TEACHING CHOICE-MAKING SKILLS TO CHILDREN WITH AUTISM

by

HANNAH HOCH

A dissertation submitted to the Graduate Faculty in Psychology in partial fulfillment
of the requirements for the degree of Doctor of Philosophy,
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Abstract

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Advisor: Professor Nancy Hemmes

Individuals with developmental disabilities often exhibit impairments in receptive and expressive language. They may not comprehend questions that use linguistic connectives such as the exclusive "or," as in "is this a dog or a cat?" As a result, they may have difficulty making choices when the choice alternatives are represented orally (i.e., "do you want ____ or ____?"), versus visually (by presentation of a picture or object representing the choice alternative). The purpose of this study was to examine the effectiveness of prompting and time delay procedures in teaching individuals with developmental disabilities to make verbal choices when the alternatives were presented as a spoken question. Following assessments to determine high- and low-preference items, the students were orally offered a choice between a high- and a low-preference item. The intervention involved a prompting procedure in which the instructor provided a verbal and/or visual prompt to the student to state the verbal label of the high-preference item. Initially the prompt was delivered immediately following the offer of a choice; then the delay to prompting was gradually increased over trials, contingent upon the student's accurately choosing the high-preference item. The prompt and time-delay procedures were introduced under a multiple-baseline-across-participants experimental design. Probes were conducted throughout to assess generalization of responding to novel people. Results

of the study differed for each participant. The verbal prompt + time-delay intervention was associated with an increase in accurate choice responding over baseline levels for one student. For the second student, when a visual cue was added, an increase in choice responding was noted. The intervention package was not associated with a change in responding from baseline for the third student. An increase in level of responding to novel instructors between baseline and treatment was seen for the first two participants. Due to the failure to demonstrate systematic changes in responding with the introduction of intervention with all three participants, the conclusions that can be drawn from this study are extremely limited. Results are discussed in terms of possible explanations for this failure of the same single intervention to result in changes in responding for all participants.

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Individuals with developmental disabilities exhibit impairments in receptive and expressive language (Lord, Risi, & Lambrecht, 2000; Noterdaeme, Sitter, & Mildenberger, 2000; Sigafoos & Pennell, 1995). Anecdotal evidence suggests that one way these language deficits are manifested is in these individuals' lack of comprehension of linguistic connectives. A linguistic connective is a word that serves to conjoin or connect words, sentences, or phrases (Merriam-Webster's Collegiate Dictionary, 1993), such as "and," "or," and "if." One connective that individuals with disabilities have particular difficulty understanding is the disjunction, or a connective that expresses an alternative or opposition between the meanings of the words it connects, such as "or". In logical operations, an exclusive disjunction is a compound proposition that is true when one and only one statement is true. For example, "the box is red or the box is blue."

Comprehension of disjunctions has been shown to improve as young children age (Suppes & Feldman, 1971; Paris, 1973), but can be slow to develop in individuals with developmental disabilities even as they age. Anecdotal reports indicate that they may struggle to answer simple questions, such as, "do you live in a house or a boat." This deficit has implications for these individuals when they are offered choices--because they have difficulty comprehending questions that involve "or," they may not be able to make valid choices when asked "do you want item a *or* item b." The purpose of the present study is to demonstrate that procedures using prompting and

time delay may be effective in teaching individuals with developmental disabilities to make valid choices when the choice alternatives are presented to the student verbally, as a disjunctive statement.

Providing individuals with disabilities choice-making opportunities has been shown to decrease problem behavior (Carr & Carlson, 1993; Cole & Levinson, 2002; Dunlap et al, 1994; Dyer, Dunlap, & Winterling, 1990; Kern et al., 1998; Powell & Nelson, 1997; Seybert, Dunlap, & Ferro, 1996; Vaughn & Horner, 1997), increase engagement in tasks (Carr & Carlson, 1993; Cosden, Gannon & Haring, 1995; Skinner, Wallace & Neddenriep, 2002), and ensure that an individual can access highly preferred stimuli (Lerman et al., 1997). By the same token, restricting choice-making opportunities can have negative effects, such as reducing interactions with others and limiting participation in daily life (Bannerman et al., 1990). Given these findings, it seems appropriate for caregivers to ensure that individuals with disabilities have the skill and opportunity to make choices throughout their daily lives.

The assessment and teaching of choice-making skills to individuals with disabilities has received considerable attention in recent literature (e.g., Browder, Cooper & Lim, 1998; Graff & Gibson, 2003; Parsons, Harper, Jensen, & Reid, 1997; Singh, Lancioni, & O'Reilly, 2003; Stafford et al., 2002). These individuals often require formal, carefully structured teaching programs, which involve strategies such as prompting and time delay, to learn the skill of choice-making (Parsons et al., 1997). A valid choice response has been defined as a response after which the individual engages with the item and does not subsequently reject it (Stafford et al.,

2002). As described above, given these individuals' impairments in language, it may be especially difficult for them to make valid choices when the choice alternatives are presented verbally (i.e., with a verbal discriminative stimulus of the choice items, "do you want [item a] or [item b]?"), as opposed to visually (by presentation of the choice alternatives or a picture representing them). Indeed, in most research on teaching choice-making skills to individuals with autism the choice alternatives were visually presented. Further, in studies that compared choice-making based on pictorial presentation versus oral presentation, choices based on pictorial presentations were more likely to be valid (e.g., Northup et al., 1996). In many cases, however, it may be beneficial for the individuals to learn how to make choices when the choice alternatives are presented in an oral format. After conducting a literature review using the EBSCO PsychInfo database (which contains citations and summaries of scholarly journal articles, book chapters, books, and dissertations, all in psychology and related disciplines, dating from 1877 to the present), this author found no research to date examining a procedure for teaching individuals to make choices when the alternatives are verbally stated. The appendix contains a more complete review of related literature.

The purpose of this study was to examine the effects of procedures employing prompting and systematic fading of the interval between the opportunity to choose and a prompt (time delay) on teaching individuals with developmental disabilities to respond orally to spoken presentations of choice alternatives. The intervention involved a prompting procedure in which the instructor presented a verbal and/or visual prompt to the student to state the verbal label of the (previously identified)

preferred choice alternative. Initially the prompt was delivered immediately following the offer of a choice. The delay to prompting was then gradually increased over trials, contingent upon the student's accurately choosing the high-preference item, until the prompts were no longer necessary. Generalization of the choice-making response to novel people was assessed. The prompt and time-delay procedures were introduced under a multiple baseline across participants design.

Method

Participants and Setting

The participants in this study were three students diagnosed with autism, all of whom were able to express their wants and needs verbally. Larry, age 16, was able to speak in four-to-six word sentences. Mary, age 5, was able to speak in three-to-four word utterances. Jackson, age 16, was able to speak in three-to-five word utterances. The participants were referred to this study by their teachers owing to their reported failure to make consistent, valid choice responses when choice alternatives were presented orally. The participants were required to demonstrate several prerequisite skills, including (a) receptive labels of all items used in the study (i.e., ability to point to matching item upon hearing verbal label), (b) expressive labels for all items used, and (c) ability to make choices when the choice alternatives were presented physically. Procedures for assessing pre-experimental choice-making behavior and the prerequisite skills are described more fully below.

All students attended small (26-29-student) schools for children with autism. Larry and Jackson were classmates in the same school. Mary attended a different school. The study was conducted in various classrooms in the students' schools. The classrooms were equipped with desks, chairs, and the choice alternatives (which were not visible to the student during the baseline and intervention conditions). At times a second observer was present in the room to collect interobserver data.

Experimenter and Research Assistants

The primary experimenter for Larry and Jackson was the author of this study, a graduate student with formal training in applied behavior analysis. The primary

investigator for Mary was her classroom special education teacher who had received formal training in applied behavior analysis. She was trained to run sessions by the author. The primary experimenters served as the instructors and conducted most of the baseline and treatment sessions throughout the study. Other classroom staff, such as teachers and clinical supervisors, served as the novel instructors for generalization probes and the second observers for interobserver agreement (IOA) data collection purposes. These instructors all had training in special education and applied behavior analysis.

Materials

The materials used in this study were edible items (for Mary) or leisure items (for Larry and Jackson) selected individually for each participant. Table 1 lists the items used for each student.

Experimental Design

A multiple-baseline-across-participants design was used to evaluate the effects of the prompting and fading procedure on independent, accurate choice responding (i.e., unprompted selection of the preferred item from among two alternatives), as well as to assess the generalization of the teaching effects from the original teacher to novel instructors.

Procedure

Prior to experimentation, potential participants were screened to determine that that they showed a deficit in making valid choice responses when choice alternatives were presented in a spoken format. The screening procedure consisted of having the student's teacher present him/her with ten choice-making opportunities

throughout the day. During each trial, the teacher asked the student, "do you want [item *a*] or [item *b*]?" (*a* and *b* referred to a preferred and a nonpreferred item). No consequences were provided for any response; the teacher just recorded the student's response and moved on to the student's next programmed activity. This procedure was followed ten times, spread across the student's day. In order to meet criterion for inclusion into the study, the students had to respond by naming the preferred item on no more than 50% of the trials.

Following the screening process, preference assessment and assessment for prerequisite skills were conducted with those individuals selected for inclusion. When prerequisite skills were not present, appropriate training procedures were implemented, as described below. During these preliminary procedures, it was determined that all individuals selected for participation were appropriate for inclusion, given the skills they demonstrated during all preliminary procedures and assessments. Following these preliminary procedures, the experimental phase began, consisting of a baseline and intervention phase. Sessions were conducted three-to-five days per week and were approximately 10 minutes in duration.

Preference Assessments

The students selected for participation in this study were presented with a multiple stimulus without replacement (MSWO) preference assessment using procedures described by DeLeon & Iwata (1996). Each participant's teacher generated a list of six highly preferred and six neutral or nonpreferred items. As mentioned above, for Mary these items were edibles, and for Larry and Jackson they were leisure activities (their parents determined whether edibles or leisure items

should be used). These items were then used in the preference assessment. To begin the assessment, the participant was seated at the table and told that he/she was going to play with some toys or eat some snacks. All 12 items were placed in front of the participant in a straight line on the table, about 5 cm apart. During each trial the instructor gave the instruction, “pick one” and allowed the participant 10 s to select an item (as indicated by reaching for or touching an item). If the participant selected an item, he/she was allowed to consume it or manipulate it for 10 s. The item was not replaced (if it was a leisure item, it was removed and placed out of view of the participant). The trial ended after the participant had consumed or received 10 s of access to the selected item. Prior to the next trial, the placement of the stimulus items was randomly re-sequenced. The next trial then followed immediately, with the instructor repeating the direction, “pick one.” This process continued until all items were selected or until the participant made no selection within 30 s from the beginning of a trial (maximum of 12 trials). This assessment was conducted three times with each student. Following this assessment, the items were ranked according to their ratio of selection. This ratio was calculated by dividing the number of times the item was selected by the number of trials in which the item was presented. The four items with the highest ratio of selection were designated as the high-preference (HP) items; the three items with the lowest ratio (less than 13% selection) were designated as nonpreferred (NP). If at any point the student stopped manipulating/ consuming an item previously designated as high preference, that item was dropped from the study and was not replaced. Four (rather than three) HP items were used to

ensure that if an item was dropped there would still be three remaining. This effect did occur with one item for all three students.

Assessments for Prerequisite Skills

Receptive labeling assessment. An assessment of the receptive labeling skill was conducted to demonstrate that the students could receptively identify each item used in the study upon hearing its verbal label. The items used in this assessment were the four HP and three NP items identified during the Preference Assessment phase. At the beginning of each trial, the teacher placed three items in front of the student and presented the instruction, "Point to (label of an item)." If the student pointed to an item (whether correct or incorrect), that item was taken away, and another was added to the array. If the student did not point to an item, the instruction was repeated. If the student again did not respond, the items were removed and the next trial was run. No programmed consequences (i.e., prompting, error correction, or reinforcement) were provided for correct or incorrect responses. This process continued until all seven items were tested. Data were recorded on accuracy of the student's selections (i.e., percentage of trials in which he/she pointed to the matching item). To move on to the next phase the student had to achieve at least 90% accuracy on this assessment. If the student could not label an item at 100% accuracy, she/he was taught the label during regular classroom instructional sessions. This assessment was repeated after the student demonstrated acquisition of the label in the classroom. Following the first assessment it was determined that each participant needed to learn the receptive labels of two of the items. They all then demonstrated 100% accuracy on the final receptive labeling assessment.

