

THE VALUE OF CHOICE AS A REINFORCER FOR TYPICALLY  
DEVELOPING CHILDREN

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Previous research has shown that providing choices may result in an increase in appropriate behavior and a decrease in inappropriate behavior; however, the process by which choice results in a behavior change is unknown. In the current study, we replicated and extended previous research by determining the prevalence of preference for choice in a large number of children and evaluating whether a history of differential outcomes associated with choice and no choice resulted in changes in preference for those conditions. Results from Study 1 showed that the majority of participants preferred choice contexts when child choice and experimenter choice resulted in identical outcomes. In Study 2, participants' preferences were altered when child choice and experimenter choice resulted in differential outcomes, but a history with differential outcomes did not produce a reliable and durable effect on selections.

*Key words:* choice, concurrent chains, concurrent operants, conditioning, preference

*Choice* is defined as the allocation of responding among concurrently available response options (Catania, 2007; Fisher & Mazur, 1997). Choice is often studied using a concurrent-operants arrangement in which at least two response options are available and each is associated with a different outcome (e.g., type of stimulus, schedule of reinforcement; Fisher et al., 1992; Herrnstein, 1961; Piazza, Fisher, Hagoopian, Bowman, & Toole, 1996). Over the past 50 years, choice has been studied as both a dependent and independent variable, which can potentially result in some confusion. For

example, choice is measured as a dependent variable to determine the relative rate of responding to each available option (Fisher & Mazur, 1997) for the purpose of determining which option is preferred. In addition, the opportunity to choose may be studied as an independent variable in which individuals are provided a choice between different response options for the purpose of changing the occurrence of a particular target behavior.

With respect to choice as an independent variable, researchers have shown that providing individuals with the opportunity to choose (a) the type of task or activity presented (e.g., Dunlap et al., 1994; Dyer, Dunlap, & Winterling, 1990; Romaniuk & Miltenberger, 2001; Vaughn & Horner, 1997), (b) the order in which tasks or activities are presented (e.g., Kern, Mantegna, Vorndran, Bailin, & Hilt, 2001; Tasky, Rudrud, Schulze, & Rapp, 2008), or (c) which reinforcers will be delivered (e.g., Dyer et al., 1990; Graff, Libby, & Green, 1998) is effective for increasing appropriate behavior,

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decreasing inappropriate behavior, or both, during demand or task contexts. However, it remains unclear whether the reinforcing effects of the opportunity to choose in itself or differential outcomes associated with the opportunity to choose are responsible for behavior change (Lerman et al., 1997; Smith, Iwata, & Shore, 1995). For example, in some studies in which choice was an effective intervention, it is possible that choice (a) produced outcomes that were more preferred than those delivered in no-choice conditions (e.g., Dyer et al., 1990), (b) resulted in an increase in the variety of stimuli accessed (stimulus variation; Bowman, Piazza, Fisher, Hagopian, & Kogan, 1997; Egel, 1980, 1981; Milo, Mace, & Nevin, 2010), or (c) permitted momentary fluctuations in preference (Vollmer & Iwata, 1991).

Recently, researchers have attempted to answer the question of whether the effectiveness of choice as an intervention is due to choice as a reinforcer or the differential outcomes produced by choice. To do this, researchers have attempted to equate the outcomes across choice and no-choice conditions or response options using various procedures, including yoking reinforcers between conditions or response options (e.g., Dunlap et al., 1994; Fisher, Thompson, Piazza, Crosland, & Gotjen, 1997), delivering different but high-preference items in all conditions or response options (e.g., Lerman et al., 1997; Smith et al., 1995), or delivering identical items in all conditions or response options (e.g., Schmidt, Hanley, & Layer, 2009; Tiger, Hanley, & Hernandez, 2006). For example, Tiger et al. (2006) used a concurrent-chains procedure to compare the relative preference for choice and no-choice conditions using identical reinforcers across the choice and no-choice conditions. In the initial link of each trial, three worksheets were presented to the participant, and each was associated with a different condition (choice, no choice, and control). The participant was asked to choose one of the three worksheets associated with different terminal links. During the

terminal link of each trial, the participant was asked to receptively label one of the items on the chosen worksheet, and correct responses resulted in the consequence associated with the chosen worksheet. If the participant chose the choice worksheet, correct responding resulted in the opportunity to choose among five identical edible items; if the participant chose the no-choice worksheet, correct responding resulted in experimenter delivery of one edible item (identical to the edible item in the choice condition); if the participant chose the control worksheet, correct responding resulted in no edible item. Five of six participants preferred the choice option; however, preference did not maintain for two participants. One of the participants preferred the no-choice option. Overall, these data indicated that choice is often more preferred and can function as a reinforcer when the outcome across choice and no-choice conditions is identical.

Often, choice is more preferred and is a relatively more potent reinforcer than no choice across a variety of species and populations (Catania & Sagvolden, 1980; Cerutti & Catania, 1997; Fenerty & Tiger, 2010; Fisher et al., 1997; Geckeler, Libby, Graff, & Ahearn, 2000; Schmidt et al., 2009; Sran & Borrero, 2010; Thompson, Fisher, & Contrucci, 1998; Tiger et al., 2006; Tiger, Toussaint, & Roath, 2010; Voss & Homzie, 1970). Several studies have shown that not only is choice more preferred or a more potent reinforcer but also the preference for choice is relatively strong and sometimes resistant to change (e.g., Thompson et al., 1998; Tiger et al., 2006, 2010). For example, Tiger et al. (2006) evaluated the strength of preference for choice for three typically developing children who initially showed preference for choice when the requirement was the same. Participants continued to select the choice option rather than the no-choice option as the response requirement was increased. Tiger et al. (2010) used a progressive-ratio schedule to quantify the strength of preference for choice

by systematically increasing the number of responses required for reinforcement within the session. Results showed higher rates of responding and higher break points (i.e., the last completed schedule before responding stopped) in the choice sessions than in no-choice sessions for two of the three participants. Overall, studies have shown that choice has more value and reinforcing strength than no-choice conditions, and these effects have been shown across minimal, constant-effort requirements as well as more difficult, increasing-effort requirements (i.e., Thompson *et al.*, 1998; Tiger *et al.*, 2006, 2010). However, these studies do not tell us the process by which choice becomes a reinforcer.

Although the majority of participants in the above-mentioned studies showed a preference for choice conditions, some participants did not show a preference for choice conditions. This may be due to a limited history of opportunities to make choices. Catania (1980) suggested that preference for choice may have survival value (phylogenic) or may be due to differential reinforcement of choice making in a person's lifetime (ontogenic). The latter suggests that preference for choice may be conditioned. If an individual has a history of choice making that results in quantitatively or qualitatively more reinforcement, choice may become a conditioned reinforcer. Smith *et al.* (1995) also made an argument for the development of a preference for choice over time as an explanation for why adults with intellectual and developmental disabilities (IDD) may not show differentiated responding between choice and no-choice conditions. The authors argued that these results might suggest that some individuals with IDD have not developed a preference for choice due to an insufficient history of making choices or choices being paired with better outcomes.

