

*AN EVALUATION OF THE VALUE OF CHOICE  
WITH PRESCHOOL CHILDREN*

JEFFREY H. TIGER, GREGORY P. HANLEY, AND EMMA HERNANDEZ

UNIVERSITY OF KANSAS

The current study examined the reinforcing effects of choosing among alternatives in a four-part evaluation. In the first study, initial-link responses in a concurrent-chains arrangement resulted in access to terminal links in which the completion of an academic task resulted in (a) the choice of a reinforcer (choice), (b) the delivery of an identical reinforcer (no choice), or (c) no material reinforcer (control). Three patterns of responding emerged: persistent preference for choice (3 participants); initial preference for choice, which did not persist (2 participants); and preference for no choice (1 participant). Additional evaluations determined if preference for choice could be enhanced (Study 2) or established (Study 3) by including more stimuli from which to choose. Choice-link selections systematically increased for all participants when more items were available from which to choose. Study 4 identified the precise value of the opportunity to choose by progressively increasing the response requirement during the choice terminal links for 3 children and determining the point at which these children stopped selecting the choice link. All children continued to select the choice link even when the work required in the choice link was much greater than that arranged in the no-choice link.

DESCRIPTORS: choice, concurrent-chains arrangement, preference, preschool children, reinforcer assessment, reinforcer value

---

Previous research has shown that the opportunity to choose may function as a reinforcer. For example, Dyer, Dunlap, and Winterling (1990) showed that the disruptive behavior of 3 students with autism or mental retardation was lower under conditions in which they could choose vocational tasks and edible reinforcers than in conditions in which teachers assigned the same activities and reinforcers unsystematically. Similarly, Dunlap et al. (1994) and Powell and Nelson (1997) showed that disruptive behavior was lower for students under conditions in which they chose academic assignments than under conditions in which similar tasks were assigned by their teachers.

---

This project was completed as partial fulfillment of the requirements for a MA degree by the first author. We thank Rachel H. Thompson and James A. Sherman for their helpful comments on an earlier version of this manuscript, and Katie Zerr for her help in developing academic materials.

Reprints may be obtained from Gregory P. Hanley, Applied Behavioral Science Department, University of Kansas, 1000 Sunnyside Avenue, Lawrence, Kansas 66045.

doi: 10.1901/jaba.2006.158-04

Despite results that support the hypothesis that the opportunity to choose activities is an effective procedure for decreasing disruptive behavior, isolating the effects of choice as an independent variable has challenged researchers. Specifically, when compared to reinforcement delivered without a choice, choice-making opportunities involve two components: (a) a selection response emitted in the presence of multiple alternatives (i.e., choice selections) and (b) the subsequent presentation of an event that may be different from that which would have been delivered otherwise (i.e., differential outcomes). Thus, these components singly or in conjunction may be responsible for the reductions in disruptive behavior observed when participants are given a choice among activities.

One method of isolating the influence of the opportunity to choose from qualitatively better outcomes is to yoke no-choice selections to choice selections (i.e., to provide the same events in both choice and no-choice conditions). There are different ways in which reinforcer selections have been yoked in studies

on choice. Dunlap *et al.* (1994), for example, recorded the stories selected by children across a 4-day choice phase, and teachers read these same stories to the participants in the same order during a 4-day no-choice phase. Thus, the choice and no-choice conditions included the same experiences; the only apparent difference between the two conditions was the opportunity to choose. Fisher, Thompson, Piazza, Crosland, and Gotjen (1997) also included a yoking procedure with smaller temporal gaps than in Dunlap *et al.* to control for potential variations in reinforcement quality across choice and no-choice alternatives. In the choice condition, pressing one microswitch resulted in a choice of edible items. In the no-choice condition, pressing another microswitch resulted in the delivery of edible items yoked to the items selected in the previous session's choice condition. Finally, pressing the third microswitch resulted in no programmed consequences (control condition). A limitation of such yoking procedures is that the momentary value of the items selected in the no-choice context may be weakened by the consumption of these items in the previous choice context. That is, momentary satiation and deprivation may have resulted in differential response allocation between the no-choice and choice conditions.

Thompson, Fisher, and Contrucci (1998) incorporated the use of identical reinforcers, mitigating the need for a yoking procedure, to evaluate the influence of choice in a concurrent-operants arrangement. In their preparation, responding to one microswitch resulted in the experimenter delivering a cup of cola from an array (no choice), responding to a second microswitch resulted in a choice of a cup of cola from an array (choice), and responding to the third microswitch resulted in no programmed consequences. Thus, any possible differences as a result of choosing were removed, and the opportunity to choose was isolated as the independent variable. The effects of choice were assessed by arranging indepen-

dent variable-interval (VI) schedules of reinforcement on the choice and no-choice switches. The schedule for the choice switch was progressively thinned to VI 10 min while a VI 15-s schedule was held constant for the no-choice switch. Responding was almost exclusively allocated to the choice microswitch at all schedule requirements evaluated, suggesting that the opportunity to choose reinforcers was highly preferable to a condition in which an identical reinforcer was associated with less effort. However, this arrangement was evaluated with only 1 participant, which may limit the generality of the results.

The purpose of the current study was to systematically assess preference for the opportunity to choose using an arrangement that has a high degree of control over choice as an independent variable. To that end, we (a) assessed preference for choice relative to no-choice conditions with 6 preschool students, (b) evaluated if increasing the number of items from which to choose influenced the value of choosing, and (c) identified specific values of choice by programming progressively increasing response requirements to access the opportunity to choose.

## GENERAL METHOD

### *Participants, Setting, and Materials*

Participants were selected from a full-day university-based preschool serving children aged 2.5 to 5.5 years old, of both typical and atypical development. Six children were selected to participate based on child and experimenter availability (see Table 1 for ages and developmental status). Sessions were conducted in small rooms adjacent to the preschool classroom. Each room was approximately 5 m by 5 m and contained a child-sized table and chair. The child was seated approximately 1.5 m from a table with three laminated worksheets that varied only in their color (orange, blue, and yellow) placed approximately 15 cm apart at the front edge of the table. Each worksheet contained four stimuli (letters, num-

Table 1  
Participant Descriptions

Name	Age	Developmental description	Gender	Academic tasks	Reinforcers
Mona	5	Typical	F	Point to sight words	M&Ms <sup>®</sup> , cheese Ritz <sup>®</sup> , jelly beans
Jay	4	Typical	M	Point to letters, numbers, and shapes	Goldfish <sup>®</sup> , Skittles <sup>®</sup> , gummy candies, cheese Ritz <sup>®</sup> , chocolate balls
Mike	5	Autism	M	Point to sight words	Kix <sup>®</sup> , Goldfish <sup>®</sup> , Fruit Loops <sup>®</sup> , Golden Grahams <sup>®</sup>
Stan	4	Typical	M	Point to letters, numbers, and shapes	Fruit Loops <sup>®</sup> , jelly beans, M&Ms <sup>®</sup> , Skittles <sup>®</sup>
Nick	3	Typical	M	Point to letters, numbers, and shapes	Goldfish <sup>®</sup> , Fruit Smiles <sup>®</sup> , jelly beans
Sue	5	Typical	F	Point to letters, numbers, and shapes	Fruit Smiles <sup>®</sup> , M&Ms <sup>®</sup> , Goldfish <sup>®</sup>

bers, or sight words) to occasion academic responding. The stimuli for each child occasioned skills from the child's individualized curriculum that he or she had not yet mastered. Directly behind each worksheet was a small disposable plate on which the available edible items were placed.