Expressive labeling assessment. Assessment of expressive labeling was conducted to demonstrate that the students could expressively label each of the seven items used in the study. At the beginning of a trial, the teacher put an item in front of the student and presented the instruction, “What’s this?” If the student responded by stating the accurate label, that item was taken away and the next trial began. If the student responded with an inaccurate label, the item was removed, and retested later on. If the student did not respond, the instruction was repeated. If the student again did not respond, the item was removed and the next trial was run. No programmed consequences (i.e., prompting, error correction, or reinforcement) were provided for correct or incorrect responses. This process continued until all seven items were tested. Data were recorded on accuracy of the student’s responses (i.e., percentage of trials in which he/she stated the accurate item label). In order to move on to the next phase of the study, the student had to achieve at least 100% accuracy on this assessment. If the student could not label an item at 100% accuracy, she/he was taught the label during regular classroom instructional sessions. This assessment was repeated after the student demonstrated acquisition of the label in the classroom. Following the first assessment it was determined that all participants needed to learn the expressive labels of two of the items (the same ones as those for which they needed to learn the receptive labels). They all then demonstrated 100% accuracy on the final expressive labeling assessment.

Assessment of Choice-Making Skill. An assessment of choice-making skill was conducted to formally demonstrate that the students could make consistent, independent choices when the choice alternatives were physically presented. A test

for the presence of this skill was conducted by asking the student to choose between one HP and one NP item (as identified during the preference assessment phase). During this assessment, the student was seated at a table across from the instructor. The instructor began the first trial by placing the two items on the table in front of the participant and asking him/her to "pick one." When the participant reached for an item, he/she was given the item and allowed to manipulate/consume it. Every HP item was paired with every NP item during this assessment, for a total of 12 trials. The percentage of trials in which the HP item was selected was recorded. In order to move on to the next phase of the study the student had to select the preferred alternative on at least 90% of the trials. All of the participants demonstrated selection of the preferred alternative on 100% of the trials.

Response Definitions

The target behavior in this study was accurate, independent choices of preferred items made by the participant. To be scored as correct, a response had to include the following: a) independent (i.e., unprompted) verbal selection (producing the verbal label) of the preferred of two presented items; and b) consumption of the edible item/ manipulation of the leisure item. The following five responses were scored as incorrect: (1) verbal selection of the nonpreferred item (e.g., "celery" for Mary); (2) no response following two presentations of the choice statement; (3) naming an item not offered during that trial following two presentations of that choice statement; (4) an unrelated verbal response (e.g., saying "snack"); and (5) verbal selection of an item but no consumption or manipulation of it. This final criterion was included to ensure that the student's verbal response represented a valid choice

(defined by Stafford et al., 2002, as a choice after which the student engages with the item and does not subsequently reject it). If a choice statement was repeated (if there was no response or the student named an item not offered) and the response to the second presentation of the choice statement was correct, that sequence of events was considered one trial and a correct response was scored (see below for more details). Data on accurate choice responding were expressed as percentage of trials in which the preferred item was selected (in the absence of a prompt) and consumed/manipulated.

Experimental Procedures

General procedures. During each trial, the participant was offered a choice between an HP item (i.e., one of the four items identified as highly preferred during the preliminary preference assessment), and an NP item (i.e., one of the three identified as nonpreferred). During each session, the participant was seated at a table across from the instructor. A session began when the instructor presented one of the following five verbal choice statements: a) "Do you want [item a] or [item b]?" b) "Should I give you [item a] or [item b]?" c) "Would you rather have [item a] or [item b]?" d) "Would you prefer [item a] or [item b]?" or e) "Should we have [item a] or [item b] for snack/break?" In each choice statement, *a* and *b* referred to the choice items. For each participant, three of these statements were designated as *training statements*, and two were designated as *probe statements*. (See Table 2 for a list of statements designated as training and probe for each participant.) The actual items remained out of view during presentation of the choice statement. During baseline and all time delay conditions, the participant was given 4 s to respond (this time limit

was based on that used by Stafford et al., 2002). If the participant did not respond within 4 s, a prompt was provided or the next trial was initiated, depending on the experimental phase. If the participant responded by naming an item that was not offered during that trial (e.g., Mary said “jelly bean” when asked “do you want chip or celery”), the instructor said “we’re not having that now” and repeated the choice statement. This was not scored as an incorrect response. If the participant again named an item that was not offered, a prompt was provided or the next trial was initiated, depending on the experimental phase. This was scored as an incorrect response. If, during any trial in which the participant received access to an item, she/he did not begin to consume/manipulate it within 5 s, the item was removed. The order in which the instructor listed the two items—HP or NP first—was counterbalanced across trials, to remove ordinal position as a possible source of control over choice responding. To accomplish this, trials were conducted in A-B-B-A-A-B-B-A order, in which during the A trials the HP item was listed first and during B trials the NP item was listed first. Each of the HP and NP items was offered at least once during every session. A total of 10 trials were conducted per session. Each of the five choice statements was presented twice. The sequence of probe- and training-statement trials was programmed as follows: the 10 trials were divided into five sets of two trials. Each session began (set 1) and ended (set 5) with the probe-statement trials. Training statements were presented in sets 2, 3 and 4. The order of the three training statements was randomly determined using a random number generator (www.random.org). In each set, the same choice statement was used, with the sequence of HP and NP items reversed (e.g., if trial 1 was “Would you prefer [HP] or

[LP],” trial 2 was “Would you prefer [NP] or [HP]”). A sample ordering of trials for a session with Mary is presented in table 3.

The following sections describe all experimental procedures presented to the participants, in their order of presentation. After the first two conditions (baseline and the verbal prompt intervention), different participants were presented with different intervention procedures, as determined by their patterns of responding during each condition.

Baseline. During baseline sessions, the choice alternatives were presented in a spoken format as described above. If the participant named one of the two items, he/she was given the item and allowed to consume/manipulate it. If the participant named both items, or made some other incorrect verbal response (i.e., said something unrelated, such as “your break”), the instructor paused for 2 s and then went on to the next trial. If the participant did not make any verbal response within 4 s, the instructor repeated the question, and the participant was again given 4 s to respond (this time limit was based on that used by Stafford et al., 2002). If the participant then responded, he/she was presented with and allowed to consume the selected item. If the participant again did not respond, the instructor moved on to the next trial.

Choice-making instruction: Intervention. During all trials in all intervention conditions, if the student responded by naming the label of the HP item, he/she was given the item and allowed to consume/manipulate it. During *training-statement trials*, if the student responded by choosing (naming) the NP item or naming both items, the designated prompt was provided immediately. If the student responded by naming an item that was not offered (e.g., Mary said “jelly bean” when the trial was

"do you want Dorito or celery?"), the instructor said "we're not having that now" and repeated the choice statement. During *probe-statement trials*, no prompts were delivered to the student. If the student responded by naming one of the two items listed in the choice statement, that item was presented. If both items were named, or another incorrect verbal response was made (e.g., the participant said something unrelated), the instructor paused for 5 s and then moved on to the next trial.

Verbal Prompt. During this phase, immediately (0-sec delay) after the instructor presented a training statement, she verbally prompted the student to state the spoken name of the HP item (i.e., the instructor said, "Say '(HP item)'"). For example, for Mary, if the HP item for the trial was a chip and the NP item was celery, the instructor said, "Do you want chip or celery? Say, 'chip'." The prompt was delivered in this way for all *training-statement trials*. During all trials, if the student responded by verbally repeating the label of the HP item, he/she was given the item and allowed to consume/manipulate it. If (at any point) the student named the NP item, both items, or made some other incorrect verbal response, the prompt was immediately re-presented (i.e., the instructor modeled the verbal label).

Verbal Prompt + Time Delay. A graduated time-delay procedure using 2-s increments was used to fade the verbal prompt across sessions (see Charlop & Trasowech, 1991). The initial delay interval between the verbal statement and spoken prompt was 0 s (as described above). When the participant imitated the instructor's modeled response at 100% accuracy and stability was seen in the probe statement data during the verbal prompt phase, the time delay was increased to 2 s. Following two consecutive sessions with 100% correct responding, the time delay was increased

to 4 s, and so on. During this condition, if at any time the participant made an incorrect response (i.e., named the NP item, named both items, or gave another incorrect verbal response), the instructor provided the verbal prompt immediately (e.g., if the HP item was a book, the instructor said "say 'book'."). If the participant imitated the modeled response (e.g., said, "Book"), he/she received immediate access to the HP item.

Modified time delay (Mary only). The procedures used in this condition were identical to those used in the verbal prompt condition with one exception: if the participant made an error, the instructor provided the prompt, and then repeated the choice statement until an independent (unprompted) accurate response was made. Only Mary participated in this condition. This condition was introduced with Mary because her responding did not increase when the time delay was introduced. Her teachers (including this author) hypothesized that the verbal prompt teaching procedure was ineffective because she was accessing the HP item immediately following a prompted response. They therefore thought that if Mary was required to produce an independent correct response before accessing the HP item, this might enhance the effectiveness of the verbal prompt.

Visual Cue (Mary and Jackson only). During *training-statement trials* under this condition, after the instructor stated the choice statement, she immediately (0 s delay) held up both choice items (i.e., the HP item and the NP item). If the participant named the HP item, access to that item was provided. If the participant named the NP item or made another incorrect verbal response, the instructor provided a verbal model (e.g., the instructor said, "say, 'book'"). If the participant imitated the

modeled response, he/she then received access to the HP item. The verbal model was repeated until the participant imitated it correctly, and then received access to the item. Only Mary and Jackson participated in this condition.

Visual Cue + Time Delay (Mary only). A graduated time-delay procedure identical to that used for the verbal prompt was used during this condition to fade out the visual cue over sessions. The initial delay interval between the verbal statement and visual cue was 0 s (as described above). When the participant labeled the HP item at 100% accuracy and stability was seen in the probe statement data during the verbal prompt phase, the time delay was increased to 2 s. Following two consecutive sessions with 100% correct responding, the time delay was increased to 4 s, and so on. During this condition, if at any time the participant made an incorrect response (e.g., named the NP item or both items), the instructor immediately provided the visual cue (i.e., held up both items). If the participant then named the HP item, she received immediate access to it. Only Mary participated in this condition.

Modified Visual Cue (Jackson only). The procedures used in this condition were identical to those used in the Visual Cue condition with one exception: after the instructor stated the choice statement, only the HP item was held up (rather than both the HP and NP items), to serve as a visual cue for the correct response. This modification was only conducted with Jackson.

Follow up (Larry only). Following session 27, the schedule at which sessions were run with Larry was thinned and sessions were run much less frequently. Procedures were the same as those used during the Verbal Prompt + Time Delay condition.

Generalization to Novel Instructors. Generalization of treatment effects across novel instructors was assessed during separate sessions in both baseline and intervention phases. During those sessions, a novel teacher, who did not conduct any other experimental trials with the student, conducted the entire session using baseline procedures. Novel instructor sessions were conducted periodically throughout baseline and during most intervention conditions, either right before a phase change (i.e., at the end of the verbal prompt condition), or when the participant demonstrated 90% accurate choice responding for at least 2 consecutive sessions.

Independent Variables and Procedural Reliability

In order to assess reliability of the implementation of the independent variables by the experimenter, the following variables were measured for accuracy: (a) correct presentation of a pre-selected choice statement (e.g., “do you want [item a] or [item b]?”) to the participant; (b) presentation of a stimulus prompt at the delay interval in effect for a given experimental phase; (c) delivery of the chosen alternative; and (d) use of prompting strategies. A second observer independently recorded data on the accurate implementation of these four variables. Data were expressed as the percentage of trials on which all components of the intervention were accurately applied. Procedural integrity data were collected for at least 35% of sessions with each student and were 100% for all students.

Interobserver Agreement

Interobserver agreement (IOA) was evaluated by having a second observer simultaneously but independently record data on all dependent and independent variables. Data were scored using point-by-point comparisons, calculated by dividing

the number of agreements by the number of agreements plus disagreements. IOA data were recorded and computed for all dependent and independent variables for at least 35% of the sessions of each experimental condition for each participant. IOA values were 100% for all measures for each participant.

Results

Figure 1 shows the percentage of accurate choice responses during training- and probe-statement trials across sessions for the primary teacher only (novel instructor probe sessions are not depicted) for each participant. The percentage was determined by dividing the number of trials in which a choice response meeting the definition listed above was made by the total number of trials per session. Results are depicted for Larry in the first panel, for Mary in the middle panel, and for Jackson in the bottom panel.

