JOURNAL OF APPLIED BEHAVIOR ANALYSIS 2011, **44,** 847–858 NUMBER 4 (WINTER 2011)

PREFERENCE FOR FLUENT VERSUS DISFLUENT WORK SCHEDULES

DANIEL M. FIENUP

THE MAY INSTITUTE AND QUEENS COLLEGE AND THE
GRADUATE CENTER OF THE CITY UNIVERSITY OF NEW YORK

AND

ASHLEY A. AHLERS AND GARY PACE

THE MAY INSTITUTE AND NORTHEASTERN UNIVERSITY

Two studies were conducted that examined the preference of a student diagnosed with a brain injury. In Study 1, a preference assessment was followed by a three-choice concurrent-operants reinforcer assessment. Two choices resulted in access to preferred activities for completing work, and a third choice resulted in access to nothing (i.e., no activity). Unpredictably, the participant consistently chose the no-activity option. Study 2 examined why this student preferred work associated with no activity over preferred activities. Through a variety of concurrent-operants procedures, it was determined that she preferred fluent work followed by reinforcers rather than work that was broken up by access to preferred activities. Implications for research on preference are discussed.

Key words: brain injury, fluency, preference, reinforcer assessment

---

One possible outcome of research is that the independent variable fails to exert control over behavior in the way it was intended. When this outcome occurs, an experimenter has to make a decision regarding how to continue. At least two options exist. The experimenter can (a) claim that the independent variable was not potent enough or that some extraneous variable was controlling behavior or (b) further evaluate the "failure" to determine why unexpected results occurred. The latter avenue is the type of process described by Roane, Fisher, and McDonough (2003), who sought to research the overjustification effect but ended up conducting detailed follow-up analyses when they obtained unexpected results. The current evaluation describes this type of research. Initially, we sought to examine the effects of various schedules of reinforcement on the behavior of students with brain injury. For two of these students, the results were consistent with published and expected outcomes. However, one student's behavior was unexpected and prompted follow-up analyses. The following introduction provides the background for the study that produced the unexpected findings (Study 1). Study 2 describes the follow-up analyses that are the primary focus of this investigation.

Measuring response allocation within a concurrent-operants arrangement is a popular method for assessing the efficacy of reinforcers (e.g., DeLeon, Iwata, Goh, & Worsdell, 1997). Results of research utilizing this approach have identified a variety of factors that influence preference for reinforcers, including response effort (DeLeon et al., 1997; Tustin, 1994), reinforcer choice (Tiger, Hanley, & Hernandez, 2006), and rate and quality of reinforcers (Mace, Neef, Shade, & Mauro, 1996). For instance, Tiger et al. (2006) conducted an analysis of the value of choice using a concurrent-operants procedure. Participants were given three work options that differed only in the programmed consequences: single edible item, multiple identical edible items, and choice of a specific edible item or no edible item. Results indicated that participants were more likely to allocate responding to the operant that allowed choice of the edible reinforcer.

All correspondence should be addressed to Daniel M. Fienup, Department of Psychology, Queens College, 65-30 Kissena Blvd., Flushing, New York 11367 (e-mail: daniel.fienup@qc.cuny.edu).

doi: 10.1901/jaba.2011.44-847

Mace et al. (1996) examined the effects of work difficulty and schedule of reinforcement on choice. Participants chose between two stacks of math cards. In two studies, the groups of cards varied by difficulty and programmed reinforcement. Participants allocated their time to math problems associated with a richer schedule of reinforcement or higher quality of reinforcement, regardless of whether the math problems were the same or different difficulty level.

Response requirement, or response effort, also has been found to differentially affect preference for different reinforcers associated with the same reinforcement schedule (DeLeon et al., 1997; Tustin, 1994). One study compared preference between two reinforcers and manipulated both the reinforcement schedule and similarity of reinforcers. In one manipulation, participants chose between two identical operants (button presses) that led to either a food or toy reinforcer (dissimilar reinforcers). The same procedure was conducted for two food reinforcers (similar reinforcers). In both procedures, the schedule of reinforcement was increased systematically. Participants responded differentially to one of the two reinforcers only under larger schedules (e.g., fixed-ratio [FR] 10) and with similar reinforcers. However, they did not respond differentially to dissimilar reinforcers under all schedules and to similar reinforcers under low schedules (e.g., FR 1).

We sought to conduct research aimed at addressing two limitations found in the reinforcer assessment and concurrent-operants literature on response effort. The first issue was the generality of published results. Previous research used simple responses to evaluate reinforcer effectiveness. Tustin (1994) required participants to push a button on a joystick, and DeLeon et al. (1997) required participants to press a microswitch. Although these behaviors may have been relevant for the participants in those studies, a broader range of behavioral outputs are required in more typical settings, such as in school (e.g., Mace et al., 1996). Student responses of interest typically include labeling stimuli, completing mathematics worksheets, and finding states on a map, to name a few examples. Originally, we sought to examine reinforcer preference using more typical school-related work requirements to examine whether similar results would emerge. Second, we sought to enhance experimental control by adding a control condition (e.g., Tiger et al., 2006) to the typical two-choice arrangement.