#### *Response Measurement and Reliability*

Sessions were divided into 15 trials. Each child's selection of an orange, blue, or yellow worksheet (defined as standing in front of or touching a worksheet) was initially recorded, and then task completion (defined as engaging in the response specified by the instruction) following a vocal, model, or physical prompt was recorded for each trial. Interobserver agreement was assessed during at least 25% of sessions by having a second observer simultaneously but independently collect data on children's selections and task completion. Agreement percentages were calculated by comparing each observer's records on a trial-by-trial basis. Agreements were defined as both observers scoring the same worksheet selected (selections) and the same type of prompt that preceded task completion. The number of trials scored as agreements were summed and divided by the number of session trials. This quotient was multiplied by 100% for each measure.

#### *General Procedure*

Prior to the start of the choice evaluation, a paired-item preference assessment (Fisher et al., 1992) was conducted to identify preferred edible items to be included in the choice assessments. The three or four items associated with the highest selection percentage were used in the choice assessments (see Table 1). One item was available during each session, and these items were systematically rotated across sessions.

During all choice assessments, we used a concurrent-chains arrangement similar to that described by Hanley, Piazza, Fisher, Contrucci, and Maglieri (1997). In the initial link of the chain, the child sat in a chair approximately 1.5 m from a table with three colored worksheets. Following a selection, the child was prompted by the experimenter to emit an academic response relevant to the stimuli on the worksheet (e.g., "point to the letter J") using a three-step graduated prompting sequence (vocal, model, and physical prompts). That is, if a correct response was not emitted within 5 s of the initial vocal prompt, the experimenter pointed to the correct stimulus while repeating the vocal prompt. If the correct response was not emitted within 5 s of the model prompt, the experimenter then guided the participant's hand to the correct stimulus while repeating the vocal prompt. The stimuli

presented were identical across all three worksheets (i.e., the letters J, K, L, and M were simultaneously presented on the orange, blue, and yellow worksheets), such that task difficulty was equated across worksheets. Similarly, stimuli were always presented with like stimuli (i.e., letters were always presented with letters, not with sight words). Correct responding, regardless of the level of prompting, resulted in the consequence programmed for that worksheet. The edible items for correct responding to each of the worksheets were identical (i.e., if five red M&Ms<sup>®</sup> were available for responding to one worksheet, then a single red M&M<sup>®</sup> was available for responding to the other worksheet), such that the presence or absence of multiple items and the opportunity to choose were the only differences between the terminal links. The relative response distribution (i.e., the number of selections of each worksheet) in the initial links was used as a measure of preference for the events programmed in the terminal links.

In addition to the various visual discriminative stimuli, descriptive rules (e.g., saying, "When you complete the orange worksheet, you can pick one of these five M&Ms<sup>®</sup>; when you complete the blue worksheet, you receive that M&M<sup>®</sup>; and when you complete the yellow worksheet, you will not receive an M&M<sup>®</sup>"), and two prompted exposures to each terminal link were provided prior to each session to facilitate discriminated initial-link responding. Sessions began immediately after the prompted exposure. Each initial link began with the experimenter prompt, "Pick the worksheet you would like to work on." If at any time during the session the participant did not select a worksheet, the procedure called for repetition of the prompt after 30 s. There were no instances in which the child refused to select a worksheet.

Worksheet selections (i.e., initial-link responding) were the primary measure of preference in all studies and are reported for the four

studies below. Responding during the terminal link (i.e., task completion following a vocal or model prompt) averaged above 90% for all participants (data available upon request).

## STUDY 1: EVALUATION OF PREFERENCE FOR CHOOSING

The purpose of this experiment was to determine preschoolers' preferences for contexts in which the child chose among multiple reinforcers relative to contexts in which the same reinforcers were delivered by an experimenter.

### *Method*

*Participants and materials.* All six children (Mona, Jay, Mike, Stan, Nick, and Sue) participated in Study 1. Materials consisted of the tasks described above.

*Interobserver agreement.* Interobserver agreement was collected during 56%, 100%, 33%, 25%, 45%, and 41% of sessions for Mona, Jay, Mike, Stan, Nick, and Sue, respectively. Agreement averaged 98% (range, 73% to 100%) for initial-link selections across participants.

*Procedure.* During the choice terminal link, correct responses resulted in praise and access to a plate of five identical edible items (e.g., M&Ms<sup>®</sup>) from which the participant could choose one item. During the no-choice terminal link, correct responses resulted in praise and access to a plate with one edible item, identical to those available in the choice link. During the control terminal link, correct responding resulted in praise only. The choice, no-choice, and control links were correlated with an orange, blue, and yellow worksheet, respectively, for all participants. Following the experimenter prompt (e.g., saying, "choose one"), the child approached the table and selected a worksheet. If the child selected the choice (orange) worksheet, the experimenter provided an academic prompt, "Point to the letter J." After completion of the response, the experimenter praised the child and held a plate of five edible items in front of the child, who then selected