Research on preference for choice suggests that various histories may affect choice responding (Catania, 1975, 1980; Catania & Sagvolden,

1980; Karsina, Thompson, & Rodriguez, 2011). For example, Karsina *et al.* (2011) attempted to condition a preference for choice in undergraduate students directly using differential reinforcement. They did so by manipulating schedules of reinforcement associated with free- and restricted-choice conditions using a computer task. They used a concurrent-chains procedure to compare a free-choice condition, in which participants selected and ordered three numbers from an array of eight, to a restricted-choice condition, in which participants ordered three preselected numbers from an array of eight. Of the 11 participants, (a) four preferred the free-choice condition over the restricted-choice condition, (b) four displayed a strong preference for the restricted-choice condition, and (c) three showed similar preference for the free- and restricted-choice conditions. Next, the seven participants who showed a preference for the restricted-choice condition or a similar preference for both conditions were exposed to a differential reinforcement procedure in which the schedule of reinforcement on free-choice trials was denser than on restricted-choice trials. Following the differential reinforcement procedure, choice trials were conducted in which the consequences for free-choice and restricted-choice options were identical. During choice trials, all seven participants showed a strong preference for free choice, and five of the seven participants continued to display this preference after exposure trials were no longer implemented. The experimenters also conducted a differential reinforcement procedure in which the schedule of reinforcement on restricted-choice trials was denser than free-choice trials; however, this exposure did not result in an increase in preference for the restricted-choice condition for any of the participants. It is possible that a preference for restricted choice may have been conditioned if it had not followed the free-choice conditioning phase; however, this was not evaluated. Overall, results suggest that pairing denser schedules of reinforcement with

choice options may be an effective way to condition choice as a reinforcer.

In summary, the majority of studies have indicated the preference for and reinforcing efficacy of choice. However, most studies on choice as a reinforcer have been conducted with a small number of children, and there have been participants who have not shown preference for choice or for whom this preference did not endure. In addition, little is known regarding the process by which choice becomes preferred or how one might go about increasing the reinforcing efficacy of choice. Karsina et al. (2011) showed that a preference for choice could be conditioned by providing participants with a history of denser schedules of reinforcement for a free-choice condition than for a restricted-choice condition. However, the generality of this finding across subject characteristics, tasks, and type of differential outcome has not been established.

Therefore, the purposes of the current study were to replicate and extend previous research on the preference of choice by determining preference for choice in a large number of typically developing children (Study 1) and evaluating whether differential histories associated with choice and no-choice conditions resulted in changes in preference for choice and no-choice conditions (Study 2).

## STUDY 1: CHOICE ASSESSMENT

### METHOD

#### *Participants and Setting*

Participants were 30 typically developing children (ranging in age from 31 to 62 months) who attended a university-based preschool. We conducted sessions two to six times per day, 2 to 5 days per week, in an individual session room (3 m by 3 m) near the classrooms. The session room contained a table, chairs, session materials, and reinforcers appropriate to the particular session being conducted.

#### *Materials*

Task materials, edible reinforcers, and discriminative stimuli were present during all choice sessions. Task materials included three identical sets of 50 flash cards that depicted pictures of common items (e.g., dog, spoon, and chair) for which the children had shown mastery in expressive labeling (i.e., at least 90% correct on a pretest). To aid in discrimination, we included two drawn pictures of a pointing hand during sessions to denote which stack of flash cards was associated with which choice option. To denote the child-choice option, we positioned one hand to point toward the participant; to denote the experimenter-choice option, we positioned the other hand to point toward the experimenter. Edible reinforcers consisted of items that were identical or very similar in size (or cut to be so) and color (e.g., small candies or pieces of chips).

#### *Response Measurement and Interobserver Agreement*

The primary dependent variable was the frequency of selection of each choice option (child choice, experimenter choice, or no reinforcement [control]) during the initial link of the concurrent-chains procedure. *Child choice* was defined as the participant touching the picture of the hand pointing to the participant. *Experimenter choice* was defined as the participant touching the picture of the hand pointing to the experimenter. *Control* was defined as the participant touching a blank piece of paper. A higher frequency of selection for one choice option over the others indicated a preference for the associated choice option.

We collected data on the frequency of the participant's independent correct responses and prompted correct responses to the target task (i.e., expressive picture labeling) during the terminal links of each session. An *independent correct response* was defined as accurately and independently labeling the item in the picture within 5 s of the presentation of the flash card.

A *prompted correct response* was defined as accurately labeling the item in the picture within 5 s of a corrective verbal prompt delivered by the experimenter. We also collected data on experimenter behaviors, including the frequency of reinforcer delivery during the terminal link. Data collectors scored a child-choice reinforcer delivery if the experimenter presented the plate associated with child-choice materials for the participant to choose one of the five identical edible items. Data collectors scored experimenter-choice reinforcer delivery if the experimenter delivered one of the five identical pieces of food on the plate associated with experimenter-choice materials.

We assessed procedural integrity on a trial-by-trial basis. For each session, we divided the number of trials in which the correct reinforcer was delivered by the total number of trials in a session (15) and converted the result to a percentage. We assessed procedural integrity for a mean of 35% (range, 26% to 45%) of sessions across participants; integrity averaged 99.6% (range, 87% to 100%).

Data were collected by trained undergraduate and graduate research assistants using paper-and-pencil data collection. We assessed interobserver agreement by having a second observer collect data for a mean of 47% (range, 22% to 78%) of sessions. We calculated interobserver agreement by comparing both observers' data using the trial-by-trial method. At the end of each session, we divided the number of trials with agreements by the total number of trials and converted the quotient to a percentage for the initial-link responses, terminal-link responses, and reinforcer-delivery responses. Mean agreement across participants for choice selections during the initial link was 99% (range, 80% to 100%). Mean agreement for independent correct responses and prompted correct responses during the terminal link was 99% (range, 80% to 100%), and mean agreement for edible delivery was 99% (range, 86% to 100%).

### *Procedure*

Before the first choice-assessment session, we conducted a paired-stimulus preference assessment (Fisher *et al.*, 1992) and used the item chosen on the highest percentage of trials during the subsequent choice assessment. During choice-assessment sessions, we used a concurrent-chains arrangement to determine relative preference for the choice options. Each session included 15 trials, each consisting of an initial link and a terminal link. We included a 15-s intertrial interval to ensure that all trials were similar in duration regardless of the choice option selected. During the initial link of each trial, the experimenter presented three stacks of identical flash cards associated with different choice options (child choice, experimenter choice, and control) to the participant. At the beginning of each trial, the experimenter instructed the participant to "pick your favorite." After the participant selected a choice option, the experimenter implemented the terminal link associated with that option. During the terminal link, the experimenter implemented one expressive labeling trial and implemented the consequence for an independent correct response or prompted correct response that coincided with the selected choice option.

### *Procedure: Initial Link*

As mentioned above, during the initial link of each trial, the experimenter presented three sets of identical flash cards to the participant. The experimenter placed a picture of a pointing hand with the finger pointing toward the participant in front of the child-choice materials, a picture of a pointing hand with the finger pointing toward the experimenter in front of the experimenter-choice materials, and a blank piece of paper in front of the control materials. Finally, the experimenter placed a plate that contained five identical edible items behind the child-choice and the experimenter-choice materials and an empty plate behind the control materials. Before the start of the session, the experimenter gave the

participant instructions regarding each of the choice options and conducted one practice trial for each option. For example, for the experimenter-choice option, the experimenter told the participant, "If you touch this hand [the picture of the hand pointing to the experimenter], you will tell me what is in the picture [on the flash card] and I will pick what treat you get to eat." For each practice trial, the experimenter prompted the participant to choose each of the options (child choice, experimenter choice, and control), and then implemented associated consequences in the terminal link.

#### *Procedure: Terminal Link*

After the participant had selected a choice option in the initial link of each trial, the experimenter implemented the terminal link associated with that option. In the terminal link of each trial, the experimenter presented a flash card from the stack associated with the selected choice option and asked the participant, "What is this?" If the participant correctly labeled the picture within 5 s of the instruction (independent correct response), the experimenter implemented the consequence associated with the selected choice option. If the participant did not correctly label the picture within 5 s of the instruction (i.e., labeled the picture incorrectly or did not respond), the experimenter vocally prompted the participant to say the correct label of the picture. For example, if a picture of a cat was presented and the participant said "dog" or did not respond within 5 s, the experimenter said, "say *cat*," and waited 5 s for the participant to respond correctly. If the participant correctly labeled the picture within 5 s of this vocal prompt (prompted correct response), the experimenter implemented the consequence associated with the selected choice option. If the participant did not respond following the vocal prompt, the experimenter would have implemented the next initial link after a 15-s delay; however, this never occurred.