Larry

During baseline, the mean percentage of accurate choice responding for Larry was 58% for training-statement trials and 37% for probe-statement trials. With the introduction of the verbal prompt condition, Larry's accurate choice responding during probe-statement trials increased to 100% in the second session (mean of 80% across sessions). Data for training-statement trials are not depicted for this phase because there was no opportunity for a correct independent response, as prompts were delivered immediately following presentation of the choice statement (0-s time delay). With the introduction of the time-delay condition, his responding during training-statement trials increased to 100% within five trials. When the time delay was increased to 4 s, responding remained stable, and never dropped below 83% for training-statement trials and 75% for probe-statement trials for the remainder of all sessions. During follow up, Larry's responding during all trials maintained at 100% for the last five sessions. Data from the first set of probe-statement trials (i.e., trials 1 and 2 for each session) were compared to the data from the second set of probe-

statement trials (i.e., trials 9 and 10) to examine for the presence of sequence effects; however, no difference in performance was noted.

Mary

During baseline, the mean percentage of accurate choice responding for Mary was 13% for training-statement trials (range 0-33%) and 18% for probe-statement trials (range 0-50%). With the introduction of the verbal prompt condition, Mary's accurate responding during probe-statement trials increased to a mean of 30% (range 0-75%). When the time delay was introduced, Mary only had one correct response during training-statement trials across three sessions. During these trials, Mary typically had no response or repeated the label of the last item named by the instructor. When the verbal prompt was provided, she typically repeated it immediately and then received access to the HP item. Her teachers (including this author) hypothesized that the teaching procedure was ineffective because she was accessing the HP item immediately following a prompted response. The modified time-delay condition was then introduced, in which following a prompted response the teacher repeated the trial until an independent response was given. Thus, Mary had to make an independent correct response to access the HP item, which her teachers thought might enhance the effectiveness of the verbal prompt. During this condition, responding during training statement probes did increase slightly (to a mean of 35%) but never approached 100% accuracy. When the Visual Cue condition was implemented, responding to probe-statement trials increased to 75% for all three sessions. When the visual cue + time-delay condition was introduced, responding during training-statement trials increased to 100% within three sessions. When the

time delay was increased to 4 s, responding remained stable. Responding only dropped below 83% once for training-statement trials, and never below 75% for probe-statement trials, for the remainder of all sessions. Just as with Larry, data from the first set of probe-statement trials were compared to the data from the second set of probe-statement trials, to examine for the presence of sequence effects. However, no difference in performance was noted.

Jackson

During baseline, a decline in the percentage of accurate choice responding was seen over time. At the beginning of baseline, Jackson did respond accurately some of the time (though only twice with over 50% accuracy). From session 26 and on, however, he rarely made a correct response, and from session 32 and on he had no correct responses. At the beginning of baseline, Jackson typically responded by repeating the last thing he heard. Thus, within each session, during four trials that response was the name of the HP item; during four trials it was the LP item; and during two trials (of the training statement “Do you want *a* or *b* for break”) that response was the words “for break.” Starting with session 25, Jackson began responding by saying “yo break” for most or all trials of each session (i.e., not just in response to the trials of “do you want *a* or *b* for a break”). The author and Jackson’s teachers hypothesized that this response may have been a partial echoic of “for break.” When the verbal prompt condition was initiated (session 42), Jackson had 25% accurate choice responding during probe trials in three out of the six sessions. During the other three sessions he had no correct responses. During training trials, he often did not respond to the initial verbal prompt by repeating the verbal model of the

label of the HP item. Rather, he continued to respond by saying “yo break,” and the instructor had to repeat the verbal prompt at least one extra time in 50% of all training-statement trials.

Because of Jackson’s lack of responding to the verbal prompt, rather than moving to the verbal prompt and time-delay condition, the visual cue condition was introduced. During the first three sessions of this condition, Jackson had only one correct response during all probe trials. Responding to the visual cue of holding up two items was inconsistent; Jackson continued to say “yo break” while pointing to the HP item, and often required multiple verbal prompts to name the HP item. When the modified visual cue was introduced (and only the HP item was held up), Jackson had only 5 correct responses out of 12 probe-statement trials (42% accuracy during all probe-statement trials). He continued to respond by saying “yo break,” and required multiple verbal prompts to name the HP item. At this point the decision was made to terminate the intervention. Jackson’s clinical team determined that given his previous learning history, it would be appropriate to terminate teaching trials at that time and restart a teaching program using different strategies (e.g., video modeling) after several months.

Figure 2 shows the percentage of accurate choice responses across sessions with the primary teacher and sessions with a novel instructor. Data points for each session in baseline and all time-delay conditions are based on all trials (training- and probe-statement trials combined). Data points in the Verbal Prompt and Visual Prompt conditions are based on probe-statement trials only. Results are depicted for

Larry in the first panel, for Mary in the middle panel, and for Jackson in the bottom panel.

Larry

During baseline, the mean percentage of accurate choice responses for Larry for both teacher and novel instructor sessions was 50% (range 40-60%). During the verbal prompt condition, Larry's accurate choice responding during sessions conducted by the primary teacher (probe-statement trials only) increased to 100%, and was 90% during the session conducted by the novel instructor. With the introduction of the time-delay condition, his responding during teacher sessions averaged 95% (range 70-100%), and during novel instructor sessions averaged 93% (range 80-100%). During follow up Larry's accurate choice responding maintained at 100% in seven out of 10 sessions.

Mary

During baseline, Mary's mean percentage of accurate choice responses during sessions conducted by her primary teacher was 15% (range 0-40%), and 28% during sessions conducted by novel instructors (range 0-50%). During the verbal prompt condition, her mean accurate choice responding during sessions conducted by the primary teacher (probe-statement trials only) increased to 30% (range 0-75%), and was 60% during the session conducted by the novel instructor. Following introduction of the time-delay condition, her responding during teacher sessions averaged 20% (range 10-40%). During the modified time-delay condition, the mean of accurate choice responding during sessions conducted by the primary teacher was 42% (range 30-50%). When the visual prompt condition was introduced, Mary had

75% accurate choice responding during every session. During the visual cue + time-delay condition, her responding during teacher sessions averaged 90% (range 70-100%), and during novel instructor sessions averaged 95% (range 90-100%).

Jackson

During baseline, a decline in Jackson's percentage of accurate choice responding was seen over time during sessions conducted by the primary teacher and novel instructors. More specifically, the mean accurate choice responding during teacher sessions was 17.5% (range 0-50%), and 20% during novel instructor sessions (range 0-40%). When the verbal prompt condition was initiated, Jackson had 25% accurate choice responding in three out of the six sessions run by the primary teacher, and no correct responses during the other three sessions. During the novel instructor probe, he responded accurately to 30% of the trials. During the visual cue condition, the mean accurate choice responding was 21% (range 0-50%).

Figure 3 is a bar graph depicting the mean percentage of accurate choice responses during training- and probe-statement trials during sessions run by the primary teacher and those run by the novel instructor for all participants. For Larry, level of responding increased across all phases under all conditions. Mean responding for all trial types across teacher and novel instructor sessions increased from 49% during baseline to 88% during the verbal prompt condition and 95% during the time-delay condition. For Mary, the mean accurate choice responding for all trial types across teacher and novel instructor sessions was 22% during baseline. It increased to 49% during the verbal prompt condition. Responding decreased to 24% during the verbal prompt + time-delay condition, and was 43% during the modified

time-delay condition. With introduction of the visual prompt, responding increased to 75%, and during the visual cue + time-delay condition, accurate choice responding averaged 95%. For Jackson, novel instructor probes were only conducted during baseline and the verbal prompt condition. The mean accuracy of choice responding across both trial types and across primary teacher and novel instructor probes was 19% during baseline, 24% during the verbal prompt condition, and 21% during the visual cue condition.

Discussion

In the present study, the effects of various prompting strategies on increasing accurate choice responding were investigated with three students with autism. Results showed that for one student (Larry), a verbal prompt strategy was associated with an increase in accurate choice responding, as compared to baseline, when it was introduced. For a second student (Mary), a visual prompt strategy was associated with an increase in accurate choice responding. For a third student (Jackson), neither prompting strategy was associated with changes in responding as compared to baseline. Results also showed an increase from baseline to the treatment phase in accurate choice responding with novel instructors for Larry and Mary.

The conclusions that can be drawn from the results of this study are limited. The most serious problem is the failure to demonstrate systematic changes with introduction of a single independent variable. Although increases in the target response were seen for two out of three students, because no single strategy was effective for all of the students, experimental control was not demonstrated. The source of control in a multiple baseline design is that when the intervention is applied for one participant, that participant's responding changes, and the responding of other participants does not change until that intervention is applied for them (Barlow & Hersen, 1984; Kazdin, 1982). In this study, however, application of the same single intervention did not result in changes in responding for all three participants. Thus, the conclusions that can be drawn from these results are extremely limited, and the results must therefore be interpreted with caution.

One possible reason for the ineffectiveness of one single procedure and the loss of experimental control is that the preference assessment procedures did not identify stimuli that could serve as reinforcers for this particular task. During the preference assessments, the reinforcing value of the stimuli was tested under a procedure requiring little response effort (selecting one of several potentially reinforcing items). Thus, the items identified as preferred may not have (and likely did not) function as reinforcers for correct responding under the experimental procedure. It seems possible that had the stimuli that were used been functional reinforcers for the choice-making response, the prompting procedure may have resulted in a systematic increase in correct responding following its introduction for the three participants.

It is also possible that experimental control was lost because of satiation. When access to the same item is provided repeatedly, that item can lose reinforcer value, and may no longer be preferred. This satiation effect may have been avoided had more HP items been used in the study from the beginning. An attempt was made to avoid these overall satiation effects by at times offering multiple exemplars of the same item (e.g., various books, different flavors of chips) before the session was begun. [This was done in a similar method to the preference assessment, in which the experimenter laid out one of each exemplar of the item (e.g., three different types of chips), and had the student pick one. The first item approached and consumed/ manipulated was then used for that session.] However, the students often were only interested in one particular form of the item (e.g., Larry only showed interest in one particular book). The students did manipulate/consume three of the HP items over

98% of the times they were presented. As previously noted , there was one item that each student stopped manipulating/ consuming (pictures for Larry and Jackson, and melon for Mary), and when this was noted these items were dropped from the study (no replacements were inserted). It might be helpful for future researchers and clinicians to take this effect into account when teaching verbal choice making skills to individuals with autism, and test the reinforcer effectiveness of the potential choice items before initiating a teaching procedure.

In a related matter, it is possible that had the choice items been more disparate in level of preference, different results may have been achieved. The items identified as nonpreferred during the preference assessment were those that the students either selected last or did not select at all. However, these items may not have been absolutely disliked, but rather only disliked relative to the HP items. It seems plausible that had items that were truly disliked and potentially aversive (e.g., task items, bitter foods) been used, different results may have been achieved. A negative reinforcement contingency may then have controlled responding as the student learned to avoid the nonpreferred (or aversive) item, thereby possibly enhancing the value of the HP item. Future researchers may want to consider this when teaching children to make choices between preferred and nonpreferred items.

It is unclear why each particular prompting strategy was or was not associated with an increase in accurate choice responding for each student. It seems plausible that Jackson's prolonged exposure (41 sessions) to baseline procedures may have affected his performance when the intervention was begun. During baseline, Jackson practiced the same incorrect response (saying "yo break") repeatedly (and almost

exclusively from session 28 and on), and the teaching procedures implemented during intervention did not appear to effectively prevent the incorrect response and prompt the correct response. As mentioned earlier, it was hypothesized that the incorrect response “yo break” may have been an echoic of the choice statement, “do you want *item a* or *item b* for break?” It remains unknown, however, why this response persisted. It seems possible that there was a natural negative reinforcement contingency in place whereby when Jackson emitted this response enough times, the session ended. When the session ended, Jackson returned to his regular classroom routine, during which he did contact positive reinforcement contingencies (and earned access to preferred activities) throughout the day. It therefore seems possible that the response “yo break” may have been rewarded on a fixed ratio 10 schedule of negative reinforcement. Perhaps had Jackson been exposed to intervention procedures earlier, the procedures may have been more effective in teaching him accurate choice responding. Extended exposure to baseline procedures is an inherent limitation of a multiple-baseline experimental design (Kazdin, 1982), however, and in this case it could not be avoided.

It also remains unknown whether particular subject characteristics (e.g. functioning level, general verbal abilities) were responsible for the difference in the students’ responding to the verbal and visual prompting strategies. The only skills assessments conducted prior to this study were those mentioned in the procedures section. It may have been helpful to have also conducted a fine-tuned assessment of students’ levels of performance of other skills (such as following complex auditory directions, number of words in each student’s receptive and expressive vocabulary).

