THE EFFECTS OF VARIED VERSUS CONSTANT HIGH-, MEDIUM-, AND LOW-PREFERENCE STIMULI ON PERFORMANCE

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The purpose of the current study was to compare the delivery of varied versus constant high-, medium-, and low-preference stimuli on performance of 2 adults on a computer-based task in an analogue employment setting. For both participants, constant delivery of the high-preference stimulus produced the greatest increases in performance over baseline; the varied presentation produced performance comparable to constant delivery of medium-preference stimuli. Results are discussed in terms of their implications for the selection and delivery of stimuli as part of employee performance-improvement programs in the field of organizational behavior management.

DESCRIPTORS: organizational behavior management, reinforcer assessment, stimulus variation

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The selection and delivery of effective reinforcers are important topics for the field of applied behavior analysis in general and organizational behavior management (OBM) in particular. One method of enhancing the effects of reinforcers on employee performance might be to vary the stimuli delivered during performance-improvement programs. Although no research on varied versus constant reinforcer presentation exists in the OBM literature, previous research on this topic has been conducted with children in educational and clinical settings.

Egel (1980) demonstrated that varied, as opposed to constant, presentation of stimuli produced more and faster bar pressing by children with autism. This finding was replicated by Egel (1981) with 3 children with autism using curriculum-based responses in a naturalistic context. Similarly, Bowman, Piazza, Fisher, Hagopian, and Kogan (1997) examined preference for lower quality varied stimuli versus higher quality constant stimuli among 7 children with developmental disabilities. Results indicated that 5 participants preferred varied presentation, and 2 participants preferred constant presentation.

Research on the effects of stimulus variation on performance by employees in organizational settings is needed. If varied presentation does enhance employee performance, its use may lead to the development of more cost-effective and efficient performance-improvement programs in organizations. The purpose of this study was to compare the delivery of varied versus constant high-, medium-, and low-preference stimuli on the performance of 2 adults on a computer-based task in an analogue employment setting.

METHOD

Participants and Setting

Participants were recruited via informational flyers distributed on a university campus and were told that the purpose of the research was to evaluate a computer software program that may assist with the completion of paperwork. Two individuals participated. Sara was a 22-year-old female undergraduate student at the university. Jane was a 34-year-old woman who was employed as an instructor at the same univer-

sity. Sessions took place in a laboratory room designed to look like an office (i.e., a desk, office chair, computer, and office supplies were present).

Data Collection

Each participant performed a task using a check-writing software program run on a laptop computer. Specifically, experimenters instructed participants to type in the correct monetary amount indicated by the program on computer-generated blank checks. The dependent variable was number of checks completed per session.

Procedure

Stimulus preference assessment. Experimenters used a reinforcer survey (Wilder, Therrien, & Wine, 2005) to determine participants' preferences for six stimuli. All six stimuli had about the same monetary value (i.e., $5). The stimuli evaluated were a $5 gift certificate (GC) to a movie theater, $5 GC to a general store, $5 GC to a health food shop, a pack of specialty pencils, a box of randomly selected specialty candy, and some stationery. Participants rated each stimulus on a 4-point Likert scale (1 = *low preference*, 2 and 3 = *medium preference*, and 4 = *high preference*).

Both participants rated the movie theater GC as high preference. Sara rated three items (general store GC, health food shop GC, and stationery) as medium preference and two items (pencils and candy) as low preference. Jane rated three items (general store GC, candy, and stationery) as medium preference and two items (pencils and health food shop GC) as low preference. Medium- and low-preference stimuli used in the comparison of varied versus constant stimuli were chosen randomly from the items each participant rated as medium and low preference during the preference assessment. In this phase, Sara's high-preference item was the movie theater GC, her medium-preference item was the health food shop GC, and her low-preference item was the pencil

pack. Jane's high-preference item was the movie theater GC, her medium-preference item was the candy, and her low-preference item was the pencil pack.

Comparison of varied versus constant presentation. A combination reversal (ABA, where A is baseline and B is comparison) and multielement design was used to evaluate the effects of varied versus constant stimuli on performance. Each participant was first exposed to a baseline condition during which no programmed consequences for completing checks were provided. Participants were told, "You can do as many as you want, as few as you want, or none at all. When you are finished, please tell me." No time limit was placed on sessions. After delivering the instructions, the experimenter left the room and waited in an adjoining room. Baseline continued until the participant declined the opportunity to complete checks for three consecutive sessions. Each participant's mean number of checks completed during baseline sessions, excluding the last three sessions, was then calculated, multiplied by two, and set as the response requirement to earn one stimulus in the comparison phase.

Following baseline, each participant was exposed to one of five conditions (high preference, medium preference, low preference, varied, and control) on a quasirandom basis. The specified stimulus (high, medium, or low preference) was delivered in its analogous condition (high preference, medium preference, or low preference) on the fixed-ratio (FR) schedule determined following baseline. Each participant received access to a randomly determined stimulus (either high, medium, or low preference) on their individually determined FR schedule during the varied condition. Each type of stimulus had an equal likelihood of being selected, and each participant was unaware of which item she would receive. For the varied preference condition, Sara received access to her high-preference, low-preference, and medium-preference items in Sessions 19,

21, and 24, respectively. Jane received access to her high-preference, medium-preference, and low-preference items in Sessions 10, 18, and 20, respectively. Participants received access to one white card (8 cm by 14 cm) on their individual FR schedules during the control condition.