*Child-choice terminal link.* During child-choice terminal links, correct responding resulted in the experimenter providing praise and sliding the plate associated with child choice to the participant. The experimenter told the participant to pick one of the edible items on the plate. After the participant picked one item, he or she was given time to consume it. Next, the experimenter replaced that item and positioned the plate back behind the task materials associated with the child-choice option.

*Experimenter-choice terminal link.* During experimenter-choice terminal links, correct responding resulted in the experimenter providing praise, choosing an item from the plate associated with experimenter choice, and providing that item to the participant to be consumed immediately.

*Control terminal link.* During control terminal links, correct responding resulted in the experimenter providing praise and presenting the empty plate to the participant.

## RESULTS AND DISCUSSION

Results of the choice assessments for each participant are depicted in Table 1 and Figures 1 and 2. Ten participants showed no difference in preference between the child-choice and experimenter-choice options, whereas 20 participants preferred the child-choice option over the experimenter-choice or control option. No participants preferred the experimenter-choice option over the child-choice option.

Graphs that show the four general patterns of responding are presented in Figures 1 and 2. Figure 1 depicts representative data for participants who showed preference for the child-choice option (i.e., graphs for 10 of the 20 participants who showed a preference for child choice). Of the participants who showed preference for child choice, three patterns of responding were observed. The first pattern was high and consistent levels for the child-choice option compared to experimenter-choice and control options. We observed these results for 12

Table 1

Mean Number of Selections for Child-Choice, Experimenter-Choice, and Control Options, and Overall Preference Determination for All Participants in Study 1

Participant	Child choice	Experimenter choice	Control	Choice preference
Valerie	7	7.2	0.8	No preference
Cate	7.1	7.8	0.1	No preference
Missy	6	7.3	1.7	No preference
Carrie	8	6.8	0.2	No preference
Jody	6.9	7.9	0.2	No preference
Elle	7.7	6.7	0.6	No preference
Max	8.5	5.4	1.1	No preference
Kelly	8.1	6.9	0	No preference
Lucy	8.1	6.9	0	No preference
Sadie	6.9	7.3	0.8	No preference
Britt	10	5	0	Child choice
Lamar	10.8	3.2	1	Child choice
Larra	11.6	3.4	0	Child choice
Mickey	10.1	4.8	0.1	Child choice
Jonah	9.1	2.4	3.5	Child choice
Irina	9.3	4	1.7	Child choice
Eric	13.4	1.4	0.2	Child choice
Roxy	12.4	2.4	0.1	Child choice
Ezra	9	5.7	0.3	Child choice
Zelda	11.1	3.5	0.4	Child choice
Xerxes	9.4	5.4	0.2	Child choice
Brad	13.4	1.6	0.2	Child choice
Hank	10	4.4	0.6	Child choice
Eddie	12.8	2.2	0	Child choice
Cole	9.4	5.1	0.5	Child choice
Claire	13.2	1.8	0	Child choice
Larry	15	0	0	Child choice
Corey	13.2	1.6	0.2	Child choice
Hayden	10.5	4	0.5	Child choice
Evan	10.8	3.3	0.9	Child choice

participants, and representative graphs for Lamar, Corey, Eddie, Eric, Claire, and Brad depict this pattern in the top six graphs of Figure 1. The second pattern was variable levels of choice responding across child- and experimenter-choice options but overall higher levels of responding for the child-choice option. We observed these results for four participants, and representative graphs for Irina and Hank depict this pattern in Figure 1. The third pattern was similar levels across child-choice and experimenter-choice options initially, followed by higher levels of responding to the child-choice option. We observed these results for four participants, and representative graphs for Mickey and Jonah depict this pattern in Figure 1. Figure 2 depicts representative data for partic-

ipants who displayed similar levels of responding for the child-choice and experimenter-choice options throughout the assessment (i.e., 5 of the 10 participants who displayed similar levels across choice options). Representative graphs for Carrie, Lucy, Jody, Sadie, and Kelly are depicted in Figure 2.

Overall, most participants (20 of 30; 66%) preferred the child-choice option during the choice assessments when the outcomes were identical across child- and experimenter-choice options. However, for some of these participants, a preference for child choice developed after repeated exposure to the consequences associated with the different choice options. One third of the participants did not display a preference for either the child- or experimenter-choice options.