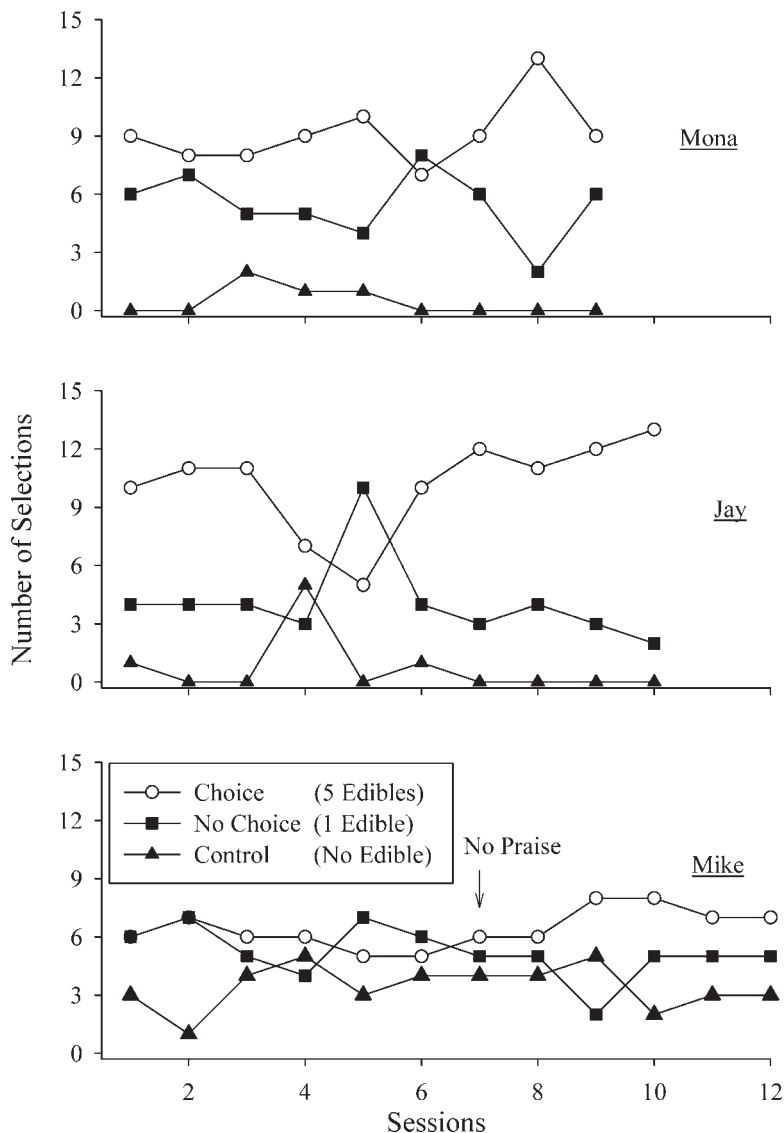


Figure 1. Number of choice, no-choice, and control selections in the initial link for Mona, Jay, and Mike.

one item (attempts to select multiple items were blocked). If the child selected the no-choice (blue) worksheet, the procedures remained identical except that the plate contained only one item. Finally, if the child selected the control (yellow) worksheet, the procedures remained identical except that no plate was delivered but praise was provided. The choice, no-choice, and control conditions were evalu-

ated in a repeated-measurement concurrent-operants design.

*Results and Discussion*

Data from Study 1 are shown in Figures 1 and 2. Mona selected the choice link most frequently ( $M = 9.1$  selections per session) followed by the no-choice link ( $M = 4.1$ ) and

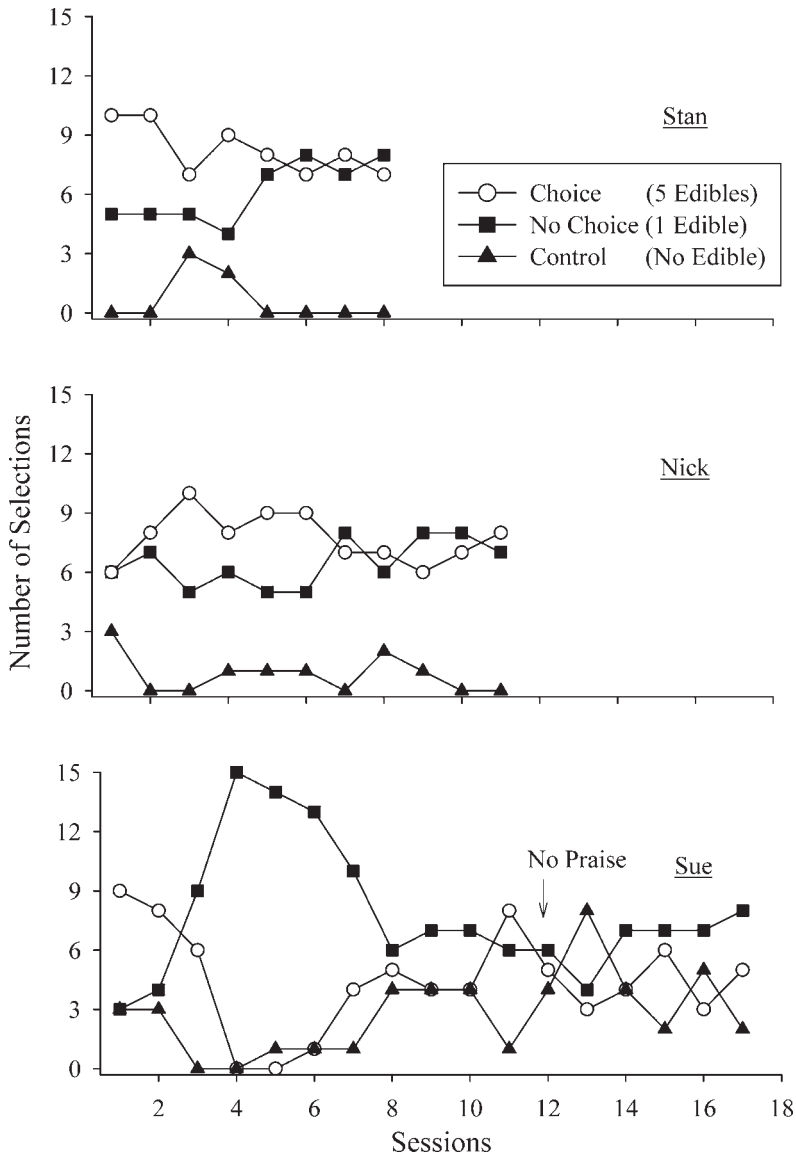


Figure 2. Number of choice, no-choice, and control selections in the initial link for Stan, Nick, and Sue.

the control link ( $M = 0.4$ ). Jay selected the choice link most frequently ( $M = 10.2$ ) followed by the no-choice ( $M = 4.1$ ) and control links ( $M = 0.7$ ). Mike initially chose all links nearly equally. Beginning in Session 7, we no longer provided praise for correct responses in any of the terminal links. After this change, there was a decrease in control-link selections ( $M = 3.4$ ) and an increase choice-link selections ( $M = 6.4$ ). Thus, we concluded that these

3 participants demonstrated a preference for the choice link relative to the no-choice link.

Stan and Nick (Figure 2) initially emitted more choice-link selections. Selections were equivalent between the choice and no-choice links, however, as the analysis progressed. Sue (Figure 2) initially allocated the majority of her responding to the no-choice link; however, we observed an emergence of responding toward the choice and control links as the analysis

progressed. Following an increase in control-link selections, we no longer provided praise for correct responses in any of the three terminal links. However, this manipulation had no noticeable effect on Sue's selections, and overall, more responding was associated with the no-choice link ( $M = 7.8$ ) than with the choice ( $M = 4.4$ ) and control ( $M = 2.8$ ) links.

