2005

The effects of discrimination training on choice-making accuracy during symbolic perference assessment formats

Christina Marie Vorndran
Louisiana State University and Agricultural and Mechanical College

THE EFFECTS OF DISCRIMINATION TRAINING ON CHOICE-MAKING ACCURACY DURING SYMBOLIC PREFERENCE ASSESSMENT FORMATS

A Dissertation
Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

The Department of Psychology

by
Christina Marie Vorndran
B.S., Saint Joseph's University, 1995
M.A., Louisiana State University, 2001
December 2005

Dedication

My mother, Mary, passed away when I was 12 years old. I know that she would be proud of me for this. It wasn't until I became a mother that I finally understood how hard it must have been for you to leave us behind.

My brother, Henry, was my inspiration for pursuing a career helping individuals with disabilities. In just 22 short years, he captured the hearts of so many and taught us that life is worth living right up until the end. You always were and always will be "my sunshine."

I dedicate this dissertation in their memory.

Acknowledgements

I would like to thank my family for their love and support throughout my life. To my father, Henry, although you are a man of few words, I know how proud you are of me and it really means a lot to me. To my Aunt Rita and Aunt Clara for their immeasurable and unwavering commitment to a father and his four children, words cannot express my gratitude. With you, I have been blessed with three mothers in this life.

To Gary and Terry, you both have supported me in numerous ways throughout this process. You believed in me and for that I will be forever grateful.

I would like to thank the participants and their families for agreeing to participate in this project, and Brenda and all the clinical associates at the Lindens for their assistance with data collection.

Sometimes a single decision affects your life in ways you could never have imagined. In 1998, I decided to accept an offer to work with Dorothea Lerman at Louisiana State University. During the seven years since making that choice, I have been a grateful recipient of one of the best shaping and differential reinforcement teaching processes. Thank you, Dorothy, for your patience and commitment to me over those seven years.

Finally, to my husband, Jim, you have complemented me perfectly both professionally and personally. Going through this process together has been both one of the most challenging and rewarding experiences of my life. I am grateful to be sharing my life with a best friend and a colleague I respect. This is just the beginning…. All my love, loyalty, and friendship.

Table of Contents

Abstract

The right of individuals with developmental disabilities to live fulfilling and normalized lives has been a focus of federal legislation and applied research over the past 30 years. Research has primarily focused on the identification and incorporation of preferred items and activities into the home and community environments of these individuals. Because of cognitive and communication limitations, some individuals with developmental disabilities require training to make choices that accurately reflect their preferences. Verbal choice methods are commonly used in everyday clinical practice; however, the accuracy of these methods for identifying actual preferences depends on the individual's ability to make auditory discriminations. Discrimination training is a strategy commonly used to teach a variety of discriminations to individuals with developmental disabilities. However, no studies to date have evaluated the efficacy of discrimination training for teaching individuals with developmental disabilities to make auditory discriminations for the purpose of improving choice-making accuracy during symbolic preference assessments.

The present study evaluated the direct and generalized effects of discrimination training on the choice-making abilities of three individuals with developmental disabilities. Results indicated that training was successful for improving choice-making accuracy for all three participants when a limited number of choices was presented. A generalization strategy of training multiple choice exemplars was moderately successful in transferring the effects of training to choices in the context of a larger assessment.

Introduction

The Administration on Developmental Disabilities (ADD) estimates that developmental disabilities currently affect over 4.5 million people in the United States (ADD, 2005). According to the Developmental Disabilities Assistance and Bill of Rights Act of 2000, developmental disabilities are characterized by severe mental and/or physical impairments that are manifested before age 22 and likely to persist (P.L. 98-527). Limitations can be seen in multiple areas of functioning, including self-care, physical mobility, learning, and communication. Historically, individuals with developmental disabilities have been considered "uneducable" (see Pennsylvania Association for Retarded Children v. Commonwealth of PA, 1972, for an example). Federal legislation over the past 30 years has significantly changed the rights and lives of individuals with disabilities in the United States. Furthermore, research has demonstrated that individuals with developmental disabilities can be educated through techniques such as instructional prompting and reinforcement.

The above issue of educating individuals with developmental disabilities will be addressed in greater detail in the following sections. The importance of incorporating individual preferences into the home, school, and work environments of individuals with disabilities will be discussed, along with a comprehensive review of the different methods for identifying preferences. Finally, a summary of the literature on strategies for teaching discriminations to individuals with autism and other developmental disabilities will be discussed. Variables believed to affect the acquisition, maintenance, and generalization of discrimination skills will be highlighted.

Choice Movement

The choice movement had its infancy in the federal right to habilitation laws of the 1970s (e.g., The Rehabilitation Act of 1973, The Education for all Handicapped Children Act of 1975). Over the last two decades, an increasing number of authors have advocated for providing individuals with disabilities the right to make choices. The majority of discussions focused on the importance of choice-making opportunities to the overall quality of life for persons with disabilities (see Bannerman, Sheldon, Sherman, & Harchik, 1990, for a discussion). For example, choice can be seen as a means of incorporating the preferences of individuals into their daily home, school, and work environments. Choice also allows clinicians to identify and use the most potent reinforcers, thus enhancing learning and performance. Research has demonstrated that choice may be associated with increases in appropriate behavior, improvements in task performance, and decreases in problem behavior (see Kern et al., 1998, for a review). Furthermore, the right to make choices allows for a more normalized lifestyle and thus should be a goal of all who serve individuals with disabilities.

Clinicians often resort to indirect measures of preference when an individual's communication or choice-making skills are significantly limited. Indirect assessment methods, which involve asking caregivers about an individual's preferences, are susceptible to a high error rate (Green et al., 1988; Green, Reid, Canipe, & Gardner, 1991). Green et al. (1988), for example, evaluated the relative preference and reinforcing value of 12 stimuli that were identified via a staff opinion survey versus a direct assessment of approach and avoidance responses for individuals with profound disabilities. Results indicated that staff opinion often did not match the results of the systematic assessment. Furthermore, the reinforcing efficacy of the stimuli was not consistently predicted by staff opinion. Despite this and other studies

demonstrating the inaccuracies of self- and caregiver-report measures, indirect methods continue to be recommended in the literature (Kincaid, 1996; O'Brien, 1987). In fact, person-centered planning is an indirect method that has been mandated by several states' laws (Hagner, Helm, & Butterworth, 1996).

Person-centered planning is a widespread practice that utilizes self-report and caregiver opinion to identify leisure and vocational activities for individuals with developmental disabilities (Reid, Everson, & Green, 1999). For example, the use of "mapping" has been presented as a method for identifying an individual's likes and dislikes in leisure, interpersonal, and vocational domains (Everson, 1996). Using this approach, caregivers provide opinions regarding the individual's preferences in a semi-structured interview format. Although the goal of person-centered planning is to incorporate client preferences into programs, research demonstrating the accuracy of this process is limited. In a notable exception, Reid et al. (1999) evaluated the efficacy of person-centered planning meetings for identifying reinforcers for four individuals with multiple disabilities. Reid et al. systematically evaluated approach and avoidance responses made toward a sample of food and leisure items or activities that were selected via person-centered planning. Results indicated that for two participants, 25% to 40% of the items were identified as non-preferred by the systematic assessment. All sampled items and activities were identified as moderately but not highly preferred for a third participant. These results indicate that person-centered planning alone is not sufficient for identifying preferences of individuals with multiple disabilities.

Direct methods of assessing preferences have been effective in identifying reinforcers for individuals with developmental disabilities, including those with limited receptive and expressive language skills. These systematic assessments will be described in the next section.

Systematic Preference Assessments

As indicated by the research described above, indirect assessment methods (e.g., caregiver-report) have questionable validity. Furthermore, self-report may be particularly difficult to obtain for individuals with disabilities due to limited receptive and expressive communication skills. An alternative to indirect assessment is direct, systematic evaluation of preference. Most studies on direct assessment involved the presentation of choices in some tangible format (e.g., the tested objects were placed within reach). The degree of preference was determined by measuring observable behaviors (e.g., physical approach, duration of engagement with the object). This method has been demonstrated to be highly effective for identifying the preferences of individuals with developmental disabilities, as discussed in more detail below.

Overall, research has demonstrated that individuals with severe disabilities have preferences that are distinct and dynamic (Green et al., 1988; see Lohrmann-O'Rourke, & Browder, 1998, for a review). However, not all systematic assessments are alike. Depending on the assessment needs and the individual's level of functioning or specific disability, methods for assessing preferences can be altered. Specifically, the stimuli to be assessed, the selection response required, and the presentation format used can be adapted to meet the needs of the assessment (see Lohrmann-O'Rourke, & Browder, 1998, for a discussion). Assessment needs can be divided into two categories: efficiency and precision. A simpler or faster administration may be required in some cases. In other cases, simplicity and speed may be less important than the need to identify a comprehensive ranking of preferences across a group of stimuli or activities.

Presentation Methods

The majority of preference assessments conducted with individuals with severe disabilities included the presentation of the tested items to the individual in some manner to identify preferences for leisure and food items (hereafter termed "tangible assessments" because the evaluation included actual objects). The various presentation methods have included single (Pace, Ivancic, Edwards, Iwata, & Page, 1985), paired-choice (Fisher et al., 1992; Mason, McGee, Farmer-Dougan, & Risley, 1989), and multiple-stimulus (DeLeon & Iwata, 1996; Windsor, Piche, & Locke, 1994) formats. Preference for one stimulus relative to others was determined by measuring an approach response (Fisher et al.) or the duration of engagement with each item (DeLeon & Iwata; Roane, Vollmer, Ringdahl, & Marcus, 1998).

Each procedural variation differs with respect to its strengths and weaknesses. Pace et al. (1985) developed the single presentation method as an alternative to indirect methods for assessing preferences and identifying reinforcers for individuals with multiple disabilities. Items were presented one at a time for 5 s. If the participant approached the item, 5 s of access to the item was provided. If an item was not approached within 5 s, the participant was prompted to sample the item, followed by a second opportunity to approach it. Items approached on at least 80% of the trials were considered "highly preferred" and predicted to function as reinforcers. Results indicated that the single stimulus method was effective for identifying reinforcing stimuli for six participants. Advantages of the single-stimulus method include ease, speed of administration, and ability to identify a wide variety of potential reinforcers. However, this method also has been shown to identify false positives (Fisher et al., 1992). That is, some items approached during the assessment do not function as actual reinforcers for that individual.

Fisher et al. (1992) compared the single presentation method to an alternative method, during which items were presented in pairs and participants were told to "pick one." Fisher et al. proposed this paired-choice method as an alternative to the single presentation method so that a more distinct hierarchy of preferences could be established. Results indicated that the paired-choice method was superior with respect to identifying a distinct hierarchy of preferences and was not associated with false positives. Furthermore, Piazza, Fisher, Hagopian, Bowman, and Toole (1996) showed that relative preference as determined via the paired-choice method correlated well with relative reinforcer efficacy. However, the paired-choice method can be lengthy to administer. In addition, some individuals cannot tolerate the frequent removal of preferred items, resulting in an increase in problem behavior (Roane et al., 1998).

Windsor et al. (1994) compared the paired-choice method to an alternative method, called the multiple-stimulus method, which was designed to identify a distinct hierarchy of preferences in less time than the paired-choice format. Participants were presented with an identical array of six items on each trial and asked to "pick one." The same highest preference item was identified via both methods, but the paired-choice method produced a more distinct ranking of preferences across the items. In particular, some of the items were never selected during the multiple stimulus method because the individual's highest preference items were available (and, thus, selected) on every trial, resulting in false negatives. These results suggest that the paired-choice method may be preferable to the multiple-stimulus method when a distinct ranking of preferences is desired.