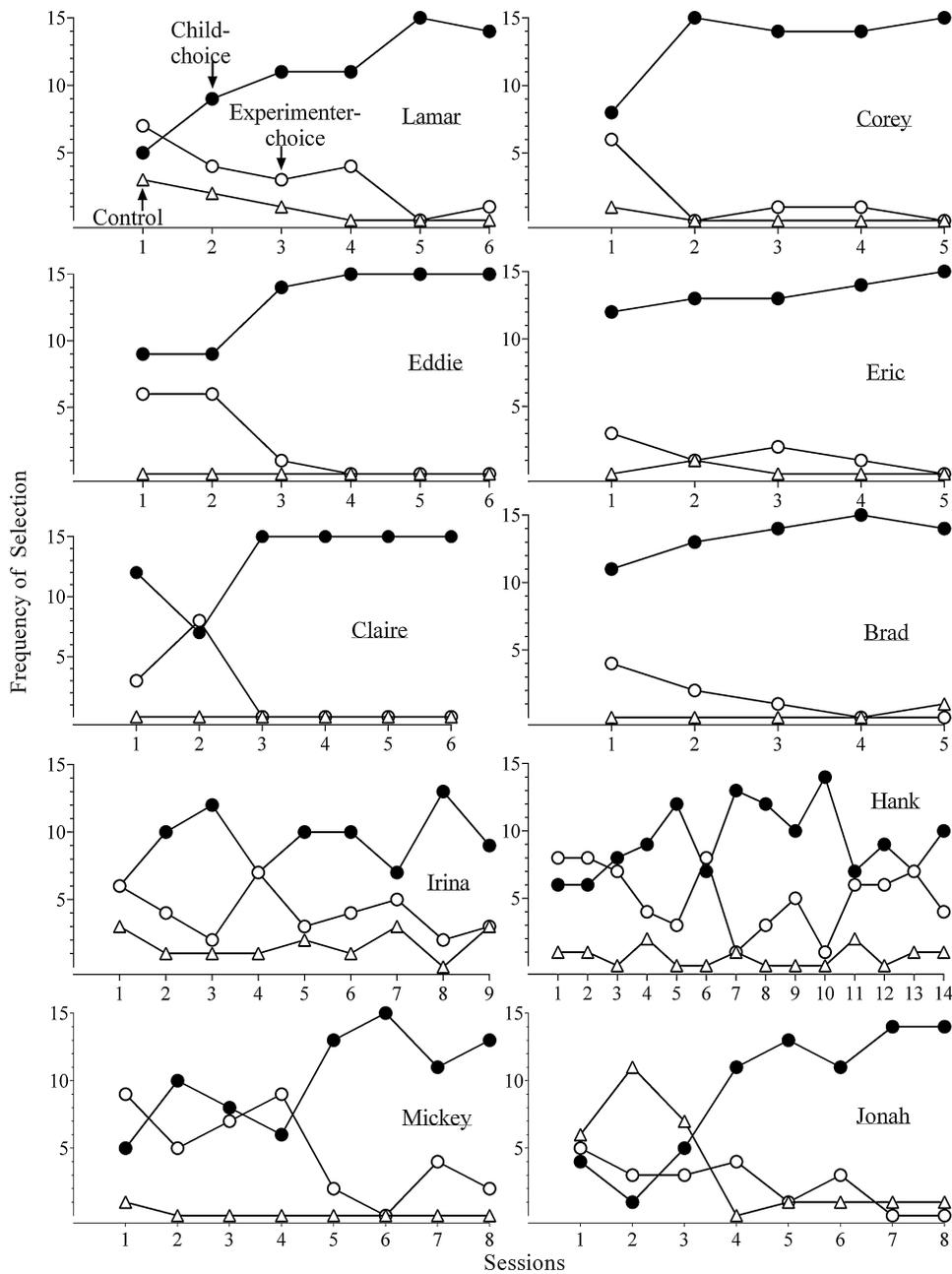


Figure 1. The frequency of selections for the child-choice, experimenter-choice, and control initial links during the choice assessment for Lamar, Corey, Eddie, Eric, Claire, Brad, Irina, Hank, Mickey, and Jonah.

This indifference may be due to a lack of differential histories associated with choice-making opportunities. Therefore, we conducted Study 2 to determine whether programming a

history of access to more preferred and varied outcomes for one choice option would influence responding toward that choice option when outcomes were again equal across options.

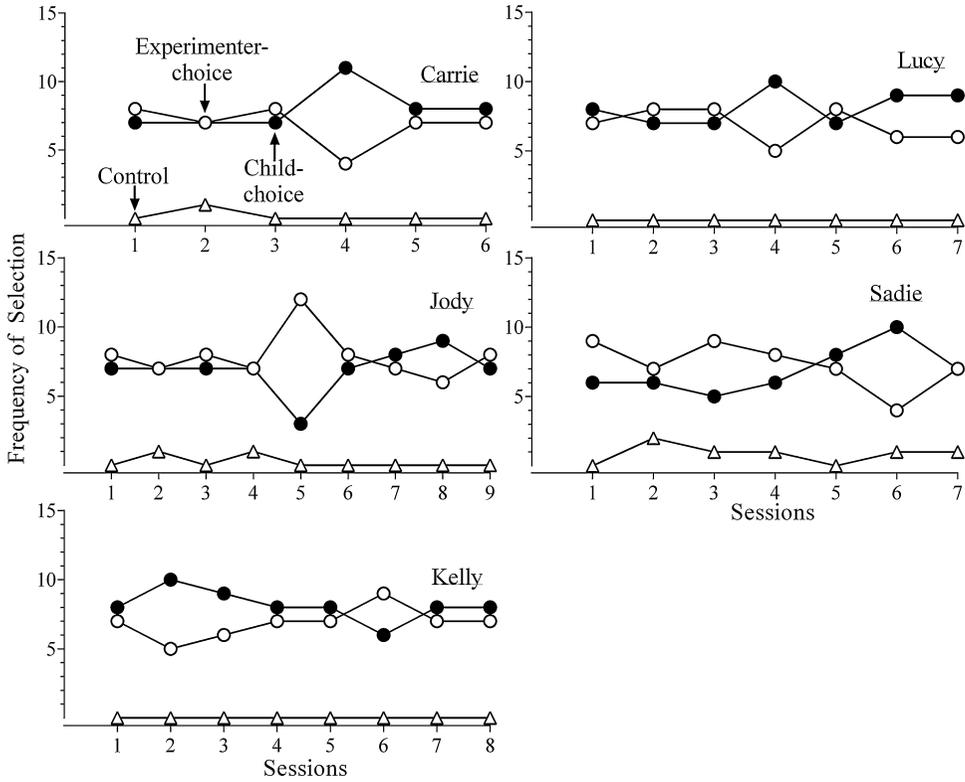


Figure 2. The frequency of selections for the child-choice, experimenter-choice, and control initial links during the choice assessment for Carrie, Lucy, Jody, Sadie, and Kelly.

Specifically, we attempted to condition (a) experimenter choice as a reinforcer for participants who showed a preference for the child-choice condition in Study 1, (b) experimenter choice as a reinforcer for participants who responded similarly for both choice conditions in Study 1, and (c) child choice as a reinforcer for participants who responded similarly for both choice conditions in Study 1.

## STUDY 2: CONDITIONING

### METHOD

#### *Participants and Setting*

Participants in Study 2 included 11 participants who also participated in Study 1. Six participated in the experimenter-choice conditioning phase, and five participated in the

child-choice conditioning phase. Sessions were conducted in a session room (3 m by 3 m) near the classrooms. Sessions were conducted three to six times per day, 3 to 5 days per week. The session room contained a table, chairs, session materials, and reinforcers appropriate to the particular session being conducted.

#### *Materials*

Task materials, edible reinforcers, and discriminative stimuli were identical to those in Study 1.

#### *Response Measurement and Interobserver Agreement*

The dependent variables and data-collection procedures were identical to those described for Study 1. Procedural integrity was assessed by having an observer collect data for a mean of

25% (range, 26% to 32%) of sessions and averaged 99.7% (range, 93% to 100%). Interobserver agreement was assessed by having a second observer collect data for a mean of 48% (range, 28% to 88%) of sessions across participants. As in Study 1, interobserver agreement was calculated by comparing both observers' data using the trial-by-trial method. The mean agreement across participants for choice selections during the initial link was 99.8% (range, 87% to 100%). The mean agreement for independent or prompted correct responding during the terminal link was 99.7% (range, 87% to 100%), and agreement for edible delivery was 99.9% (range, 87% to 100%).

### *Procedure*

To attempt to condition child choice as a reinforcer, we paired the child-choice condition with a large variety of high-preference edible items, and we paired the experimenter-choice condition with a small variety of low-preference edible items. To attempt to condition experimenter choice as a reinforcer, we paired experimenter choice with a large variety of high-preference edible items, and we paired the child-choice condition with a small variety of low-preference edible items. We chose to pair different, high-preference items during conditioning phases because previous research has indicated that the manipulation of variables such as stimulus variation, preference, and number of items in the stimulus array influence allocation of responding (e.g., Fisher et al., 1997; Tiger et al., 2006). We chose to present eight items in the stimulus array because previous research has suggested that a higher number of items associated with a choice option, even though only one item is delivered, may be an influential variable (e.g., Tiger et al., 2006). We chose to use all of these variables (i.e., higher stimulus variety, higher preferred items, and higher number of items in the stimulus array) instead of only a single variable (i.e., higher stimulus variety alone) to maximize the potential conditioning effects.

For Study 2, baseline data were the data collected during the choice assessment from Study 1. For 10 of the 11 participants, 1 to 3 days elapsed from the end of Study 1 to the beginning of Study 2; for one participant (Carrie), 2 weeks elapsed between the studies. After the choice assessment from Study 1, we implemented a conditioning phase to attempt to condition the child-choice or experimenter-choice option as a reinforcer. After the conditioning phase, we conducted another choice assessment (identical to the one conducted in Study 1) to evaluate whether the participants' preference shifted from one choice option to another. For two participants who did not show significant or consistent change in behavior during the second choice assessment, we implemented a second conditioning phase to attempt to condition the other choice option as a reinforcer. After that conditioning phase, we conducted a third choice assessment.