These two features guided our design of Study 1. To examine the generality of results obtained by Tustin (1994) and DeLeon et al. (1997), we selected work requirements from students' everyday instruction. A control option was added to the reinforcer assessment to enhance experimental control, in the event that a participant selected equally among stimuli. This option, if chosen, resulted in access to no stimuli. It should be noted that the participant reported in Study 1 was only one of three participants who originally participated. The unexpected results that emerged warranted presenting an analysis of this student alone.

STUDY 1

Method

Participant. Eve was a 16-year-old girl who attended a private day school that specialized in neurorehabilitation. At 9 months of age, Eve had intractable seizures that were treated with a right hemispherectomy. She later received a diagnosis of nonverbal learning disorder. At school, Eve worked on a variety of academic programs such as math (e.g., greater than/less than problems) and reading (fourth-grade level chapter books). She sat at her desk and worked independently on worksheets and, after completion, turned them in for feedback from her teachers. Eve raised her hand and asked her teachers for help when she experienced difficulty with her work and engaged in preferred academic activities (e.g., reading or playing a game) for approximately 20 to 30 min. She worked on less

preferred academic activities (e.g., math problems) for approximately 5 min before requesting a break. Eve's classroom structure included 5- to 10-min breaks with preferred activities contingent on completing work in a given subject. Shorter breaks were provided as needed. Eve participated in this study to examine the impact of various contingent preferred activities on her completion of low, medium, and high work requirements. The high work requirements exceeded what Eve was expected to complete in her classroom.

Setting. All sessions were conducted in the library of Eve's school. The large room was divided into four sections, and sessions were conducted in a quiet corner that was surrounded by bookshelves on three sides. This arrangement limited potential distractions from others in the library. Sessions were conducted at a square table that seated four. The experimenter sat at a right angle to Eve.

Materials. Cards (12.7 cm by 7.6 cm) indicated the available preferred activities during preference and reinforcer assessments. The cards included text and pictorial representations of preferred activities that were identified by Eve's teacher. In the leftmost 5.1 cm of the card, text was displayed in Times New Roman 30 font that represented each choice. In the remaining space on the right was a centered picture of the object. Ten cards were created. The ''draw on whiteboard'' card included a picture of a dry-erase board and signaled access to a dry-erase board (21.6 cm by 27.9 cm) and marker. The ''make copies'' card displayed a picture of a man using a copy machine and signaled access to making copies in a copy room down the hall from the library. The ''movie'' card displayed a picture of a movie camera and signaled access to watching a preferred movie on a television in the library. The ''computer'' card included a picture of a computer and signaled access to a laptop computer on which Internet games could be played. The ''book'' card contained a picture of a book and signaled access to a preferred book to read. The ''Great States with staff'' card contained a picture of the Great States Junior board game and signaled access to playing the game with the experimenter. This game involved rolling dice, moving a game piece around a board, and answering questions about states in America. The ''Great States alone'' card contained a picture of the Great States Junior board game and signaled access to playing the game without the experimenter. The ''go for a walk'' card displayed a picture of a person walking and signaled taking a walk in the hall with the experimenter. The ''handshake and chat'' card included a picture depicting two stick figures talking and signaled access to a handshake with the experimenter and conversation based on Eve's choice of topics. The ''tidy'' card displayed a picture of someone cleaning and signaled access to sorting three colors of poker chips that were spread out on the table.

Eve completed worksheets during the reinforcer assessment phase. The worksheets were pieces of paper (21.6 by 27.9 cm) that contained two to 20 problems, with a maximum of 20 problems in two columns of 10 problems. Each problem contained two one- or two-digit numbers with a space in between for Eve to write in a $>$ or $<$ symbol. These worksheets were identical to work she completed in her classroom.

Procedure. Study 1 involved two phases. The first phase was a preference assessment designed to identify a ranked preference of various activities. The second phase was a reinforcer assessment designed to compare the reinforcing effects of stimuli chosen from the preference assessment when a work requirement was present.

Preference assessment. A multiple-stimulus without replacement (MSWO, DeLeon & Iwata, 1996) preference assessment was conducted with 10 stimuli. Five sessions were conducted, each consisting of 10 choices. To begin a session, the experimenter arranged the 10 choice cards 2.5 cm apart in a semicircle array. Prior to any choices, the experimenter stated, ''I am going to review your choices. You

can do each activity for 3 min. Follow along with your finger.'' The experimenter then pointed to each card and read the verbal description. After all 10 choice cards were identified, the experimenter said, ''Which activity would you like to do first? Point to the card with the activity you would like to do.'' When Eve pointed to a card, the experimenter said, ''You have 3 minutes for —. Once I start the timer you can begin.'' The timer was started, and Eve was allowed 3 min of free access to the activity she chose. When the timer went off, the experimenter removed the activity and said, ''Your time is up. Have a seat at the table.'' The experimenter removed the card Eve chose on the previous trial. To vary the order of stimuli, the experimenter then removed the furthest card to the left and placed it farthest to the right on the semicircle. Then the experimenter said, ''What activity would you like to do next? Point to the card with the activity you would like to do.'' These procedures continued until the participant made 10 choices.