DeLeon and Iwata (1996) extended this study by adapting the multiple-stimulus method described by Windsor et al. (1994) such that the item selected on each trial was removed from the array during subsequent trials. This method, called multiple-stimulus without replacement

(MSWO), greatly improved the reliability and validity of the multiple-stimulus method. Instead of selecting the same one or two items on every trial, participants are required to select from among previously unselected items on each trial. As with the single-stimulus method, the multiple-stimulus methods are easy and efficient to administer. Moreover, as with the paired-choice method, the MSWO format has been shown to identify a distinct ranking of preferences (DeLeon & Iwata). These strengths are important when frequent and brief assessments of preference are needed (e.g., when offering choices within the context of daily work sessions). Nevertheless, the multiple stimulus method is not always indicated. For example, the single-stimulus or paired-choice methods may be more appropriate for individuals who have visual impairment (Paclawskyj & Vollmer, 1995) or difficulty making choices from among a large array of items for other reasons.

Symbolic Presentation Formats

As noted above, the actual objects being evaluated were presented to the individual in most research on systematic preference assessments. However, within the past 10 years, an increasing number of studies have evaluated the efficacy of alternative presentation modalities (e.g., pictures, verbal statements). Instead of presenting the actual choice items, pictures (e.g., a photo or drawing of a banana versus a picture of an apple) or verbal labels (e.g., "would you like a banana or an apple?") of choice items are presented. Using pictures rather than actual objects when presenting choices has a number of practical advantages. First, pictures allow for the assessment of objects or activities that are difficult to move or manipulate (e.g., television, computer) or that cannot be provided immediately following a choice (e.g., swimming, going to the mall). Second, an assessment with pictures probably would require less time to administer. Verbal presentation of choices would have the same advantages. Moreover, verbal assessments

could be administered anywhere at anytime because they do not require materials and appear more normalized.

The efficiency and accuracy of pictorial formats for identifying reinforcer preferences among individuals with multiple disabilities have been evaluated using the tangible assessments as a basis for comparison (Graff & Gibson, 2003; Higbee, Carr, & Harrison, 1999). Higbee et al. (1999) found that the tangible format was more effective than the pictorial method for establishing a distinct hierarchy of preference rankings. Results were inconclusive, however, because of a procedural confound. Specifically, the consequence for making a selection differed in the tangible and pictorial assessments. That is, participants received access to the selected item in the tangible assessment but not in the pictorial assessment. Thus, the failure of the pictorial method to produce a distinct ranking of stimuli was likely the result of extinction during the pictorial assessment. A similar study by Graff and Gibson (2003) showed that both formats yielded similar rankings for 3 of 4 participants with developmental disabilities. Furthermore, both formats were equally effective for identifying reinforcers. The Graff and Gibson study did not contain the same confound that occurred in the Higbee et al. study. Nevertheless, the results should be considered preliminary because only four individuals participated, and all participants had a history of using picture communication systems. The generality of the findings to individuals without a similar history is unknown.

Verbal presentation methods, if effective, would be the most inexpensive, efficient way to identify preferences and to offer choices to individuals with disabilities. Thus, studies have compared the relative efficacy of likert-type questionnaires to other choice-based verbal and pictorial methods for identifying reinforcers (Northup, George, Jones, Broussard, & Vollmer, 1996; Northup, Jones, Broussard, & George, 1995; Wilder, Ellsworth, White, & Schock, 2003).

However, the participants in most of these studies were not diagnosed with developmental disabilities. For example, Northup et al. (1996) evaluated the relative efficacy of a reinforcer survey, a verbal choice questionnaire, and a pictorial choice procedure for identifying reinforcer categories for four participants with attention deficit hyperactivity disorder (ADHD). The survey method was based on procedures described by Fantuzzo, Rohrbeck, Hightower, and Work (1991) and included verbal presentations of stimuli representing each of five categories (e.g., food, activities, attention). The participants were asked to rate each category by indicating whether they liked the items 'a little', 'a lot', or 'not at all.' The verbal and pictorial choice procedures involved presenting two categories of potential reinforcers at a time either verbally or with picture coupons and asking the participants to make choices (either vocally or with an approach response). Results indicated that the survey method was least effective for identifying relative preference or reinforcer value and frequently resulted in false positive results. The verbal and pictorial choice methods were somewhat better at predicting relative reinforcer efficacy for 3 of 4 participants; however, neither method identified a preference hierarchy that matched the relative reinforcer efficacy of the items associated with each category.

A similar study by Wilder, Ellsworth, et al. (2003) found that the pictorial choice method was relatively more accurate (63% correspondence with a reinforcer assessment) than the verbal survey (56% correspondence) or the verbal choice (50% correspondence) methods for identifying reinforcers for individuals with schizophrenia. However, results of this study and those obtained by Northup et al. (1996) may have been limited because preferences for general types or categories of reinforcers (e.g. 'food' versus 'activities') were assessed rather than specific items. Thus, other comparison studies have evaluated individual items rather than groups of items.

In two similar studies, hierarchies of preferred stimuli generated via tangible assessments were compared to those generated by verbal choice assessments (Cohen-Almeida, Graff, & Ahearn, 2000; Wilder, Wilson, Ellsworth, & Heering, 2003). Both studies included individuals for whom vocal speech was the primary mode of communication. However, the participants in the two studies differed in that Wilder, Wilson, et al. evaluated four individuals with schizophrenia whereas Cohen-Almeida et al. evaluated six individuals with developmental disabilities. Both studies showed that the verbal choice and tangible formats identified the same high-preference and low-preference items for a majority of the participants. Not surprisingly, the verbal assessments were completed in less time than the tangible assessments. IQ scores were examined in both studies to determine if this score was an accurate predictor of performance on the verbal assessment. The IQ scores of all participants in Wilder, Wilson, et al. were 70 or higher. No correspondence between IQ score and consistency of preference rankings was identified for those participants. Participants' IQ scores in the Cohen-Almeida et al. study ranged from 53 to 97. A correlation coefficient comparing the rank order of items obtained by the two formats was calculated for each participant. The participant with the highest correlation coefficient also had the highest IQ score. The two participants with the lowest correlation coefficients also had the lowest IQ scores. The remaining (three) participants in the middle did not show correspondence between correlation coefficients and IQ scores (in terms of their rankings). These results suggest level of mental retardation may not predict an individual's ability to accurately report preferences via a verbal format

The verbal method is likely to be least useful of all the possible formats for individuals with communication deficits, even if the individual has a vocal repertoire. Nonetheless, parents, teachers, and other caregivers frequently offer verbal choices to individuals with developmental

disabilities who have vocal skills, apparently overlooking this important limitation. Even individuals with a vocal repertoire have some degree of communication difficulty that affects their ability to accurately understand or respond to verbal statements or questions regarding their preferences (Cohen-Almeida et al., 2000; Wilder, Wilson, et al., 2003). Many individuals with autism and developmental disabilities exhibit echolalia, a verbal behavior characterized by the repetition of recently heard verbal utterances spoken by another person. For example, if given a choice among verbally presented stimuli, a person with echolalia would repeat all or some of the choice statement (e.g., when asked, "Do you want pretzels or carrots?" a person with echolalia would say, "Do you want pretzels or carrots?" or just "Carrots").

Given the advantages of the verbal formats (inexpensive, portable, efficient, easy to use), additional research is warranted to determine whether individuals can be taught to make accurate choices among verbally presented stimuli. A first step would be to evaluate methods for teaching individuals to consistently and accurately respond to choice-making opportunities presented via verbal formats. Because verbal presentation formats require auditory discrimination skills, discrimination training would be an appropriate strategy for teaching such skills. Various instructional tactics for teaching discriminations, including prompts, prompt fading, and differential reinforcement, will be described in the next section.

Discrimination Training

The purpose of discrimination training is to teach an individual to respond in a specific way in the presence of a specific stimulus condition through the process of differential reinforcement. As part of training, a response in the presence of one stimulus condition is reinforced. This stimulus condition is known as the S^D (or "discriminative stimulus"), meaning that reinforcement for the response is available in the presence of that stimulus. A response in

the presence of the other stimulus condition receives relatively less or no reinforcement. This stimulus condition is known as an S^{Δ} (or "S-delta"). Through the process of differential reinforcement, the individual learns to exhibit a particular response in the presence of the S^{D} and not (or rarely) in the presence of the S^{Δ}. This paradigm has been used widely to teach a variety of basic and complex discrimination skills, such as those involved in labeling objects and functions (e.g., Dyer, Christian, & Luce, 1982; Tekin-Iftar, Acar, & Kurt, 2003; Wolery, Gast, Kirk, & Schuster, 1988), identifying coins (Frank & Wacker, 1986), completing motor tasks (e.g., Riley, 1990; Sewell, Collins, Hemmeter, & Schuster, 1998), reading (McGee, Krantz, & McClannahan, 1986), and using prepositions (Summers, Rincover, & Feldman, 1993). Choice making via pictures or verbal statements requires complex visual and auditory discrimination skills not unlike those listed above. Discrimination training may be helpful for improving such skills; however, no research has been conducted to date that directly evaluated this specific application of discrimination training.

Stimuli known as prompts are presented in the early stages of discrimination training during or after the presentation of the natural antecedent (i.e., S^{D} or S^{Δ}) that is ultimately meant to control the appropriate response from the learner. Prompts can take a variety of forms across various stimulus modalities (e.g., visual, auditory, physical). The purpose of prompting is to direct the learner to the integral component(s) of the natural stimulus or to the desired response and then to systematically withdraw that assistance.

Types of Prompts

Similar to the selection of a preference assessment format, decisions about the most appropriate prompting strategies will depend on the unique combination of the task to be trained, the abilities of the learner, and the desired outcome. Extra-stimulus prompts involve the

introduction of additional stimuli to assist the individual with learning the discrimination. In a review of the literature, MacDuff, Krantz, & McClannahan (2001) noted that verbal and model prompts are the most commonly used extra-stimulus prompts in research and practice. A verbal prompt could be used to model the correct choice response when teaching auditory choice discriminations among items of varying preference levels. For example, after asking the individual whether he would like a "cookie" (preferred item) or "broccoli" (non-preferred item), the word "cookie" could be repeated as a prompt. Other extra-stimulus prompts include gestures (e.g., pointing), physical guidance (e.g., hand-over-hand assistance), pictures (e.g., sequence of photos to teach multi-step tasks), or text (e.g., written instructions). In contrast, within-stimulus prompts involve modifying the stimulus itself by exaggerating the critical feature(s) of the correct stimulus. For example, when teaching a child to discriminate among pictures of items of varying preference, the picture of the highest preferred item could be enlarged relative to the other pictures. Research has found that within-stimulus prompts are somewhat more effective than extra-stimulus prompts for individuals with autism and other developmental disabilities (e.g., Frank & Wacker, 1986; Schreibman, 1975; Summers et al., 1993; Wolery et al., 1988). However, both prompting strategies have been shown to be highly effective in teaching a variety of skills to individuals with developmental disabilities.

Prompt-Fading Procedures

The purpose of prompt fading is to systematically decrease the level of assistance provided to the learner in order to promote independent responding to the natural stimulus. Thus, stimulus control is transferred from the prompt to the natural stimulus. Various methods of prompt fading include least-to-most prompting, most-to-least prompting, delayed prompting, graduated guidance, and stimulus shaping and fading (see Cooper, 1987; Demchak, 1990;

MacDuff et al., 2001, for detailed discussions). All procedures have been shown to be effective for teaching numerous skills. However, each procedure has advantages and disadvantages. In addition, the efficacy of the procedures depends on the unique match between the abilities of the learner and the type of task taught.

