure after errors	SPR			SPR	SPR
Delayed pointing prompt used if client did not respond			MCP	MCP	SPR MCP
Edibles and praise for initial correct responses, but only praise for correct responses after error correction					SPR
Within-stimulus prompt fading	MCP	MCP			
Discovery reinforcement contingency	MCP	MCP	MCP	MCP	MCP
Error interruption procedure	MCP	MCP	MCP	MCP	MCP
Choice of 3 out of 6 reinforcers at start of session, alternated during session				MCP	MCP
Clients who learned with SPR	2/5, (0/5 rapidly)			0/3	3/3, (1/3 rapidly)
Clients who generalized with SPR	0/5				1/3
Clients who learned with MCP	3/3, (1/3 rapidly)	3/3	3/4	4/4	1/4, (0/4 rapidly)
Clients who generalized with MCP	2/3	2/3	1/3	2/4	0/1

SPR = standard prompting and reinforcement procedure; MCP = multiple component package

Results based on the first attempt to teach a failed level. Rapid learning = <100 trials, learned = 100+ trials.

Generalized means passed the test level/prototype task after learning the training task.

independently. If he or she made an error, the tester would then demonstrate the correct response, and the client then no longer had to match the items, but could have simply imitated the tester. Stated differently, if the client received the same reinforcer for a simple imitative response that would have been available for an initial correct response, then there may have been no motivation to learn to perform the task independently. Regardless of the correctness of the client's response on an initial trial, there would have been an opportunity to obtain the edible reinforcer on a subsequent imitative trial. In the current study, the differential reinforcement procedure may have added this motivation factor to the standard prompting and reinforcement procedure, thus helping the clients to learn the tasks.

For the multiple component procedure, the largest difference between the current procedure and previous ones was the lack of within-stimulus prompt fading in the current procedure. Within-stimulus prompt fading involves exaggerated dimensions between the correct and incorrect items, to make it easier for the client to initially discriminate between them. These prompts are systematically faded out until the client can perform the task with the items at their usual size and/or colour (e.g. Schreibman, 1975). Yu and Martin (1986) and Hazen et al. (1989) used within-stimulus prompt fading in their multiple component procedures, and had great success in teaching the tasks. The Walker et al. (1991) and Conyers et al. (2000) studies found that the multiple component technique was successful without within-stimulus prompt fadingThe first two studies were teaching visual discrimination tasks. The latter two studies were teaching an auditory discrimination task. It may be that for the visual discrimination tasks, within-stimulus prompt fading is an important technique, but that for auditory tasks, it is not required. The multiple component procedure used in the current study was also used to

teach a visual discrimination. It did not have within-stimulus prompt fading, and was not found to be an effective procedure.

The delayed pointing prompt was ineffective for both procedures. The main reason for this was that three of the four participants responded too quickly to experience it. One participant received many pointing prompts, but often made errors, even with these prompts. Touchette and Howard (1984) remarked that a delay seems to be required for the stimulus control of the prompt to be transferred to the task materials. That is why the prompts began delayed. However, perhaps it would be more effective if the prompt was presented at the beginning of the trial, when the object to be matched is given to the client. Then, after several correct responses, the prompt could be increasingly delayed. This would allow all the clients to experience the prompt, and might help them to make fewer errors at the beginning of training. This is important, because errorless learning is more effective than a trial-and-error style for persons with developmental disabilities. A client who makes errors is more likely to make subsequent mistakes, in comparison to a client who has not yet made an incorrect response (Touchette & Howard, 1984).

Another way to make the procedure more effective might be to fade the pointing prompt more slowly. Participant C received many pointing prompts, yet they often did not help her performance. In this study, the pointing prompt was faded out in 5-second increments, after three correct prompted responses at each step. Other studies faded out the prompt in smaller increments, and required more correct responses per step. As well, in previous studies, if the client made a certain number of errors, the prompt was presented sooner (Touchette & Howard, 1984; Yu & Martin, 1986). With smaller fading steps, and more practice at each prompting level, the pointing prompt might have helped Participant C make fewer errors, and learn the tasks faster.

