JOURNAL OF APPLIED BEHAVIOR ANALYSIS 2009, **42,** 833–837 NUMBER 4 (WINTER 2009)

PARAMETRIC ANALYSIS OF PRESESSION EXPOSURE TO EDIBLE AND NONEDIBLE STIMULI

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We assessed the effects of individually defined small, medium, and large periods of presession access to edible and nonedible reinforcers on response rates during sessions in which responding produced access to identical reinforcers. Any presession access to an edible reinforcer decreased response rates for 1 participant, and small and medium periods of presession access to nonedible reinforcers resulted in similar or increased response rates for 2 participants.

DESCRIPTORS: establishing operations, parametric evaluation, presession access, reinforcer efficacy

The reinforcing efficacy of various stimuli may be malleable, particularly across states of deprivation or satiation (Meehl, 1950). This phenomenon is frequently described in terms of establishing operations (EO), or operations that alter the reinforcing or punishing efficacy of a stimulus and increase or decrease responding that has produced that stimulus (Michael, 1982). The reinforcing efficacy of a stimulus is conceivably stronger given deprivation from that stimulus and conceivably weaker given continued exposure to that stimulus (or satiation). Several studies (e.g., North & Iwata, 2005; Vollmer & Iwata, 1991) have found that increased access to edible items decreased responding for those stimuli and that those effects can be idiosyncratic across individuals (Roscoe, Iwata, & Rand, 2003). Finally, parametric analyses have demonstrated that different magnitudes of reinforcers have differential effects on within-session response rates. Thus, the purpose of the current study was to conduct a parametric analysis of three different durations of presession access to edible and nonedible reinforcers to describe the effects of reinforcer availability on within-session response rates.

This experiment was completed by the first author in partial fulfillment of the requirement of the MA degree from the University of the Pacific. Jolene Sy is now at the University of Florida. We thank Ken Beauchamp and Carolynn Kohn for their comments on an earlier version of this manuscript. We also thank Stephany Crisolo, Monica Francisco, Katie Kestner, and Sophia Spearman-Linquist for their help with this project and Christopher Bullock, Michelle Frank, and Nicole Hausman for many helpful suggestions.

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doi: 10.1901/jaba.2009.42-833

METHOD

Participants and Setting

Participants were Gael, a 5-year-old boy who had been diagnosed with Down syndrome; Ravi, a 4-year-old boy who had been diagnosed with mental retardation; and Reggie, a 5-year-old boy who had been diagnosed with autism. One to five sessions were conducted per day in classrooms or an adjacent room, 3 to 5 days per week.

Response Measurement and Interobserver Agreement

The dependent variable was rate of correct responses to academic tasks that had been

selected based on teacher nomination. A correct response was defined for Gael as placement of a foam letter or number onto one of the hook-and-loop squares on the board that was identical in color so that the hook-and-loop square on the letter or number made contact with the square on the board. A correct response for Ravi and Reggie was defined as placement of a bead completely around a pipe cleaner.

Trained observers recorded the frequency of correct responses to academic tasks and duration of access to edible and nonedible stimuli using data-collection sheets or handheld computers. For the parametric analysis, a second observer independently collected data during 38%, 30%, and 63% of the sessions for Gael, Ravi, and Reggie, respectively. Each session was divided into consecutive 10-s intervals, and agreement was calculated in each interval by dividing the smaller number of recorded responses by the larger number. Fractions were averaged across intervals to obtain the percentage of interobserver agreement. Mean percentage of interobserver agreement for correct responses and item access exceeded 80% (range, 71% to 100%) for all participants.

Stimulus Preference Assessment and Reinforcer Assessment

Prior the parametric evaluation, separate edible and nonedible preference assessments were conducted using procedures described by Fisher et al. (1992). Next, reinforcer tests identified grapes, chocolate candies, and crackers as edible reinforcers for Gael, Ravi, and Reggie, respectively. A ball was identified as the nonedible reinforcer for Gael and Ravi.

Parametric Evaluation: Procedure and Design

The effect of presession access to edible and nonedible reinforcers on the rate of correct responses to academic tasks was examined using a multielement plus reversal design. During the multielement component, we alternated between conditions in which sessions were preceded by small, medium, or large durations of access to edible or nonedible reinforcers. The order of small, medium, and large presession periods was determined randomly by rolling a die. During the baseline and reversal components, sessions were not preceded by access to edible or nonedible reinforcers. Sessions that included edible reinforcers were alternated with sessions that included nonedible reinforcers, and the order of these sessions was randomly determined.