For least-to-most prompting, the instructor provides increasing assistance to the learner while allowing time for independent responding between each new level of assistance (e.g., Godby, Gast, & Wolery, 1987; Heckaman, Alber, Hooper, & Heward, 1998). For example, when teaching an individual to make a choice between two pictured food items (a high preference food and a non-preferred food), the instruction to "choose one" would be presented initially without any prompts. The individual would be given 5 s to 10 s to respond independently. If the learner does not respond correctly, the least intrusive prompt that may be effective (e.g., a gesture toward the picture of the higher preferred item) would be provided. Increasingly more intrusive prompts (e.g., model, physical assistance) would be provided until the individual responds correctly. This procedure is appropriate for teaching most skills. However, research indicates that this prompting technique can be associated with more errors, higher levels of problem behavior, and a greater number of required learning trials than other prompting procedures, such as most-to-least prompting (Heckaman et al., 1998; Karsh, Repp, & Lenz, 1990; Repp, Karsh, & Lenz, 1990) and time-delay (Doyle, Wolery, Gast, & Ault, 1990; Gast, Ault, Wolery, Doyle, & Belanger, 1988; Godby et al., 1987).

Most-to-least prompting begins with the most amount of assistance that is needed for a correct response to occur. The level of assistance is then gradually faded over time to allow for increased opportunities for independent responding (MacDuff, Krantz, & McClannahan, 1993). For example, a therapist may initially use full physical guidance (e.g., hand-over-hand

assistance) when prompting an individual to choose a preferred item from among low preference items. During subsequent teaching sessions, the intrusiveness of the prompt would be decreased gradually (e.g., less physical guidance would be used or the therapist would switch to a less intrusive type of prompt, such as a model) until the individual responds correctly in the absence of a prompt. The most-to-least prompting procedure is generally recommended for complex, multi-step tasks (Wolery & Gast, 1994).

Prompts also can be faded by increasing the amount of time between the presentation of the natural stimulus (e.g., instruction) and delivery of the prompt (Wolery et al., 1988). Called progressive time delay, this method gradually allows more opportunities for independent responding. For example, an extra-stimulus prompt consisting of modeling the correct response initially may be presented simultaneously with the natural stimulus. Then, the latency between the natural stimulus and delivery of the prompt would be systematically increased over time. For example, when teaching an individual to discriminate between preferred and non-preferred items, the therapist could present a model prompt immediately following the question, "Do you want (preferred item) or (non-preferred item)?" Model prompts then would be delayed for longer and longer periods of time on future learning trials until the correct response consistently occurs before the prompt. The criteria by which to increase the delay are usually based on the individual's performance. For example, the delay may increase by 1s for every three consecutive correct trials. This procedure has been associated with rapid acquisition and low error rates while teaching a variety of skills to individuals with developmental disabilities (e.g., Handen & Zane, 1987; Oppenheimer, Saunders, & Spradlin, 1993; Touchette and Howard, 1984; Wolery et al., 1992).

Finally, stimulus shaping and fading involve a set of procedures for gradually altering within-stimulus prompts. When teaching a child to discriminate among pictures of items of varying preference, the initial stages of training may consist of an enlarged picture of the highest preferred item relative to the other pictures. Over time, the relative size of the pictures would be adjusted gradually until the learner is responding accurately (choosing the picture of the highest preferred item) when all of the pictures are the same size. These methods have been associated with nearly error-free learning and may be particularly beneficial for individuals with autism and other developmental disabilities (Schreibman, 1975). Nonetheless, stimulus shaping and fading often require more preparation and materials than the other procedures.

Learning to make discriminations is a basic task yet one that challenges individuals with autism and other developmental disabilities. As discussed above, researchers have compared various prompting and fading procedures to identify the most effective teaching strategies for this population. However, once acquired, discrimination skills must generalize to the natural environment in order for the individual to make functional use of the skill. Strategies for effective generalization have been discussed and studied in the literature. Such strategies, as they apply to generalization of discrimination skills, will be discussed in the next section.

Generalization

Generalization refers to the transfer of a response from a trained stimulus condition to an untrained one. For example, suppose an individual has learned to discriminate between the verbal response “cookie” (a preferred food) and “carrot” (a non-preferred food) and, thus, consistently selects the cookie when a choice of the two foods is presented. Generalization would be observed if the individual then made the same discrimination in the context of a choice between a cookie and other low-preference foods (e.g., chooses “cookie” when offered at the

same time as “celery”). A seminal review paper on generalization by Stokes and Baer (1977) contrasted discrimination and generalization by stating that the former has been traditionally accepted as an active process while the latter has been considered a passive process. While discrimination procedures have been highly effective with individuals with developmental disabilities, generalization rarely occurs without strategies designed to promote such transfer. The authors argued that generalization can and should be programmed, and offered nine categories by which researchers at the time were attempting to actively promote generalization. The categories ranged from relatively passive approaches to generalization, such as “training and hoping” and “recruiting natural contingencies,” to more active techniques, such as “training sufficient exemplars” or “programming common stimuli.”

When teaching discriminations involving choice responses, the most relevant generalization technique described by Stokes and Baer (1977) is to train sufficient exemplars. With this technique, additional untrained stimulus conditions are systematically taught until generalization is obtained across all desired conditions. For example, training may begin with one pair of choice items of disparate levels of preference (e.g., cookie versus apple). Additional training exemplars would include a combination of previously trained and untrained items (e.g., cookie versus cucumber, potato chip versus apple, raisin versus celery). Stokes and Baer noted that the number of exemplars “sufficient” for generalization likely depends on the nature of the task, desired level of generalization, and the skills of the learner. When training an individual to discriminate among all possible preferred and non-preferred food items (nearly unlimited exemplars), maximizing the effects of generalization becomes an important goal. Thus, research aimed at investigating how these factors affect generalization is warranted.

Purpose of Proposed Study

Numerous authors have proposed that individuals with disabilities can live more fulfilling and "normalized" lives if they are provided with varied and frequent choice-making opportunities (see Bannerman et al., 1990; Kern et al., 1998, for discussions). Such opportunities enable those who work with this population to identify and integrate preferred items and activities into home, school, and work environments. Research has shown that individuals with even the most severe developmental disabilities have distinct preferences (see Lohrmann-O'Rourke, & Browder, 1998, for a review). As discussed above, systematic preference assessments have been effective in identifying those preferences. Despite assumptions by caregivers, research comparing the various methods of preference assessments has shown that vocal ability or intellectual level alone do not predict accurate self-reporting of preferences (Cohen-Almeida et al., 2000; Wilder, Wilson, et al., 2003). For example, individuals with autism and other developmental disabilities may appear to be making an accurate choice, but may only be repeating the last phrase heard. Nevertheless, verbal assessment formats have notable advantages over other methods. They require little training or expertise, are easy to administer, do not require extra materials, are portable, and appear more normalized. Thus, further investigation of methodologies for improving choice-making accuracy among this population is warranted. Discrimination training has been a widely used and successful approach to skill training. However, its application to training individuals to discriminate among preferred and non-preferred items has not been documented in the literature.

The present study included individuals with developmental disabilities who were able to make consistent choices of food items in the presence of the actual items (i.e., tangible preference assessment), but they were unable to make consistent choices when the food options

were presented verbally. The purpose of the study was to determine (a) whether these individuals could learn unknown discriminations via discrimination training with a select number of food pair exemplars, (b) the extent to which the effects of training would be observed in the context of the original assessment, and (c) whether the effects of training would generalize to untrained or novel items.

Method

Participants and Setting

Five individuals with multiple disabilities and some vocal speech were initially selected for participation in this study. Individuals for whom vocal speech was their primary mode of communication were selected based on (a) the results of the Assessment of Basic Learning Abilities (ABLA; see Kerr, Meyerson, & Flora, 1977, for detailed procedures), and/or (b) a reported history of immediate echolalia. It was hypothesized that individuals with a history of echolalia would have difficulty choosing their highest preferred items when the choices were presented in a vocal format [e.g., "Do you want (high-preference item) or (low-preference item)?"]. Individuals for whom vocal speech was not the primary form of communication were selected based on the results of (a) the ABLA test, or (b) a brief verbal plus visual assessment probe (see procedures described below). The ABLA test was designed to assess the participant's ability to learn imitation and discrimination skills ranging from a simple imitation (Level 1) to a two-choice auditory-visual combined discrimination (Level 6). To be included in the study, an individual who participated in the ABLA test was required to pass Level 3 (visual discrimination only) because the skill required at this level is similar to the skill necessary to participate in a tangible assessment (Conyers et al., 2002). In addition, only individuals who failed Level 6 were eligible for participation because the combined auditory and visual discrimination skill required by this level is similar to the skill required to select an item that is presented verbally and whose position changes. Thus, it was expected that individuals meeting this criterion would not be able to make accurate choices with a verbal assessment format without additional training.

Lydia was an 8-year-old girl diagnosed with a visual impairment, severe mental retardation, a seizure disorder, and severe brain injury secondary to shaken baby syndrome at 3.5

weeks of age. Vocal speech was her primary mode of communication; however, her speech was sometimes difficult to understand. Lydia was selected for participation in this study based on her performance on the ABLA test (she passed Level 3 but not Level 6) and a history of echolalia. At the time of this study, Lydia was prescribed Trazodone™, Risperdal™, Topamax™, Clonidine™, and Depakote™. No medication changes occurred during the course of the study. Nicky was a 9-year-old boy diagnosed with a seizure disorder, ADHD, and severe mental retardation. He reportedly was developing typically until he was involved in a motor vehicle accident at 11 months of age and consequently suffered a major head injury. Nicky used multiple forms of communication including American Sign Language, picture exchange, and vocal speech. Nicky's vocal speech was limited to two- to three-word utterances, which often required prompting or was echolalic in nature. Nicky was also selected for participation in this study based on the results of the ABLA test. Nicky was prescribed Ritalin™ throughout this study. Julia was a 15-year-old girl diagnosed with autism and moderate mental retardation. Julia's primary mode of communication was vocal speech. Julia was selected for participation in this study because of a history of echolalia (both immediate and delayed). At the time of this study, Julia was prescribed Abilify™, Klonipin™, and Lamictal™. Both the Lamictal™ and Abilify™ dosages were increased during the early stages of her participation in Phase 1. Two other individuals were initially considered for participation in this study based on the results of the ABLA test (for one) and after performing at or below chance levels on a brief verbal plus visual assessment probe (for both). Both individuals were later excluded from participation after failing to meet the criterion for training described below in Phase 1. Specifically, their performances on the verbal plus visual format gradually improved across sessions prior to

training. The verbal alone format was not able to be conducted because neither participant had vocal speech abilities.

Lydia and Nicky attended the same classroom in a private school for individuals with acquired brain injuries. Lydia also attended the residential portion of the program. Nicky was a day student. Sessions were conducted in a staff training room within their school, which contained large tables, chairs, a television, and materials needed to conduct sessions. At the time of this study, Julia had resided in a neurobehavioral stabilization facility for individuals with severe behavior problems for 10 months. Sessions with Julia were conducted in the dining room of her living unit, which contained tables, chairs, and materials needed to conduct sessions.

Identification of Stimuli

Nine food items to include in the preference assessments were identified via parent, teacher, and/or staff interview. Interview questions were designed to help identify both preferred and non-preferred categories of snack foods (e.g., salty, sweet, sour). For Julia, two additional non-preferred items were identified via a single stimulus preference assessment (Pace et al., 1985). Items that Julia either did not approach or expelled were considered non-preferred. These additional items were included in her generalization probes (described below).

Response Measurement and Reliability

In Phases 1 and 2, preference was determined by measuring approach responses during all preference assessment formats except the verbal alone presentation format. An approach was defined as touching, reaching for, or pointing to one of the food items, pictures, or containers presented. Choice, for the verbal alone format, was defined as a distinguishable vocal response that matched the name of one of the food items presented as a choice.

A second observer simultaneously, but independently recorded choice responses during at least 30% of preference assessment and training trials with each participant. Interobserver agreement was calculated on a trial-by-trial basis by dividing the total number of agreements by the sum of agreements and disagreements and multiplying by 100%. Agreements were defined as trials on which both observers scored a choice response for the same food item. Disagreements were defined as trials on which both observers did not score a choice response for the same food item. Mean interobserver agreement for choice responses during the preference assessments in Phase 1 was 98.4% (range, 90.5% to 100%) for Lydia, 98.7% (range, 91.7% to 100%) for Nicky, and 99.4% (range, 97.2% to 100%) for Julia. Mean interobserver agreement for choice responses during training sessions in Phase 2 was 98.7% (range, 90% to 100%) for Lydia, 99.4% (range, 93.3% to 100%) for Nicky, and 100% for Julia. Mean interobserver agreement for choice responses during generalization sessions in Phase 2 was 100% for Lydia, 95.8% (range, 94.4% to 97.2%) for Nicky, and 100% for Julia.