One way to think of the results of this study is in terms of Kerr's (1977) "Christmas Tree" model. From Study 1, when a task was learned, the majority of clients learned it in less than 100 trials. The highest ABLA level that these clients had passed was level 4. For a task to replace level 5 of the ABLA test, it would have to be significantly harder than a level 4 task. In other words, it would have to be on a higher branch of the tree. If the clients had been unable to learn the VVNM tasks using standard prompting and reinforcement, it would demonstrate that VVNM tasks are on a higher branch of the tree. Instead, the clients were able to learn most of them fairly rapidly. This would indicate that the VVNM tasks are merely a more complex form of a match-to-sample task - further out on the same branch.

Across both studies, the participants failed to generalize to the VVNM prototype task, even after receiving training on three different VVNM tasks. One reason for this may be that each task looked very different from the next. As well, the action required for each task was different. For the VVNM prototype task, the sample object was placed inside a container. For Tasks 1 and 3, and during multiple component training of Task 4 for Participants B and C, the sample object was placed on top of the matching object, and for Task 2, a flat card was placed on top of a flat card, which in turn sat upon a small platform. The differences between the topography of the responses required for each task may have hindered the client's ability to generalize to the VVNM prototype task. In order to facilitate generalization, the training task materials could be made more similar to the generalization task materials, and the same physical action could be required to complete them correctly.

In conclusion, the findings of this research suggest three generalizations: (a) based on a very small sample size, failed VVNM tasks may not be as difficult to teach,

using standard prompting and reinforcement, as failed ABLA tasks; (b) learning a minimum of two VVNM training tasks was insufficient to produce generalization to the VVNM prototype task; and (c) a multiple component training procedure that had been effective for teaching failed auditory ABLA levels was not effective for teaching VVNM training tasks.

References

Berkowitz, S. (1990). A comparison of two methods of prompting in training discrimination of communication book pictures by autistic students. Journal of Autism and Developmental Disorders, 20, 255-262.

Casey, L., & Kerr, N. (1977). Auditory-visual discrimination and language production. Rehabilitation Psychology, 24 (Monograph Issue), 137-155.

Conyers, C., Martin, G.L., Yu, D., & Vause, T. (2000). Rapid teaching of a two-choice auditory-visual discrimination to persons with severe developmental disabilities. Journal on Developmental Disabilities, 7, 84-92.

DeWiele, L.A., & Martin, G.L. (1998). The Kerr-Meyerson assessment of basic learning abilities: A self instructional manual. Unpublished manual available from G. Martin, Psychology Department, University of Manitoba, Winnipeg, MB, Canada, R3T 2M6.

Egel, A.L. (1980). The effects of constant versus varied reinforcer presentation on responding by autistic children. Journal of Experimental Child Psychology, 30, 455-463.

Glenn, S.S., Whaley, D.L., Ward, R., & Buck, R.W. (1980). Obtaining color discriminations in developmentally disabled children by disrupting response stereotyping. Behavior Research of Severe Developmental Disabilities, 1, 175-189.

Goodman, R. (2000). Visual-visual nonidentity matching: Its position in the ABLA hierarchy and its predictive validity. Unpublished honours thesis, University of Manitoba, Winnipeg, Canada.

Hazen, A., Szendrei, V., & Martin, G.L. (1989). The AVC discrimination test: A valuable tool for teachers of developmentally disabled persons. Journal of Practical Approaches to Developmental Handicap, 13, 7-13.

Kerr, N. (1977). Implications of results for theory and practice: The "christmas tree" model. Rehabilitation Psychology, 24 (Monograph Issue), 133-136.

Kerr, N., Meyerson, L., & Flora, J.A. (1977). The measurement of motor, visual and auditory discrimination skills. Rehabilitation Psychology, 24 (Monograph Issue), 95-112.

Koegel, R., & Williams, J. (1980). Direct versus indirect response-reinforcer relationships in teaching autistic children. Journal of Abnormal Child Psychology, 8, 537-547.