Although no formal assessments were conducted, it was noted that Larry was able to follow more complex directions independently than Mary and Jackson. For example, Larry could follow a complex direction such as, “go get the blue jar- it’s on the bottom shelf of the cabinet next to the desk,” whereas Mary and Jackson would need each component of that direction broken down into single steps. Additionally, Larry had a much larger vocabulary (receptive and expressive) than Mary and Jackson. Perhaps there would not have been such a disparity in the effectiveness of the teaching procedures used in this study had the participants been better matched in terms of other skills

As mentioned in the introduction, one language deficit often seen in individuals with developmental disabilities is an inability to comprehend statements containing disjunctions. The goal of this study was to examine the effects of teaching procedures for teaching students with autism to respond to disjunctive questions regarding preferred and not preferred items that were out of sight. It is unknown, however, whether students’ inability to consistently respond correctly by naming the preferred item during baseline was due to their lack of comprehension of disjunctive statements or to the fact that the items being offered were not visible to them. Similarly, although Larry and May did learn to respond accurately by naming the preferred item, it is unknown whether they truly began to comprehend the disjunctive “or” or whether they simply learned to respond correctly to the five disjunctive choice questions used in this study. Future researchers might test participants’ ability to comprehend and respond correctly to other similar disjunctive questions.

Another limitation of the current study is that responding to choice statements referring to novel stimuli not used during training statements was not investigated. Anecdotally, both Larry's and Mary's teachers reported that their students did make more accurate choice responses to other choice questions during the rest of the school day following training. Nevertheless, no objective data were collected to demonstrate these effects. Future researchers might consider assessing responding to novel choice stimuli.

Another future area of study might involve investigating the use of a prompting and time-delay package to increase responding to other disjunctive statements that do not involve preferences, such as those that reference categories of stimuli (i.e., "do you live in a house or a tree?"). As described above, in this study many complications arose due to the use of preferred and nonpreferred items in the choice arrangement (e.g., ensuring that a valid choice response was being taught, using choice items that were functional reinforcers rather than simply preferred items). An alternative way of teaching individuals to respond to the disjunctive construction would be to use statements that do not require that a valid choice be measured, and which need not rely on the selected activity/item to be reinforcing.

Table 1

Target Items Used for Each Participant

Participant	HP Items	LP Items
Larry	book, squishy balls, drawing, pictures	Legos, music, magazine
Mary	chip, pretzel, jelly bean, melon	celery, broccoli, grape
Jackson	books, light toy, action figures, pictures	Legos, music, puzzle

Table 2

Assignment of Choice Statements to Participants

Participant	Training Statements	Probe Statements
Larry	1. Do you want [item a] or [item b]? 2. Should I give you [item a] or [item b]? 3. Would you prefer [item *a*] or [item *b*]?	1. Should we have [item a] or [item b] for break? 2. Would you rather have [item a] or [item b]?
Mary	1. Do you want [item a] or [item b]? 2. Should we have [item a] or [item b] for snack? 3. Would you rather have [item a] or [item b]?	1. Would you prefer [item a] or [item b]? 2. Should I give you [item a] or [item b]?
Jackson	1. Do you want [item a] or [item b]? 2. Should we have [item a] or [item b] for break? 3. Should I give you [item a] or [item b]?	1. Would you prefer [item a] or [item b]? 2. Would you rather have [item a] or [item b]?

Table 3

Sample Set of Trials for Mary

1. Would you prefer jelly bean or celery?
2. Would you prefer broccoli or chip?
3. Should we have grape or pretzel for snack?
4. Should we have chip or broccoli for snack?
5. Do you want pretzel or grape?
6. Do you want celery or jelly bean?
7. Should I give you broccoli or pretzel?
8. Should I give you chip or grape?
9. Would you rather have jelly bean or broccoli?
10. Would you rather have pretzel or celery?

**In this sample, the HP items are chips, pretzels, and jelly beans, and the NP items are celery, broccoli, and grapes.*

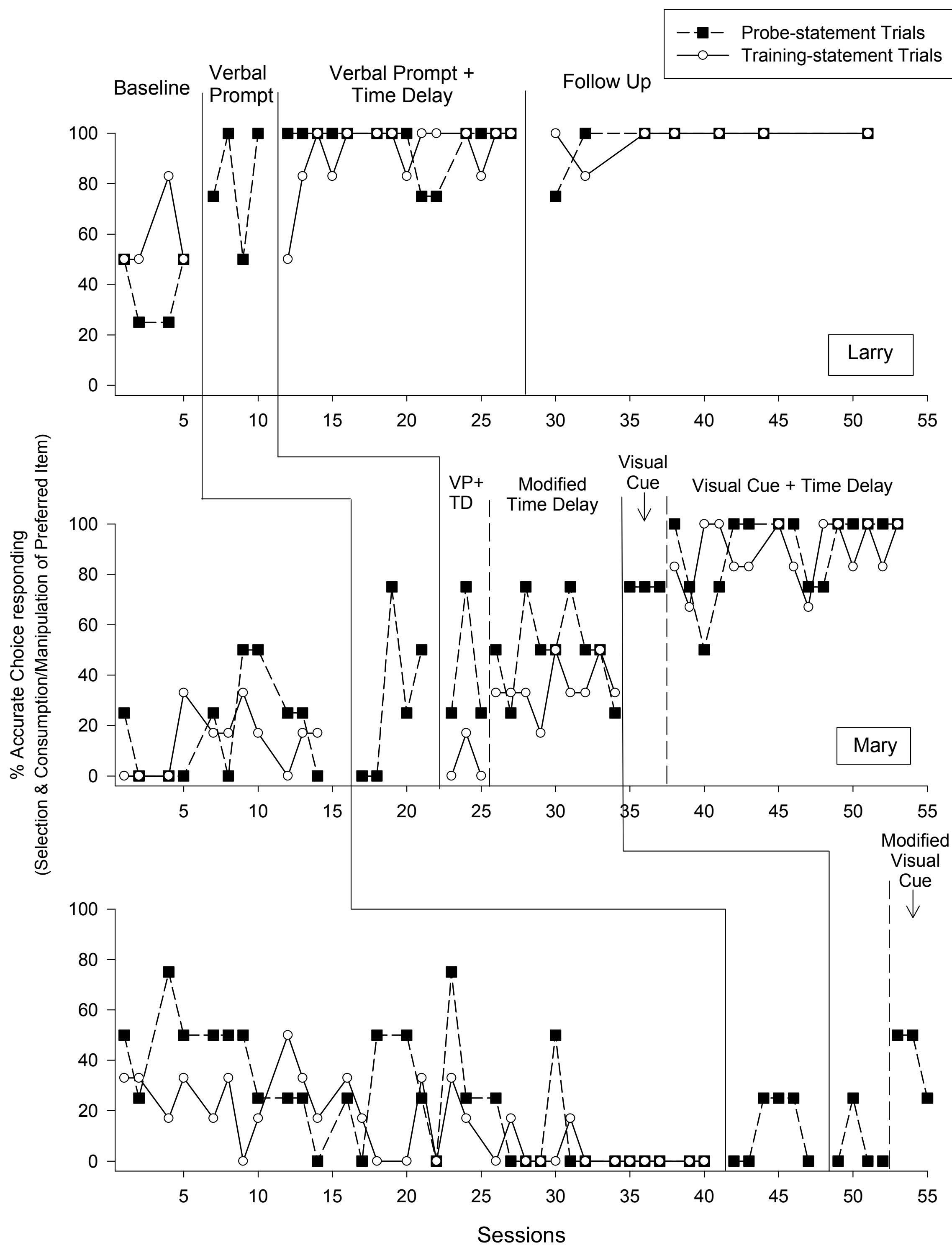

Figure 1: Percentage of accurate choice responses during sessions run by the primary teacher for all participants. Data from training-statement trials and probe-statement trials are plotted separately.

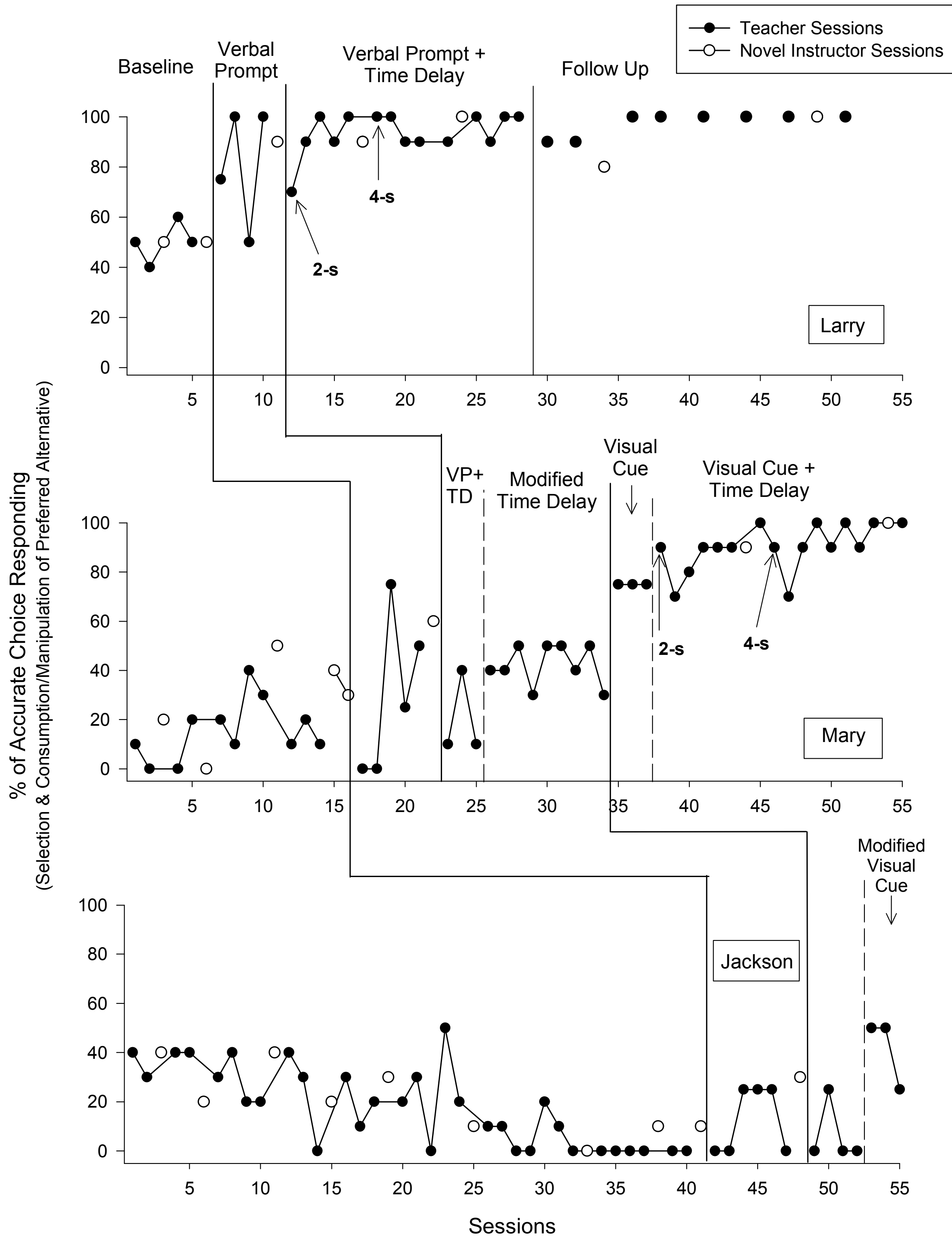

Figure 2: Percentage of accurate choice responses across sessions with the primary teacher and sessions with a novel instructor for Larry (top panel), Mary (middle panel) and Jackson (bottom panel). Data from training- and probe-statement trials are combined for each session.