Phase 1: Preference Assessments

A series of preference assessments were conducted during this phase. The purpose of the assessments was to (a) identify a consistent ranking of preferred food items, (b) compare rankings obtained via several preference assessment formats, and (c) identify a verbal assessment format that would benefit from discrimination training.

Procedures

All preference assessments were conducted using a paired-choice format (Fisher et al., 1992). Presentation formats included tangible, pictorial, verbal plus visual, and verbal alone (see further description of each format below). The same nine food items were included in each session. All sessions consisted of 36 trials whereby each item was paired with every other item

exactly one time per session. Trials were randomly presented; however, no item was presented more than two trials in a row. Prior to each session, the therapist allowed the participant to sample each item; however, labels of the items were only paired with their delivery prior to the verbal assessment formats.

Approach data from each assessment were calculated on an item-by-item basis by adding the number of trials during which a given food item was selected. Items were then ranked from most to least preferred by assigning the item chosen on the most number of trials the highest ranking and continuing until all items were ranked. If more than one item was chosen the same number of times, each item was assigned the same number ranking and the next item's ranking was adjusted to account for the actual number of items ranked above it. For example, if one item was ranked first and two items were ranked second, the next highest ranked item would be assigned a rank of four.

The symbolic preference assessment formats (pictorial, verbal plus visual, and verbal alone) were systematically compared to the results of the tangible assessment format with each participant. Nicky participated in the pictorial and verbal plus visual formats, while Lydia and Julia participated in the pictorial and verbal alone formats. The verbal plus visual format was excluded for Lydia and Julia because vocal speech was their primary mode of communication. However, this format was used for Nicky as an intermediate step because of its usefulness as an alternative to the verbal alone format for individuals with limited vocal speech (Conyers et al., 2002). Nicky did not participate in the verbal alone format because his performance during the verbal plus visual format met the criterion for training. The same nine stimuli used in the tangible assessments were used in each of the symbolic format assessments. One to five sessions

were conducted per day, three to five days per week for all participants. Sessions varied in length depending on the condition, but never exceeded 1 hour.

Tangible. During each session, pairs of food items were placed in front of the participant approximately 12 inches apart, and the therapist instructed the participant to "choose one." Upon approaching one item, the other food item was removed, and the participant was allowed to consume the chosen item. If a participant selected a food item vocally, the response was ignored and the therapist repeated the instruction to "choose one." All three individuals participated in this assessment format. The purpose of this format was to (a) determine whether the participant could make consistent choices relating to preference, and (b) obtain a gold standard of preference for comparison with the other formats.

Pictorial. Pairs of colored photographs (4 in. x 6 in.) of food items were placed in front of the participant approximately 12 inches apart. Photographs consisted of the same-sized portion of the food items and mode of presentation as presented in the tangible assessments (e.g., one potato chip on a paper plate). The therapist instructed the participant to "choose one." The names of the food items were not stated and the actual food items were not visible to the participant. Upon approaching one picture, the pictures were removed, the selected food item was presented, and the participant was allowed to consume it. Left-right positioning of the pictures was counterbalanced such that each item appeared on each side an equal number of times. If a participant selected a food item vocally, the response was ignored and the therapist repeated the instruction to "choose one." All three individuals participated in this assessment format. The purpose of this condition was to determine whether pictures could be used as extra-stimulus prompts during training on one of the verbal formats.

Verbal Plus Visual. In practice, verbal presentation formats require vocal responses and do not include any tangible representation of the stimuli. However, the verbal plus visual format requires receptive language skills with less emphasis on expressive language skills. That is, it requires an approach response rather than a vocal choice response. Procedures for this format were based on those described by Conyers et al. (2002). Identical opaque containers containing the food items were placed in front of the participant 12 inches apart. Prior to each session, the therapist presented each food item on a plate and verbally stated its name while allowing the participant to sample each item. During each trial, the therapist placed two items into separate containers (the participant was unable to observe the items as they were placed into the containers), closed the containers, and pointed to each container and said, "Do you want [food name] (while pointing to the left container) or [food name] (while pointing to the right container)?" Upon choosing, the container was opened, the food item presented, and the participant was allowed to consume the item. The left-right positioning of the items was counterbalanced within each session. If Nicky pointed to a container but stated the name of a different item, the vocal response was ignored and the food item inside the chosen container was delivered.

Verbal Alone. During each trial, the therapist said, "Do you want [food name] or [food name]?" The verbally chosen food item then was presented, and the participant was allowed to consume it. Food items were kept in an opaque box or on a chair beside the therapist and were not visible to the participant until delivered upon choosing. As with the other formats, all food items were presented an equal number of times as the first and second choice. Lydia and Julia participated in this assessment format. Nicky did not participate in this format because he met the criterion for training with the verbal plus visual format.

Identical tangible assessments were conducted with each participant until the three highest-ranked items and the three lowest-ranked items were consistent across two sessions. To be identified as consistent, stimuli only needed to obtain a "top three" or "bottom three" ranking, not the exact same number ranking across two consecutive assessments. The same number of sessions was conducted with each symbolic format (or a minimum of three sessions if only two tangible sessions were required to meet the consistency criterion). The three highest-ranked items and three lowest-ranked items of each session were compared on an item-by-item basis to those obtained in the last tangible session for the symbolic assessments. The "matched" items were summed and the total was divided by six and multiplied by 100% to yield a percentage of correspondence with the tangible assessment. Thus, a correspondence score of 100%, would require that the three highest- and three lowest-ranked items be the same across both formats. Similar to the criterion for consistency within the tangible format, the items did not need to be in the exact same order, only in the same top or bottom group. A correspondence score below 83% (less than 5 out of 6 matched items) across two or more sessions of the verbal plus visual or verbal alone format was the criterion used to identify a format for training. If the mean correspondence score for pictorial format sessions was equal to or greater than 75%, pictures were considered a possible prompt for training.

Results

Table 1 lists the nine items used in each participant's assessments. Consistent rankings for the top three and bottom three food items were obtained after two, four, and five tangible sessions for Lydia, Nicky, and Julia, respectively. Correspondence between the tangible assessment and the verbal alone assessment was below 83% on three of three verbal alone sessions for Lydia (mean 61.1%; range, 50% to 66.7%), indicating that she would benefit from

training with this format. The mean percentage of correspondence for the pictorial format was 75% (range, 66.7% to 83.3%); thus, pictures were considered a possible prompt for training with Lydia. Correspondence between the tangible assessment and the verbal plus visual assessment was below 83% on three of four sessions for Nicky (mean 54.2%; range, 33.3% to 100%). Thus, the verbal plus visual format was chosen for training. The mean percentage of correspondence for the pictorial format sessions was 83.3% (range, 66.7% to 100%), indicating that pictures might be an effective prompt for training with Nicky. Finally, Julia's correspondence between the tangible assessments and the verbal alone assessments was below 83% on four of five verbal alone sessions (mean 70.0%; range, 66.7% to 83.3%). The mean percentage of correspondence for the pictorial format sessions was 58.4% (range, 50% to 66.7%); therefore pictures were not considered appropriate prompts for training with Julia.

Table 1. Nine food items used with each participant. The first three items and the last three items listed correspond to the three highest- and three lowest-preferred items identified in the tangible assessments.

Lydia	Nicky	Julia
Reese's Pieces®	Potato Chip	Pickle
Slim Jim®	M&M®	Bologna
Potato Chip	Slim Jim®	Skittles®
Blueberry Muffin	Wheat Thin®	Chocolate Chip Cookie
Pretzel	Tomato	Orange
Twizzler®	Twizzler®	Carrot
Carrot	Raisin	Triscuit®
Fruit Cocktail	Blueberry Muffin	Celery
Tomato	Carrot	Peanut Butter Chip

Trials when the three highest and three lowest items were presented against each other were examined to identify appropriate pairs for training. For Lydia, two pairs (potato chip versus carrot and potato chip versus tomato) were selected for training because the lower preferred items were chosen on at least one of the last three verbal alone format trials. No other

pairs met the criterion for training for Lydia. For Nicky, three pairs (potato chip versus carrot, Slim Jim® versus raisin, and M&M® versus carrot) were selected for training because the lower preferred items were chosen on at least one of the last three verbal plus visual format trials. All other pairs also met this criterion; however, these three were chosen in order to include each of the three highest preferred items in training. Finally, for Julia, three pairs (pickle versus peanut butter chip, bologna versus celery, and Skittles® versus Triscuit®) were selected for training because the lower preferred items were chosen on at least one of the last three verbal alone format trials. Additional pairs (Skittles® versus celery, pickle versus Triscuit®, and bologna versus peanut butter chip and Triscuit®) also met this criterion; however, the three chosen pairs were selected to represent each of the three highest and three lowest preferred items in training.

Phase 2: Discrimination Training and Tests for Generalization

Throughout this phase, choices continued to be presented in a paired-choice format; however, all trials were presented in the assessment format selected for training for each participant. The purpose of this phase was to evaluate the direct and generalized effects of discrimination training.

Procedures

Pre-Training Probes. The purpose of this condition was to establish a pre-training baseline of responding for each pair identified for training. Sessions were conducted during which 5 trials (6 trials for Julia) of each pair selected for training were randomly presented. Given the number of pairs selected for training, this resulted in pre-training sessions consisting of 10 trials for Lydia, 15 trials for Nicky, and 18 trials for Julia. The presentation of the items was counterbalanced to control for any left-right bias (Nicky) or echolalic responses (Lydia and

Julia). A minimum of three pre-training sessions was conducted before training was commenced on the first pair. The order of training across pairs depended on the stability of the baselines.

Discrimination Training. The purpose of this condition was to assess whether multiple discriminations could be systematically trained to a predetermined criterion level. Each training session consisted of 10 trials. Participants were asked to choose between the higher preferred item of the pair and "nothing" for the first pair of food items taught. For example, a picture of a chip on a plate was presented to Lydia along with a picture of an empty plate while saying, "Do you want chip or nothing? Chip." Similarly, for Nicky, the therapist showed two open containers, one with a Slim Jim® inside and another left empty, and asked, "Do you want Slim Jim® or nothing?" The lower preference item was introduced into the sessions after the participant met the mastery criterion (see below). This initial discrimination training step (i.e., the high preference item versus nothing) was omitted for the remaining pairs, with the exception of Julia's second pair.

Prompting strategies differed across participants and across pairs for one participant (i.e., Lydia). Table 2 lists the types of prompts and prompt fading procedures used with each participant. Some form of response prompt and progressive time delay fading were used with all three participants.

Table 2. Summary of types of prompts and prompt fading procedures for each participant.

Verbal Training for Lydia		
Trained Pair	**Type of Prompt**	**Fading Procedure**
Potato Chip versus Nothing	Pictures	Time Delay
Potato Chip versus Tomato	Pictures	Time Delay
Potato Chip versus Carrot	Pictures	Time Delay
Potato Chip versus Carrot	Pictures with carrot presented second on all trials	Time Delay
Potato Chip versus Carrot	Model	Time Delay

Table 2 continued.