In sum, the opportunity to choose was more preferred for 5 participants (Mona, Jay, Mike, Stan, and Nick), although this preference did not persist for 2 participants (Stan and Nick), and 1 participant (Sue) demonstrated a preference for not choosing. Stan's and Nick's results suggest that the opportunity to choose may serve as a reinforcer; however, for some individuals, the strength of the reinforcer may diminish in the absence of important differential consequences (e.g., access to more preferred reinforcers; Fisher et al., 1997) associated with choosing. Sue's results (i.e., a preference for no-choice conditions when the consequence for choice and no-choice selections were matched) have not been demonstrated in prior research.

## STUDY 2: ENHANCING THE VALUE OF CHOICE

Research that has evaluated individuals' preference for choice has usually compared choice conditions to a no-choice alternative (Brigham & Sherman, 1973; Fisher et al., 1997; Thompson et al., 1998). Further, the number of items from which to choose has varied across studies. The purpose of Study 2 was to examine the influence of the number of items from which to choose on children's selections of a choice condition.

### *Method*

*Participants and materials.* The 3 participants for whom elevated choice-link selections persisted during Study 1 (Mike, Jay, and Mona) were included in this evaluation. All materials were identical to those described in Study 1.

*Interobserver agreement.* Interobserver agreement data were collected during 38%, 80%, and 28% of sessions for Mona, Jay, and Mike, respectively, and averaged 100% agreement for initial-link selections across participants.

*Procedure.* The same initial-link stimuli were used as in Study 1. There were three terminal links in this arrangement, each correlated with a different-colored worksheet. During the orange link, correct responses resulted in praise and access to a plate with four identical edible items from which one could be chosen. During the blue link, correct responses resulted in praise and access to a plate with two items, identical to those presented in the orange link, from which one could be chosen. During the yellow (control) link, correct responses resulted in praise only. The relative quantity of items from which to choose was the independent variable manipulated in this study and was systematically increased from 4 to 8, 12, and 16 items. The influence of the relative quantity was evaluated in a nonconcurrent multiple-baseline design across participants, with an embedded reversal design for Mona's analysis.

### *Results and Discussion*

Data from Study 2 are shown in Figure 3. Data representing control-link selections were omitted from Figure 3 to ease visual inspection of the data (Mona, Mike, and Jay averaged 0.1, 1.8, and 0.3 control-link selections per session across the assessment, respectively). Initially, when there were four items from which to choose in the orange link and two items from which to choose in the blue link, Mona selected the orange link ( $M = 8.5$ ) more frequently than the blue link ( $M = 6.5$ ). When we increased the number of items from which to choose in the orange link from four to eight, Mona almost exclusively selected the orange link ( $M = 14.3$ ), suggesting that increasing the number of items from which to choose may have increased the value of that terminal link. We attempted to reverse this performance by decreasing the number of items in the orange link back to

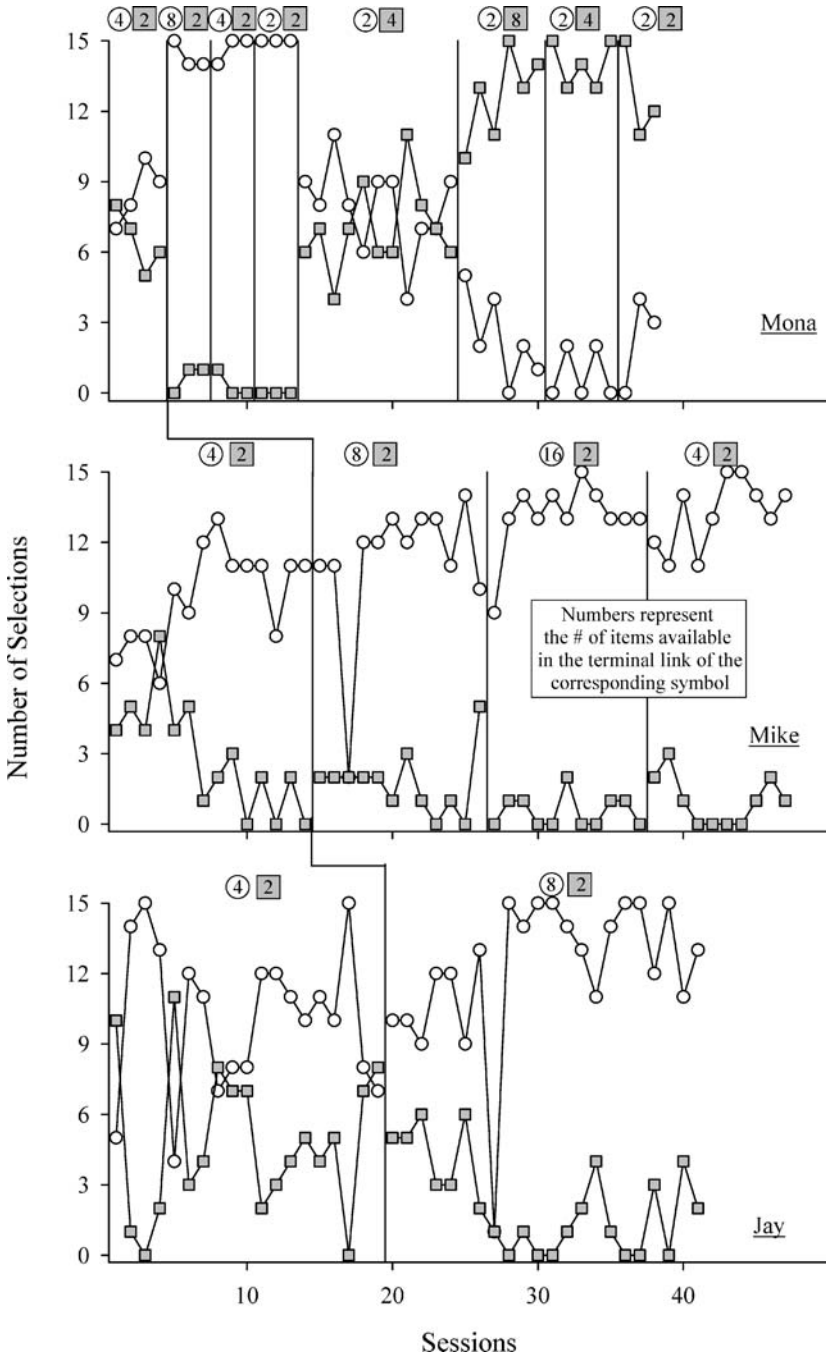


Figure 3. Number of selections in the initial link when the number of items from which to choose in the terminal link was varied across phases for Mona, Mike, and Jay. Control-link selections are not shown.