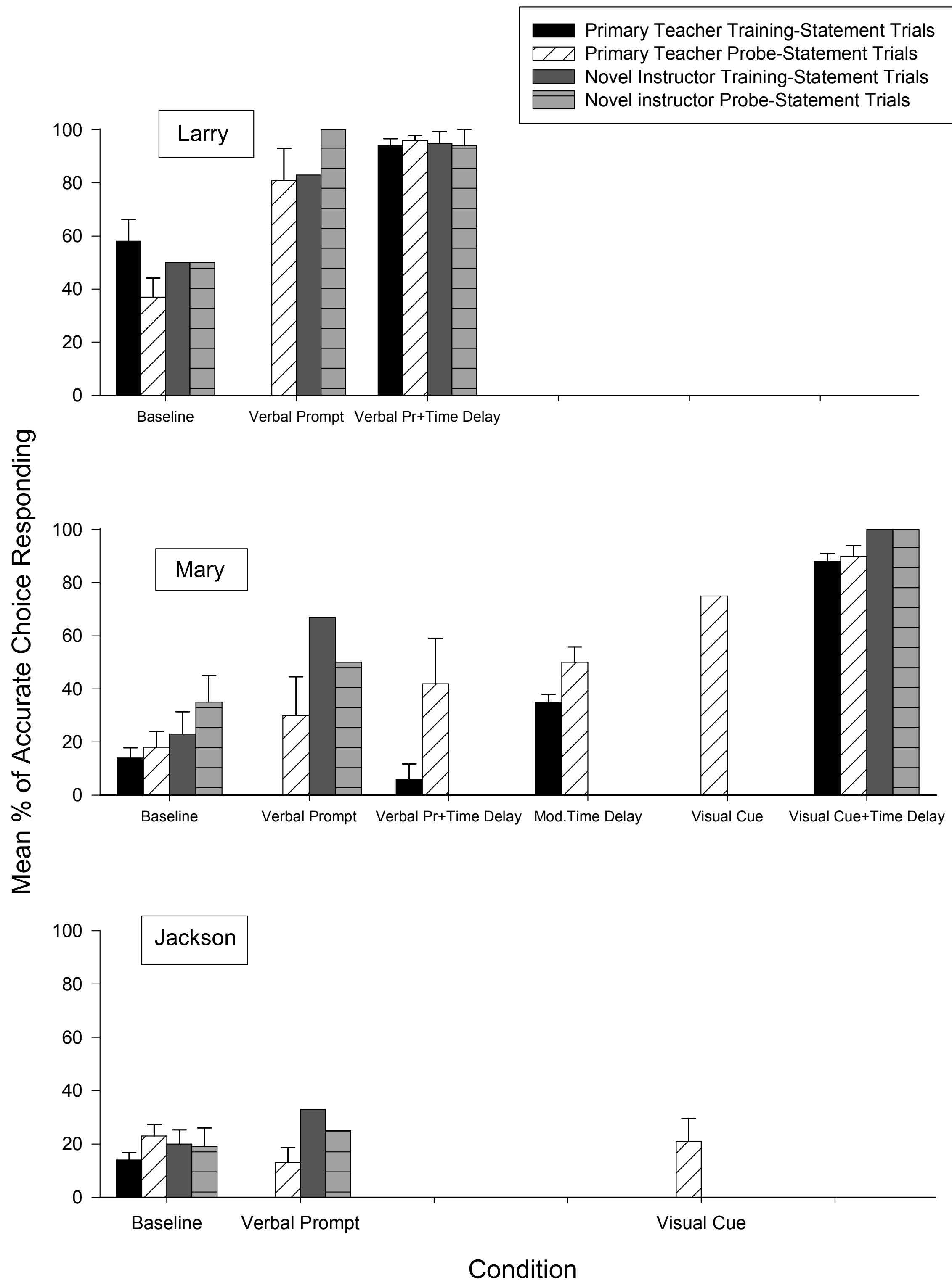

Figure 3: Mean percentage of accurate choice responding during training- and probe-statement trials across primary teacher and novel instructor probe sessions for Larry (top panel), Mary (middle panel), and Jackson (bottom panel). The error bars represent the standard error of the mean.

Appendix A

A Review of the Literature on Choice as an Antecedent Intervention

This paper reviews studies in which individuals with developmental disabilities were provided with an opportunity to choose among various activities or stimulus materials to be used or made available during an upcoming teaching session. Procedures meeting this description are referred to as *antecedent choice procedures.* The literature indicates that the opportunity to choose some aspect of an impending activity is associated with decreases in maladaptive behavior and increases in adaptive behavior, such as task completion and appropriate engagement, during the activity. These effects will be termed the *collateral effects* of choice-making. Following a review of procedures for teaching choice-making and for assessing choice validity, the effects of offering choice prior to teaching sessions are reviewed. The paper concludes with an analysis of the principles governing the collateral effects of antecedent choice procedures.

Providing individuals with disabilities choice-making opportunities has been shown to decrease problem behavior (Carr & Carlson, 1993; Cole & Levinson, 2002; Dunlap et al, 1994; Dyer, Dunlap, & Winterling, 1990; Kern et al., 1998; Powell & Nelson, 1997; Seybert, Dunlap, & Ferro, 1996; Vaughn & Horner, 1997), increase engagement in tasks (Carr & Carlson, 1993; Cosden, Gannon & Haring, 1995; Skinner, Wallace & Neddenriep, 2002), increase participation in leisure activities (Reinharsten, Garfinkle, & Wolery, 2002), increase social and conversational interactions (Carter, 2001; Koegel, Dyer & Bell, 1987), increase an individual's independence (Sigafoos, 1998), and improve the success of interventions such as

functional communication training (Durand et al., 1993). Additionally, including opportunities for choice making in treatment programs also ensures that an individual can access highly preferred stimuli (Lerman et al., 1997).

By the same token, restricting choice-making opportunities can have negative effects, such as reducing interactions with others and limiting participation in daily life (Bannerman et al., 1990). Furthermore, limited opportunities to exert control and make choices may contribute to the development and strengthening of problem behavior (Sigafoos, 1998). Thus, there is much evidence supporting the inclusion of choice-making opportunities in interventions for individuals with disabilities.

There are also situations in which the incorporation or allowance for choice may be detrimental (Bannerman et al., 1990). For example, it can be counter-productive to skill acquisition if, for example, an individual chooses to always engage in activities that are already mastered and chooses away from novel activities or tasks, or if an individual consistently chooses activities that result in little or no social interaction). Additionally, there are some individuals for whom the addition of choice can be aversive or punishing. Making a choice necessarily means that at least one alternative is removed contingent upon making a choice. Thus, when two or more alternatives are equally preferred, removal of any of them can produce problem behavior and punish the skill of choice making. These are factors that must be taken into account when planning interventions for individuals for disabilities.

In recent years, there has been an increasing trend in the use of antecedent-based interventions for individuals with disabilities (Luiselli, 1998). An antecedent intervention is one that manipulates the presentation of a stimulus or event that

precedes a target response. The purpose is to increase the level of appropriate behavior and prevent or reduce problem behavior through modification of specific antecedent stimuli (Moes, 1998). This intervention is accomplished when features of a particular antecedent stimulus (e.g., task demand) are altered, or when the method of presentation of the aversive antecedent stimulus is changed (Carr et al., 1998). For example, if math tasks are a precursor for problem behavior, an antecedent intervention might involve changing the presentation of the math task to a different format (e.g., worksheet instead of verbal questions).

Recent innovations include investigations of choice-making opportunities as a specific antecedent variable. In an antecedent choice procedure, an individual is presented with the a priori opportunity to choose among various activities or activity materials. This is an antecedent intervention in that the method of presentation of a stimulus (such as a task demand) is altered such that it is presented in a choice array, rather than alone. The literature shows that the opportunity to choose some aspect of an impending activity is associated with decreases in maladaptive behavior and increases in adaptive behavior, such as task completion and appropriate engagement, during the activity (e.g., Carr & Carlson, 1993). These effects will be termed the *collateral effects* of choice making.

From a behavior analytic perspective, the analysis of choice is concerned with the distribution of behavior among two or more response alternatives (Catania, 1998; Pierce & Epling, 1999). Choice-making, as a response, has been defined as the act of selecting an activity from among several options (Shevin & Klein, 1984). The reliable selection of one alternative over other available alternatives has been referred

to as preference (Pierce & Epling, 1999). Accordingly, a preferred activity is one that the individual has shown to select consistently from among several activities (Kearney & McKnight, 1997). While the term *choice* refers to the at-the-moment selection of an activity from among several available alternatives, *preference* describes an individual's choice of activities in the past (Romaniuk & Miltenberger, 2001).

The basic paradigm for investigating choice and preference is a concurrent operants arrangement in which two or more (typically incompatible) responses (or stimuli), each associated with its own schedule of reinforcement, are made available simultaneously (Pierce & Epling, 1999). Such an arrangement allows for identification of an individual's preferences. When one alternative is chosen more frequently than any other, this outcome can be an indication of the individual's preference for that particular source of reinforcement at that particular moment (Pierce & Epling, 1999).

Although the benefits of increased opportunities for choice-making and disadvantages of restricting those opportunities may seem self-evident, it is important to investigate these effects systematically in a population that historically has not had extensive opportunities for making choices and exerting control over their environment. Only in the 1990s has there been an emergence of objective research on the effects of providing choice-making opportunities on the behavior of individuals with disabilities. The purpose of this paper is to review the literature that examines the collateral effects of the availability of *antecedent* choice-making opportunities as an intervention for individuals with disabilities. The paper will

begin with a discussion of procedures for teaching choice-making skills. This discussion will be followed by a review of the research on the collateral effects of antecedent choice, or antecedent interventions that include choice-making opportunities. The paper will conclude with a discussion of the principles governing the collateral effects of choice.

TEACHING AND ASSESSING CHOICE-MAKING IN INDIVIDUALS WITH DISABILITIES

Individuals with developmental disabilities exhibit impairments in receptive and expressive language, and as a result, they may have difficulty making choices and expressing preferences in conventional ways (Sigafoos, 1998). In cases when initiations of choice and preference consist of idiosyncratic or unconventional response forms (e.g., waving toward an item), others may fail to recognize the function of these responses as expressions of choice or preference. Therefore, caregivers of individuals with disabilities must learn how to recognize these unconventional responses or teach more conventional choice responses, such as pointing to the item (Bambara & Koger, 1996; Sigafoos, 1998). Thus, the first step in teaching an individual with developmental disabilities to make choices is to establish choice-making responses that effectively control his/her environment.

When individuals engage in idiosyncratic actions that are assumed to be choice responses, or when they emit responses under formal choice procedures, it is important to assess the extent to which these actions actually constitute valid means of indicating preferences and making choices. A meaningful, or valid, choice is one in which the individual engages with or consumes the chosen stimulus, and does not

subsequently reject it and seek out another alternative (Stafford et al., 2002). Sigafoos and Dempsey (1992) described an assessment procedure to determine the validity of various idiosyncratic choice-making responses of three children with multiple disabilities. Opportunities were provided for the participants to choose between foods and beverages. A choice making response was recorded if the child reached for, moved toward or looked at one of the available items. In the first (matched) condition, the teacher delivered the item corresponding to the child's choice. In the second (unmatched) condition, the teacher delivered the item opposite to the chosen one. A reversal design demonstrated that acts of refusal (e.g., pushing item away, turning head away) occurred more frequently when the item opposite the one chosen was delivered. Thus, acceptance or rejection of a "chosen" item or activity may be the true indicator of the validity of the individual's choice: if the response is truly an expression of choice for a preferred alternative, the individual should be more likely to accept/consume/engage in the chosen alternative.

Once a valid choice response has been identified or established, the next step of teaching the skill of choice-making can begin. Before the individual can be taught to choose the preferred item, however, it is important to first identify his or her preferences using systematic preference assessments (Stafford et al, 2002). By definition, a choice is made when an individual selects one option from among two or more options. If an individual is unable to make consistent choices when two or more options are presented simultaneously, items can first be presented in a single-stimulus presentation format. In this assessment procedure, various items are presented one at a time and preference is inferred by observing the individual's response. Dimensions

of responding that have been shown to be indicative of preference include an approach response, acceptance of the item, consumption of the item, and positive affect (e.g., positive facial expression) (Sigafoos, 1998; Stafford et al., 2002). When the individual has engaged in the identified "preference response" in the presence of a particular item for at least 80% of presentations, that item may be classified as preferred (Bambara & Koger, 1996; Stafford et al., 2002). Similarly, items for which the preference response is demonstrated for 0-20% of presentations may be classified as nonpreferred, or disliked (Stafford et al., 2002).

Once preferences have been identified using this single-stimulus-presentation procedure, instruction in choice making can begin. The skill of choice making can be taught using a simultaneous-presentation method (also referred to as a forced choice format), in which two or more stimuli are presented simultaneously (Bambara & Koger, 1996; Derby et al., 1995; Shevin & Klein, 1984; Stafford et al., 2002). Shevin and Klein (1984) suggest that instruction begin with the presentation of pairs of stimuli consisting of one preferred and one nonpreferred stimulus. An errorless-learning procedure can then be used to prompt the individual to select the preferred alternative. (Using this procedure, the instructor can physically prompt the individual to select the preferred item and then fade the physical prompt over time.) Over time the prompts can be faded using a time delay procedure (Stafford et al., 2002), until the individual is consistently demonstrating the choice response for the items identified as preferred.