Verbal Plus Visual Training for Nicky		
Trained Pair	**Type of Prompt**	**Fading Procedure**
Slim Jim® versus Nothing	Visual (actual items)	Time Delay
Slim Jim® versus Raisin	Visual (actual items) Blocked incorrect responses	Time Delay
M&M® versus Carrot	Visual (actual items) Blocked incorrect responses	Time Delay
Potato Chip versus Carrot	Visual (actual items) Blocked incorrect responses	Time Delay
Verbal Training for Julia		
Trained Pair	**Type of Prompt**	**Fading Procedure**
Pickle versus Nothing	Model	Time Delay
Pickle versus Peanut Butter Chip	Model	Time Delay
Bologna versus Nothing	Model	Time Delay
Bologna versus Celery	Model	Time Delay
Skittles® versus Triscuit®	Model	Time Delay

For Lydia, picture prompts paired with verbal labels were used initially with all pairs. During training on potato chip versus carrot, the order of presentation of the two items was adjusted such that the carrot was always presented second. This modification was made to determine whether a temporary increase in errors due to echolalic responding would assist Lydia in learning the discrimination. Finally, a model prompt (i.e., "Do you want chip or carrot? Chip") was used. For Nicky, visual prompts were presented by first showing Nicky the two items as the therapist placed them into the containers. Initially, the containers remained open throughout the trial but were closed for subsequent trials after five consecutive correct responses with each pair. On subsequent trials, an error correction procedure was implemented whereby attempts to point to the incorrect container were blocked. Finally, for Julia, training on all pairs consisted of a model prompt similar to that described above for Lydia. Prompts were systematically faded using a progressive time delay procedure after two consecutive trials with a correct response. The delay began at 0 s and was increased in 1-s increments until a 10-s delay

was reached. However, stimulus control was transferred from the prompt to the natural stimulus at or before the delay reached 3 s for all three participants. The criterion for mastery was two consecutive sessions with 80% or greater independently correct responses.

Post-Training Probes. The purpose of this condition was to evaluate whether the effects of training would improve performance on the trained pair when trials were interspersed among untrained pairs and whether performance on untrained pairs would remain at baseline levels. Post-training sessions were identical to pre-training sessions. Trials for pairs that had reached the mastery criterion for training were again interspersed among those for pairs that had not yet been trained. Three post-training sessions were conducted following training with each pair.

Tests for Generalization. The purpose of this condition was to evaluate the transfer of learning to the full assessment. These sessions were identical to the nine-item preference assessment sessions using the format that required training. One test for generalization was conducted following training on each pair. A minimum of two tests for generalization was conducted after the last pair was trained. Additional sessions were conducted with Nicky and Julia during which each of the three high-preference items was paired with each of the three low-preference items once. The purpose of these additional sessions was to determine whether generalization would improve if only trials including items with distinctly different levels of preference were included.

Generalization Probes. The purpose of these probes was to determine whether the effects of training would transfer or generalize when a trained, high-preference food was offered with a novel, non-preferred food. This condition was conducted with Julia only. Each of two non-preferred food items, identified via a single-stimulus preference assessment described previously, was presented with each of the three highest preferred food items identified in the tangible

assessment (for a total of 6 trials per session). Sessions were conducted once prior to training and then once following training of each pair. No formal training was conducted specifically for these items.

Tangible Re-Assessments. The purpose of these sessions was to conduct periodic checks to confirm that preferences had not shifted during the course of the study. Additional full nine-item tangible format sessions were conducted with each participant, including immediately before or immediately after each test for generalization, to ensure that preferences had not changed over time. Procedures for these sessions were identical to those in the tangible condition described above. Additional truncated sessions also were conducted with all participants intermittently throughout the remainder of the study. Truncated sessions consisted of 3 trials of each of the pairs chosen for training presented in the tangible format.

Data Analysis

Data were calculated on a trial-by-trial basis for pre- and post-training sessions by adding the total number of trials that each item was chosen. This total was divided by the total number of trials that item was presented, and that number was multiplied by 100% to yield a percentage of trials chosen (for each item). Data from pre-training sessions were visually inspected to determine the pair that would be selected to begin discrimination training. Pairs were selected for training based on the stability or trend of the pre-training data for that pair.

Data were calculated on an item-by-item basis for the generalization tests and tangible re-assessment sessions by adding the number of trials during which a given food item was selected. As in Phase 1, items were ranked from most to least preferred by assigning the item chosen on the most number of trials the highest ranking and continuing until all items were ranked. Items selected on an identical number of trials were treated in the same manner described above. Data

from tests for generalization and tangible re-assessment sessions were analyzed using procedures identical to those described in Phase 1 to calculate the percentage of correspondence for each generalization session.

Data from generalization probes were calculated on a trial-by-trial basis by adding the total number of trials that each high preference item was chosen. This total was divided by the total number of trials presented, and that number was multiplied by 100% to yield a percentage of trials with the higher preferred items chosen.

Experimental Design

The effects of discrimination training with each participant were evaluated using a concurrent multiple baseline design. The introduction of training was staggered across two or three pairs of food items for each participant. Generalization effects were evaluated in a non-concurrent multiple baseline across participants design.

Results

Discrimination Training. Lydia met the mastery criterion for potato chip versus nothing and potato chip versus tomato in just 30 trials each, indicating that a picture paired with verbal choices was a successful prompting strategy. However, when the same strategy was attempted for potato chip versus carrot, mastery criterion was not achieved after 60 trials. Multiple errors were observed at this time due to echolalic responding (e.g., Lydia would point towards the picture of the potato chip and say, “carrot” on trials when the therapist presented the choice with the word “carrot” spoken last; i.e., “Do you want chip or carrot?”). When the order of the items was adjusted such that carrot was always presented second, Lydia displayed obvious frustration (i.e., she would often say, “I don’t want it” and hand the carrot back to the therapist after receiving it). However, Lydia continued to make errors in this condition. After 50 trials, a new

prompting strategy (verbal prompt) was introduced (described above). Lydia met the mastery criterion for this pair in 30 trials.

Nicky met mastery criterion on Slim Jim® versus raisin, M&M® versus carrot, and potato chip versus carrot with a visual prompt consisting of the actual item in 30, 40, and 30 trials, respectively. The additional blocking procedure was necessary for all pairs. Given the low number of trials necessary to meet mastery criterion with each pair, this procedure proved both effective and efficient. Finally, for Julia, mastery criterion was met using verbal prompts after 40 trials for pickle versus peanut butter chip, 30 trials for bologna versus celery and 30 trials for Skittles® versus Triscuit®.

Post-Training Probes. Figure 1 depicts the results of Lydia's discrimination training on the verbal alone format. Prior to training on potato chip versus tomato, Lydia selected her higher preferred item (potato chip) on 60% of trials. Following discrimination training, she chose potato chip on 100% of trials for 3 of 5 sessions. Lydia's performance on potato chip versus carrot was more variable during baseline, including one session during which she never chose potato chip. However, following discrimination training on that pair, Lydia's performance improved to 100% across two consecutive sessions. A third post-training session was not conducted because Lydia's performance was 100% for two consecutive sessions for both pairs during those sessions. These results indicate that discrimination training was effective for the acquisition of these two pairs and that the effects of training maintained when choice trials were interspersed among untrained pairs.

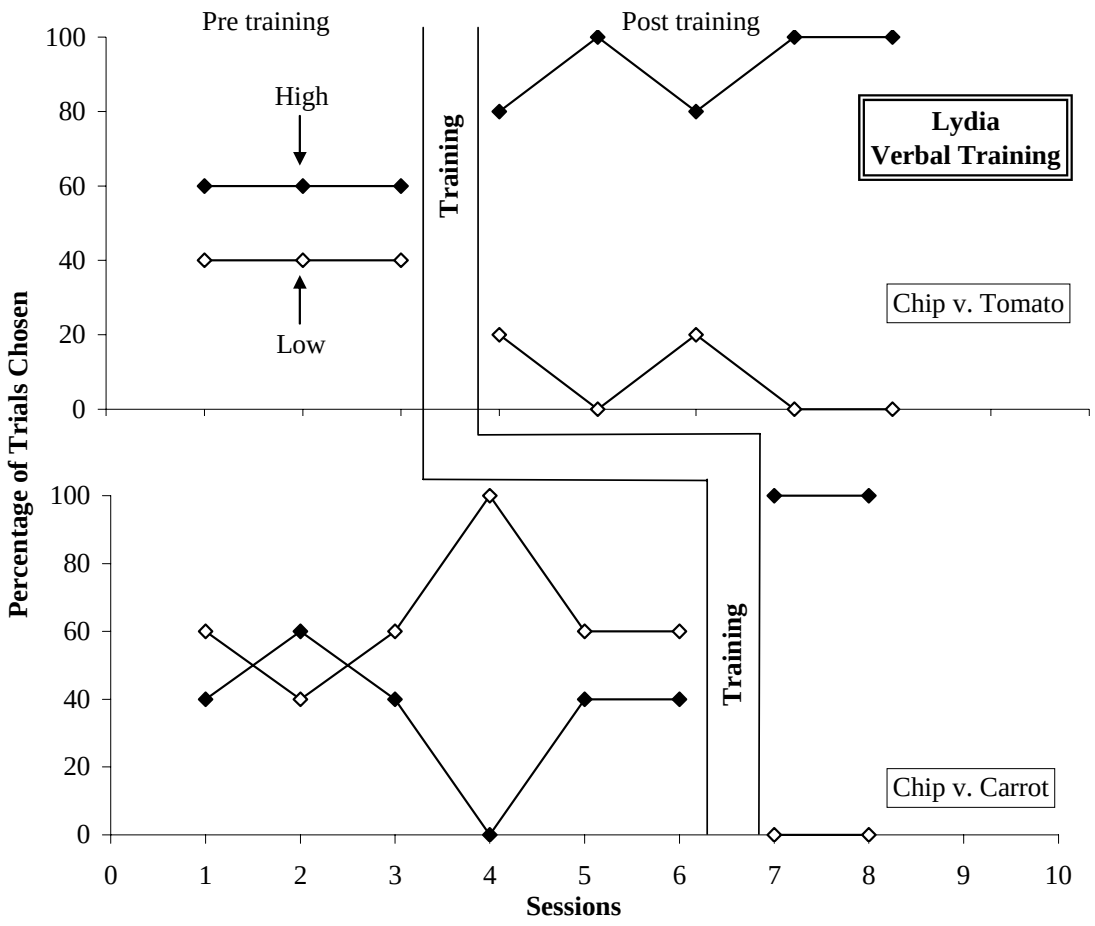

Figure 1. The effects of discrimination training on two pairs within the verbal alone format for Lydia.

Figure 2 depicts the results of Nicky's discrimination training on the verbal plus visual format. Nicky frequently chose his lower preferred item more often than his higher preferred item across all three baselines (13 out of 18 sessions). Discrimination training on Slim Jim® versus raisin dramatically improved Nicky's performance on that pair while his performance on the other two pairs remained poor. Subsequent training on each of the remaining pairs resulted in improvements in performance on that pair. Furthermore, Nicky's performance on Slim Jim® versus raisin remained high, indicating that the effects of training maintained when choice trials were interspersed among untrained pairs.