For four participants who did not show a change in preference during the posttest choice assessment after the original conditioning phase, we used an interspersed method to attempt to condition that same choice option. During the interspersed conditioning phase we conducted five conditioning sessions followed by one choice assessment session and repeated this pattern five times, for a total of 25 conditioning sessions interspersed with five test sessions. These procedures are similar to those used by Karsina et al. (2011) in which more frequent choice trials were conducted after a recent history of conditioning trials. It is possible that conditioning effects for some participants in the current study were not maintained during the original choice assessment phase that followed the conditioning phase because multiple sessions were conducted in the choice assessment phase in which the outcomes of the two choice options were equated, which may have resulted in extinction.

### *Procedure: Child-Choice Conditioning*

Each child-choice conditioning session consisted of 15 trials. Each trial included an initial link and a terminal link. As in Study 1, during

the initial link, the experimenter placed all three stacks of flash cards on the table in front of the participant and said, "pick your favorite." After the participant selected a stack, he or she entered the terminal link. The terminal link consisted of one expressive labeling trial followed by a 15-s delay before the next trial was presented.

*Initial link.* Initial-link procedures during child-choice conditioning were similar to those in Study 1 with a few exceptions. The experimenter placed a plate that contained eight high-preference edible items (items ranked 2 through 9 during the preference assessment conducted before Study 1) behind the child-choice materials. In addition, the experimenter placed a plate that contained two pieces of a low-preference edible item (item ranked lowest but selected at least once during the preference assessment conducted before Study 1) behind the experimenter-choice materials and an empty plate behind the control materials.

*Terminal link.* The terminal link during child-choice conditioning was similar to that conducted in Study 1; however, the consequences associated with each of the choice options were different (see below).

*Child-choice terminal link.* During child-choice terminal links, if the participant responded correctly the experimenter provided praise, slid the plate containing eight high-preference edible items to the participant, and told the participant to pick one.

*Experimenter-choice terminal link.* During experimenter-choice terminal links, if the participant responded correctly, the experimenter provided praise, picked one of the two identical low-preference edible items from the plate, and provided it to the participant to consume.

*Control terminal link.* During control terminal links, if the participant responded correctly, the experimenter provided praise and presented the empty plate to the participant.

#### *Procedure: Experimenter-Choice Conditioning*

Experimenter-choice conditioning sessions were identical to child-choice conditioning

sessions except that the eight high-preference stimuli were associated with the experimenter-choice initial and terminal links and the two low-preference items were associated with the child-choice initial and terminal links.

#### *Design*

A pretest and posttest design was used in which a choice assessment (identical to the assessment conducted during Study 1) was conducted before (pretest) and after (posttest) conditioning sessions to determine changes in preference for child-choice versus experimenter-choice conditions. Baseline was the choice assessment conducted during Study 1. After each conditioning phase (i.e., conditioning phases with 25 consecutive conditioning sessions), a choice assessment was conducted to determine the effects of conditioning on preference for child-choice versus experimenter-choice options. During interspersed conditioning phases, five conditioning sessions were followed by a single choice-assessment session. This pattern was repeated five times for a total of 25 conditioning sessions and five choice-assessment sessions. All phases were conducted immediately following the previous phase; therefore, all phases were conducted during a 3-week timespan.

#### RESULTS AND DISCUSSION

Figures 3, 4, and 5 show the number of selections for the child-choice, experimenter-choice, and control options across choice assessments and conditioning phases. In addition, a summary of preference determinations for all participants across phases in Studies 1 and 2 is presented in Table 2. Three interesting outcomes were found. First, during the conditioning phases, all of the participants in Study 2 responded to the option paired with favorable outcomes. This finding replicates previous research showing that participants shifted their responding from the child-choice option to the experimenter-choice option when the latter

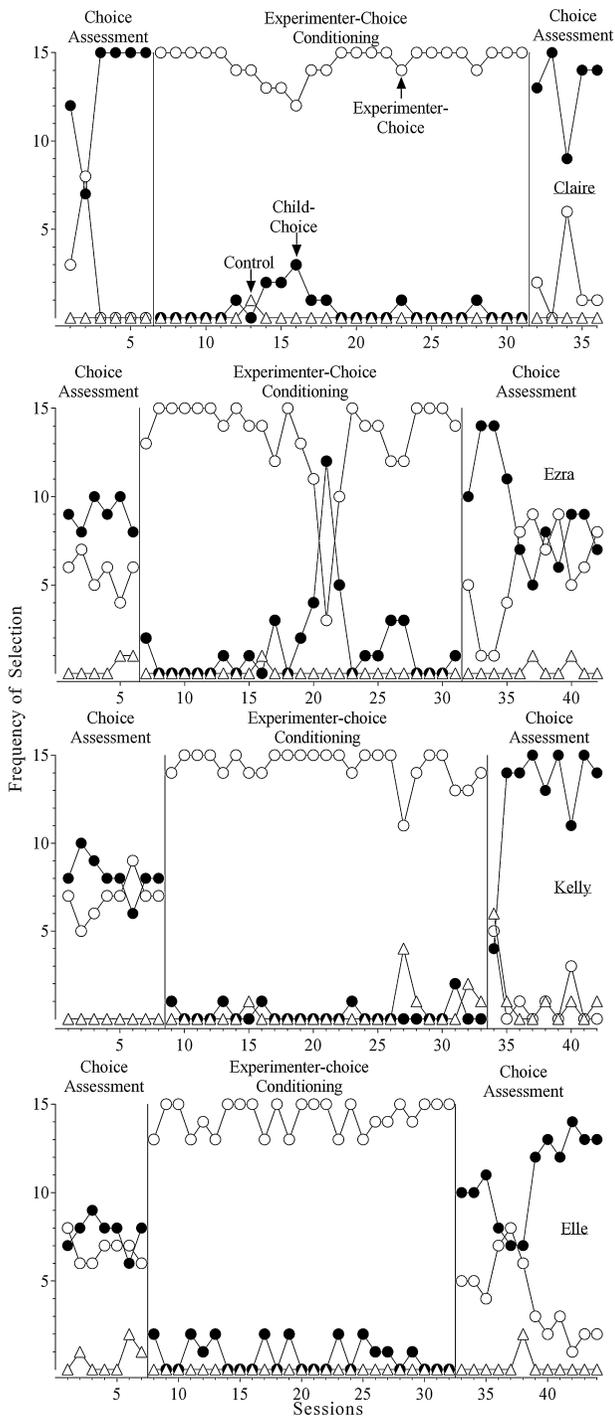


Figure 3. The frequency of selections for the child-choice, experimenter-choice, and control initial links during pretest (initial choice assessment), experimenter-choice conditioning, and posttest (choice assessment after conditioning) for Claire, Ezra, Kelly, and Elle, who were exposed to experimenter-choice conditioning after the pretest and before the posttest choice assessments.