Several researchers have conducted empirical investigations of procedures for teaching choice-making skills. For example, in 1998, Browder, Cooper and Lim

developed a protocol for teaching adults with severe disabilities to express preferences for settings or activities. After each participant's preference (as measured by duration of engagement) for participating in a specific leisure activity (e.g., exercising, playing golf) in a particular setting (i.e., in their day center or in the community) was assessed, the participants were taught to match particular objects to matched settings (e.g., green golf ball signaled golf in community) using an errorless teaching procedure that incorporated time-delay. A forced-choice preference assessment was then conducted in which two objects that represented two alternative settings were displayed together. The participants were then asked to choose where they wanted to go. Results showed that all participants selected the object corresponding to the desired setting, as measured by their subsequent behavior (e.g.., when they chose the community setting, they subsequently got their coats and started to leave). This study offers a formal protocol for assessing an individual's preference for settings of activities.

In 1997, Parsons and colleagues developed a formal protocol involving two types of choice presentations (object and picture) for assessing different levels of choice-making skills of seven older adults with profound mental retardation. The evaluation began with a paired object assessment, in which for each trial two leisure items were presented within the participant's view (e.g., keyboard and magazine) and the participant was asked to select one item. After the participant chose an item (defined as touching, picking up or pointing to the object), he/she was provided with 1-min of access to the activity. When the individual had demonstrated a preference for a leisure activity during the object presentation phase (i.e., selecting an object on

70% or more of trials), an assessment with the pictures of the same objects was conducted. During the paired picture assessment, two photographs were presented to the participant; the actual objects were not within the participant's view. After the participant chose a picture, the corresponding object was immediately presented to the individual for 1 min. Results of these evaluations showed two different patterns of responding. For five participants, an activity preference was established during the object assessment phase, but none emerged during the picture assessment. For the other two participants, the same preferences were demonstrated during both the object and picture assessments. Thus, these assessment procedures provide a means for evaluating choice-making skills and differentiating between two levels of choice-making skills among adults with severe disabilities.

Although some authors (e.g., Bambara & Koger, 1996) have recommended beginning the instruction of choice-making with two preferred items (e.g., ice cream and candy), others (e.g., Shevin & Klein, 1984) have found that individuals with disabilities may be more likely to express clear preferences and make clear choices when those choices are between preferred and non-preferred items (e.g., ice cream and spinach).

In 2002, Stafford and colleagues conducted a study investigating a procedure to teach individuals with disabilities and limited or no choice-making skills to make choices between preferred stimuli. They implemented choice instruction using a time delay procedure to teach a sequence of choice levels to five students with severe intellectual disabilities. After determining the participants' preferences for various items using a single-presentation preference assessment procedure, three forced-

choice assessment phases were conducted. During the first assessment, one preferred and one nonpreferred item were presented simultaneously, and a time delay procedure was used to teach the participants to select the preferred item. During baseline of this condition, no prompts were provided. Under the time-delay procedure, a prompt to select the preferred item was delivered following the opportunity to choose. A 0-s delay to prompting was used during the first five sessions, after which a 4-s delay was implemented until the participant reached criterion (i.e., 8 out of 10 selections for preferred item). In the second assessment, this procedure was used with pairs of one preferred and one neutral stimulus, and in the third assessment, it was used with pairs of two preferred stimuli. Results showed that during baseline, the participants did not demonstrate consistent independent responding to the preferred stimulus, and often did not make any response. With the implementation of the time delay procedure, all of the participants learned to make consistent, independent choices. The authors suggest that beginning choice instruction with the presentation of preferred and nonpreferred stimuli, before moving to presentation of two preferred stimuli, allows for reinforcement of the choice-making response by emphasizing the choice made. The participant is therefore able to experience differential consequences for two choice responses, thus being systematically taught the skill of choice-making.

The number of items presented in the choice array can then be systematically increased over time (Bambara & Koger, 1996). For example, in 2003, Singh and colleagues used a four-step procedure to teach a young girl with multiple disabilities to make choices about food and beverage preferences using a microswitch. Using a

systematic, stepwise sequence, the participant was taught to discriminate and choose between 5 colored microswitches. By slowly increasing the number of microswitches that were available, the participant learned to make choices between two, three, four, and then five stimuli. These findings demonstrate that individuals with disabilities can be taught to make choices from among increasingly larger arrays of stimuli.

Assessing Choice-Making Skills before Antecedent Choice Interventions

As clear from the above articles, some individuals with developmental disabilities need to be systematically trained in the skill of choice-making. It is essential to make sure that the individual has the prerequisite skill of choice making before beginning an intervention that involves offering choices (Bambara & Koger, 1996). However, in most articles involving antecedent choice interventions the authors do not discuss whether formal choice-making-skill assessments were conducted. In some articles, preference assessments were conducted in which the student had to choose one item from an array of two or more items (Bambara, Ager, & Koger, 1994; Cole et al., 1997; Killu, Clare, & Im, 1999; Reinhartsen, 2002; Vaughn & Horner, 1997). (These assessments were conducted to identify preferred and non-preferred items that would be used within the choice intervention.) In these assessments, preferences are determined by the level of selection of each item. For example, if an item is chosen 80% of the time, it is designated as preferred. In order for such patterns of responding to occur, the participant must be able to discriminate among the items and consistently select one over the others (Parsons et al., 1990). Thus, in these studies, when preferences do emerge, it can be inferred that the participant does have the skill of choice-making.

Summary of Research on Teaching Choice-Making Skills

The articles discussed above support the need for educational programs to include systematic instructional procedures for teaching choice-making skills. These teaching programs must include: (1) teaching discriminations between choice alternatives, (2) procedures for teaching functional choice-making responses, (3) conducting effective preference assessments, and (4) systematically increasing the number of choice alternatives. Only by ensuring that the individual can exhibit all of these responses can it be said that he or she has learned the skill of choice-making.

CHOICE AS AN ANTECEDENT INTERVENTION

In this section, procedures that incorporate the opportunity for choice as antecedent-based interventions will be reviewed. As mentioned earlier, antecedent interventions are characterized by the restructuring or modification of aspects of the teaching context or delivery of instruction/demand, so as to minimize the likelihood of challenging behavior, and thus increase the likelihood of success (Moes, 1998). In an antecedent choice intervention, some aspect of the task demand is modified such that it is presented in a choice array, rather than alone.

In a recent review of the literature on antecedent interventions, Kern and colleagues (2002) found that choice was implemented as an antecedent intervention for 14% (6 of 42) of the participants in the studies they examined. In those studies, providing choice within the context of a task event was shown to produce improvements in students' performances, both in terms of decreasing challenging behavior and increasing adaptive behavior (e.g., Carr & Carlson, 1993; Cole & Levinson, 2002; Cosden, Gannon & Haring, 1995; Dunlap et al, 1994; Dyer, Dunlap,

& Winterling, 1990; Powell & Nelson, 1997; Seybert, Dunlap, & Ferro, 1996; Skinner, Wallace & Neddenriep, 2002; Vaughn & Horner, 1997).

As indicated in the preceding paragraphs, research on the effects of antecedent choice interventions has focused on one or more of the following dependent measures: (a) problem behavior, (b) task engagement measures (e.g., task completion and task initiations), and (c) pro-social behavior. In these articles, there are several ways in which choice has been presented. One method is to present a choice of tasks or activities. A second method is to allow choice of various features of the tasks or activities (e.g., stimulus materials). A third method is to allow choice of the sequence of tasks. There have been a number of investigations of the separate and combined effects of these various choice procedures on the aforementioned dependent measures.

Effects of Choice Interventions on Problem Behavior and Task Engagement

Many investigators have examined the effects of antecedent choice procedures on the problem behavior of individuals with disabilities. In some investigations, students are allowed to choose from a pool of tasks. For example, in 1997, Powell and Nelson investigated the effects of choice making on the maladaptive behavior of a second-grade student with attention deficit hyperactivity disorder (ADHD) enrolled in a general education classroom. Results showed that when the student was allowed to select one of three language arts assignments, maladaptive behavior decreased (as compared to the No Choice condition). In a similar study, Seybert, Dunlap and Ferro (1996) examined the effects of activity choice on the problem behavior and task engagement of three high school students with mental retardation. During the No

Choice condition, vocational and domestic activities were randomly assigned to the student. During the choice condition, the students were allowed to choose from a pool of 4-6 tasks. Results showed that problem behavior was relatively lower and task engagement was relatively higher when choice of tasks was available, as compared to when choice was not available.

In other investigations, students have been allowed to select task-related items. For example, in 1994, Harding and colleagues conducted assessments of the problem behavior of several children (aged 4-6 years) in an outpatient clinic. For two children, simply offering a choice of two task materials (e.g., different colored crayons for a coloring task) produced decreases in problem behavior and increases in appropriate behavior (including task engagement). For a third child, however, although some improvement was seen with choice making alone, additional consequence strategies were needed to further decrease problem behavior and increase appropriate behavior.

In a similar study, Cole and Levinson (2002) compared the effects of using choice as compared to no choice within instructional routines on the problem behavior of two students with developmental disabilities. Results showed that when multiple choices of materials and actions were embedded into various school routines (including attendance and hand-washing routines), problem behavior decreased and more steps of the instructional routine were completed. These results support the expansion of choice opportunities beyond a simple choice of task to include multiple opportunities for choice within daily routines.

Another method for allowing choices during academic activities is to allow students to select different aspects or characteristics of a task. For example, in 1995, Bambara and colleagues conducted a two-phase study examining the challenging behavior and task initiations of a 50-year-old man with severe disabilities. During phase 1, task initiations were shown to be higher and problem behavior did not occur when the participants were provided with choices of when and whether to initiate the task, as compared to during the No Choice condition. In phase 2, various opportunities for choice making were incorporated into household activities, including choice of task materials, task location, order of tasks steps, and when to complete the task steps. Results indicated that task initiations were substantially higher and the frequency of challenging behavior was substantially lower when choice was available, as compared to a No Choice condition.

To further investigate the effects of different methods of implementing choice-making opportunities, Dibley and Lim (1999) compared the effects of providing choice-making opportunities between and within daily routine activities for an adolescent female classified with a severe intellectual disability. Results showed that problem behavior was lower and the number of initiations to complete the task was higher in the choice within activities condition (where the participant had the opportunity to choose task-related materials, timing, or actions) as compared to the No Choice condition. When the opportunity to choose between activities was added, further decreases in problem behavior and increases in task initiations were observed. These findings demonstrate that different dimensions of choice-making opportunities

can be embedded within and between daily routine activities to produce decreases in problem behavior and increases in task initiations.

Another method of incorporating choices into the daily routines of individuals with disabilities is through the use of activity schedules. An activity schedule is a set of pictures or words that cues the user to engage in a sequence of activities (McClannahan & Krantz, 1999). It can serve as a framework for teaching and allowing individuals with developmental disabilities to make choices (i.e., choose between or among activities in the schedule, or choose the sequence of activities). Watanabe and Sturmey (2003) evaluated the effects of inserting choice-making opportunities within activity schedules. Results showed that when the participants (adults with disabilities) were allowed to choose three vocational tasks (from a pool of nine), on-task behavior was relatively higher than when no choice was available.

Allowing individuals to select the sequence in which they will complete the tasks has also been shown to affect levels of problem behavior and task engagement. For example, in 2001, Kern and colleagues showed that when the participants selected the order in which they would complete the tasks, task engagement was higher and problem behavior was lower, as compared to when choice of task sequence was not available.

Similarly, Moes (1998) investigated the effects of allowing choice of task sequence and task materials on the problem behavior and task engagement of four students with autism. The tasks used in this study were homework assignments. The effects of teacher as opposed to student selection of the order of the homework activities, the sequence of items or problems within the activities, and the stimulus

materials used to complete the assignment were compared. For all four children, disruptive behavior was lower, correct responding was higher, and the rate of task completion was greater during the choice condition as compared to the No Choice condition. Although the separate effects of allowing choice of task sequence as compared to choice of task materials cannot be evaluated separately, these findings contribute to recent support for the benefits of choice making on student accuracy and productivity (e.g., Cosden et al., 1995).

One issue that may arise when allowing students to choose from a pool of tasks is that they may avoid specific tasks and thus not complete specific goals. For example, if math is a non-preferred task, the student may always choose away from the math task. This procedure may result in the prevention and non-occurrence of problem behavior, but does not offer a way to ensure that the particular goal is addressed. It may be necessary to employ additional antecedent or consequence-based strategies to ensure that the student does work on the particular task. For example, stimulus (demand) fading procedures may be needed (e.g., Pace, Iwata, Cowdery, Adree, & McIntyre, 1993), or the format of the task may be modified (e.g., Dunlap, Kern-Dunlap, Clarke, & Robbins, 1991). Alternatively, a dimension of reinforcement (such as quality, rate, or magnitude) may be altered such that the reinforcer offered for completion of the non-preferred task is greater in some way as compared to the reinforcer offered for completion of the more-preferred task (see Mace, Neef, Shade, & Mauro, 1996). This possible outcome must be taken into account and addressed when planning and implementing choice-making opportunities within task situations.

