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ASSESSING THE VALUE OF CHOICE IN A TOKEN SYSTEM

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Responding of 4 children was assessed under conditions in which (a) no programmed contingencies were arranged for target behavior, (b) responding produced tokens that could be exchanged for a single highly preferred edible item, and (c) responding produced a token that could be exchanged for a variety of preferred edible items. After assessing the effects of these contingencies, the preferences of 3 participants were assessed using a concurrent-chains schedule. Preference for the opportunity to choose from the same or qualitatively different edible items varied across participants, and findings were generally consistent with those of Tiger, Hanley, and Hernandez (2006).

Key words: choice, concurrent chains, preference, token reinforcement

In a series of studies, Tiger, Hanley, and Hernandez (2006) assessed children's academic performance during conditions in which they could obtain one highly preferred edible item contingent on task completion (no choice) or select one identical edible item from an array of five identical edible items (choice). These conditions were then compared to a condition in which no edible items were arranged to control for the simple presentation of edible items. Tiger et al. evaluated the opportunity to choose using a concurrent-chains evaluation (e.g., Luczynski & Hanley, 2009), and results showed that some children preferred the opportunity to choose and others did not. However, in the evaluations described by Tiger et al., experimenters presented children with descriptive rules associated with the various options (e.g., "If you pick this option you can pick one of five identical edible items; if you pick that option, you receive this edible item"). Although practical for academic settings and very young children, the incorporation of rules makes it more difficult to distinguish control by experimentally programmed contingencies from control by rules (Skinner, 1953). Further, completion of the response requirement in Tiger et al.'s study resulted in immediate access to the item. In application, this may not be the most practical arrangement. An alternative strategy might involve the presentation of tokens, which have been shown to bridge delays between completion of the response requirement and receipt of primary or backup reinforcers.

The purpose of the current study was to conduct a systematic replication of the procedures described by Tiger et al. (2006) in the context of a token system. The study was designed to determine if the opportunity to choose backup reinforcers in a token system would influence response rates associated with academic tasks and children's preferences for arrangements in which the opportunity to

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choose was or was not presented. Participants were not given any verbal instructions about the different conditions. Rather, nonverbal schedule-correlated stimuli were associated with the various operating contingencies. In this way, performance was based on contact with the arranged contingencies.

METHOD

Participants, Setting, and Materials

Four typically developing children (all 4 years old) enrolled in preschool participated in this study. Dylan, Mira, Milo, and Luke participated in the preference (Fisher et al., 1992) and reinforcer assessments; however, Dylan did not participate in the concurrent-chains evaluation. Experimental sessions were conducted at each participant's preschool in an available space in the classroom.

Session materials included academic worksheets (letters and numbers that could be traced), colored pencils, poker chips, and a smock worn by the experimenter. Each of the items was one of four different colors (see below). The colors were included to enhance discrimination. Trained undergraduate or graduate students acted as the experimenter for all the sessions.

All sessions lasted 3 min, and data were collected on the target response, delivery of tokens, and condition selection (when participants had the opportunity to choose). Approximately three sessions were conducted per day, and data were collected manually or with handheld computers.

Response Measurement and Interobserver Agreement

Interobserver agreement was obtained for at least 25% of sessions across all conditions. The partial agreement within intervals method was used to determine interobserver agreement, which was calculated by dividing the smaller response frequency by the larger response frequency per 10-s interval, and converting the ratio to a percentage. These percentages were averaged to generate session agreement. Interobserver agreement was assessed for at least 32% of sessions across all conditions and exceeded 80% for all participants.

Procedure

During all sessions, the target response consisted of tracing numbers and uppercase and lowercase letters with a pencil. Prior to each session, the experimenter gave participants the following instruction: ''Here are some letters and numbers to trace. You can do as many as you want, as few as you want, or none at all.'' In addition, during the first exposure to each condition, the experimenter implemented a three-prompt instructional sequence when a participant did not emit a response in the first 10 s of the first session. At the end of the 3-min session, the experimenter removed the worksheet and said, ''Okay, you're finished.''

The reinforcer assessment was conducted using a combined reversal and multielement design. The baseline condition (A) was introduced in the first phase. The second phase consisted of a multielement arrangement of the no-choice condition (B), the single-choice condition (C), and the varied-choice condition (D). During baseline, participants worked with a green worksheet. Participants received no tokens during these sessions. Instructions were provided to participants at the beginning and end of the session, as described previously.