four; however, Mona continued to select the orange link almost exclusively ( $M = 14.7$ ). We then further decreased the number of items

from which to choose in the orange link to two, so that the consequences were the same in the blue and orange links (i.e., a choice between



two identical items). Mona exclusively selected the orange link ( $M = 15$ ). It was possible that the orange worksheet had acquired conditioned reinforcing properties following pairings with the increased number of items from which to choose in the terminal link. To examine this, we increased the number of items from which to choose in the blue link to four. Selections of the blue ( $M = 7.0$ ) and orange ( $M = 7.9$ ) links were similar throughout this comparison. We then increased the number of items from which to choose in the blue link from four to eight, and we saw an increase to almost exclusive blue-link selections ( $M = 12.3$ ), which was similar to the earlier selections associated with increasing the number of items from which to choose. We then returned to four and then two items from which to choose in the blue link, and blue-link selections were maintained at high levels ( $M_s = 14.0$  and  $12.7$ , respectively), thus replicating the effects observed with the prior orange link.

When there were four items from which to choose in the orange link and two items from which to choose in the blue link, Mike primarily selected the orange link ( $M = 9.7$ ) following some initial variability, suggesting that a larger array of stimuli from which to choose may be more preferred than a smaller array. When we increased the number of items in the orange link to eight, Mike's orange-link selections also increased slightly ( $M = 11.2$ ). We then further increased the number of items from which to choose in the orange link to 16, and orange-link selections again increased slightly ( $M = 13.1$ ), providing evidence of a positive association between expanding the choice array and the value of that terminal link. We then attempted to reverse this effect by decreasing the number of items from which to choose back to four; however, selections for the orange link persisted at elevated levels ( $M = 13.2$ ), a result that was similar to the results obtained with Mona.

During the initial comparison, in which there were four items from which to choose in the orange link and two items from which to choose

in the blue link, Jay's selections were variable, but he usually selected the orange link ( $M = 10.2$ ) more often than the blue link ( $M = 4.8$ ). We then increased the number of items from which to choose in the orange link from four to eight, and Jay's orange-link selections increased and became more stable ( $M = 12.2$ ).

In summary, as the number of items from which to choose was increased, all participants' selections of the corresponding terminal link systematically increased. These results suggest that increasing the number of items from which to choose enhanced the existing preference for choosing. Results for 2 of the participants also suggested that varying the number of items in the choice array may lead to the development of discriminative properties associated with the different stimuli (i.e., a conditioned reinforcement effect).

### STUDY 3: ESTABLISHING THE VALUE OF CHOICE

Results of Study 1 indicated that 2 participants (Nick and Stan) did not have a consistent preference for the choice option, and 1 participant (Sue) did not initially demonstrate sensitivity to choice as a reinforcer. Thus, the purpose of this experiment was to replicate the procedures used in Study 2 to establish the choice option as the preferred selection for these participants.

#### *Method*

*Participants and materials.* Stan, Nick, and Sue participated in this evaluation. All materials were identical to those described in Study 1.

*Interobserver agreement.* Interobserver agreement data were collected during 35%, 42%, and 30% of sessions for Stan, Nick, and Sue, respectively, and averaged 99% (range, 93% to 100%) for initial-link selections across participants.

*Procedure.* Data from Study 1 were used as baselines for this study. For Study 3, contingencies that operated in both the initial and terminal links were similar to those in Study 1, except that during the choice link, the number of edible

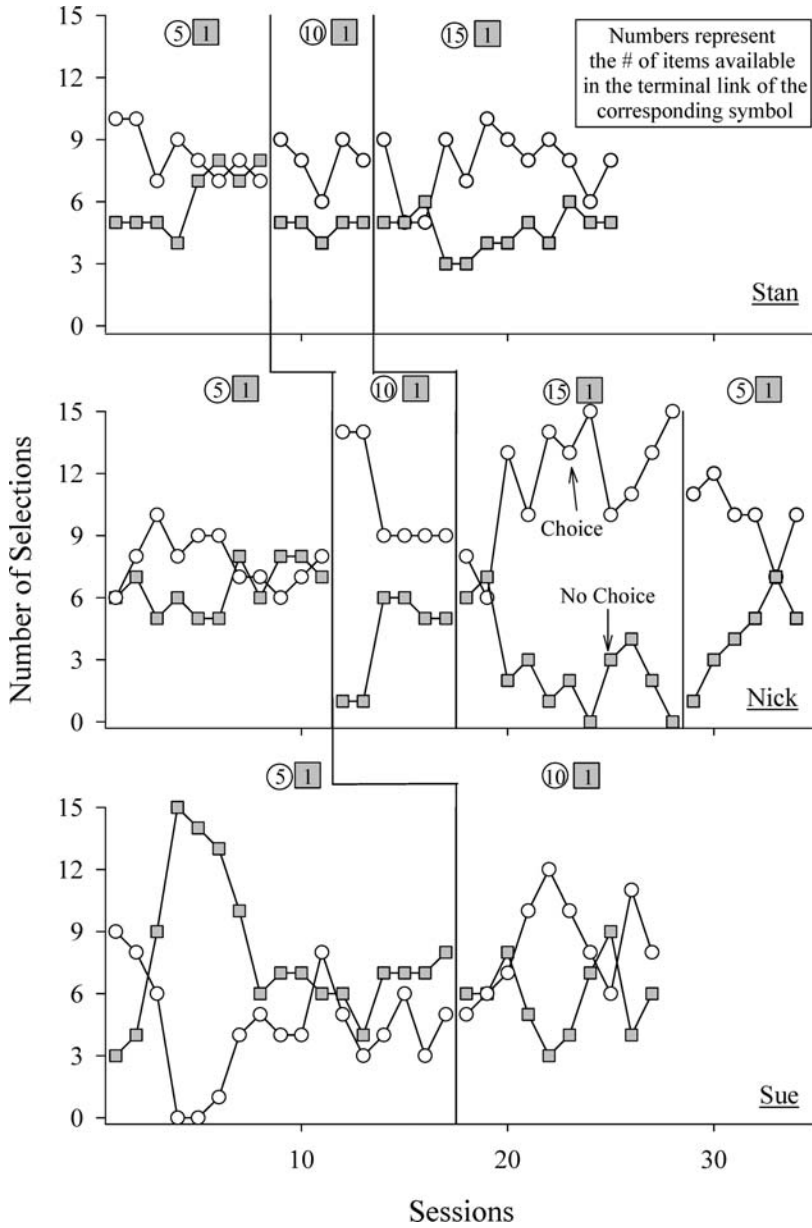


Figure 4. Number of choice and no-choice selections in the initial link when the number of items from which to choose in the terminal was varied across phases for Stan, Nick, and Sue. Control-link selections are not shown.

items from which to choose was systematically manipulated (i.e., increased from 5 to 10 and 15 items) while only one edible item remained available in the no-choice link. Experimental control was demonstrated using a combination of reversal (Nick) and nonconcurrent multiple-baseline designs across participants.