After five sessions, the order in which a stimulus was chosen was added across the sessions, resulting in a number that represented relative rank. The stimulus with the lowest number was designated the high-preference (HP) option for the reinforcer assessment. The stimulus with the highest number was designated the low-preference (LP) option for the reinforcer assessment.

Reinforcer assessment. A three-choice concurrent-operants procedure was conducted to evaluate the reinforcing efficacy of the stimuli identified in the preference assessment. Each reinforcer assessment session consisted of six trials in which three identical work requirements were presented to Eve, each resulting in access to different preferred activities. The work requirement was increased whenever responding was stable with a given work requirement. A unit of work was defined as the completion of two more than/less than math problems. The following schedules were evaluated: FR 1, FR 2, FR 5, FR 10, and FR 20. FR 1 involved completing two problems, FR 2 involved completing four problems, and FR 20 involved completing two worksheets (20 problems $\times$ 2 worksheets = 40 problems). Unique worksheets were created for each of the FR requirements that contained the number of problems specified by the schedule. Within an FR requirement, several versions of the worksheet were created that varied by the problems presented and order of problems.

The stimuli used in this phase were the HP and LP activities identified in the preference assessment. During this assessment, three identical worksheets, separated by 15.2 cm, were placed in front of Eve. The HP card and LP card were placed above two of the worksheets, leaving one worksheet without a card above it (referred to as the no-Sr+ option). The placement of cards above worksheets was determined randomly. Prior to making a selection, the experimenter said, ''You can choose whichever worksheet you want to do. Each worksheet is the same. If you chose this worksheet, you can earn —. If you choose this worksheet, you can earn —. If you choose this worksheet, you will not earn an activity.'' Then, the experimenter asked Eve to repeat the contingencies. The experimenter pointed to a worksheet, and Eve named the associated preferred activity. Eve called the no-Sr+ option ''nothing.'' Next, Eve was asked to choose a worksheet. She chose a worksheet by either naming the associate activity (HP, LP, no Sr+) or touching a worksheet. Eve then began the work and was given 3 min of access to the associated preferred activity when she completed the work requirement. However, if she chose the worksheet with the no-Sr+ option, the next trial started immediately. This pattern continued until she completed six worksheets for a session. Once she chose an option, she was not permitted to receive a different consequence, although she never requested to do so. For each session, the number of choices of each worksheet and associated activity were calculated and converted to percentage of trials chosen.

Design. During the reinforcer assessment, experimental control was demonstrated through

Table 1
Preference Assessment Results

Stimuli	Session ranking					
	1	2	3	4	5	Total
draw on whiteboard	8	2	1	1	1	13
make copies	10	4	5	2	2	23
movie	2	5	2	10	6	25
computer	3	1	3	9	10	26
book	4	6	9	5	3	27
Great States with staff	1	9	6	4	7	27
go for a walk	9	3	4	6	8	30
tidy	5	7	8	3	9	32
handshake and chat	6	8	7	7	5	33
Great States alone	7	10	10	8	4	39

Note. Each column represents Eve's within-session rank of the stimuli. The Total column represents the addition of ranks across all five sessions for a given stimulus. Thus, lower numbers represent more preferred stimuli, and higher numbers represent less preferred stimuli. Data are presented in the order of preference, with the most preferred stimuli at the top of the table and least preferred stimuli at the bottom.

the use of a concurrent-operants procedure. The no-Sr+ option was considered a control choice because it was not expected that Eve would select this option with the availability of HP and LP activities.

Interobserver agreement and treatment integrity. For the purpose of calculating interobserver agreement, an independent second observer collected data during 20% of the preference assessment sessions and 32% of the reinforcer assessment sessions. Agreements and disagreements were assessed on each trial during a session. An agreement entailed both observers recording identical choices (e.g., HP, LP, or no Sr+). Per session, interobserver agreement was calculated by dividing the number of agreements by the total number of observations and multiplying that number by 100%. Agreement for all preference assessment and reinforcer assessment sessions was 100%.

A treatment integrity data sheet was created for both preference and reinforcer assessment sessions. Each data sheet contained all steps of the assessment, including placement of choice cards, delivery of instructions, reviewing contingencies with Eve, and allowing access to chosen stimuli. Treatment integrity data were collected on 20% of the preference assessment sessions and 32% of the reinforcer assessment sessions. For all preference assessments and reinforcer assessments, the procedures were implemented with 100% integrity.