Each of the conditions was presented three times, for a total of 15 sessions. Experimenters gave participants the same instructions as in baseline and to stop and say ''I'm done'' when they finished. No time limit was placed on sessions, although all sessions were less than 20 min in duration, and no limits were placed on the number of stimuli earned per session. For the varied condition, the earned stimulus was held constant during a specific session (i.e., if the stimulus earned was the low-preference stimulus, only the low-preference stimulus was earned each time the criterion was met during that session). At the beginning of each session, the experimenter told and showed the participant which item she would receive (except in the varied condition, during which the experimenter told the participant that she would get either her high-, medium-, or low-preference item) and the number of checks needed to receive one item. Participants received no formal feedback on the number of checks completed until after they finished a session. However, they were free to monitor their own performance. Once finished with a session, they received a 2-min break. After the break, the experimenter randomly selected another one of the five conditions, and the procedures were repeated. No more than two consecutive presentations of the same condition were permitted. Participants completed two to five sessions per visit. The experimenter continued to conduct one of the five conditions randomly until each condition had been conducted three times. At the end of each block of sessions, the experimenter wrote the names and quantity of the items earned on a sheet of paper for the participant to take with her. The items earned were delivered at the beginning of the next scheduled block of sessions, which was within 3 days.

Interobserver agreement and integrity of the independent variable. Interobserver agreement data on the number of checks completed were collected on at least 50% of sessions for each participant. An agreement was defined as both observers scoring the same number of checks completed; a disagreement occurred when observers scored a different numbers of checks completed. Interobserver agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and converting this ratio to a percentage. For both participants, mean agreement was 100%. Integrity of the independent variable was assessed by having a second observer verify that the items participants earned during sessions were subsequently delivered. Mean integrity, which was conducted on at least 50% of sessions for both participants, was 100%.

RESULTS AND DISCUSSION

Figure 1 displays Sara's and Jane's results. Sara completed a mean of 16 checks (range, 1 to 26) during the first eight sessions of baseline (no responding in the final three sessions). Therefore, her response requirement was set at 32 checks for the comparison phase. Sara completed no checks during the low-preference and the control conditions. She completed a mean of 82 checks (range, 68 to 95) during the medium-preference condition, a mean of 143 checks (range, 77 to 198) during the high-preference condition, and a mean of 70 checks (range, 58 to 89) during the varied condition. She did not complete any checks during the return to baseline.

Jane completed a mean of 61 checks (range, 35 to 77) during the first three sessions of baseline (no responding in the final three sessions). Therefore, her response requirement was set at 122 checks for the comparison phase. She completed no checks during the control
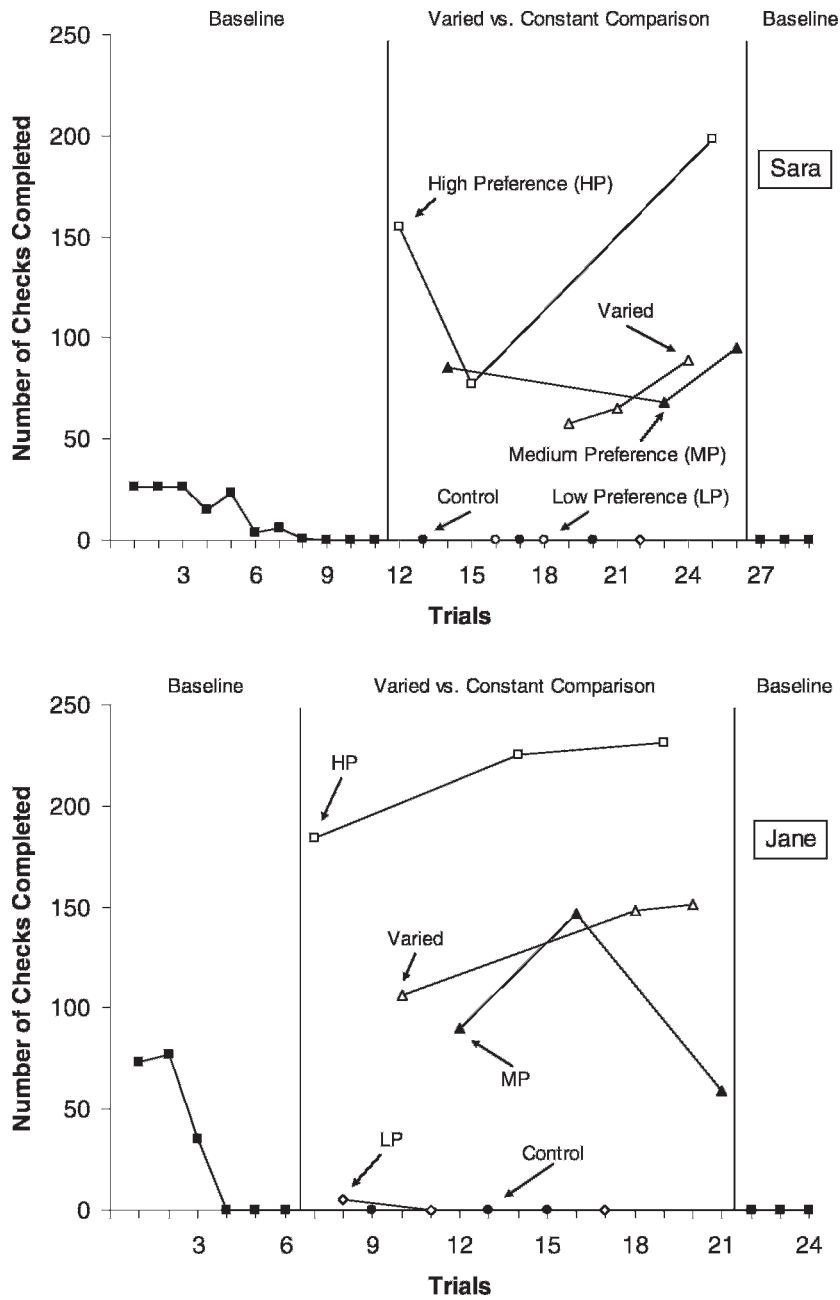
Figure 1. Number of checks completed across baseline, constant high-preference (HP), constant medium-preference (MP), constant low-preference (LP), varied preference, and control conditions for Sara (top) and Jane (bottom). For the varied preference condition, Sara received access to her high-, low-, and medium-preference items in Sessions 19, 21, and 24, respectively. Jane received access to her high-, medium-, and low-preference items in Sessions 10, 18, and 20, respectively.