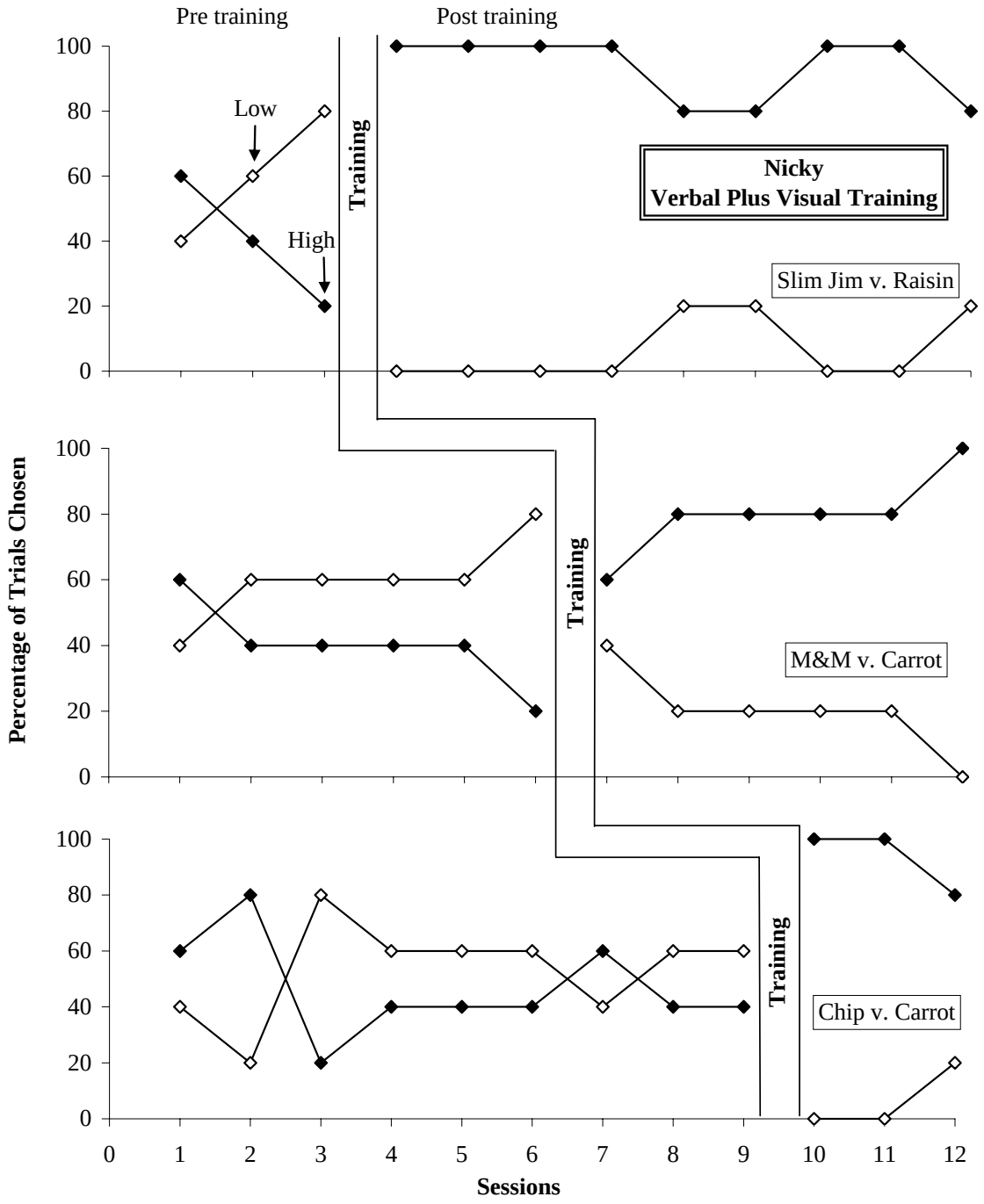

Figure 2. The effects of discrimination training on three pairs within the verbal plus visual format for Nicky.

Figure 3 depicts the results of Julia's discrimination training on the verbal alone format. Julia's performance moderately improved following training on each pair (she never chose the

higher preferred item 100%); however, she consistently chose her higher preferred item more often than the lower preferred item during all but one post-training session, indicating some degree of acquisition and maintenance for trained pairs. Unlike Nicky and Lydia, Julia's post-training performance on previously trained pairs worsened following training on subsequent pairs. During session 12, Julia chose her lower preferred item (celery) more often than her higher preferred item (bologna). Retraining on this pair was conducted to determine whether this change in performance was due to a maintenance failure. More trials to criterion were required (50) than the first time this pair was trained (30). However, her performance on the post-training probes improved following this retraining while her performance on the other two trained pairs remained unchanged.

Tests for Generalization. Figure 4 shows the percentage of correspondence of the generalization sessions to the original tangible assessments for all three participants. None of the participants demonstrated significant improvements from baseline after training on the first pair (first post-training data point) using this measure. This was not unexpected, as training had been conducted with just one of the 36 pairings included in the assessment. Nicky's performance steadily increased to 83.3% after discrimination training on the third pair. Lydia and Julia showed improvement after training on the second and third pairs, respectively. However, further analysis of Julia's data indicated that she chose peanut butter chip (a low preference food) over each of her three high-preference items during the second and third tests for generalization. However, data from all tangible re-assessment sessions indicated that peanut butter chip remained a low preference item throughout the study.

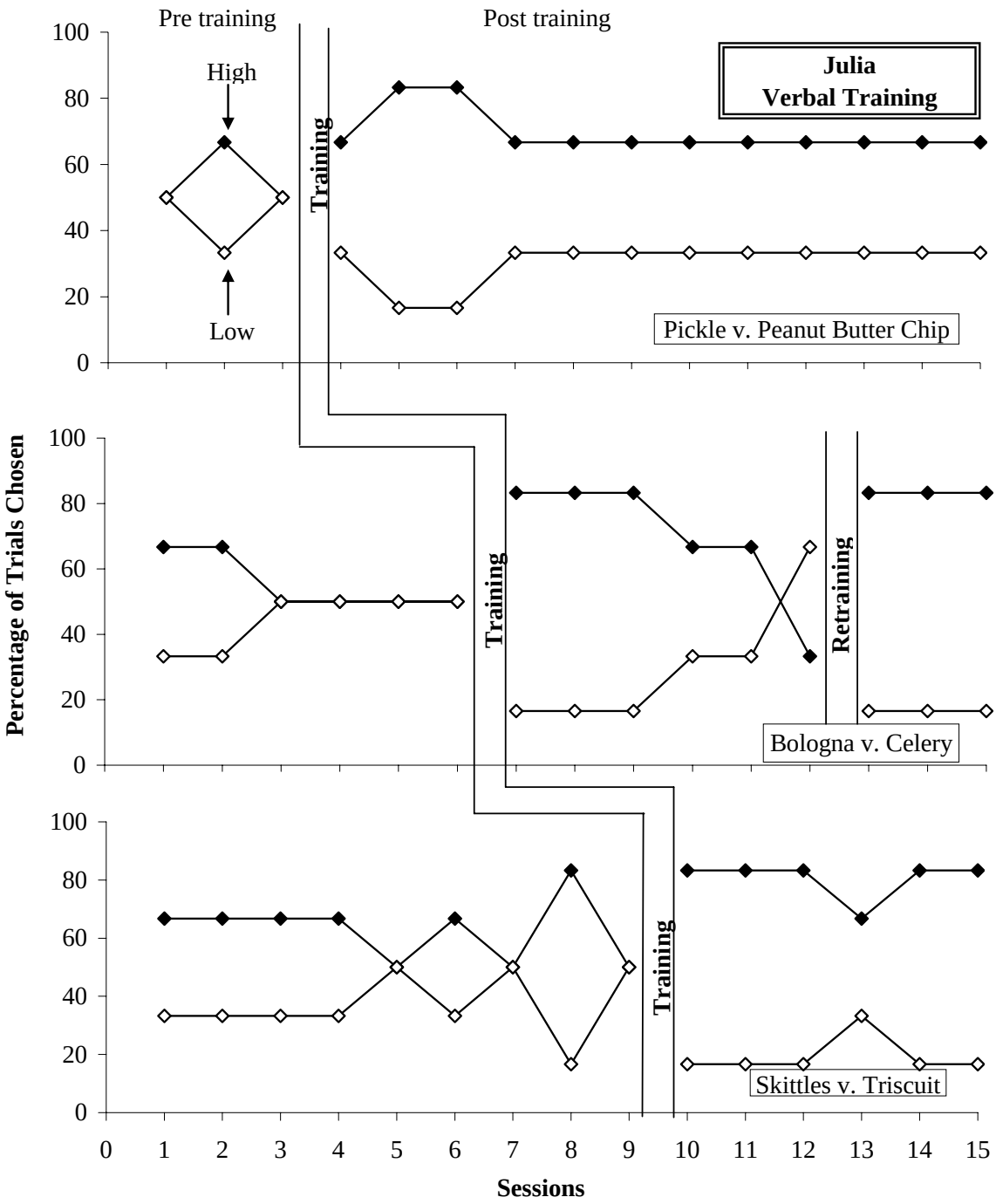

Figure 3. The effects of discrimination training on three pairs within the verbal alone format for Julia.

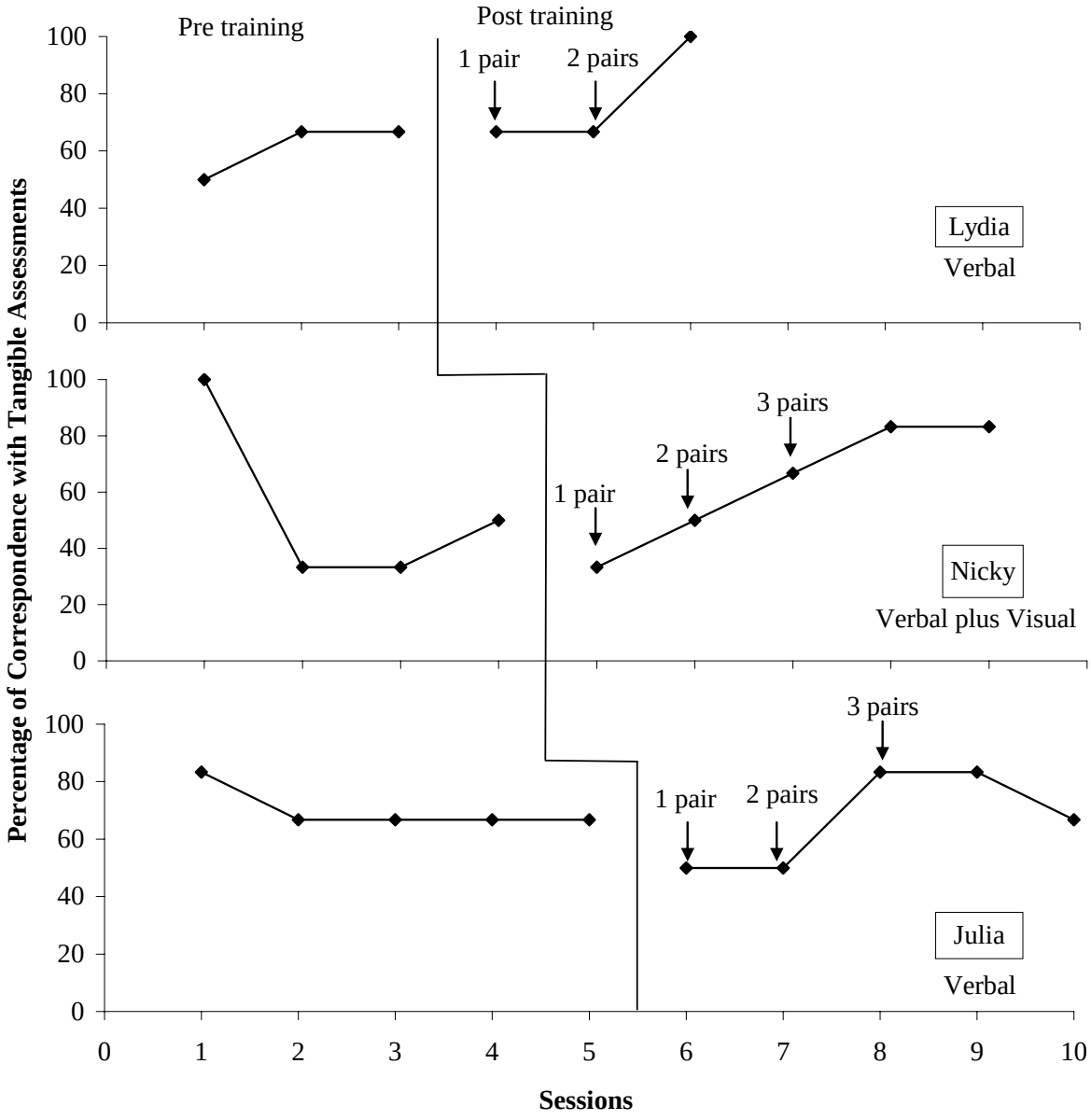

Figure 4. Percentage of correspondence with the tangible assessments across generalization sessions for all participants. Arrows indicate the number of pairs trained at that point.