Results and Discussion

Table 1 displays the results of Eve's preference assessment. "draw on whiteboard" had the lowest overall rank and "Great States alone" had the highest overall rank. Thus, for the reinforcer assessment, "draw on whiteboard" served as the HP option and "Great States alone" served as the LP option.

Figure 1 displays the results of the reinforcer assessment. During the first three sessions of the FR 1 phase, Eve chose work associated with each of the available options (HP, LP, and no Sr+). In Sessions 4 and 5, she exhibited preference for work associated with the HP activity, but reverted back to even distribution of choice during Session 6. During Sessions 7, 8, and 9, she demonstrated exclusive preference for the work associated with no Sr+. When the schedule was increased to FR 2 and FR 5, she demonstrated exclusive preference for the no-Sr+ work option. During the first session of FR 10, she chose the HP option on five of six trials and the no-Sr+ work option for the remaining

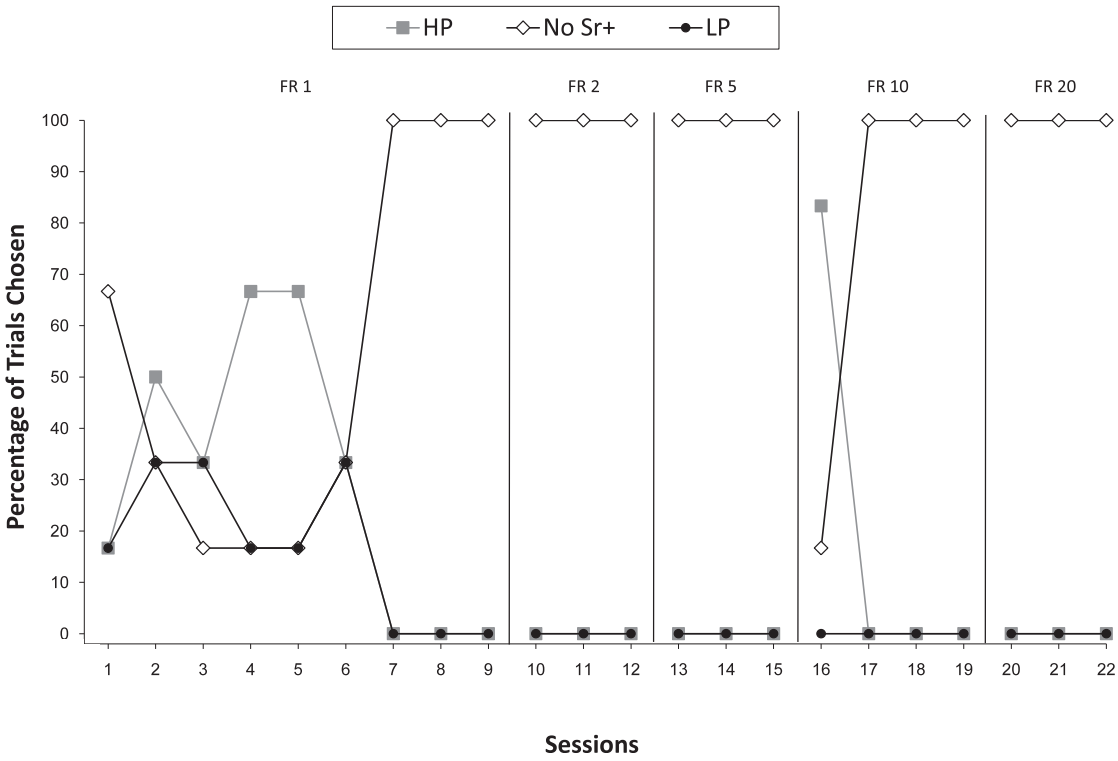

Figure 1. Percentage of trials in which Eve chose work associated with a high-preference (HP) activity, low-preference (LP) activity, and no Sr+ during the reinforcer assessment.

trial. However, in the remaining FR 10 and all FR 20 sessions, Eve demonstrated exclusive preference for the no-Sr+ work option.

Originally, the no-Sr+ option was conceptualized as a control condition. Using a two-choice concurrent-operants procedure, DeLeon et al. (1997) demonstrated that participants allocated responding equally between two choices under low response requirements. The no-Sr+ option was added to enhance experimental control in the current study, because it was expected that the participant would not select this option if her behavior was under control of the various choices. Nonetheless, Eve demonstrated preference for the no-Sr+ work option under all response requirements.

One interpretation is that the preference assessment did not identify a stimulus that was a reinforcer for academic responding. This outcome may not be surprising, given that Eve completed academic work independently in her classroom. However, a number of other variables could have accounted for the obtained results. First, the behavior of choosing the no-Sr+ option and saying ''nothing'' could have been more reinforcing than choosing one of the other options, regardless of the work and presence or absence of preferred activities that followed. Although Eve was not required to state which choice she was making, she tended to vocalize her choice in addition to touching the work sample she chose. To test this, Eve could be presented with the same choices as during the reinforcer assessment, but without the work requirement. Thus, she could be asked to choose among the following choices: ''nothing,'' ''draw on whiteboard,'' and ''Great States alone.'' Under these conditions, choosing ''nothing'' would indicate that this behavior was more automatically reinforcing than choosing the other options.