Fixed-ratio (FR) schedule baseline. During this condition, participants received a small bite of the edible reinforcer (e.g., half a grape) or 20 s of access to the nonedible reinforcer on an FR 1 (Reggie) or FR 2 (Gael and Ravi) schedule. An FR 2 schedule was used to test whether the stimuli would function as reinforcers when response requirements were increased. A maximum of two baseline sessions were conducted per day (one in which edible reinforcers were delivered and one in which nonedible reinforcers were delivered).

Free-access assessment. Edible and nonedible assessments were conducted separately. In both assessments, the therapist gave participants unlimited access to the reinforcer until either a total of 15 min elapsed or 20 s elapsed with no consumption or interaction with the stimulus. Consumption was scored as a duration measure, beginning when the edible item passed the participant's lips and continuing until there was an absence of visual mouth movement, or the participant failed to reach for an additional item. Interaction with the nonedible reinforcer was defined as contact between the stimulus and some part of the participant's body or orientation towards the reinforcer. The total duration of consumption or interaction, rounded to the nearest minute, was categorized as the large access period. Two thirds of this period was categorized as the medium access period, and one third of this period was categorized as the small access period. The 15-min maximum was implemented to decrease the likelihood of gorging and to limit the extent that participants were removed from ongoing classroom activities.

Parametric evaluation. Prior to some sessions, participants had free access to edible items for 3, 6, or 9 min for Gael and 2, 4, or 6 min for Ravi and Reggie for the small, medium, and large durations, respectively. Prior to the remaining sessions, Gael and Ravi had free access to nonedible reinforcers for 5, 10, or 15 min for the small, medium, and large durations, respectively. At most, one free-access period to edible reinforcers and one free-access period to nonedible reinforcers was provided per day. Immediately after the presession period ended, a session identical to sessions in the FR baseline condition (FR 1 for Reggie, FR 2 for Gael and Ravi) was conducted. Sessions involving the contingent presentation of an edible reinforcer were conducted immediately after periods of free access to that edible reinforcer, and sessions involving the contingent presentation of a nonedible reinforcer were conducted immediately after periods of free access to that reinforcer. Sessions lasted 5 min, corrected for the duration of reinforcer access (i.e., the timer was paused while the participant consumed or interacted with the item).

RESULTS AND DISCUSSION

Figure 1 depicts the results of the parametric evaluation. Relative to the initial baseline condition (M = 2.7 responses per minute), Gael's mean rate of correct responses was variable following presession access to the edible reinforcer. However, small presession access to the edible reinforcer appeared to increase mean response rate (M = 3.1), whereas mean response rate following medium (M = 2.3) and large presession access (M = 2.2) decreased slightly relative to the initial baseline condition. On the other hand, data in the second panel show that mean response rates during the small (M = 1.8), medium (M = 1.5), and large (M = 1.2) periods of presession access to nonedible reinforcers exceeded the mean response rate during the initial baseline (M = 0.9).

For Ravi, response rates following small (M = 2.5) and medium (M = 2.5) presession access to edible items increased relative to the initial baseline condition (M = 1.2). However, mean response rate was lower following the large period of edible presession access (M = 0.8) than in the initial baseline. During the nonedible evaluation, Ravi's mean baseline response rate was 2.0, and mean response rate increased following the small (M = 3.6) and medium (M = 3.4) presession access intervals.