Martin, G.L., & Pear, J. (1996). Behavior modification: what it is and how to do it (5th ed.). New Jersey: Prentice Hall.

Martin, G.L., & Yu, D. (2000). Overview of research on the Assessment of Basic Learning Abilities test. Journal on Developmental Disabilities, 7, 10-36.

Martin, G.L., Yu, D., Quinn, G., & Patterson, S. (1983). Measurement and training of AVC discrimination skills: Independent confirmation and extension. Rehabilitation Psychology, 28, 231-237.

McDonald, L., & Martin, G.L. (1993). Facilitating discrimination learning for persons with developmental disabilities. International Journal of Rehabilitation Research, 16, 160-164.

Meyerson, L. (1977). AVC behavior and attempts to modify it. Rehabilitation Psychology, 24 (Monograph Issue), 119-122.

Saunders, R.R., & Sailor, W. (1979). A comparison of three strategies of reinforcement on two-choice learning problems with severely retarded children. AAESPH Review, 4, 323-333.

Schreibman, L. (1975). Effects of within-stimulus and extra-stimulus prompting

on discrimination learning in autistic children. Journal of Applied Behavior Analysis, 8, 91-112.

Stubbings, V., & Martin, G.L. (1998). Matching training tasks to abilities of people with mental retardation: A learning test versus experienced staff. American Journal on Mental Retardation, 102, 473-484.

Tharinger, D., Schallert, D., & Kerr, N. (1977). Use of AVC tasks to predict classroom learning in mentally retarded children. Rehabilitation Psychology, 24 (Monograph Issue), 113-118.

Touchette, P.E., & Howard, J.S. (1984). Errorless learning: Reinforcement contingencies and stimulus control transfer in delayed prompting. Journal of Applied Behavior Analysis, 2, 175-188.

Wacker, D.P., Kerr, N.J., & Carroll, J.L. (1983). Discrimination skill as a predictor of prevocational performance of institutionalized mentally retarded clients. Rehabilitation Psychology, 28, 45-59.

Walker, J., Martin, G.L., & Graham, M. (1991). Rapid teaching of an auditory two-choice discrimination to severely mentally handicapped persons. Journal of Practical Approaches to Developmental Handicap, 15, 8-11.

Yu, D., & Martin, G.L. (1986). Comparison of two procedures to teach visual discriminations to severely handicapped persons. Journal of Practical Approaches to Developmental Handicap, 10, 7-12.

Yu, D., Martin, G.L., & Williams, L. (1989). Expanded assessment for discrimination learning with the developmentally handicapped: A practical strategy for research and training. American Journal on Mental Retardation, 94, 161-169.

Appendix A

Project Description and Consent Form

Project title: Teaching visual-visual nonidentity matching tasks

You are being asked consent for your son/daughter to participate in a project in which we will compare two procedures to teach a visual-visual non-identity matching (VVNM) task. A VVNM task is one in which you learn that two objects go together, even though they are different. Examples of everyday VVNM tasks involve learning to match a sock to a shoe, or a pencil to a piece of paper. This project is being run by Sara Spevack, through the supervision of Dr. Garry Martin of the University of Manitoba, and has been approved by the University of Manitoba human ethics review committee.

What is the study about?
We will first try to teach to him/her a VVNM task using standard prompting and reinforcement procedures. These are the procedures that St. Amant staff would typically use to teach the task. If he/she does not learn the task within a reasonable period of time using standard prompting and reinforcement, then we will try to teach the VVNM task using a new instructional package that emphasizes a different way of providing prompts and reinforcers. We think that the new instructional package will be more effective than standard prompting and reinforcement, and that it will help him/her to learn to perform VVNM tasks more quickly.