Eve also could have chosen the no-Sr+ work option because completing worksheets was more reinforcing than engaging in the activities identified from the preference assessment. If this was the case, she chose the no-Sr+ work option to maintain or receive quicker access to another trial with the relatively more preferred activity (i.e., academic work). Thus, choosing the no-Sr+ option minimized the latency to access another worksheet. To test this, Eve could be asked to choose among completion of worksheets, drawing on a dry-erase board (HP), and playing Great States Junior by herself (LP). Under these conditions, choosing worksheets would indicate that completing worksheets was a more reinforcing activity than the activities identified from the preference assessment.

A third reason why Eve chose the no-Sr+ work option could have been due to how the reinforcer assessment procedure allocated work within a session. It is possible that the scheduling of work had an abolishing effect on the reinforcers (e.g., Laraway, Snycerski, Michael, & Poling, 2003). Eve may have chosen the no-Sr+ option because the reinforcing value of the HP and LP activities was diminished by breaking up work into six trials that involved the completion of one worksheet at a time. This would indicate that disfluent work abolished the efficacy of reinforcers. Furthermore, it is possible that Eve learned that the sooner she completed her work, the sooner she escaped the sessions and returned to her classroom. Thus, choosing no Sr+ decreased the session length. To test both hypotheses, Eve could be presented with schedules that vary in the temporal allocation of work (fluent and disfluent) and in the number of activities contained in each schedule.

STUDY 2

In Study 1, Eve unexpectedly chose no-Sr+ work over work choices that were associated with HP and LP activities. Previous work on progressive-ratio reinforcer assessments included choices between various reinforcer options without a no-Sr+ control option (e.g., DeLeon et al., 1997), and thus did not permit this type of finding. It appeared to be worthwhile to conduct follow-up analyses to investigate further the results obtained in Study 1. Study 2 was a three-phase study designed to evaluate potential variables that may have influenced Eve's choice behavior. Phase 1 evaluated the value of choosing no Sr+ relative to other socially mediated stimuli. Phase 2 evaluated the value of work versus activities identified by the preference assessment. Phase 3 evaluated the effect of work schedule and time in session on the efficacy of reinforcers.

Method

Participant and setting. The participant and setting were identical to Study 1.

Materials. Some of the same materials from Study 1 were used in Study 2, including the "draw on whiteboard" (HP) and "Great States alone" (LP) cards. The cards were created using the same specifications as those in Study 1. The no-Sr+ card had "nothing" written on the card and displayed an empty space instead of a picture. The "worksheet" card displayed a picture of a math worksheet (described in Study 1) and signaled access to 20-problem worksheets.

Phase 3 of Study 2 included choices among different schedules of work. Cards associated with each schedule had text in Times New Roman 24 font. At the top center of each card was the word "schedule." Two spaces below began the schedule activities. Each activity was written on a single bulleted line. The disfluent work and HP schedule had the activities in the following order: worksheet, draw on whiteboard, worksheet, draw on whiteboard, worksheet, draw on whiteboard, worksheet, draw on whiteboard, worksheet, draw on whiteboard, worksheet, draw on whiteboard. The fluent work and HP schedule had the activities in the following order: worksheet, worksheet, worksheet, worksheet, worksheet, worksheet, draw on whiteboard, draw on whiteboard, draw on whiteboard, draw on whiteboard, draw on whiteboard, draw on whiteboard. The fluent

work and no-Sr+ schedule had the activities in the following order: worksheet, worksheet, worksheet, worksheet, worksheet, worksheet.

Procedure. A series of concurrent-operants procedures was used. In all cases, Eve was presented with three choices and instructed to select an option.

In Phase 1, Eve was presented with three choices that compared access to preferred activities with a "nothing" option in the absence of a work requirement. Specifically, Eve was presented with cards that represented the following stimuli: access to the HP activity, access to the LP activity, and no Sr+. Selecting the HP card produced 3 min of free access to the dry-erase board and marker. Selecting the LP card produced 3 min of free access to the Great States Junior board game that could be played alone (i.e., not with the experimenter). Selecting the no-Sr+ card terminated the trial. The contingency for the no-Sr+ card was the same as during the Study 1 reinforcer assessment.

Each session was composed of six trials. On each trial, Eve was presented with the three choice cards, horizontally arranged with approximately 2.5 cm between each card. The order of the cards was randomized across trials. For each trial, the experimenter pointed to each card and asked, "What do you get if you choose this card?" Once Eve correctly labeled the stimuli (draw on whiteboard, Great States alone, nothing), the experimenter asked, "Which one do you choose?" Eve selected a card by touching it. Sessions continued until a clear preference was demonstrated across a minimum of three sessions.