These data indicated that training on individual pairs did not immediately generalize to untrained pairs; however, improvements were observed with all three participants. These improvements occurred because discriminations taught outside the context of the full assessment generalized when the same pairs were presented within the context of the full assessment with

numerous untrained pairs. Table 3 depicts the choices among trained pairs during each test for generalization. Lydia continued to demonstrate this form of generalization after training on the second pair. Although generalization for the first trained pair (Slim Jim® versus raisin) never emerged for Nicky, he consistently chose the high preference food over the low preference food after training on the second and third pairs. Julia's data follow a similar pattern. That is, generalization data for the first trained pair (pickle versus peanut butter chip) were inconsistent. Although Julia chose the pickle over the peanut butter chip during the first test for generalization session, she chose peanut butter chip during the next two generalization sessions. These data correspond to her pattern of performance for that same pair during post-training probes. That is, following training on the second and third pairs, Julia's performance on pickle versus peanut butter chip was negatively affected. Generalization data on the second and third pairs were more consistent. By the fourth and fifth tests for generalization, Julia consistently chose the higher preferred item from among each of the three trained pairs.

Table 3. Choices during trials with trained pairs during each test for generalization for the three participants. The higher preferred items are underlined. Shaded cells indicate that training had not yet occurred for that pair.

Lydia		
Session	Potato Chip versus Tomato	Potato Chip versus Carrot
1	Potato Chip	Carrot
2	Potato Chip	Potato Chip
3	Potato Chip	Potato Chip

Nicky			
Session	Slim Jim® versus Raisin	M&M® versus Carrot	Potato Chip versus Carrot
1	Raisin	M&M®	Carrot
2	Slim Jim®	M&M®	Potato Chip
3	Slim Jim®	M&M®	Potato Chip
4	Raisin	M&M®	Potato Chip
5	Raisin	M&M®	Potato Chip

Table 3 continued.

Julia			
Session	Pickle versus Peanut Butter Chip	Bologna versus Celery	Skittles® versus Triscuit®
1	Pickle	Celery	Skittles®
2	Peanut Butter Chip	Celery	Skittles®
3	Peanut Butter Chip	Bologna	Skittles®
4	Pickle	Bologna	Skittles®
5	Pickle	Bologna	Skittles®

These findings showed that, for Lydia, training on individual pairs generalized to those pairs when presented in the context of the full assessment only after training on each pair. Results for Nicky and Julia were less consistent. For example, both Nicky's and Julia's choices for their first trained pairs were inconsistent across the test for generalization sessions, indicating that perhaps generalization did not truly occur (i.e., chance performance) or generalization occurred initially, but the effects did not maintain.

Further analyses of the data suggested a potential relationship between the level of maintenance and generalization and the number of common items among the trained pairs. Specifically, Julia's generalization data were the least robust and her training consisted of three pairs with no common items (i.e., 6 different foods were included in discrimination training). Nicky's generalization data were somewhat better, especially for the two trained pairs that shared a common (low-preference) item. Finally, Lydia's generalization data were the best. She was taught to discriminate between two pairs that shared a common (high-preference) item. Results of additional generalization sessions conducted with Nicky and Julia are depicted in Table 4. When only the three highest-preferred items were paired with the three lowest-preferred items, Nicky showed marked improvements in the accuracy of his choices, especially

for trained pairs. Lydia's performance was unchanged from previous full tests for generalization.

Table 4. Percentage of trials with higher-preferred item chosen when the assessment contained only the three highest preferred items versus the three lowest preferred items (i.e., additional tests for generalization) for Nicky and Lydia.

Nicky		
Session	All pairs	Trained pairs
1	66.7	66.7
2	88.9	100
3	100	100
4	88.9	100
5	100	100
Julia		
Session	All pairs	Trained pairs
1	66.7	100
2	55.6	33.3
3	77.8	100
4	66.7	66.7
5	66.7	66.7

Generalization Probes. Data from generalization probe sessions with Julia are not depicted on the figures. Prior to discrimination training, Julia selected her higher preferred items on 33.3% of trials. Following discrimination training on each pair, Julia selected her higher preferred items on 100% of trials. This finding indicated that generalization to pairs with distinct differences in preference occurred after one exposure to discrimination training.

Tangible Re-Assessments. Mean percentages of correspondence between the initial tangible assessments and the periodic tangible re-assessments were 89%, 92%, and 100% for Lydia, Nicky, and Julia, respectively. This indicates that preferences did not change during the course of the study.

Discussion

Systematic preference assessments have been used primarily to identify highly-preferred items and activities to be incorporated into the daily school, home, and work environments of individuals with developmental disabilities. Recent research has investigated the relative efficacy of various common presentation formats for such assessments (e.g., Cohen-Almeida et al., 2000; Wilder, Wilson, et al., 2003). Verbal assessment formats differ from tangible and pictorial formats because an auditory discrimination, rather than a visual discrimination, is necessary for accurate choice making. To date, no studies have evaluated methods to teach individuals with developmental disabilities to improve their performance on verbal preference assessments. Results of the present study indicated that discrimination training along with a generalization strategy of training multiple exemplars was moderately successful in attaining that goal with three participants.

Although each of the three participants demonstrated improved choice-making accuracy among trained pairs following discrimination training, the effects did not reliably transfer to untrained pairs or to trained pairs in the context of a larger assessment. Multiple potential factors may have contributed to this outcome, including the relative abilities of the participants, the relative preference of the food items chosen for the assessment, and the number and distinctiveness of the pairs of food items selected for training.

Although the participants shared similar diagnoses (i.e., developmental disabilities and mental retardation), their ability to learn the auditory discrimination required by this study may have been affected by their unique learning histories and discrimination skills prior to their participation in this study. Furthermore, the impact of their relative abilities to attend during extended sessions (some sessions lasted up to 30 to 40 min) may have affected their results. For

example, anecdotal observations of Nicky's performance during tests for generalization indicated that his choice-making accuracy decreased across the 36 trials. Because trials were randomly presented, the effects of this decline in performance were spread evenly across trained and untrained pairs. Additional truncated generalization sessions demonstrated that his choice-making accuracy improved and maintained across four sessions when sessions consisted of only nine trials with food items of disparate levels of preference. Julia did not appear to have the same attending problems during the lengthier generalization sessions. Performance during her truncated generalization sessions did not show any improvement over the full assessment sessions, indicating that some other factor may have contributed to her lack of generalization.

Although Julia's performance on each trained pair was above 80% immediately following training, this level of performance did not maintain when subsequent pairs were trained. In one case (bologna versus celery), she selected her lower-preference item more often than her higher-preference item during a post-training session. Given these limited maintenance effects, Julia's generalization data are not surprising. Additional re-training and tests for generalization could have been conducted to determine if maintenance failures accounted for her relatively poor generalization. In a similar vein, Lydia's and Nicky's performance during the generalization tests could only be as good as their performance during the post-training probes. Because maintenance effects were not thoroughly evaluated in this study, the extent to which they affected the generalization data is unknown.

The relative preference of the food items used in this study is a potential limitation. Food items were chosen based on caregiver report of preferred and non-preferred food categories. Although follow-up questions were included that further probed specific food items from each category (e.g., "what type of sweets are preferred/non-preferred?"), it is possible that the items

selected for the assessment were not sufficiently distinct in terms of preference level to enhance acquisition or generalization of the discriminations. To that end, only Lydia refused to eat each of her low-preference items every time they were presented, whereas Nicky only occasionally refused to eat the low-preference items. In contrast, Julia never refused to eat any of the original nine food items. If the low-preference items were not disliked, reinforcement may not have been withheld following an "incorrect" choice (i.e., access to the low-preference food item may have been somewhat reinforcing). Data from Julia's additional generalization probe sessions support this hypothesis. That is, when presented with a choice between her highest-preferred items and two items that she previously refused, she quickly learned to choose each of her higher preferred food items with 100% accuracy across three consecutive sessions.

The "correct" choice on any given trial also could have depended on the momentary motivating operation for the presented items. For example, after Julia chose pickle (a high-preference food) across a number of sessions, Triscuit® (a low-preference food) may have been momentarily more preferred when a choice between pickle and Triscuit® was presented. Data from the tangible re-assessments indicated that the relative motivating operations for all items remained consistent over the course of the study. Nonetheless, this interpretation cannot be completely ruled out.

Another important limitation of the study is that the number and type of pairs included in training were not held constant across the participants. Pairs were selected for training based on "errors" made during sessions with the relevant presentation format. Specifically, choices between the three highest- and three lowest-preferred items were analyzed. For Lydia, errors occurred with only two of the nine analyzed pairs, both of which included the same high-preference item (potato chip). Thus, training was conducted with both pairs. Nicky and Julia

made errors with many of the pairs. Thus, pairs were selected for training based on additional criteria. For example, for Nicky, each of the three pairs selected for training included a different high-preference item. However, two of those pairs shared a common low-preference item (carrot). Thus, for the third participant (Julia), an attempt was made to control for overlapping items among trained pairs. Each of the three pairs selected for training included a different high- and low-preference item. The extent to which this variable influenced the results is not clear.

The number and type of pairs included in training should be held constant or studied more systematically in future research. Data from this study suggested that including common items among the pairs would improve the outcomes of training. The relative benefits of including common low-preference items versus common high-preference items should be examined in further research. However, some authors have suggested that generalization may be more likely to occur if a wide variety of exemplars are included in discrimination training (see Stokes and Baer, 1977, for a discussion).

Although the efficacy of the prompting strategies used in this study is well documented in the literature, future research should investigate methods for selecting appropriate strategies. The decision to consider using pictures as prompts in this study was based on a criterion of 75% mean correspondence during pictorial assessments. Only Lydia's and Nicky's data met this criterion with 75% and 83.3% mean correspondence, respectively. Results of Lydia's training indicated that using pictures as visual prompts was ineffective for training one pair (potato chip versus carrot) after 110 trials. Because pictorial prompts were not tested with Nicky, it is unknown whether a mean correspondence greater than 75% would have been a more effective predictor. Future research should investigate the efficacy of different criteria for predicting the success of pictorial prompts.

Results of this study provide preliminary evidence that discrimination training can improve the choice-making accuracy of individuals with developmental disabilities during verbal preference assessments. Limitations of this study and the small number of participants further temper the results. While the direct results of discrimination training were promising for all three participants, generalization data were not as robust. As discussed above, the acquisition and maintenance of initial discriminations may influence the degree of generalization.

Research is needed to further investigate teaching strategies for improving choice-making skills for individuals with developmental disabilities. Results of this study provide preliminary evidence that discrimination training techniques may be appropriate for teaching such skills. Food items were used as choice stimuli in this study because they are highly salient and potent reinforcers for many individuals with developmental disabilities. However, future research should evaluate similar training strategies using leisure or vocational items or activities. Variables potentially affecting training such as the relative consumption of items included in the original array and the relative learning histories should be controlled across participants.

The present study did not include criteria for ensuring skill maintenance prior to testing for generalization. Future research should ensure that the effects of training are maximized by conducting retraining as necessary and monitoring the effects over longer periods of time before testing for generalization. Only one method for promoting generalization was used in this study. Systematically training multiple exemplars produced only moderate generalization effects. Perhaps training additional and more varied exemplars would have improved generalization. On the other hand, additional or different strategies for programming for generalization discussed in Stokes and Baer (1977) may have been more successful. Future research should continue to investigate this and other strategies for promoting generalization.

References

Bannerman, D. J., Sheldon, J. B., Sherman, J. A., & Harchik, A. E. (1990). Balancing the right to habilitation with the right to personal liberties: The rights of people with developmental disabilities to eat too many doughnuts and take a nap. *Journal of Applied Behavior Analysis,* 23, 79-89.