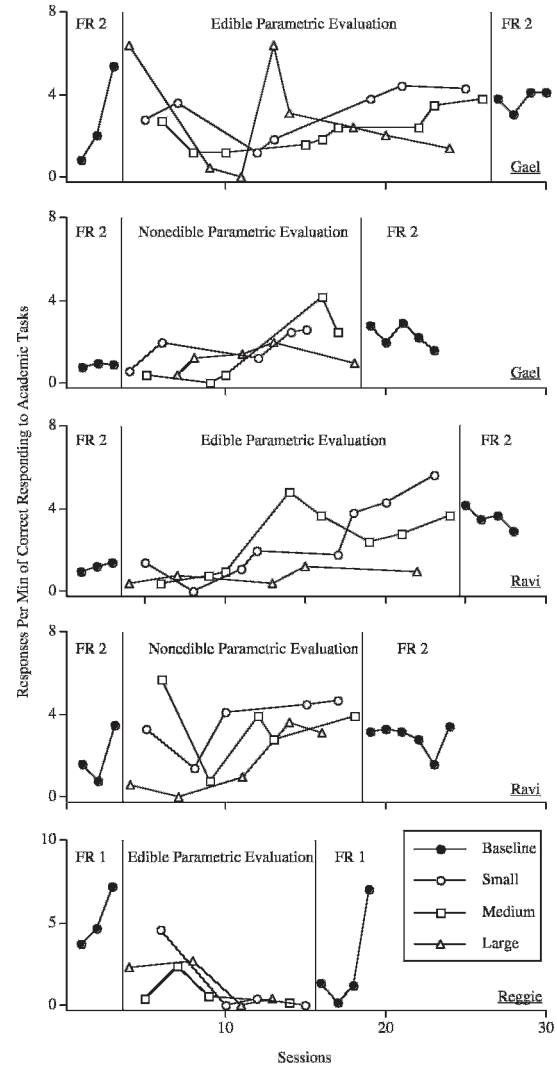

Figure 1. Rate (responses per minute) of correct responses to academic tasks during the parametric evaluation for all participants. FR 1 or FR 2 schedules of reinforcement were used. Reggie did not complete the nonedible reinforcer assessment.

However, when the large presession access interval was assessed, mean response rate was slightly lower ($M = 1.7$) than in the initial baseline. Gael's and Ravi's results were similar, in that mean response rate during the baseline replication exceeded that in the initial baseline.

Reggie completed only the edible evaluation. Results for Reggie suggested that any level of presession access to edible items would result in response suppression relative to the initial baseline.

Parametric analyses were conducted to identify the effects of presession access along a continuum, albeit a limited one. Previous research on presession variables analyzed the effect of, at the most, two dimensions of a variable (e.g., O'Reilly et al., 2007; Roscoe et al., 2003). The present study focused specifically on a single dimension: presession access and outlines measures that may be useful to assess the effects of presession access on an individual basis. Because previous literature has indicated that individuals are differentially affected by exposure to edible items (e.g., North & Iwata, 2005), we conducted an initial free-access assessment to determine presession magnitude in a relative fashion for each participant. In addition, we were able to determine response rate while controlling for consumption time by pausing the timer while the participant accessed either stimulus.

The results of the current investigation have clinical implications. Results suggest that some stimuli (e.g., a ball) may be more likely to function as a reinforcer given long durations of access. That is, given extended noncontingent presession access and contingent access, some nonedible stimuli may function as reinforcers. With limited presession access and limited contingent access, the reinforcing efficacy of nonedible stimuli may be reduced. This supports the finding that duration may influence the reinforcing efficacy of some stimuli (Steinhilber & Johnson, 2007). In addition, as in prior research (e.g., Vollmer & Iwata, 1991), the present results suggest that presession exposure may have idiosyncratic effects across individuals. More specifically, any presession access to edible items might eliminate responding during contingent access for some but might enhance the efficacy of contingent edible items for others. Thus, data from assessments that track both the occurrence and the effects of outside access to reinforcers may guide the programming of an effective intervention.

One limitation of the current investigation was the failure to replicate original baseline rates during the return to baseline. There are several possible explanations for this finding. For example, certain durations of presession access may not only strengthen the reinforcing efficacy of nonedible items during sessions but may also strengthen the reinforcing efficacy across sessions. These results, along with those from previous research (Roantree & Kennedy, 2006), suggest that presession access to attention can serve a priming function and increase the reinforcing efficacy of attention. Anecdotally, we can report that Gael and Ravi were more likely to interact with the experimenter during the return to baseline, which may have altered the reinforcing efficacy of ball play. A final explanation may stem from an additional limitation of this investigation: the brevity of the conditions. Had baseline sessions in the replication condition been extended, baseline rates may have been replicated.

A third limitation was the 15-min limit during the free-access assessment. For some stimuli (e.g., the ball), longer durations of access may be necessary to produce satiation. Thus, 15 min of free access, although arbitrarily categorized as the large duration for 2 participants, may not in fact have functioned as satiation. Future research may be designed to evaluate the influence of presession access without limiting the maximum duration of access time.

In addition, participants were not functioning in a closed economy (i.e., reinforcers were available outside the experimental sessions) and

what occurred at school or home could have varied from day to day. Reggie's mother reported that he had access to the edible item used as a reinforcer at home. Similarly, Ravi's teacher reported that he had access to balls (the stimulus assessed during his nonedible parametric evaluation) during recess. Despite these limitations, the results of this investigation suggest that parametric evaluations should be conducted on an individual basis and that conclusions should be restricted to the type of stimulus evaluated, because differences in response rates were observed across individuals, reinforcer topographies, and presession durations.

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Received March 10, 2008
Final acceptance July 11, 2008
Action Editor, Jennifer Zarcone