In Phase 2, Eve was presented with cards representing the following stimuli: access to the HP activity, access to the LP activity, and access to math worksheets. All other procedures were identical to those in Phase 1.

In Phase 3, Eve was presented with three schedules. All schedules required the completion of six worksheets. Fluent work schedules involved completion of the worksheets consecutively. The disfluent work schedule broke up completion of the work requirements with periods of access to preferred activities. Two of the schedules included access to the HP activity from the preference assessment. One schedule did not include access to a preferred activity. The disfluent work and HP activity schedule began with the completion of a worksheet followed by free access to the HP activity for 3 min. This pattern continued until six worksheets were completed and 18 min of access to the dry-erase board elapsed. The fluent work and HP activity schedule began with the completion of six worksheets followed by free access to the HP activity for 18 continuous minutes. The fluent work and no-Sr+ schedule began and ended with the completion of six worksheets. All schedules had identical total work requirements. Schedules that involved access to the HP activity produced the same total amount of access to the activity. The fluent work and no-Sr+ schedule was associated with the shortest session because it only included work and then the session was terminated.

Each session involved a single choice trial. Only one trial was conducted on a given day because of the amount of work involved. For each session, a single schedule was placed in front of Eve, and she and the experimenter read the list of activities, which involved stating that "draw on whiteboard" was for 3 min. Then, Eve was asked to read the schedule, but she was required to read only the activities (worksheet and draw on whiteboard) without stating time variables. After reviewing all three schedules, the experimenter placed the schedules horizontally in front of Eve in a randomly determined order. The experimenter asked, "Which one do you choose?" Eve selected a schedule by touching that schedule. A session was terminated after completing all activities listed on the schedule.

Design. Similar to Study 1, all phases of Study 2 used a concurrent-operants procedure to demonstrate experimental control.

Interobserver agreement and treatment integrity. As in Study 1, an independent second observer collected data for 40% of the Phase 1 sessions,

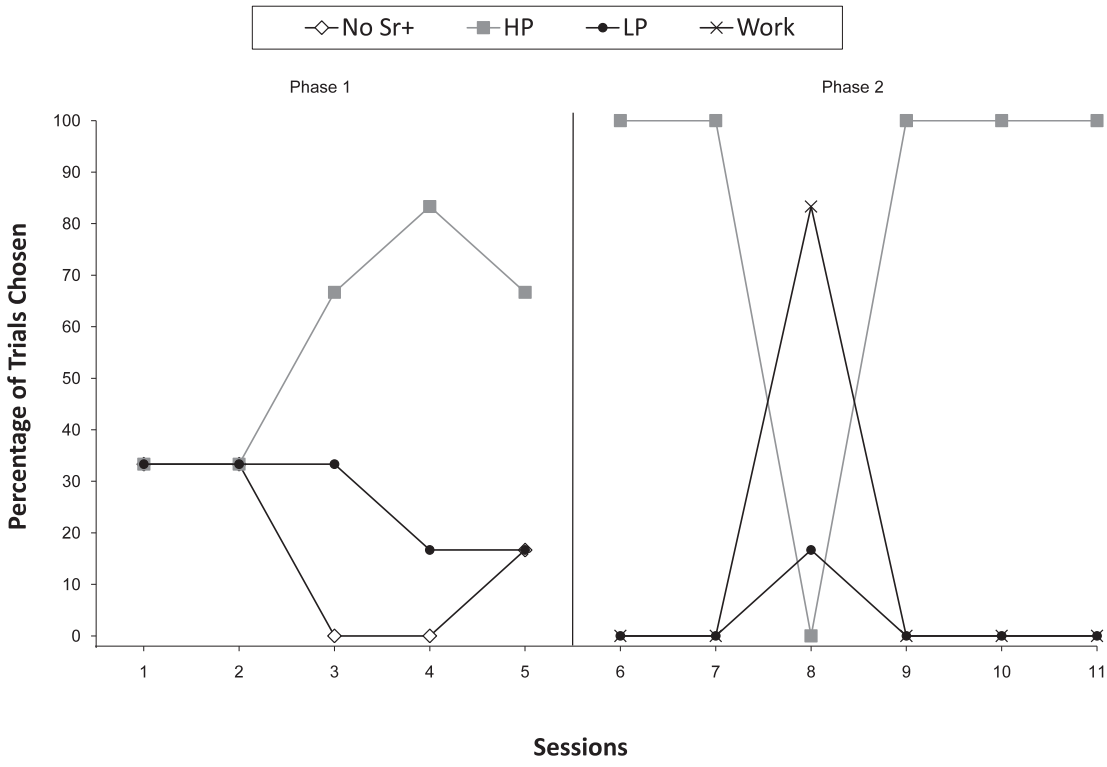

Figure 2. Percentage of trials in which Eve chose no Sr+, a high-preference (HP) activity, a low-preference (LP) activity, and work during concurrent-operants procedures.