Cohen-Almeida, D., Graff, R. B., & Ahearn, W. H. (2000). A comparison of verbal and tangible stimulus preference assessments. *Journal of Applied Behavior Analysis, 33,* 329-334.

Conyers, C., Doole, A., Vause, T., Harapiak, S., Yu, D. C. T., & Martin, G. (2002). Predicting the relative efficacy of three presentation methods for assessing preferences of persons with developmental disabilities. *Journal of Applied Behavior Analysis, 35*, 49-58.

Cooper, J. O. (1987). Stimulus control. In J. O. Cooper, T. E. Heron, & W. L. Heward (Eds.), *Applied behavior analysis* (pp. 365-376), Columbus, OH: Merrill.

DeLeon, I. G., & Iwata, B. A. (1996). Evaluation of a multiple-stimulus presentation format for assessing reinforcer preferences. *Journal of Applied Behavior Analysis, 29,* 519-533.

Demchak, M. (1990). Response prompting and fading methods: A review. *American Journal on Mental Retardation, 94,* 603-615.

Developmental Disabilities Assistance and Bill of Rights Act of 2000, 42 U. S. C. 15002 § 102, P. L. 98-527.

Doyle, P. M., Wolery, M., Gast, D. L., & Ault, M. J. (1990). Comparison of constant time delay and the system of least prompts in teaching preschoolers with developmental delays. *Research in Developmental Disabilities, 11,* 1-22.

Dyer, K., Christian, W. P., & Luce, S. C. (1982). The role of response delay in improving the discrimination performance of autistic children. *Journal of Applied Behavior Analysis, 15,* 231-240.

Education for All Handicapped Children Act, P.L. 94-142 (1975).

Everson, J. M. (1996). Using person-centered planning concepts to enhance school-to-adult life transition planning. *Journal of Vocational Rehabilitation, 6,* 7-13.

Fantuzzo, J. W., Rohrbeck, C. A., Hightower, A. D., & Work, W. C. (1991). Teacher's use and children's preferences of rewards in elementary school. *Psychology in the Schools, 28,* 175-181.

Fisher, W., Piazza, C. C., Bowman, L. G., Hagopian, L. P., Owens, J. C., & Slevin, I. (1992). A comparison of two approaches for identifying reinforcers for persons with severe and profound disabilities. *Journal of Applied Behavior Analysis, 25,* 491-498.

Frank, A. R., & Wacker, D. P. (1986). Analysis of a visual prompting procedure on acquisition and generalization of coin skills by mentally retarded children. *American Journal of Mental Deficiency, 90,* 468-472.

Gast, D. L., Ault, M. J., Wolery, M., Doyle, P. M., & Belanger, S. (1988). Comparison of constant time delay and the system of least prompts in teaching sight word reading to students with moderate retardation. *Education and Training in Mental Retardation, 25,* 117-128.

Godby, S., Gast, D. L., & Wolery, M. (1987). A comparison of time delay and system of least prompts in teaching object identification. *Research in Developmental Disabilities, 8,* 283-305.

Graff, R. B., & Gibson, L. (2003). Using pictures to assess reinforcers in individuals with developmental disabilities. *Behavior Modification, 27,* 470-483.

Green, C. W., Reid, D. H., Canipe, V. S., & Gardner, S. M. (1991). A comprehensive evaluation of reinforcer identification processes for persons with profound multiple handicaps. *Journal of Applied Behavior Analysis, 24,* 537-552.

Green, C. W., Reid, D. H., White, L. K., Halford, R. C., Brittain, D. P., & Gardner, S. M. (1988). Identifying reinforcers for persons with profound handicaps: Staff opinion versus systematic assessment of preferences. *Journal of Applied Behavior Analysis, 21,* 31-43.

Hagner, D., Helm, D. T., & Butterworth, J. (1996). "This is your meeting": A qualitative study of person-centered planning. *Mental Retardation, 34,* 159-171.

Handen, B. L., & Zane, T. (1987). Delayed prompting: A review of procedural variations and results. *Research in Developmental Disabilities, 8,* 307-330.

Heckaman, K. A., Alber, S., Hooper, S., & Heward, W. L. (1998). A comparison of least-to-most prompts and progressive time delay on the disruptive behavior of students with autism. *Journal of Behavioral Education, 8,* 171-201.

Higbee, T. S., Carr, J. E., & Harrison, C. D. (1999). The effects of pictorial versus tangible stimuli in stimulus-preference assessments. *Research in Developmental Disabilities, 20,* 63-72.

Karsh, K. G., Repp, A. C., Lenz, M. W. (1990). A comparison of the task demonstration model and the standard prompting hierarchy in teaching word identification to persons with moderate retardation. *Research in Developmental Disabilities, 11,* 395-410.

Kern, L., Vorndran, C. M., Hilt, A., Ringdahl, J. E., Adelman, B. E., & Dunlap, G. (1998). Choice as an intervention to improve behavior: A review of the literature. *Journal of Behavioral Education, 8,* 151-169.

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

Kincaid, D. (1996). Person-centered planning. In L. K. Koegel, R. L. Koegel, & G. Dunlap (Eds.), *Positive behavior support: Including people with difficult behavior in the community*. (pp. 439-465). Baltimore: Brookes.

Lohrmann-O'Rourke, S. & Browder, D. M. (1998). Empirically based methods to assess the preferences of individuals with severe disabilities. *American Journal on Mental Retardation, 103,* 146-161.

MacDuff, G. S., Krantz, P. J., & McClannahan, L. E. (1993). Teaching children with autism to use photographic activity schedules: Maintenance and generalization of complex response chains. *Journal of Applied Behavior Analysis, 26,* 89-97.

MacDuff, G. S., Krantz, P. J., & McClannahan, L. E. (2001). Prompts and prompt-fading strategies for people with autism. In Maurice, C., Green, G., & Foxx, R. M. (Eds.), *Making a difference: Behavioral intervention for autism.* (pp. 37-50). Austin, TX: PRO-ED.

Mason, S. A., McGee, G. G., Farmer-Dougan, V., & Risley, T. R. (1989). A practical strategy for ongoing reinforcer assessment. *Journal of Applied Behavior Analysis, 22,* 171-179.

McGee, G. G., Krantz, P. J., & McClannahan, L. E. (1986). An extension of incidental teaching procedures to reading instruction for autistic children. *Journal of Applied Behavior Analysis, 19,* 147-157.

Northup, J., George, T., Jones, K., Broussard, C., & Vollmer, T. R. (1996). A comparison of reinforcer assessment methods: The utility of verbal and pictorial choice procedures. *Journal of Applied Behavior Analysis, 29,* 201-212.

Northup, J., Jones, K., Broussard, C., & George, T. (1995). A preliminary comparison of reinforcer assessment methods with ADHD children. *Journal of Applied Behavior Analysis, 28*, 99-100.

O'Brien (1987). A guide to lifestyle planning. In B. Wilcox & G. T. Bellamy (Eds.). *A comprehensive guide to the activities catalog* (pp. 175-189). Baltimore: Brookes.

Oppenheimer, M., Saunders, R. R., Spradlin, J. E. (1993). Investigating the generality of the delayed-prompt effect. *Research in Developmental Disabilities, 14,* 425-444.

Pace, G. M., Ivancic, M. T., Edwards, G. L., Iwata, B. A., & Page, T. J. (1985). Assessment of stimulus preference and reinforcer value with profoundly retarded individuals. *Journal of Applied Behavior Analysis, 18,* 249-255.

Paclawskyj, T. R., & Vollmer, T. R. (1995). Reinforcer assessment for children with developmental disabilities and visual impairments. *Journal of Applied Behavior Analysis, 28,* 219-224.

Pennsylvania Association for Retarded Children (PARC) v. Commonwealth of Pennsylvania, 334 F. Supp. 1257 (E. D. PA 1972).

Piazza, C. C., Fisher, W. W., Hagopian, L. P., Bowman, L. G., & Toole, L. (1996). Using a choice assessment to predict reinforcer effectiveness. *Journal of Applied Behavior Analysis, 29,* 1-9.

Rehabilitation Act of 1973, P.L. 93-112.

Reid, D. H., Everson, J. M., & Green, C. W. (1999). A systematic evaluation of preferences identified through person-centered planning for people with profound multiple disabilities. *Journal of Applied Behavior Analysis, 32,* 467-477.

Repp, A. C., Karsh, K. G., & Lenz, M. W. (1990). Discrimination training for persons with developmental disabilities: A comparison of the task demonstration model and the standard prompting hierarchy. *Journal of Applied Behavior Analysis, 23,* 43-52.

Riley, G. (1990). Prompting strategies for those with a severe mental handicap: A comparison of procedures using only response prompts with a procedure combining stimulus and response prompts. *Behavioural Psychotherapy, 18,* 193-206.

Roane, H. S., Vollmer, T. R., Ringdahl, J. E., & Marcus, B. A. (1998). Evaluation of a brief stimulus preference assessment. *Journal of Applied Behavior Analysis, 31,* 605-620.

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.

Sewell, T. J., Collins, B. C., Hemmeter, M. L., & Schuster, J. W. (1998). Using simultaneous prompting within an activity-based format to teach dressing skills to preschoolers with developmental delays. *Journal of Early Intervention, 21,* 132-145.

Stokes, T. F., & Baer, D. M. (1977). An implicit technology of generalization. *Journal of Applied Behavior Analysis, 10,* 349-367.

Summers, J. A., Rincover, A., & Feldman, M. A. (1993). Comparison of extra- and within-stimulus prompting to teach prepositional discriminations to preschool children with developmental disabilities. *Journal of Behavioral Education, 3,* 287-298.

Tekin-Iftar, E., Acar, G., & Kurt, O. (2003). The effects of simultaneous prompting on teaching expressive identification of objects: An instructive feedback study. *International Journal of Disability: Development and Education, 50,* 149-167.

Touchette, P. E., & Howard, J. S. (1984). Errorless learning: Reinforcement contingencies and stimulus control transfer in delayed prompting. *Journal of Applied Behavior Analysis, 17,* 175-188.

Wilder, D. A., Ellsworth, C., White, H., & Schock, K. (2003). A comparison of stimulus preference assessment methods in adults with schizophrenia. *Behavioral Interventions, 18,* 151-160.

Wilder, D. A., Wilson, P., Ellsworth, C., & Heering, P. W. (2003). A comparison of verbal and tangible stimulus preference assessment methods in adults with schizophrenia. *Behavioral Interventions, 18,* 191-198.

Windsor, J., Piche, L. M., & Locke, P. A. (1994). Preference testing: A comparison of two presentation methods. *Research in Developmental Disabilities, 15,* 439-445.

Wolery, M., & Gast, D. L. (1984). Effective and efficient procedures for the transfer of stimulus control. *Topics in Early Childhood Special Education, 4,* 52-77.

Wolery, M., Gast, D. L., Kirk, K., & Schuster, J. (1988). Fading extra-stimulus prompts with autistic children using time delay. *Education and Treatment of Children, 11,* 29-44.

Wolery, M., Holcombe, A., Cybriwsky, C., Doyle, P. M., Schuster, J. W., & Ault, M. J. (1992). Constant time delay with discrete responses: A review of effectiveness and demographic, procedural, and methodological parameters. *Research in Developmental Disabilities, 13,* 239-266.

Vita

Christina Marie Vorndran is a candidate for the degree of Doctor of Philosophy in the school psychology program at Louisiana State University. She graduated from Saint Joseph's University with a Bachelor of Science degree in psychology and did post-baccalaureate work at Children's Seashore House and the University of Pennsylvania under the supervision of Drs. Lee Kern, Timothy Vollmer, and Joseph Lalli. She earned a Master of Arts degree in psychology from Louisiana State University under the supervision of Dr. Dorothea C. Lerman and is currently following a doctoral program under the supervision of Dr. Lerman at Louisiana State University. She expects to graduate with a Doctor of Philosophy degree in December, 2005.