*Results and Discussion*

Data from Study 3 are shown in Figure 4. Control-link selections are not shown, but they averaged 1.9, 0.7, and 2.1 responses per session across the assessment for Stan, Nick, and Sue, respectively. When there were five items from which to choose in the choice link, Stan

eventually selected both the choice ( $M = 8.3$ ) and no-choice ( $M = 6.1$ ) links near equally. When the number of items from which to choose in the choice link was increased from 5 to 10, Stan selected the choice link more frequently ( $M = 8.0$ ) than the no-choice link ( $M = 4.8$ ). No change in this pattern was observed when the number of items from which to choose in the choice link was increased from 10 to 15 ( $M = 7.8$ ).

Nick selected the choice and no-choice links near equally ( $M_s = 7.7$  and  $6.5$ , respectively) when there were five items from which to choose in the choice link. When the number of items from which to choose in the choice link was increased to 10, Nick selected the choice link ( $M = 10.7$ ) more frequently than the no-choice link ( $M = 4.0$ ). When the number of items from which to choose in the choice link was increased from 10 to 15, we observed a further increase in choice-link selections ( $M = 11.6$ ). The influence of the greater quantity of items from which to choose was altered by decreasing the number of items in the choice link to five. Under these conditions, a slight decrease in choice-link selections was observed ( $M = 10.0$ ), whereas no-choice selections were on an upward trend ( $M = 4.4$ ) as the analysis ended.

Sue selected the no-choice link ( $M = 7.8$ ) more often than the choice link ( $M = 4.4$ ) when there were five items from which to choose in the choice link. When the number of items in the choice link was increased from 5 to 10, we observed a slight increase in choice-link selections ( $M = 8.3$ ) and a decrease in selections of the no-choice link ( $M = 5.8$ ); however, she continued to exhibit responding across both alternatives. Sue's evaluation ended prematurely when she graduated from the preschool.

Results of Study 3 suggested that, for all participants, the opportunity to choose from an array of five reinforcers was no more preferred than selecting an identical item in the absence of an array. However, as the number of items

available in the choice link was increased, this option was more preferred than the no-choice link. These findings suggest that the opportunity to choose served as a reinforcer for responding, but only within a particular context that involved relatively large differences between the numbers of items presented in the two options.

Overall, these results are consistent with those of Study 2 in that increasing the number of items from which to choose can increase the reinforcing value of choice. The results of Study 3 may be interpreted in several ways. One could consider changing the number of items from which to choose a manipulation of the reinforcer magnitude. However, the participant could obtain only one item, regardless of how many items were in the array. Thus, a more appropriate manipulation of choice magnitude would involve providing more opportunities to choose rather than more items from which to choose. Another interpretation could be that the number of items in the array served as an illusory discriminative stimulus. That is, some participants may have had previous experiences in which a larger number of items from which to choose signaled the availability of a greater magnitude or quality of reinforcement. However, it is unlikely that preference for choice links would be maintained for the extended duration of this assessment if selections were solely under control of stimuli previously correlated with greater magnitudes or qualities of reinforcement. Alternatively, the current data may suggest that increasing the number of items from which to choose may function as an establishing operation (EO) that increases the reinforcing value of the opportunity to choose and increases the likelihood of behavior associated with that option.

#### STUDY 4: QUANTIFYING A PREFERENCE FOR CHOICE

Results of Studies 1, 2, and 3 identified choice as valuable under some conditions and

showed that the efficacy of choice as a reinforcer can be influenced by altering the number of items from which to choose. Despite changes in the reinforcing efficacy of choice, it was unclear how valuable the opportunity to choose was for each child. The value of a reinforcer may be determined by examining responding for that reinforcer under increasing response requirements (Hursh, 1980). Thus, the final experiment attempted to identify an absolute value of the opportunity to choose as a consequence for the academic behavior of 3 children by progressively increasing response requirements in the terminal link associated with choosing.

### *Method*

*Participants and materials.* Mike, Mona, and Jay participated in Study 4 (the other children were no longer available for participation due to graduation or scheduling conflicts). All materials were identical to those described in Study 1.

*Interobserver agreement.* Interobserver agreement data were collected during 30%, 25%, and 50% of sessions for Mike, Mona, and Jay, respectively, and averaged 99% (range, 33% to 100%) for initial-link selections. It should be noted that low agreement for initial-link selections was observed in a single session with Jay because the reliability observer skipped an early trial that affected the correlation of the remaining entries.

*Procedure.* Contingencies that operated in the initial links were identical to those in Study 1. A baseline was established in which completion of a single academic task was required to fulfill the terminal-link requirements in the choice, no-choice, and control links. The number of tasks required to produce reinforcement in the choice terminal link was then progressively increased to 2, 3, 4, 8, 12, 16, and 32 tasks across sessions for each participant, whereas one academic task was required to fulfill the requirement in the no-choice and control terminal links throughout the assessment. The maximum number of items from which to choose from Study 2 (i.e., those that resulted in the highest level of

selections) was held constant in the choice link (16 items for Mike, 8 items for Mona and Jay). From these arrays, one item could be chosen. A reversal design was used with Mona and Jay to demonstrate experimental control over the effects of increasing the response requirement in the choice link (Mike graduated from the preschool before a reversal could be completed).

### *Results and Discussion*

Data from Study 4 are shown in Figure 5 and are presented as a function of number of selections plotted against schedule requirements. Control-link selections are not presented in Figure 5 but averaged 1.0, 1.2, and 0 for Mike, Mona, and Jay, respectively. During baseline, Mike almost exclusively selected the choice link ( $M = 12.6$ ). As the choice-link schedule requirements increased, no-choice link responding emerged. When the choice-link fixed-ratio (FR) value reached 32, Mike selected the no-choice link slightly more often than the choice link.

An initial baseline was established in which Mona selected the choice link on all but one occasion ( $M = 14.7$  selections). This pattern continued as the FR schedule in the choice terminal link was increased to an FR 8, but was disrupted at the FR 12 schedule when the majority of her selections were for the no-choice link. Mona then primarily selected the control link at the FR 16 and FR 32 schedules (14 of 15 and 8 of 15 responses, respectively; data not shown). Baseline conditions were then reestablished, in which Mona selected the choice link almost exclusively ( $M = 14.3$ ), and then the FR schedule in the choice link was progressively increased. Exclusive selections of the choice link were again disrupted at the FR 12 schedule, and selections switched to the no-choice link at the FR 16 schedule and continued at the FR 32 schedule.