How can you help, and how much time will it take?
If you take part in this study, I will:

1. Do an assessment of his/her visual and auditory discriminations to discover what sorts of tasks he/she can readily learn
2. Do an assessment to see if he/she is able to do a VVNM task
3. If he/she does not know how to do the task, I will do a small number of teaching sessions, to see if he/she can learn it quickly using standard prompting and reinforcement techniques (demonstration, guided practice, independent practice)
4. If he/she is able to learn it, great! If not, I will try again, using a new teaching package (with error prevention, delayed prompting, direct response-reinforcer relationship)

The study will take approximately two one-hour sessions per week, and will be completed within six months.

Is participation voluntary?
Yes. Participation is voluntary. Whether your son/daughter participates in this study or not will not affect any services he/she may be receiving now or in the future from the St. Amant Centre or from the University of Manitoba.

Can he/she stop at any time?
Yes. Even after agreeing to participate, he/she can stop at any time and for any reason. It will not affect any services he/she may be receiving now or in the future.

Will all personal information be kept confidential?
Yes. The identities of all participants will be kept strictly confidential. All data collected during the study will be kept in a locked office and will be accessible only to the researchers. Any presentations, reports, or publications as a result of this project will not contain any identifying information.

What are the risks in taking part in the study?
The teaching procedures in this study will involve modeling, verbal prompting, pointing prompts, error prevention, and positive reinforcement (praise and/or edibles, if health allows). These are commonly used procedures and there is no risk to the participants. We will stop a session immediately if the participant gives any indication that he/she wishes to leave or stop.

What are the benefits of taking part in the study?
We will be attempting to teach to each participant a VVNM task, if he/she is not already able to do it. If we

are successful, each participant may be better able to learn other, similar tasks in his/her daily routine. This study will also show if this task is a good assessment task, which may in turn help us to learn more about other clients, and the types of tasks that they are able to learn rapidly.

Will participating cost anything?
No.

Will there be compensation for participating?
No. There is no financial compensation for participating.

Who should I call if I have questions or concerns about the project?
If you have any questions or concerns about the project, please call either: Sara Spevack (Research Assistant), 256-4301 ext. 438, or Dr. Garry Martin, 474-8589.

What should I do if I am interested?
If you are a family member or an advocate, but are not the legal guardian, we would like your support for the participant to take part in this project. Please sign the next section, *Support of Family/Advocate*, to indicate your support. The person(s) with legal authority to give consent should sign in the section, *Signature of Person Legally Authorized to Give Consent*, at the bottom of the page.

Support of Family/Advocate (if family is not the legal guardian)

I support the participation of (print name of participant) _____ in this project.

_____	_____	_____
Print Name of Parent/Advocate	Signature of Parent/Advocate	Date

Signature of Person Legally Authorized to Give Consent

By signing this form, I give consent for (print name of participant) _____ to participate in the above named research project. I am aware that he/she may stop at any time with no impact upon the services that the participant is receiving or may receive in the future. I agree to allow project staff to:

- Gather demographics and diagnostic information about the participant from the clinical/agency records
- Assess the client on the ABLA test and the non-identity object matching task
- Perform teaching sessions with the standard prompting and reinforcement technique
- If necessary, run teaching sessions with the multiple-component technique

_____	_____	_____
Print Name of Person Legally Authorized to Give Consent	Signature of Person Legally Authorized to Give Consent	Date

Appendix B

ABLA Test Data Sheet from DeWiele & Martin (1998, pp.50-51)

Data Sheet For ABLA Test

Subject_____ Tester_____ Observer_____ Date _____

Instructions: If response is correct, circle trial number. If response is incorrect, place X on trial number. Pass is 8 consecutive correct. Discontinue when 8 errors have accumulated. Errors on correction trials should be underlined. If a student corrects an error during a correction trial, do not record a correct trial.