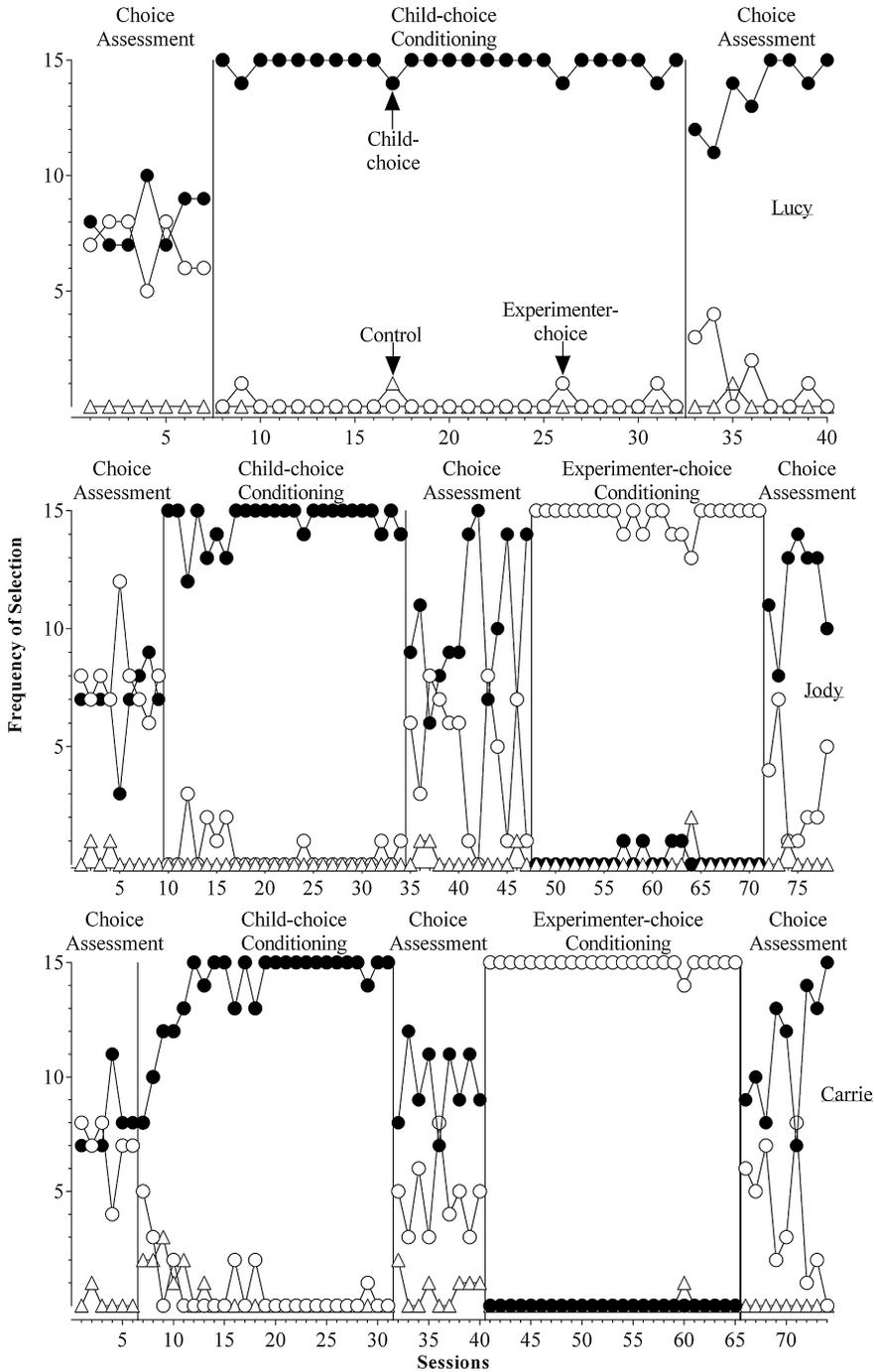


Figure 4. The frequency of selection for the child-choice, experimenter-choice, and control initial links during the pretest (initial choice assessment), child-choice conditioning, and posttest (choice assessment after conditioning) for Lucy, Jody, and Carrie, who were exposed to child-choice conditioning after the pretest, as well as the experimenter-choice conditioning and second posttest (choice assessment after conditioning) for Jody and Carrie, who experienced both conditioning phases.

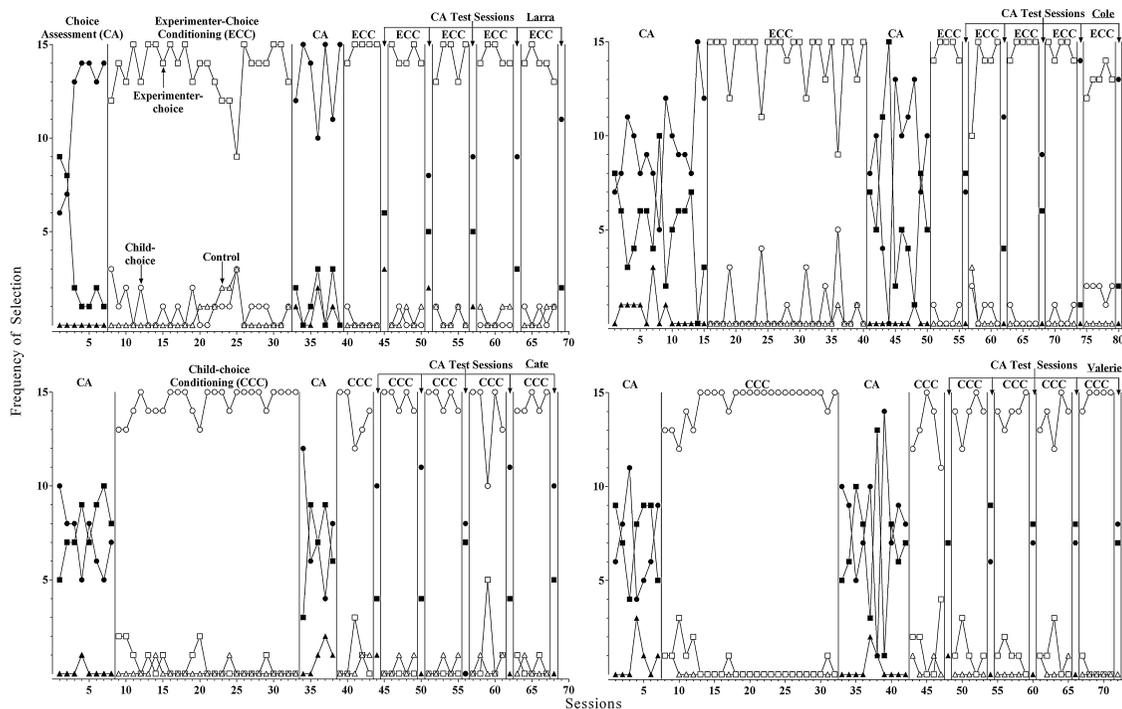


Figure 5. The frequency of selection for the child-choice, experimenter-choice, and control initial links during the pretest, choice conditioning, posttest, and interspersed conditioning phases for Larra and Cole, who were exposed to the experimenter-choice conditioning (ECC) phase, and Cate and Valerie, who were exposed to the child-choice conditioning (CCC) phase.

option was associated with higher quality reinforcers (e.g., Fisher et al., 1997). Second, four participants did not show a change in preference from the pretest to posttests, espe-

cially Claire and Larra, who showed a clear preference for the child-choice option in the pretest. Third, seven participants showed a change in preference from the pretest to the

Table 2  
Preference Determination Based on Response Allocation for Participants Across Phases in Studies 1 and 2

Participant	Choice assessment (Study 1)	Conditioning phase	Choice assessment (Study 2)	Additional conditioning phase	Choice assessment (second Study 2)
Claire	Child choice	ECC	Child choice		
Ezra	Child choice	ECC	No preference		
Larra	Child choice	ECC	Child choice	Interspersed ECC	Child choice
Cole	Child choice	ECC	Child choice	Interspersed ECC	Child choice
Kelly	No preference	ECC	Child choice		
Elle	No preference	ECC	Child choice		
Lucy	No preference	CCC	Child choice		
Jody	No preference	CCC	Child choice	ECC	Child choice
Carrie	No preference	CCC	Child choice	ECC	Child choice
Cate	No preference	CCC	No preference	Interspersed CCC	Child choice
Valerie	No preference	CCC	No preference	Interspersed CCC	No preference

ECC = experimenter-choice conditioning, CCC = child-choice conditioning.

posttests. One of seven participants (Ezra) began to respond similarly for both choice options. Six of seven participants showed a change in preference to the child-choice option; however, this preference for the child-choice option occurred after both child-choice conditioning and experimenter-choice conditioning; therefore, we cannot confidently attribute this preference shift to our conditioning procedures.