Effects of Choice Interventions on Pro-social Behavior

Other studies have examined the effects of offering choices of leisure activities on the levels of pro-social behavior. For example, in 1993, LaMore and Nelson examined whether offering students choice of objects to paint before an art activity would increase their painting. Results showed that the frequency of brush strokes and duration of painting was higher when a choice of objects was provided.

In 2001, Carter examined the effects of allowing choices during play on disruptive behavior and social initiations, and language development. The three participants all exhibited disruptive behavior, limited interactive play skills, and delayed language acquisition. During the study, the participant was brought into a room with 10 games. In the choice condition, the instructor waited to begin until the child had chosen a game to play with. During the no-choice condition, the instructor selected the order of games played. The instructor then systematically incorporated the targeted language goals (e.g., correct grammar usage) into the play conversation. Results indicated that when choice was allowed, there was little or no problem behavior, and increased actions to initiate and sustain play. During the No Choice condition, however, levels of disruptive behavior were relatively higher and little or no play initiations were observed. Correct language production occurred in both conditions; however, generalization to the home was only observed following the choice condition.

In 2002, Reinhartsen, Garfinkle, and Wolery compared the effects of teacher selection as opposed to child choice of toys on the occurrence of appropriate play (i.e., appropriate manipulation of a toy) and problem behavior in a classroom context

of three 2-year-old boys with autism. In the teacher selection condition, the toy was randomly selected by the investigator. In the child choice condition, the student was offered a choice of two toys to play with. Results showed that for all three participants, appropriate play was higher in the child choice condition as compared to the teacher selection condition. Additionally, for two students, problem behavior was lower when choice was available as compared to when it was not available. This study extends previous literature on providing choice-making opportunities to very young children, and to a novel topography of behavior, appropriate play.

The findings of the studies reviewed here indicate that including antecedent choice-making opportunities for individuals with disabilities into various routines and activities throughout the day can produce improvements in task engagement and pro-social behavior, as well as decreases in problem behavior. The question that remains is, what are the learning processes underlying these choice interventions that produce the changes in behavior.

THE PRINCIPLES GOVERNING THE COLLATERAL EFFECTS OF CHOICE

The principles governing the effects of antecedent choice making on the level of adaptive and maladaptive behavior (the *collateral effects* of choice) has been a topic of considerable study. It is possible that the effects of having the opportunity to make choices are attributable to the differential consequences, or outcomes, produced by each response option. More specifically, presenting items or activities in a choice array may allow the individual to select desirable stimuli (positive outcome) and/or to avoid aversive stimuli (negative outcome). Alternatively, the act of choosing *per se* may have beneficial effects that are independent of or in addition to the chosen

stimulus/response option (Lerman et al, 1997; Kern et al., 2001; Fisher & Mazur, 1997). In this analysis, the effects may be attributable to conditioned reinforcing value of the opportunity to choose if previous opportunities for choice making were consistently paired with positive outcomes (Fisher & Mazur, 1997; Moes, 1998; Wacker et al., 1998), or with removal of aversive stimuli.

To dissociate these explanations regarding the principles underlying the effects of antecedent choice procedures, researchers have conducted systematic empirical investigations of the relation between choice and preference. To determine if choice outcome is important, effects of the level of preference for the item/activity choices made available can be examined. If the underlying mechanism of the effectiveness of choice procedures is access to preferred stimuli, then assigning highly preferred stimuli should have the same effects as offering a choice of stimuli. If, however, control over the outcome, rather than the outcome itself, is what causes the choice procedure to be effective, then level of preference should not affect behavior. In studies examining the underlying mechanisms of choice procedures, investigators examine the separate effects of choice as compared to preference (e.g., they might compare the effects of providing a choice of two equally preferred tasks, assigning high-preference tasks, or assigning low-preference tasks).

In 1990, Parsons, Reid, Reynolds, and Bumgarner conducted a study in which they systematically compared the effects of choice vs. preference of vocational tasks on on-task behavior and disruptive behavior. In one condition, the participants were offered a choice of low- or high-preference tasks. In a second condition, they were assigned high-preference tasks, and in a third condition they were assigned low-

preference tasks. On-task behavior was substantially higher during the choice and high-preference conditions as compared to the assigned low-preference condition. In a similar study conducted at a job setting, Bambara, Ager and Koger (1994, experiment 1) showed that on-task behavior of adults with mental retardation occurred at nearly identical levels when they were given a choice of a high- or low-preference task or assigned a high-preference task, but was substantially lower when they were assigned low-preference tasks. Cole and colleagues (1997) found comparable results for two pre-teen students (aged 11 and 12) with developmental disabilities in a classroom setting.

Killu, Clare and Im (1999) conducted a study with three boys (ages 12-13) diagnosed with learning or developmental disabilities to investigate further the effects of antecedent choice procedures when the choices were of two nonpreferred tasks. Results indicated that task engagement was lowest with nonpreferred tasks, even with the addition of the choice component. Additionally, all three participants had higher levels of task engagement when working with preferred tasks, regardless of whether choice was available. These results extend the work of previous studies (i.e., Parsons et al., 1990; Bambara et al., 1994; Cole et al., 1997) by showing that for some students, the addition of choice will not improve task performance when the tasks are nonpreferred, thus demonstrating that preference is the more salient variable.

The results of the studies discussed in this section show that for many individuals, the addition of a choice-making component does not improve on the effects of assigning a preferred activity. That is, performance was no better with the addition of the choice component. Even when the tasks were non-preferred, the

addition of a choice opportunity did not improve behavior; only availability of a preferred task did that (Cole et al., 1997). Taken together, these findings indicate that for many students, the level of preference for the task, itself, might be the variable responsible for the change in behavior, more so than the sole availability of choice per se.

In contrast, other studies have shown that choice making may have functional properties that are independent of preference for the activity chosen. In 1994, Dunlap and colleagues conducted a two-part study investigating the effects of the presence vs. absence of choice of academic tasks in an elementary school setting. In study 1, two participants were assigned or were allowed to choose from a menu of academic tasks. Results showed that disruptive behavior was lower and task engagement was higher in the choice condition, even though the students frequently worked on the same activities during both conditions. In study 2 a yoking procedure was used in the no-choice condition to further evaluate the mechanism of choice. A five-year old male described as severely emotionally disturbed participated in this study, which was conducted during a reading activity in his classroom. In the No Choice yoked condition, the sequence of books was determined by the teacher but matched to the sequence of the participant's selections during the previous choice condition, to further distinguish the effects of preference from choice making alone. Results showed that again disruptive behavior was lower and task engagement was higher during the choice condition, as compared to the no-choice condition. The finding that in both studies responding differed systematically across conditions of choice as compared to no choice, even when the tasks were the same, suggests that choice

making may be a functional variable that has value which exceeds the influence of activity preference.

In 1996, Umbreit and Blair conducted a similar study in which they, too, investigated the effects of choice and activity preference on the disruptive behavior of a young boy with mental retardation. Results showed that when preferred activities were presented, problem behavior did not occur when choices were provided and rarely occurred when no choice was provided. When non-preferred activities were presented, problem behavior occurred when choices were and were not offered, but was relatively lower when choice of activity was available, as compared to when there was no choice. Taken together, these data suggest that the availability of choice was a distinct variable that interacted with level of preference, in that disruptive behavior was lower with both preferred and non-preferred activities when choice was available.

In addition to allowing the individual to access a preferred stimulus (or task), antecedent choice procedures may also allow the individual to escape the more aversive task. To investigate this possibility, Romaniuk, Miltenberger, and Conyers (2002) investigated the influence of activity choice on problem behavior maintained by escape as compared to problem behavior maintained by attention. The participants were seven students with various diagnoses. Results showed that the children whose problem behavior was maintained by escape from tasks displayed substantial decreases in problem behavior when choice of tasks was provided (as compared to when no choice of tasks were provided), but children whose problem behavior was maintained by attention did not show any difference when choice was provided. The

authors suggest that allowing choice of tasks decreased problem behavior maintained by escape from tasks because the nature of the choice procedure inherently allowed the individual to escape the more aversive tasks, thus eliminating the motivation for the problem behavior. Overall, these results suggest that interventions that involve choice among tasks are more likely to be beneficial for those individuals who display problem behavior that is maintained by escape from task demands than for those who display problem behavior that is maintained by attention in the same academic situations.

Other studies have shown that the same procedures produce differential effects for different participants. For example, in 1994, Bambara, Ager and Koger (in experiment 2) investigated the effects of a choice procedure in which a choice of equally preferred neutral/low-preference tasks were offered as compared to a condition in which there was no choice. Results showed that for four participants, there was no change in on-task behavior, thus suggesting that the inclusion of choice as a variable did not affect behavior. For a fifth participant, however, on-task behavior was higher in the choice condition, although preference for one task over the other was not demonstrated.

In a similar study, Vaughn and Horner (1997) compared the levels of problem behavior under conditions of student-choice vs. teacher choice of both highly preferred and less preferred academic tasks. Results showed that for two of four participants, when the choice was between two low preference tasks, rates of problem behavior were minimally lower when they could choose the task as compared to when the teacher selected the task. No effect on problem behavior was seen with the

other two participants. Additionally, for two of three participants, when highly preferred tasks were used, rates of problem behavior were low overall, but slightly lower with choice (as compared to the no-choice condition).

Martin, Martin, Spevack, Verbeke, and Yu (2002) provide further insight into the relation between preference and choice. They postulate that perhaps when some individuals are assigned or allowed to choose a high preference task, the natural reinforcers for completing it are such that performance will be high (and problem behavior low) in either condition. When completing moderate or low preference tasks, however, the natural reinforcers may be minimal, and having a choice may in those cases be better, and produce higher levels of appropriate behavior (and concomitantly lower levels of problem behavior), as compared to when no choice of these items is offered. Thus, one mechanism that may be responsible for the effectiveness of choice interventions may be the level of preference of the choice alternatives: when the task alternatives are all highly preferred, the presence of choice may not have additional effects. Nevertheless, when the task alternatives are of moderate or low preference, the presence of choice may be discriminably better than having no choice, and may thus have more of an effect on behavior.

In the articles discussed above, researchers conducted empirical investigations into the underlying mechanisms of choice interventions. The mixed results of these studies suggest that in the end, the reason that offering choices produces desirable changes in behavior may differ for each individual. Although for some students the outcome of the choice alternatives is the relevant factor, for other students, the act of choice itself is the reinforcing and effective factor. It may therefore be important to

concentrate on identifying variables that influence the effectiveness of antecedent choice at the level of the individual. To this end, several researchers have investigated factors that may be correlated with a choice effect. In one investigation, Martin, Martin, Spevack, Verbeke and Yu (2002) found that there was no effect of age (children vs. adults) or type of task/activity (academic vs. vocational). Some authors have postulated that level of functioning may be correlated with the efficacy of a choice intervention. For example, Moes (1998) states that the participant who showed the smallest effect (least difference in behavior between choice and no-choice conditions) had the lowest scores on cognitive test scores and the most severe language impairment. Moes suggests that participants with higher language abilities might be better able to express their preferences by choosing their tasks and stimulus materials, and thus allowing choice may be a more effective intervention for them. However, in the seven studies they reviewed, Martin and colleagues (2002) did not see any effect of level of functioning. Thus, individual subject characteristics that make a choice intervention more or less likely to succeed remain unknown, and suggest an avenue for future research. Further investigation of procedures for identifying a profile for individuals for whom and situations in which choice-making opportunities are not necessary or therapeutic continues to seem warranted.

CONCLUDING COMMENTS

With the increasing focus on antecedent-based interventions for individuals with disabilities, there has also been an increasing emphasis on the need for incorporating choice-making opportunities into the lives of these individuals. There is growing evidence that providing opportunities for choice making represents a

useful addition to behavior intervention plans (Carr & Carlson, 1993; Cole & Levinson, 1992; Dunlap et al, 1994; Dyer, Dunlap, & Winterling, 1990; Kern et al., 1998; Powell & Nelson, 1997; Seybert, Dunlap, & Ferro, 1996; Vaughn & Horner, 1997). It is clear that for many individuals, the simple inclusion of choice-making opportunities into a teaching context or instructional routine can prevent the occurrence of severe problem behavior and simultaneously promote the occurrence of appropriate behavior.

There are additional variables related to antecedent choice interventions that have not yet been examined. For example, do the changes in behavior maintain over extended periods of time? To date there have been no studies examining the long-term effects of these interventions. Additionally, for individuals for whom the inclusion of choice-making opportunities produces decreases in problem behavior, what can be done to prevent that problem behavior when choices are not appropriate or available (e.g., events related to an individual's health)? Further, given the substantial increase in choice-making opportunities provided to individuals with disabilities, it may now be appropriate to discuss situations in which the incorporation of choice-making might be inappropriate. Future researchers may want to investigate these questions.