Jay selected the choice link on a majority of occasions during an initial baseline ( $M = 14.0$ ). This selection pattern continued until the FR schedule was increased to 8. Jay then primarily

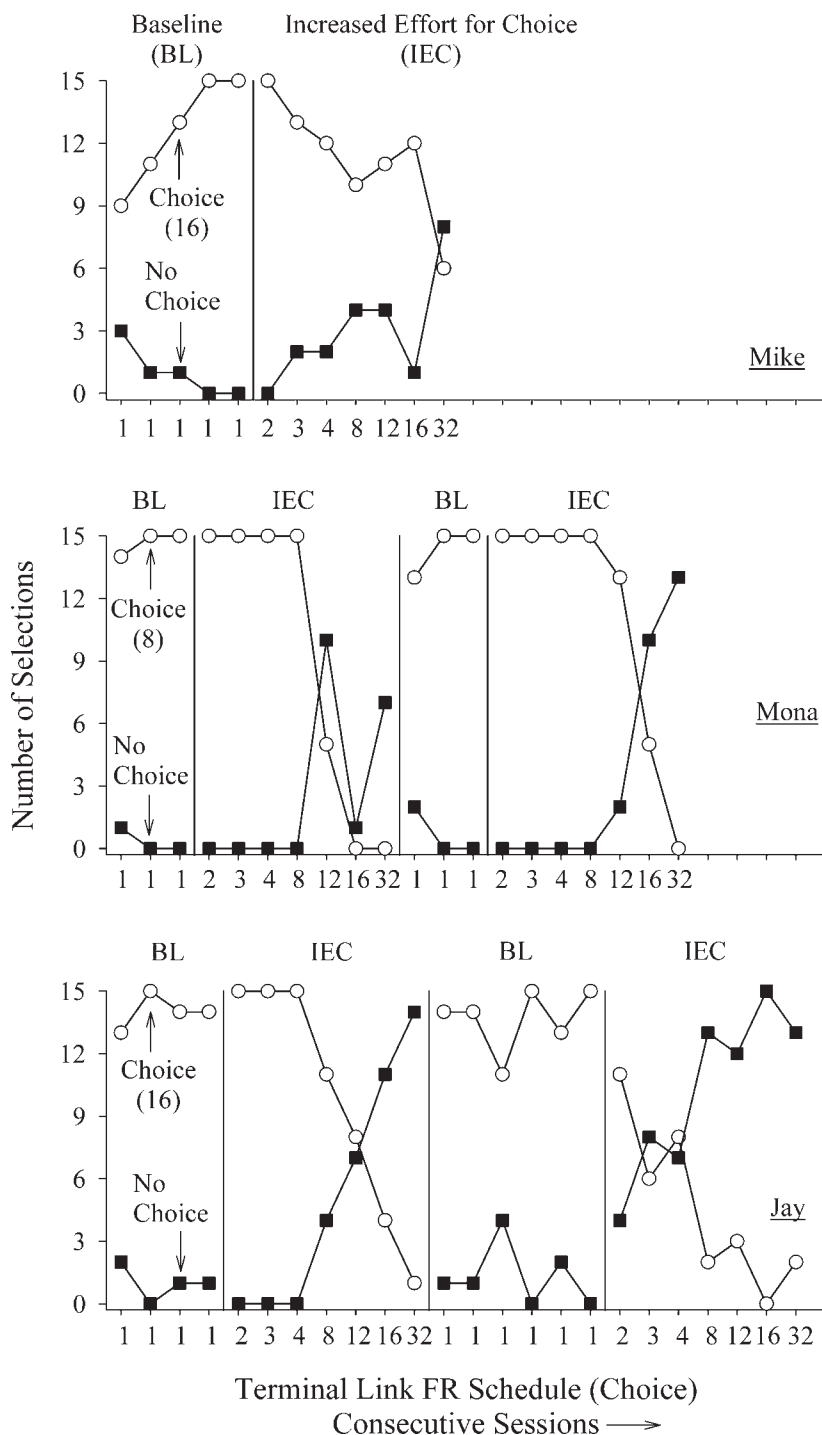


Figure 5. Number of choice and no-choice selections in the initial link when the work requirement in the choice terminal link was progressively increased for Mike, Mona, and Jay. Numbers in parentheses note the number of items from which to choose. Control-link selections are not shown.

selected the no-choice link when the choice terminal link was set at FR 16 and FR 32. We reestablished baseline in which Jay primarily selected the choice link ( $M = 13.7$ ). Preference for the choice link was disrupted during the initial change from an FR 1 to an FR 2. Jay demonstrated a preference for the no-choice link at all steps between the FR 8 and FR 32 schedules, although he continued to select the choice link intermittently throughout this condition.

These data demonstrate that the participants selected the choice link under conditions in which the response effort greatly favored the no-choice link. These selections were obtained even though the material consequences (i.e., edible items) provided in the choice link were of no greater magnitude or quality than in the no-choice link. Further, these data suggest that this preference was quantifiable and relatively reliable, in that the switchover points for Mona (and to a lesser extent for Jay) occurred at similar steps in the progression during within-subject reversals.

One limitation of our methods was that children could contact reinforcement by not emitting an independent response (i.e., waiting for the experimenter to physically guide them and then collecting reinforcement). If this were the case, then the effort variable would not be relevant. This does not appear to be the case in the current study, because only 9 of 2,289 terminal-link responses across the 3 participants were physically prompted. However, if participants waited to be physically prompted, the choice condition would have involved a relatively longer delay to reinforcement, and continued selections for the choice condition would have provided an indicator of the absolute value of choice.

## GENERAL DISCUSSION

The conditions under which the opportunity to choose did and did not function as a reinforcer for the academic behavior of preschool

children were evaluated. This project (a) included methodological features that permitted the isolation of choice as an independent variable, (b) extended a prior line of research to a new population (i.e., preschool children) and to a more socially valid (academic) response, (c) suggested a procedure to increase the value of the opportunity to choose (i.e., increase the number of items from which to choose), and (d) demonstrated one method for quantifying the value of the opportunity to choose.