Prior to the introduction of the token conditions, the experimenter gave the participant two to four tokens noncontingently and asked him or her to hand the experimenter one token at a time. Each token exchange resulted in one bite of the food. When all tokens were exchanged, the session commenced. During sessions, the experimenter placed tokens in a small receptacle positioned next to the worksheets.

For the no-choice condition, participants worked with a red worksheet and received a token according to a fixed-ratio (FR) 5 schedule

(i.e., the token-production schedule). After completion of each 3-min session, the participant exchanged his or her tokens for only one type of reinforcer identified as the most preferred item via a prior preference assessment. The item was put on one plate, and each time one token was exchanged for a reinforcer, the plate was replenished with the same item until the participant had exchanged all of the tokens. In the single-choice condition, the participant worked with a yellow worksheet, and the token-production and token-exchange schedules were the same as those described in the no-choice condition. During token exchange, the experimenter arranged five identical edible items on a plate (e.g., fruit snacks). The same highly preferred item chosen for the no-choice condition was used. The experimenter gave the participant the opportunity to choose one item. Although we attempted to ensure that all stimuli were identical in the single-choice condition, it is possible that slight differences in size, color, or shape may have influenced responding. After the participant chose an item, the experimenter replenished the plate such that the same five items remained on the plate at all times.

In the *varied-choice condition*, the participant worked with a blue worksheet, and the token-production and token-exchange schedules were the same as those described in the single-choice condition. During token exchange, the participant could exchange each token for one item from the five most highly preferred items (e.g., one fruit snack, one piece of candy, one cookie, one piece of chocolate, one marshmallow). The experimenter placed each item on a plate and replenished the item if the participant chose it during the token exchange. These three conditions were presented once each day in a random order. After the multielement B-C-D condition, a reversal to baseline (A) was introduced.

During the concurrent-chains evaluation, each participant was permitted to select a condition as described by Tiger et al. (2006). Each pile of like-colored worksheets consisted of schedule-correlated stimuli in the initial link of the chains and was arranged in a row, with each worksheet equidistant from the other. The colors corresponded to the same conditions to which participants had been exposed during the reinforcer assessment. The experimenter instructed the participant to choose the worksheet by saying, ''Go to the table and pick one color you would like to work with.'' The experimenter changed the placement of the colored items on the table before the start of the next session and gave the participant the opportunity to make another initial-link response.

After a participant chose the worksheet color, the experimenter put on a colored smock that matched the selected worksheet, and a 3-min session commenced. During the token-exchange period, programmed consequences for the terminal link were available (i.e., no choice, single choice, varied choice). The experimenter presented three opportunities to make initial-link color selections each day, except for Luke, who received only one or two opportunities to make a selection (due to unavailability).

RESULTS AND DISCUSSION

Figure 1 depicts response rates during the reinforcer assessment for all participants. These data represent response rates for situations in which the experimenter selected particular conditions (e.g., no choice, varied choice). When reinforcers were arranged for target behavior in the no-choice, single-choice, and varied-choice conditions, responding increased relative to rates obtained in the prior baseline condition. Dylan's performance in the no-choice condition was the exception. When compared to the no-reinforcement baseline condition ($M = 0.44$ responses per minute), no change in mean level of responding was observed in the last three sessions of the no-choice condition ($M = 0.44$); this suggested that there was no reinforcement effect when edible items were available but he could not