Bibliography

Bambara, L. M., Ager, C., & Koger, F. (1994). The effects of choice and task preference on the work performance of adults with severe disabilities. *Journal of Applied Behavior Analysis,* 27, 555-556.

Bambara, L. M., & Koger, F. (1996). *Innovations: Opportunities for daily choice making.* Washington, D.C.: American Association on Mental Retardation.

Bambara, L. M., Koger, F., Katzer, T., & Davenport, T. A. (1995). Embedding choice in the context of daily routines: An experimental case study. *Journal of the Association for Persons with Severe Handicaps, 20,* 185-195.

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.

Barlow, D. H., & Hersen, M. (1984). *Single case experimental designs* (2nd ed.): *Strategies for studying behavior change.* Elmsford, NY: Pergamon.

Browder, D. M., Cooper, K. J., & Lim, L. (1998). Teaching adults with severe disabilities to express their choice of settings for leisure activities. *Education & Training in Mental Retardation & Developmental Disabilities, 33,* 228-238.

Carr, E. G., & Carlson, J. I. (1993). Reduction of severe behavior problems in the community using a multicomponent treatment approach. *Journal of Applied Behavior Analysis, 26,* 157-172.

Carr, E. G., Carlson, J. I., Langdon, N. A., Magito-McLaughlin, D., & Yarbrough, S. C. (1998). Two perspectives on antecedent control: Molecular and molar. In J. K. Luiselli & M. J. Cameron (Eds.), *Antecedent control: Innovative Approached to behavioral support.* Baltimore, MD: Paul H. Brooks Publishing Co.

Carter, C. M. (2001). Using choice with game play to increase language skills and interactive behaviors in children with autism. *Journal of Positive Behavioral Interventions, 3*(3), 131-151.

Catania, A. C. (1998). *Learning.* Englewood Cliffs, N.J.: Prentice-Hall.

Charlop, M. H., & Trasowech, J. E. (1991). Increasing autistic children's daily spontaneous speech. *Journal of Applied Behavior Analysis, 24,* 747-761.

Cole, C. L., Davenport, T. A., & Bambara, L. M. (1997). Effects of choice and task preference on the work performance of students with behavior problems.

Behavioral Disorders, 2, 65-74.

Cole, C. L., & Levinson, T. R. (2002). Effects of within-activity choices on the challenging behavior of children with severe developmental disabilities. *Journal of Positive Behavioral Interventions, 4,* 29-37.

Cosden, M., Gannon, C., & Haring, T. G. (1995). Teacher-control versus student-control over choice of task and reinforcement for students with severe behavior problems. *Journal of Behavioral Education, 5,* 11-27.

Derby, K. M., Wacker, D. P., Andelman, M., Berg, W., Drew, J., Asmus, J., Prouty, A., & Laffey, P. (1995). Two measures of preference during forced-choice assessments. *Journal of Applied Behavior Analysis, 28,* 345-346.

Dibley, S. & Lim, L. (1999). Providing choice making opportunities within and between daily school routines. *Journal of Behavioral Education, 9,* 117-132.

Dunlap, G., dePerczel, M., Clarke, S., Wilson, D., Wright, S., White, R., & Gomez, A. (1994). Choice making to promote adaptive behavior for students with emotional and behavioral challenges. *Journal of Applied Behavior Analysis, 27,* 505-518.

Dunlap, G., Kern-Dunlap, L., Clarke, S., & Robbins, F. R. (1991). Functional assessment, curricular revision, and severe behavior problems. *Journal of Applied Behavior Analysis, 24,* 387-397.

Durand, V. M., Berotti, D., and Weiner, J. S. (1993). Functional communication training: Factors affecting effectiveness, generalization, and maintenance. In Reichle, J. & Wacker, D. P. (Eds.), *Communicative alternatives to challenging behavior: Integrating functional assessment and intervention strategies.* Baltimore, MD: Paul H. Brookes Publishing Co.

Dyer, K., Dunlap, G., & Winterling, V. (1990). Effects of choice making on the serious problem behaviors of students with severe handicaps. *Journal of Applied Behavior Analysis, 23,* 515-524.

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

Fisher, W. W., & Mazur, J. E. (1997). Basic and applied research on choice responding. *Journal of Applied Behavior Analysis, 30,* 387-410.

Harding, J., Wacker, D. P., Cooper, L. J., Millard, T., & Jensen-Kovalan, P. (1994). Brief hierarchical assessment of potential treatment components with children in an outpatient clinic. *Journal of Applied Behavior Analysis, 27,* 291-300.

Kazdin, A. E. (1982). *Single-case research designs*: *Methods for Clinical and Applied Settings.* New York: Oxford University press

Kearney, C. A. & McKnight, T. J. (1997). Preference, choice, and persons with disabilities: A synopsis of assessments, interventions, and future directions. *Clinical Psychology Review, 17,* 217-238.

Kern, L., Choutka, C. M., & Sokol, N. G. (2002). Assessment -based antecedent interventions used in natural settings to reduce challenging behavior: An analysis of the literature. *Education & Treatment of Children, 25,* 113-130.

Kern, L., Mantegna, M. E., & Vorndran, C. M. (2001). Choice of task sequence to reduce problem behaviors. *Journal of Positive Behavior Interventions, 3,* 3-10.

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

Killu, K., Clare, C. M., & Im, A. (1999). Choice vs. preference: The effects of choice and no choice by preferred and non preferred spelling tasks on the academic behavior of students with disabilities. *Journal of Behavioral Education, 9,* 239-253.

Koegel, R. L., Dyer, K., & Bell, L. K. (1987). The influence of child-preferred activities on autistic children's social behavior. *Journal of Applied Behavior Analysis, 20,* 243-252.

LaMore, K. & Nelson, D. (1993). The effects of options on performance of an art project in adults with mental disabilities. *American Journal of Occupational Therapy, 47,* 397-401.

Lerman, D. C. Iwata, B. A. Rainville, B. Adelinis, J. D. Crosland, K. & Kogan, J. (1997). Effects of reinforcement choice on task responding in individuals with developmental disabilities. *Journal of Applied Behavior Analysis, 30,* 411-422.

Lord, C., Risi, S., & Lambrecht, L. (2000). The Autism Diagnostic Observation Schedule--Generic: A standard measure of social and communication deficits associated with the spectrum of autism. *Journal of Autism & Developmental Disorders, 30,* 205-223.

Luiselli, J. K. (1998). Intervention conceptualization and formulation. In J. K. Luiselli & M. J. Cameron (Eds.), *Antecedent control: Innovative Approached to behavioral support.* Baltimore, MD: Paul H. Brooks Publishing Co.

Mace, F. C., Neef, N. A., Shade, D., & Mauro, B. C. (1996). Effects of problem difficulty and reinforcer quality on time allocated to concurrent arithmetic problems. *Journal of Applied Behavior Analysis, 29,* 11-24.

Martin, T. L., Martin, G. L., Spevack, S, Verbeke, A., & Yu, D. C. T. (2002). Does choice, independent of preference, improve behaviour for persons with developmental disabilities? A review. *Developmental Disabilities Bulletin, 30,* 1-15.

McClannahan, L. E. & Krantz, P. J. (1999). *Activity schedules for children with autism: Teaching independent behavior.* Bethesda, MD, US: Woodbine House.

Merriam-Webster's collegiate dictionary (10th Ed.). (1993). Springfield, MA: Merriam-Webster.

Moes, D. R. (1998). Integrating choice-making opportunities within teacher-assigned academic tasks to facilitate the performance of children with autism. *Journal of the Association for Persons with Severe Handicaps, 23,* 319-328.

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.

Noterdaeme, M., Sitter, S., & Mildenberger, K. (2000). Diagnostic assessment of communicative and interactive behaviours in children with autism and receptive language disorder. *European Child & Adolescent Psychiatry, 9,* 295-300.

Pace, G. M., Iwata, B. A., Cowdery, G. E., Adree, P. J., & McIntyre, T. (1993). Stimulus (instructional) fading during extinction of self-injurious escape behavior. *Journal of Applied Behavior Analysis, 26,* 205-212.

Paris, S. G. (1973). Comprehension of language connectives and propositional logical relationships. *Journal of Experimental Child Psychology, 16,* 278-291.

Parsons, M. B., Harper, V. N., Jensen, J. M., & Reid, D. H. (1997). Assisting older adults with severe disabilities in expressing leisure preferences: A protocol for determining choice-making skills. *Research in Developmental Disabilities, 18,* 113-126.

Parsons, M. B., Reid, D. H., Reynolds, J., & Bumgarner, M. (1990). Effects of chosen versus assigned jobs on the work performance of persons with severe handicaps. *Journal of Applied Behavior Analysis, 23,* 253-258.

Pierce, W. D., & Epling, W. F. (1999). *Behavior analysis and learning (2nd edition)*. Upper Saddle River, N.J.: Prentice Hall.

Powell, S., & Nelson, B. (1997). Effects of choosing academic assignments on a student with attention deficit hyperactivity disorder. *Journal of Applied Behavior Analysis, 30,* 181-183.

Reinhartsen, D. B., Garfinkle, A. N., & Wolery, M. (2002). Engagement with toys in two-year-old children with autism: Teacher selection versus child choice. *Research & Practice for Persons with Severe Disabilities, 27,* 175-187.

Romaniuk, C., & Miltenberger, R. G. (2001). The influence of choice and preference of activity on problem behavior. *Journal of Positive Behavioral Interventions, 3,* 152-159.

Romaniuk, C., Miltenberger, R., & Conyers, C. (2002). The influence of activity choice on problem behaviors maintained by escape versus attention. *Journal of Applied Behavior Analysis, 35,* 349-362.

Seybert, S., Dunlap, G., & Ferro, J. (1996). The effects of choice-making on the problem behaviors of high school students with intellectual disabilities. *Journal of Behavioral Education, 6,* 49-65.

Shevin, N., & Klein, N. K. (1984). The importance of choice-making skills for students with severe disabilities. *Journal of the Association for Persons with Severe Handicaps, 9,* 159-166.

Sigafoos, J. (1998). Choice making and personal selection strategies. In J. K. Luiselli & M. J. Cameron (Eds.), *Antecedent control: Innovative Approached to behavioral support.* Baltimore, MD: Paul H. Brooks Publishing Co.

Sigafoos, J., & Dempsey, R. (1992). Assessing choice making among children with multiple disabilities. *Journal of Applied Behavior Analysis, 25,* 747-755.

Sigafoos, J. & Pennell, D. (1995). Parent and teacher assessment of receptive and expressive language in preschool children with developmental disabilities. *Education & Training in Mental Retardation & Developmental Disabilities, 30,* 329-335.

Singh, N. N., Lancioni, G. E., & O'Reilly, M. F. (2003). Self-determination during mealtimes through microswitch choice-making by an individual with complex multiple disabilities and profound mental retardation. *Journal of Positive Behavior Interventions, 5,* 209-215.

Skinner, C. H., Wallace, M. A., Neddenriep, C. (2002). Academic remediation: Educational applications of research on assignment preference and choice.

Child & Family Behavior Therapy, 24, 51-65.

Stafford, A. M., Alberto, P. A., Frederick, L. D., Heflin, L. J., & Heller, K. W. (2002). Preference variability and the instruction of choice making with students with severe intellectual disabilities. *Education and Training in Mental Retardation and Developmental Disabilities, 37,* 70-88.

Suppes, P., & Feldman, S. (1971). Young children's comprehension of logical connectives. *Journal of Experimental Child Psychology, 12,* 304-317.

Umbreit, J. & Blair, K. S. (1996). The effects of preference, choice and attention on problem behavior at school. *Education and Training in Mental Retardation and Developmental Disabilities, 31,* 151-161.

Vaughn, B. J., & Horner, R. H. (1997). Identifying instructional tasks that occasion problem behaviors and assessing the effects of student versus teacher choice among these tasks. *Journal of Applied Behavior Analysis, 30*, 299-312.

Wacker, D. P., Berg, W. K., Asmus, J. M., Harding, J. W., & Cooper, L. J. (1998). Experimental analysis of antecedent influences on challenging behavior. . In J. K. Luiselli & M. J. Cameron (Eds.), *Antecedent control: Innovative Approached to behavioral support.* Baltimore, MD: Paul H. Brooks Publishing Co.

Watanabe, M., & Sturmey, P. (2003). The effect of choice-making opportunities during activity schedules on task engagement of adults with autism. *Journal of Autism & Developmental Disorders, 33,* 535-538.