33% of the Phase 2 sessions, and 33% of the Phase 3 sessions. Agreements and disagreements were assessed the same way as described in Study 1. Per session, interobserver agreement was calculated by dividing the number of agreements by the total number of observations and multiplying that number by 100%. Agreement for all phases was 100%.

A treatment integrity data sheet was created for the three phases of Study 2. The data sheet included all steps of the assessment, including placement of choice cards, delivery of instructions, reviewing contingencies with Eve, and allowing access to chosen stimuli. Treatment integrity data were collected for 40% of the Phase 1 sessions, 33% of the Phase 2 sessions, and 17% of the Phase 3 sessions. Across all phases, the procedures were implemented with 100% integrity.

RESULTS AND DISCUSSION

Figure 2 displays the results for Phase 1. During the first two sessions, Eve chose each of the three options equally. In the remaining three sessions, she demonstrated a clear preference for the HP option, and she infrequently chose the LP and no-Sr+ options. Overall, these results demonstrated that Eve had a clear preference for the HP option. Figure 2 also displays the results for Phase 2. Overall, Eve demonstrated exclusive preference for the HP option in five of six sessions. Figure 3 displays the cumulative choices in Phase 3. With the exception of the second session, Eve always chose the fluent work HP activity option. She never chose the disfluent work HP activity option.

Taken together, a clear picture of Eve's preferences was determined across the phases of Study 2. Phase 1 ruled out automatic reinforcement as an alternative explanation

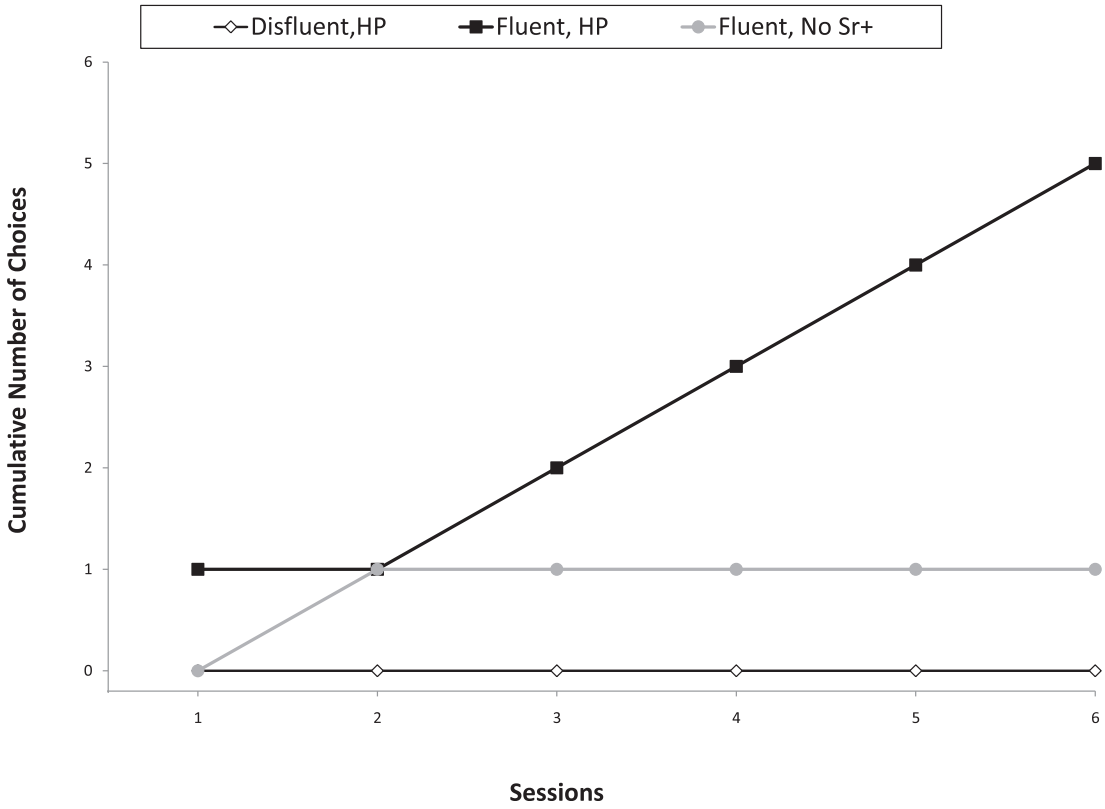

Figure 3. The cumulative frequency of Eve's choices among different schedules during Phase 3.

because Eve consistently chose the HP activity over the LP activity or no-Sr+ choice. Phase 2 ruled out the possibility that Eve preferred to work rather than to engage in the activities, because she chose to engage in the HP activity more than the LP activity or completing worksheets. Phase 3 demonstrated that, when able to choose a work schedule and consequence, Eve chose to complete her work all at once (fluent work) and consume all of her reinforcing activities at once. This choice resulted in a relatively longer time spent in the session. Thus, Eve was not trying to escape sessions, because she selected the fluent work option (no Sr+) only once.