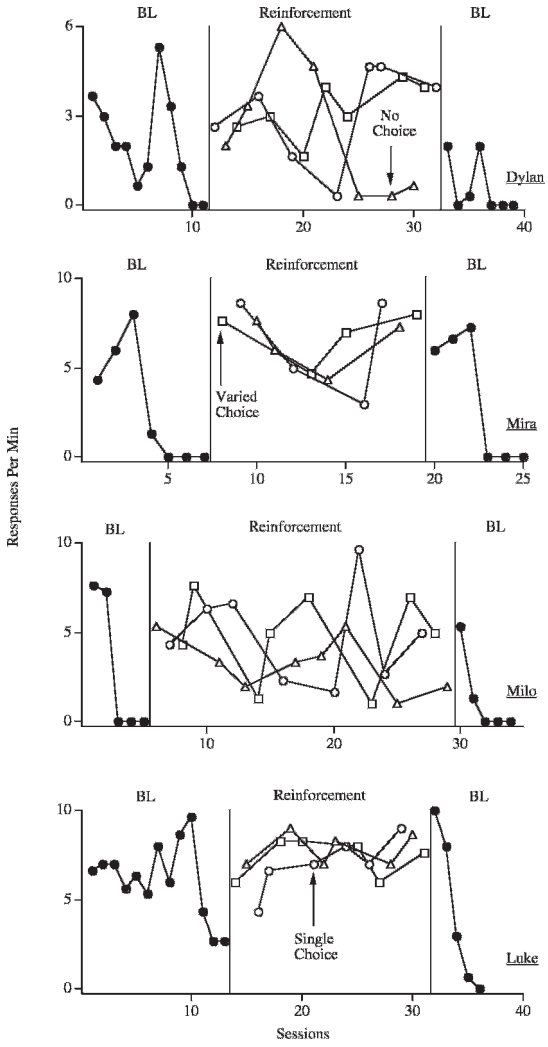

Figure 1. Results of the reinforcer assessment for all participants. Response rates are depicted by the open triangles for the no-choice condition, open circles for the single-choice condition, and open squares for the varied-choice condition.

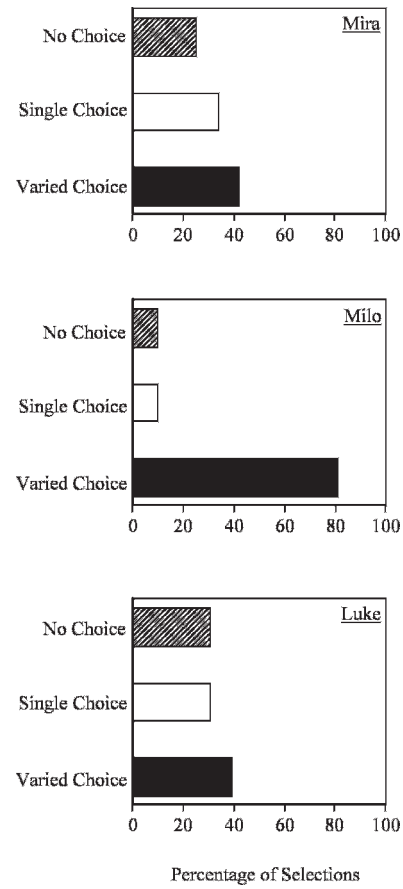

Figure 2. Mean percentage of selections for Mira, Milo, and Luke during the concurrent-chains evaluation. Although not depicted in the figure, participants were also given the opportunity to select the baseline condition (this never occurred).

choose the item. Following the reinforcement condition, baseline was reintroduced, and response rates for all participants decreased to low levels, particularly during the last three sessions of the condition.

Figure 2 depicts the percentage of selections for each of the conditions available, for all participants who completed the concurrent-chains evaluation. Mira, Milo, and Luke were given 24, 21, and 24 choice opportunities, respectively. Results indicated preference for the varied-choice condition (42% of selections) for Mira, a strong preference for the varied-choice condition (81% of selections) for Milo, and a modest preference for the varied-choice condition (39% of selections) for Luke.

Results of the present study replicate those reported by Tiger et al. (2006), in that preference for the opportunity to choose varied across participants. The findings of Tiger et al. appear to be sufficiently robust to the extent that findings of the current study were similar and were obtained using token reinforcers in the absence of rules. In addition, Tiger et al.

focused exclusively on participant selections for various initial- and terminal-link options. This is useful information as it relates to preference. However, of similar importance is a sense of the amount of work (e.g., response rate) that is completed under the various conditions.

One limitation of the present study is apparent in the number of opportunities to choose. Preference for one condition may have been more discernible given more than three opportunities to select a condition. Another limitation involves the absence of a clear evaluation of the role of the tokens. In the present study, tokens were never removed; thus, definitive conclusions regarding the role of tokens cannot be reached (Foster & Hackenberg, 2004). Future research may involve procedures similar to those described in the present study, but should include token-withdrawal conditions.

A third limitation of the current study may be found in the reinforcement schedule. An FR 5 schedule was in place that necessarily decreased reinforcement rate compared to the common FR 1 schedule implemented in preference and reinforcer assessment research. It is possible that an FR 1 schedule would have established higher rates of responding in one condition than another, thereby exaggerating preference. However, an FR 5 schedule was used to reduce the possibility of satiation. Future research may involve decreasing session duration to control reinforcement rate or titrating the response requirement (either up, down, or both) to assess how reinforcer rate might affect preference.

Choice could be a simple classroom alteration designed to improve the performance of some students (Romaniuk et al., 2002). Future studies could assess the practical implications of choice by investigating the effects of parametric increases in work requirements on preference for a variety of choice (or no-choice) conditions.

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