condition and five checks during the initial low-preference condition. No subsequent responding was observed during the low-preference condition. She completed a mean of 99 checks (range, 59 to 147) during the medium-preference condition. During the high-preference condition, she completed a mean of 213 checks (range, 184 to 231), and she completed a mean of 135 checks (range, 106 to 151) during the varied condition. She did not complete any checks during the return to baseline.

It is interesting to note that on a few occasions, responding was just short of a criterion (e.g., during Session 19, Sara completed 58 checks, 8 shy of criterion). Such findings were likely due to a miscalculation on the part of the participant, because both participants reported that they attempted to tally their own responses.

Unlike previous research that has compared varied and constant reinforcer presentation (e.g., Egel, 1980, 1981), the results of the current study suggest that varied presentation of items produced performance above baseline levels but lower than conditions in which constant access to a high-preference item was provided contingent on performance. However, in the two studies by Egel, it is not known if the item delivered in the constant condition was highly preferred; a stimulus preference assessment was not conducted. Other differences between the current study and the Egel studies that could account for the discrepant findings were the items delivered and timing of delivery. Egel used edible items delivered immediately after responding. In the current study, some of the items were secondary reinforcers delivered after the performance.

The current study adds to the literature by demonstrating that the effects of stimulus variation relative to constant presentation may depend on preference for the items being delivered. Bowman et al. (1997) demonstrated that some individuals preferred lower quality varied stimuli over higher quality constant stimuli. Similarly, more recent research (Francisco, Borrero, & Sy, 2008) has suggested that lower preference stimuli can function as reinforcers. The results of the current study add to those of Bowman et al. by suggesting that the delivery of varied stimuli produces improvements in performance comparable to those produced by constant delivery of medium-preference stimuli.

These results have implications for the selection and delivery of items as part of employee performance-improvement programs in the field of OBM. Specifically, this study suggests that the delivery of varied, randomly selected stimuli as part of performance-improvement programs may result in improved performance. In addition, this practice might be advantageous for other reasons. For example, if a number of employees in an organization are on performance-improvement programs, the delivery of each individual's most preferred item contingent on improved performance might be difficult to arrange on a consistent basis. On the other hand, delivery of stimuli selected at random from among a small number of items most preferred by some, but not all, employees would likely be easier to coordinate.

The results of this study suggest a number of topics for future research. First, price arrangement of the various items could be examined by increasing or decreasing the price (i.e., criteria for check completion) of items. Second, future research could examine the effects of receipt of a high- or low-preference item immediately before receipt of an item of a different value. Participants may respond less for medium- or low-preference items after they have just earned access to a high-preference item.

Because the dependent variable in the current study was number of checks completed as opposed to rate of check completion, these results should be viewed as preliminary. A measure of response rate would provide information about response efficiency, which might be particularly important in organizations. A

second limitation is the restricted set of stimuli used in the study. Future research on this topic should employ a wider variety of stimuli, and perhaps some stimuli that are exchangeable for goods and services at multiple sites (e.g., a VISA check card). Finally, the accuracy of check completion was not examined. Future research using a task such as the one employed in this study should examine the integrity of task completion.

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