GENERAL DISCUSSION

This set of studies produced unexpected findings that resulted from a well-researched preference assessment procedure that is commonly employed with individuals with intellectual disabilities (Deleon et al., 1997; Tustin, 1994). The original aim of Study 1 was to examine whether students, engaging in more typical school activities, would demonstrate similar patterns of behavior to those in the earlier two studies. Due to Eve's unusual pattern of responding, we conducted follow-up analyses to examine why she chose to work for no reinforcer instead of either the HP or LP activity that had been identified via the preference assessment. A series of concurrent-operants evaluations revealed that Eve chose the no-Sr+ option because she preferred to complete all of her work at once. The HP activity functioned as a reinforcer only when Eve was able to select fluent work schedules.

Given the final outcomes of Study 2, one can reframe the contingencies that governed Eve's

behavior during the original reinforcer assessment. She was presented with three choices, each involving an identical work component. The three choices involved work with access to the HP activity, work plus LP activity, or work and the presentation of the next trial. Work plus access to a preferred activity was functionally a disfluent work schedule, because each work requirement was broken up by access to a preferred stimulus. Even though it was not our intention, the work plus no-Sr+ schedule functioned similarly to a fluent work schedule. Thus, the three choices in Study 1 were disfluent work with HP activity, disfluent work with LP activity, and fluent work with no Sr+. Eve demonstrated preference for fluent work with no Sr+. In Study 2 (Phase 3), we compared disfluent work with HP activity to fluent work with HP activity or no Sr+. In this case, Eve chose fluent work with HP activity. Only under conditions of fluent work did Eve demonstrate a preference for programmed reinforcement.

The fact that access to fluent work was a prerequisite for choosing preferred activities suggests that fluent work schedules functioned as an establishing operation (Laraway et al., 2003). Fluent work altered the reinforcing value of the HP activity. When work was disfluent, Eve chose work not associated with preferred activities. This finding suggested that disfluent work functioned as an abolishing operation. Together, the temporal distribution of work appeared to be a motivating operation and, depending on how work was distributed temporally, could have an establishing or abolishing effect on reinforcers.

These results add to previous research on reinforcer assessments by showing that another variable, fluency of work schedule, can affect preference for reinforcers. The findings have both clinical and methodological implications. Clinically, it is important to consider the potential impact of contextual factors when selecting reinforcers. In this study, the task influenced the effectiveness of reinforcers. Preference for fluency of scheduled work could be assessed as part of an overall assessment of reinforcer efficacy. It appears that reinforcer assessments have become part of standard practice. Clinicians could add schedule preferences to this assessment to determine the most effective reinforcers for a learner. Methodologically, these findings highlight the need to allow participants to opt out of programmed contingencies. Going into Study 1, the no-Sr+ option was considered to be an experimental control. After the fact, the no-Sr+ option can be viewed as opting out of the programmed contingencies. If Study 1 had involved only two choices (HP and LP activities), it seems likely that HP activities would have been preferred, especially as response effort was increased (similar to DeLeon et al., 1997). Inclusion of the no-Sr+ option allowed Eve to opt out of our planned contingencies and prompted follow-up analyses that uncovered a meaningful controlling variable (i.e., temporal allocation of work).

Responses can vary along many dimensions, such as quantity, temporal distribution, difficulty (qualitative), and duration. These dimensions can influence preference for reinforcers (DeLeon et al., 1997; Mace et al., 1996; Tustin, 1994), and research is needed to determine when and how dimensions of responses influence the effectiveness of reinforcers. In addition, interactions among these variables should be examined. For instance, preference for fluent or disfluent work could depend on the quantity of work required. Large quantities of work could be associated with preference for disfluent schedules, whereas small quantities of work could be associated with preference for fluent schedules. Future research should address individual and combinations of factors that influence reinforcer effectiveness.

REFERENCES

DeLeon, I. G., & Iwata, B. A. (1996). Evaluation of a multiple-stimulus presentation format for assessing reinforcer preferences. *Journal of Applied Behavior Analysis*, *29*, 519–533.

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.

Laraway, S., Snycerski, S., Michael, J., & Poling, A. (2003). Motivating operations and terms to describe them: Some further refinements. *Journal of Applied Behavior Analysis*, *36*, 407–414.

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.

Roane, H. S., Fisher, W. W., & McDonough, E. M. (2003). Progressing from programmatic to discovery research: A case example with the overjustification effect. *Journal of Applied Behavior Analysis*, *36*, 35–46.

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.

Tustin, R. D. (1994). Preference for reinforcers under varying schedule arrangements: A behavioral economic analysis. *Journal of Applied Behavior Analysis*, *27*, 597–606.

Received January 19, 2010
Final acceptance January 23, 2011
Action Editor, Joel Ringdahl