Similar descriptions of the value of the opportunity to choose are reported in basic research, in which nonhuman organisms have responded to gain access to choice conditions over no-choice conditions. Catania and Sagvolden (1980) arranged the delivery of grain to follow the completion of either a choice or no-choice terminal link involving the key pecking of pigeons. With rats as subjects, Voss and Homzie (1970) arranged choice and no-choice paths on a runway, both of which led to an identical goal box with food. Both studies demonstrated more selections of the options associated with a choice among reinforcers. Despite the effectiveness of these basic preparations for identifying preferences for choice relative to no-choice conditions, similar research to assess human preference has often involved less controlled methods, by allowing reinforcers of different quality to be delivered in choice and no-choice conditions.

In some applied evaluations of choice as an independent variable, the experimenters placed no constraints on the consequences associated with choosing; that is, the consequences for choosing or not choosing involved dissimilar reinforcers (e.g., Dyer *et al.*, 1990). This approach makes it difficult to identify the contribution of choosing on any effects observed. Yoking no-choice to choice selections (e.g., Fisher *et al.*, 1997) better controls for the effects of qualitatively different consequences but still permits the momentary effects of

establishing operations to influence preferences. Using identical reinforcers in both choice and no-choice links may eliminate the potential confounding effects of providing differential consequences and stimulus satiation, thereby allowing for a determination of the reinforcing value of the opportunity to choose.

Catania (1980) has suggested that choice may emerge as a reinforcer through both phylogenetic (i.e., genetic) and ontogenic (i.e., conditioning) sources. The phylogenetic perspective suggests that the probability of survival is higher for species that prefer choosing, and therefore this preference has been selected throughout our evolutionary history. For example, an animal that forages for multiple fruits in several areas would be more likely to survive a harsh season than an animal that forages for one fruit in a single area. The ontogenic perspective suggests that individual organisms have experienced that choosing results in an improvement of some form, and therefore this preference has been selected from a personal history of improved outcomes associated with choosing. That is, choosing rarely results in selections among identical options, as was arranged in this study. Rather, a choice is usually between items of discrepant value, with the opportunity to choose ensuring procurement of the more valuable one. There is also a lingering question regarding the behavioral principles involved in the opportunity to choose. Some of the present results are consistent with results of previous experiments that show that the opportunity to choose serves as an EO (Michael, 1982; 1993), increasing the reinforcing value of the stimulus delivered (e.g., Romaniuk et al., 2002). However, results of the present study showed that the opportunity to choose also served as a reinforcer, by showing increased selections of a terminal link associated with choosing relative to one in which this opportunity was unavailable. It appears that under different conditions, choosing serves as either an EO or a reinforcer.

Regarding the practical implications of this study, the results suggest that providing the opportunity to choose reinforcers is a means of increasing the effectiveness of differential reinforcement. Along with restricting access to programmed reinforcers items outside treatment times (Vollmer & Iwata, 1991) and varying the delivery of items (Bowman, Piazza, Fisher, Hagopian, & Kogan, 1997; Egel, 1981), providing a choice among multiple reinforcers is a simple, quick, and inexpensive means of further increasing the effectiveness of reinforcers. It is unlikely in practice that teachers would provide choices among identical items (e.g., five identical computer games) to increase the reinforcing efficacy of the item. Nevertheless, results of the current investigation suggest that providing a choice among discrepant reinforcers (e.g., computer games, toy cars, or free time) would be effective because it results in access to a relatively high-preference activity *and* the opportunity to choose, both of which have independent reinforcing value.

## REFERENCES

- Bowman, L. G., Piazza, C. C., Fisher, W. W., Hagopian, L. P., & Kogan, J. S. (1997). Assessment of preference for varied versus constant reinforcers. *Journal of Applied Behavior Analysis, 30*, 451–458.
- Brigham, T. A., & Sherman, J. A. (1973). Effects of choice and immediacy of reinforcement on single response and switching behavior of children. *Journal of the Experimental Analysis of Behavior, 19*, 425–435.
- Catania, A. C. (1980). Freedom of choice: A behavioral analysis. *Psychology of Learning and Motivation, 14*, 97–145.
- Catania, A. C., & Sagvolden, T. (1980). Preference for free choice over forced choice in pigeons. *Journal of the Experimental Analysis of Behavior, 34*, 77–86.
- Dunlap, G., dePerczel, M., Clarke, S., Wilson, D., Wright, S., White, R., et al. (1994). choice making to promote adaptive behaviors for students with emotional and behavioral challenges. *Journal of Applied Behavior Analysis, 27*, 505–518.
- Dyer, K., Dunlap, G., & Winterling, V. (1990). The effects of choice making on the problem behaviors of students with severe handicaps. *Journal of Applied Behavior Analysis, 23*, 515–524.
- Egel, A. L. (1981). Reinforcer variation: Implications for motivating developmentally disabled children. *Journal of Applied Behavior Analysis, 14*, 345–350.

- Fisher, W., Piazza, C. C., Bowman, L. G., Hagopian, L. P., Owens, J. C., & Slevin, I. (1992). A comparison of two approaches for identifying reinforcers for persons with severe and profound disabilities. *Journal of Applied Behavior Analysis, 25*, 491–498.
- Fisher, W. W., Thompson, R. H., Piazza, C. C., Crosland, K., & Gotjen, D. (1997). On the relative reinforcing effects of choice and differential consequences. *Journal of Applied Behavior Analysis, 30*, 423–438.
- Hanley, G. P., Piazza, C. C., Fisher, W. W., Contrucci, S. A., & Maglieri, K. (1997). Evaluation of client preference for function-based treatment packages. *Journal of Applied Behavior Analysis, 30*, 459–473.
- Hursh, S. R. (1980). Economic concepts for the analysis of behavior. *Journal of the Experimental Analysis of Behavior, 34*, 219–238.
- Michael, J. (1982). Distinguishing between motivational and discriminative functions of stimuli. *Journal of the Experimental Analysis of Behavior, 37*, 149–155.
- Michael, J. (1993). Establishing operations. *The Behavior Analyst, 16*, 191–206.
- 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.
- Romaniuk, C., Miltenberger, R., Conyers, C., Jenner, N., Jurgens, M., & Ringenberg, C. (2002). The influence of activity choice on problem behaviors maintained by escape versus attention. *Journal of Applied Behavior Analysis, 35*, 349–362.
- Thompson, R. H., Fisher, W. W., & Contrucci, S. A. (1998). Evaluating the reinforcing effects of choice in comparison to reinforcement rate. *Research in Developmental Disabilities, 19*, 181–187.
- Vollmer, T. R., & Iwata, B. A. (1991). Establishing operations and reinforcement effects. *Journal of Applied Behavior Analysis, 24*, 279–291.
- Voss, S. C., & Homzie, M. J. (1970). choice as a value. *Psychological Reports, 26*, 912–914.

*Received November 17, 2004*

*Final acceptance October 17, 2005*

*Action Editor, Henry Roane*