Figure 3 shows the results for the four participants (Claire, Ezra, Kelly, and Elle) who experienced only experimenter-choice conditioning. All four participants selected the experimenter-choice option most frequently during the conditioning phase, regardless of responding during the pretest; however, this preference for the experimenter-choice option did not persist during the posttest during which child choice and experimenter choice resulted in identical outcomes. Claire showed a substantial preference for the child-choice option during the pretest, and during the posttest she again selected the child-choice option more frequently than the experimenter-choice or control options. Therefore, we concluded that the experimenter-choice conditioning phase was not sufficient to affect her preference. During the pretest, Ezra showed a slight preference for the child-choice option, and during the first four sessions of the posttest, he selected the child-choice option more frequently than the experimenter-choice option; however, after this, he began to select the child- and experimenter-choice options at a similar frequency. Kelly and Elle responded similarly for the child-choice and experimenter-choice options during the pretest. During the posttest, both participants selected the child-choice option more frequently than the experimenter-choice and control options.

Figure 4 shows the results for Lucy, Jody, and Carrie, who responded similarly for the child- and experimenter-choice options during the pretest, participated in the child-choice conditioning phase, and showed an increase in their selection for the child-choice option in the

posttest. Jody and Carrie also participated in the experimenter-choice conditioning phase after the first posttest. During the experimenter-choice conditioning phase, both participants selected the experimenter-choice option more frequently than the child-choice and the control options. During the second posttest, Jody and Carrie selected the child-choice option more frequently than the experimenter-choice and control options. With these participants, child-choice conditioning was associated with a preference shift toward the child-choice option during the choice assessment. These participants showed a preference for experimenter choice only when differential outcomes favored this link.

Although many of the participants showed a change in responding, at least to some degree, in favor of the child-choice option following a conditioning history, there were some participants who did not show a change in responding after conditioning. An interspersed method was used to condition either the child- or experimenter-choice option in which choice-assessment sessions were interspersed among conditioning sessions. Data for these participants (Larra, Cole, Cate, and Valerie) are shown in Figure 5. Larra and Cole showed a preference for the child-choice option in the pretest, although Cole's preference was moderate. Next, they participated in the experimenter-choice conditioning phase. As for other participants, both of these participants selected the experimenter-choice option during the conditioning as well as the interspersed conditioning phases. However, during the posttest and interspersed choice-assessment sessions, they continued to select the child-choice option more frequently than the experimenter-choice or control options. The data from Larra and Cole indicate that it is difficult to condition experimenter choice, particularly when an individual already has a preference for child choice, which replicates the findings of Karsina *et al.* (2011).

Figure 5 (bottom) shows the results for Cate and Valerie, who responded similarly for the child-choice and experimenter-choice options during the pretest and then participated in the child-choice conditioning evaluation. Both participants selected the child-choice options most frequently during the conditioning and interspersed conditioning sessions. Cate selected the child-choice option at a similar frequency as the experimenter-choice option during the initial posttest; however, during the interspersed child-choice conditioning sessions, she selected the child-choice option more frequently than the experimenter-choice or control options. The data for Cate indicate that interspersing frequent and single choice-assessment sessions allowed us to observe changes in preference. It is possible that, for Cate, there were short-term conditioning effects that dissipated, possibly due to extinction, in the extended choice-assessment posttest. Valerie also displayed similar levels of responding across child-choice and experimenter-choice options during the pretest and continued to select both choice options at similar levels during the initial posttest and the interspersed choice-assessment sessions. Thus, the method of interspersing frequent and single choice-assessment sessions with conditioning sessions did not show any effect of the conditioning procedure for Valerie.

## GENERAL DISCUSSION

The purpose of Study 1 was to determine the probability of a preference for choice with a relatively large population ( $N=30$ ) of typically developing children. Most participants (20 of 30) showed a preference for choice, even though the terminal-link outcomes were identical. Overall, these data suggest that the majority of young typically developing children prefer to make choices rather than having someone else choose for them.

Although most participants in Study 1 preferred child-choice over experimenter-choice

options, one third (10 of 30) responded similarly to both choice options. There are several possible reasons for this lack of preference for choice. First, it is possible that these participants did not have a robust history with choices that resulted in better outcomes such as more preferred items or activities, higher number of items from which to choose, and increased stimulus variation. Second, it is possible that the stimuli used to aid in discrimination between child-choice and experimenter-choice options were not effective for some participants. For example, it is possible that some participants attended only to the presence of the edible items (or other stimuli) that were identical across child-choice and experimenter-choice options, resulting in indiscriminate responding. If more salient discriminative stimuli had been used, we may have seen discriminated selections by some of these participants.

The purpose of Study 2 was to determine whether we could condition preference for the child-choice option, experimenter-choice option, or both, by exposing participants to differential outcomes associated with the child-choice or experimenter-choice options. Several interesting results were found. First, during conditioning sessions, all participants selected the choice option that was associated with the better outcome (a higher variety of high-preference items), regardless of which option was being conditioned (child choice or experimenter choice) and regardless of their pattern of responding in previous choice-assessment sessions. These results replicate previous research that has shown that participants will shift responding to a previously low-preference option if the outcome for selecting this option is better than the previous high-preference option (e.g., Fisher et al., 1997; Tiger et al., 2006).

Second, both conditioning phases were associated with a change in responding for the child-choice option for some participants. Four of the participants who experienced the experimenter-choice conditioning phase and two of

the participants who experienced the child-choice conditioning phase showed a subsequent increase in responding toward the child-choice option during posttests. However, due to the use of a pretest–posttest design and the fact that similar patterns of responding were seen with participants who experienced both conditioning phases, no definitive conclusions can be deduced from these results. In fact, it is possible that simple exposure to making choices and not making choices may have influenced preference for the child-choice option. Use of an alternative design, such as a multiple baseline design across participants, may allow more conclusive results.

Third, the experimenter-choice conditioning was not effective for any of the participants. These results are similar to the results found by Karsina *et al.* (2011) in that after successfully conditioning a preference for the free-choice option with several participants, they were unable to condition a preference for the restricted-choice option. Collectively, our results and those of Karsina *et al.* may indicate that a preference for choice may be difficult to change following a programmed history of differential reinforcement. However, the difficulty in conditioning experimenter choice may also be due to the variables that were used in the conditioning procedures. We used different high-preference stimuli during the conditioning procedure, and Karsina *et al.* used denser schedules of reinforcement in their procedure. It is possible that other variables that have been shown to affect choice responding, such as delay to reinforcement and the effort required to obtain a reinforcer (DeLeon, Iwata, Goh, & Worsdell, 1997; Mace, Neef, Shade, & Mauro, 1996; Neef, Mace, & Shade, 1993; Neef, Shade, & Miller, 1994), would have been effective for conditioning experimenter choice as a reinforcer for these individuals. It is also possible that providing these participants with a more extensive conditioning history (*i.e.*, more conditioning sessions) would have resulted in a change in preference for the experimenter-choice option.

Future researchers may consider evaluating the effectiveness of conditioning by evaluating procedural changes to increase the effectiveness of the conditioning procedure. For example, conducting more conditioning sessions may be necessary to provide an individual with a substantial history to change preference for particular choice options. Second, as we attempted to do with several participants, conducting single and more frequent choice-assessment sessions may allow determination of the effects of conditioning sessions on preferences because they allow one to determine the immediate effects of the conditioning procedure without the continued exposure to extinction that is inherent in consecutive choice-assessment sessions. Finally, as suggested by others (*e.g.*, Smith *et al.*, 1995), future researchers may also consider evaluating procedures to teach individuals to discriminate the conditions under which it is appropriate to choose and the conditions under which it is more appropriate to allow others to choose for them. For example, young children may be able to choose between some articles of clothing, such as a blue or green shirt; however, it is probably more appropriate to allow their parents to choose whether or not they wear protective clothing, such as a coat.