Level 1 (Imitation) *Passing criterion includes 8 consecutive correct trials as follows:*
- *2 trails with foam + box*
- *2 trials with cube + box*
- *2 trials with foam + can*
- *2 trials with cylinder + can*

Red Box:	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*
Yellow Can:	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*

Level 2 (Position) *Correct container is yellow can (can & box remain stable)*

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

Level 3 (Visual) *'L' and 'R' indicate correct placement of can, left or right. Correct response is foam in can.*

L	R	L	L	R	L	R	R	R	L	L	R	L	R	R	L
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
L	L	R	L	R	R	L	R	R	R	L	R	L	L	R	L
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
L	R	R	L	R	L	L	R								
33	34	35	36	37	38	39	40								

Level 4 (Match to Sample) *'L' and 'R' indicate correct placement of can. 'B' indicates Box, present cube. 'C' indicates Can, present cylinder.*

R	R	L	R	L	L	R	L	L	L	R	R	R	L	L	R
C	B	B	C	C	B	B	C	B	C	B	C	B	B	C	B
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
L	L	R	L	R	R	L	R	L	R	L	L	R	R	L	L
B	C	C	C	B	C	B	B	B	B	C	C	C	B	B	C
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
L	R	L	L	R	R	L	L								
B	B	C	C	C	B	B	C								
33	34	35	36	37	38	39	40								

Level 5 (Auditory) *Containers remain stable. Ask for Red Box (B) or Yellow Can (C).*

B	B	C	B	C	C	B	C	C	B	C	C	B	C	B	B
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	B	B	C	B	C	C	B	B	C	B	B	C	B	C	C
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
B	C	C	B	C	B	B	C								
33	34	35	36	37	38	39	40								

Level 6 (AVC) *'L' and 'R' indicate correct placement of can. Ask for Red Box (B) or Yellow Can (C).*

R	R	L	L	R	R	L	L	L	L	R	R	L	L	R	R
B	C	C	B	C	B	C	B	C	C	B	C	B	B	B	C
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
L	L	R	L	R	R	L	L	R	L	R	R	L	L	R	R
C	C	B	C	B	C	C	B	B	C	B	B	C	C	B	C
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
L	L	R	L	L	R	R	R	L							
C	B	B	C	C	B	B	B	C							
32	33	34	35	36	37	38	39	40							

Appendix C

Prototype VVNM Task Test Sheet

Date:
Participant:
Tester:
IOR:

'L' and 'R' indicate position of can
'H' indicates hourglass, match to box; 'S' indicates star, match to can

H	S	S	H	H	S	S	H	S	H	S	H	S	S	S	H
R	R	L	R	L	L	R	L	L	L	R	R	R	L	L	R
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

H	H	S	H	S	S	S	H	H	H	S	S	H	H	S	H
L	L	R	L	R	R	L	R	L	R	L	L	R	R	L	L
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

Appendix D

Data Sheet for Task 1

Participant:
Tester:
IOR:

"L" and "R" indicate position of cup
"H" indicates hexagon, match to cup; "T" indicates triangle, match to bowl

Date

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
L	L	R	R	L	R	L	R	R	L	L	R	R	L	R	R	L	L	L	R
H	T	H	H	T	T	H	T	T	H	H	T	T	T	H	H	H	T	H	T

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
L	R	L	R	R	L	L	R	R	L	L	R	L	R	L	L	R	R	L	R
H	T	H	H	T	T	H	H	T	T	H	T	T	H	H	H	T	T	T	H

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
R	L	L	L	R	L	L	R	R	R	L	R	R	L	L	L	R	L	R	L
T	H	T	H	T	T	T	H	T	H	T	T	H	H	H	T	T	H	H	H

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
L	R	R	L	L	R	R	L	R	L	R	L	R	R	L	L	R	L	L	R
H	H	T	H	T	T	H	T	T	T	H	T	T	H	H	H	T	H	H	T

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
R	L	R	L	R	R	L	R	L	L	L	R	R	R	L	L	R	L	L	R
H	H	T	T	T	H	H	H	T	H	T	T	H	H	T	T	H	H	T	T

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
L	R	R	R	L	R	L	L	L	R	R	L	L	L	R	L	R	L	R	R
T	T	H	H	H	T	H	T	T	H	H	T	T	H	H	H	T	T	H	T

Appendix E

Generalization Task 2 Test Sheet

Date:
Participant:
Tester:
IOR:

'L' and 'R' indicate position of saw
'H' indicates horse; 'S' indicates saw

H	S	S	H	H	S	S	H	S	H	S	H	S	S	S	H
R	R	L	R	L	L	R	L	L	L	R	R	R	L	L	R
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

H	H	S	H	S	S	S	H	H	H	S	S	H	H	S	H
L	L	R	L	R	R	L	R	L	R	L	L	R	R	L	L
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

Appendix F

Data Sheet for Task 2

Participant:
Tester:
IOR:

"L" and "R" indicate position of disk
"d" indicates disk; "C" indicates cactus

Date

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
L	L	R	R	L	R	L	R	R	L	L	R	R	L	R	R	L	L	L	R
d	C	d	d	C	C	d	C	C	d	d	C	C	C	d	d	d	C	d	C

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
L	R	L	R	R	L	L	R	R	L	L	R	L	R	L	L	R	R	L	R
d	C	d	d	C	C	d	d	C	C	d	C	C	d	d	d	C	C	C	d

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
R	L	L	L	R	L	L	R	R	R	L	R	R	L	L	L	R	L	R	L
C	d	C	d	C	C	C	d	C	d	C	C	d	d	d	C	C	d	d	d

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
L	R	R	L	L	R	R	L	R	L	R	L	R	R	L	L	R	L	L	R
d	d	C	d	C	C	d	C	C	C	d	C	C	d	d	d	C	d	d	C

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
R	L	R	L	R	R	L	R	L	L	L	R	R	R	L	L	R	L	L	R
d	d	C	C	C	d	d	d	C	d	C	C	d	d	C	C	d	d	C	C

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
L	R	R	R	L	R	L	L	L	R	R	L	L	L	R	L	R	L	R	R
C	C	d	d	d	C	d	C	C	d	d	C	C	d	d	d	C	C	d	C

Appendix G

Task 3 Test Sheet

Date:
Participant:
Tester:
IOR:

'L' and 'R' indicate position of heart
'P' indicates popsicle stick; 'S' indicates star, match to heart

P	S	S	P	P	S	S	P	S	P	S	P	S	S	S	P
R	R	L	R	L	L	R	L	L	L	R	R	R	L	L	R
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

P	P	S	P	S	S	S	P	P	P	S	S	P	P	S	P
L	L	R	L	R	R	L	R	L	R	L	L	R	R	L	L
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

Appendix H

Data Sheet for Task 3

Participant:
Tester:
IOR:

"L" and "R" indicate position of heart
"S" = star, match to heart; "P" = popsicle stick, match to box

Date

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
L	L	R	R	L	R	L	R	R	L	L	R	R	L	R	R	L	L	L	R
S	P	S	S	P	P	S	P	P	S	S	P	P	P	S	S	S	P	S	P

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
L	R	L	R	R	L	L	R	R	L	L	R	L	R	L	L	R	R	L	R
S	P	S	S	P	P	S	S	P	P	S	P	P	S	S	S	P	P	P	S

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
R	L	L	L	R	L	L	R	R	R	L	R	R	L	L	L	R	L	R	L
P	S	P	S	P	P	P	S	P	S	P	P	S	S	S	P	P	S	S	S

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
L	R	R	L	L	R	R	L	R	L	R	L	R	R	L	L	R	L	L	R
S	S	P	S	P	P	S	P	P	P	S	P	P	S	S	S	P	S	S	P

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
R	L	R	L	R	R	L	R	L	L	L	R	R	R	L	L	R	L	L	R
S	S	P	P	P	S	S	S	P	S	P	P	S	S	P	P	S	S	P	P

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
L	R	R	R	L	R	L	L	L	R	R	L	L	L	R	L	R	L	R	R
P	P	S	S	S	P	S	P	P	S	S	P	P	S	S	S	P	P	S	P

Appendix I

Task 2 Test Sheet

Date:
Participant:
Tester:
IOR:

'L' and 'R' indicate position of disk
'd' indicates disk; 'C' indicates cactus

d	C	C	d	d	C	C	d	C	d	C	d	C	C	C	d
R	R	L	R	L	L	R	L	L	L	R	R	R	L	L	R
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

d	d	C	d	C	C	C	d	d	d	C	C	d	d	C	d
L	L	R	L	R	R	L	R	L	R	L	L	R	R	L	L
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

Appendix J

Data Sheet for Training VVNM Prototype Task

Participant:
Tester:
IOR:

"L" and "R" indicate position of can
"S" = star, match to can; "H" = hourglass, match to box

Date

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
L	L	R	R	L	R	L	R	R	L	L	R	R	L	R	R	L	L	L	R
S	H	S	S	H	H	S	H	H	S	S	H	H	H	S	S	S	H	S	H

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
L	R	L	R	R	L	L	R	R	L	L	R	L	R	L	L	R	R	L	R
S	H	S	S	H	H	S	S	H	H	S	H	H	S	S	S	H	H	H	S

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
R	L	L	L	R	L	L	R	R	R	L	R	R	L	L	L	R	L	R	L
H	S	H	S	H	H	H	S	H	S	H	H	S	S	S	H	H	S	S	S

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
L	R	R	L	L	R	R	L	R	L	R	L	R	R	L	L	R	L	L	R
S	S	H	S	H	H	S	H	H	H	S	H	H	S	S	S	H	S	S	H

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
R	L	R	L	R	R	L	R	L	L	L	R	R	R	L	L	R	L	L	R
S	S	H	H	H	S	S	S	H	S	H	H	S	S	H	H	S	S	H	H

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
L	R	R	R	L	R	L	L	L	R	R	L	L	L	R	L	R	L	R	R
H	H	S	S	S	H	S	H	H	S	S	H	H	S	S	S	H	H	S	H

Appendix K

Procedural Reliability Checklist for the Standard Prompting and Reinforcement Technique

Procedural Reliability - Standard Prompting and Reinforcement Technique

	Demo 1	Demo 2	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Trial 7	Trial 8	Trial 9	Trial 10	Trial 11	Trial 12	Trial 13
New Session:															
Demonstration															
Prompted Trial															
Independent Resp															
Steps of task:															
Containers in Correct Position															
Offer Correct Object															
Correct Verbal Cue															
Delayed Pointing															
Praise Correct Resp															
Give Edible															
Error Correction:															
Demonstration															
Prompted Trial															
Independent Resp															
Praise Correct Resp															
New Error Correction															

	Trial 14	Trial 15	Trial 16	Trial 17	Trial 18	Trial 19	Trial 20
Steps of task:							
Containers in Correct Position							
Offer Correct Object							
Correct Verbal Cue							
Delayed Pointing							
Praise Correct Resp							
Give Edible							
Error Correction:							
Demonstration							
Prompted Trial							
Independent Resp							
Praise Correct Resp							
New Error Correction							

Date:

Participant:

Teacher:

PR:

Choice of Reinforcer:

Appendix L

Procedural Reliability Checklist for the Multiple Component Technique

Procedural Reliability - Multiple Component Technique

	Demo 1	Demo 2	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Trial 7	Trial 8	Trial 9	Trial 10	Trial 11	Trial 12	Trial 13
New Session:															
Demonstration															
Prompted Trial															
Independent Resp															
Steps of task:															
Containers in Correct Position															
Offer Correct Object															
Correct Verbal Cue															
Delayed Pointing															
Praise Correct Resp															
Edible Hidden Under															
Varied Edible															
Error:															
Tray Removed Promptly															
Focus on Paper															

	Trial 14	Trial 15	Trial 16	Trial 17	Trial 18	Trial 19	Trial 20
Steps of task:							
Containers in Correct Position							
Offer Correct Object							
Correct Verbal Cue							
Delayed Pointing							
Praise Correct Resp							
Edible Hidden Under							
Varied Edible							
Error:							
Tray Removed Promptly							
Focus on Paper							

Date:

Participant:

Teacher:

PR:

Choices for Reinforcers:

1

2

3