## 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. doi: 10.1901/jaba.1997.30-451
- Catania, A. C. (1975). Freedom and knowledge: An experimental analysis of preference in pigeons. *Journal of the Experimental Analysis of Behavior*, *24*, 89–106. doi: 10.1901/jeab.1975.24-89
- Catania, A. C. (1980). Freedom of choice: A behavioral analysis. *The Psychology of Learning and Motivation*, *14*, 97–145. doi: 10.1016/S0079-7421(08)60160-7
- Catania, A. C. (2007). *Learning* (interim 4th ed.). Cornwall-on-Hudson, NY: Sloan.
- 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. doi: 10.1901/jeab.1980.34-77

- Cerutti, D., & Catania, A. C. (1997). Pigeons' preference for free choice: Number of keys versus key area. *Journal of the Experimental Analysis of Behavior*, *68*, 349–356. doi: 10.1901/jeab.1997.68-349
- DeLeon, I. G., Iwata, B. A., Goh, H., & Worsdell, A. S. (1997). Emergence of reinforcer preference as a function of schedule requirements and stimulus similarity. *Journal of Applied Behavior Analysis*, *30*, 439–449. doi: 10.1901/jaba.1997.30-439
- 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. doi: 10.1901/jaba.1994.27-505
- 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. doi: 10.1901/jaba.1990.23-515
- Egel, A. L. (1980). The effects of constant vs. varied reinforcer presentation on responding by autistic children. *Journal of Experimental Child Psychology*, *30*, 455–463. doi: 10.1016/0022-0965(80)90050-8
- Egel, A. L. (1981). Reinforcer variation: Implications for motivating developmentally disabled children. *Journal of Applied Behavior Analysis*, *14*, 345–350. doi: 10.1901/jaba.1981.14-345
- Fenerty, K. A., & Tiger, J. H. (2010). Determining preschoolers' preferences for choice-making opportunities: Choice of task versus choice of consequence. *Journal of Applied Behavior Analysis*, *43*, 503–507. doi: 10.1901/jaba.2010.43-503
- Fisher, W. W., & Mazur, J. E. (1997). Basic and applied research on choice responding. *Journal of Applied Behavior Analysis*, *30*, 387–410. doi: 10.1901/jaba.1997.30-387
- Fisher, W. 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. doi: 10.1901/jaba.1992.25-491
- 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. doi: 10.1901/jaba.1997.30-423
- Geckeler, A. S., Libby, M. E., Graff, R. B., & Ahearn, W. H. (2000). Effects of reinforcer choice measured in single-operant and concurrent-schedule procedures. *Journal of Applied Behavior Analysis*, *33*, 347–351. doi: 10.1901/jaba.2000.33-347
- Graff, R. B., Libby, M. E., & Green, G. (1998). The effects of reinforcer choice on rates of challenging behavior and free operant responding in individuals with severe disabilities. *Behavioral Interventions*, *13*, 249–268. doi: 10.1002/(SICI)1099-078X(199811)13:4<249::AID-BIN19>3.0.CO;2-1
- Herrnstein, R. J. (1961). Relative and absolute strength of response as a function of frequency of reinforcement. *Journal of the Experimental Analysis of Behavior*, *4*, 267–272. doi: 10.1901/jeab.1961.4-267
- Karsina, A., Thompson, R. H., & Rodriguez, N. M. (2011). Effects of a history of differential reinforcement on preference for choice. *Journal of the Experimental Analysis of Behavior*, *95*, 189–202. doi: 10.1901/jeab.2011.95-189
- Kern, L., Mantegna, M. E., Vorndran, C. M., Bailin, D., & Hilt, A. (2001). Choice of task sequence to reduce problem behaviors. *Journal of Positive Behavior Interventions*, *3*, 3–10. doi: 10.1177/109830070100300102
- 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. doi: 10.1901/jaba.1997.30-411
- 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. doi: 10.1901/jaba.1996.29-11
- Milo, J., Mace, F. C., & Nevin, J. A. (2010). The effects of constant versus varied reinforcers on preference and resistance to change. *Journal of the Experimental Analysis of Behavior*, *93*, 385–394. doi: 10.1901/jeab.2010.93-385
- Neef, N. A., Mace, F. C., & Shade, D. (1993). Impulsivity in students with serious emotional disturbance: The interactive effects of reinforcer rate, delay, and quality. *Journal of Applied Behavior Analysis*, *26*, 37–52. doi: 10.1901/jaba.1993.26-37
- Neef, N. A., Shade, D., & Miller, M. S. (1994). Assessing influential dimensions of reinforcers on choice in students with serious emotional disturbance. *Journal of Applied Behavior Analysis*, *27*, 575–583. doi: 10.1901/jaba.1994.27-575
- Piazza, C. C., Fisher, W. W., Hagopian, L. P., Bowman, L. G., & Toole, L. (1996). Using a choice assessment to predict reinforcer effectiveness. *Journal of Applied Behavior Analysis*, *29*, 1–9. doi: 10.1901/jaba.1996.29-1
- Romaniuk, C., & Miltenberger, R. G. (2001). The influence of preference and choice of activity on problem behavior. *Journal of Positive Behavior Interventions*, *3*, 152–159. doi: 10.1177/109830070100300303
- Schmidt, A. C., Hanley, G. P., & Layer, S. A. (2009). A further analysis of the value of choice: Controlling for illusory discriminative stimuli and evaluating the effects of less preferred items. *Journal of Applied Behavior Analysis*, *42*, 711–716. doi: 10.1901/jaba.2009.42-711
- Smith, R. G., Iwata, B. A., & Shore, B. A. (1995). Effects of subject- versus experimenter-selected reinforcers on the behavior of individuals with profound developmental

- disabilities. *Journal of Applied Behavior Analysis*, *28*, 61–71. doi: 10.1901/jaba.1995.28-61
- Sran, S. K., & Borrero, J. C. (2010). Assessing the value of choice in a token system. *Journal of Applied Behavior Analysis*, *43*, 553–557. doi: 10.1901/jaba.2010.43-553
- Tasky, K. K., Rudrud, E. H., Schulze, K. A., & Rapp, J. T. (2008). Using choice to increase on-task behavior in individuals with traumatic brain injury. *Journal of Applied Behavior Analysis*, *41*, 261–265. doi: 10.1901/jaba.2008.41-261
- 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. doi: 10.1016/S0891-4222(97)00050-4
- Tiger, J. H., Hanley, G. P., & Hernandez, E. (2006). An evaluation of the value of choice with preschool children. *Journal of Applied Behavior Analysis*, *39*, 1–16. doi: 10.1901/jaba.2006.158-04
- Tiger, J. H., Toussaint, K. A., & Roath, C. T. (2010). An evaluation of the value of choice-making opportunities in single-operant arrangements: Simple fixed- and progressive-ratio schedules. *Journal of Applied Behavior Analysis*, *43*, 519–524. doi: 10.1901/jaba.2010.43-519
- 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. doi: 10.1901/jaba.1997.30-299
- Vollmer, T. R., & Iwata, B. A. (1991). Establishing operations and reinforcement effects. *Journal of Applied Behavior Analysis*, *24*, 279–291. doi: 10.1901/jaba.1991.24-279
- Voss, S. C., & Homzie, M. J. (1970). Choice as a value. *Psychological Reports*, *26*, 912–914. doi: 10.2466/pr0.1970.26.3.912

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