ENHANCING TOLERANCE TO DELAYED REINFORCERS: THE ROLE OF INTERVENING ACTIVITIES

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Three participants with moderate to profound mental retardation were exposed to choices between an immediate small amount and a delayed larger amount of a preferred reinforcer. All participants initially showed a relatively high preference for the smaller reinforcer, suggesting impulsive choice making. However this preference reversed, suggesting self-control, when the larger reinforcer was available immediately and, over time, its delay was gradually increased. Results highlight the potential utility of incorporating concurrent activities into self-control training paradigms.

DESCRIPTORS: choice, delayed reinforcement, developmental disabilities, impulsivity, self-control

Self-control, or selecting the larger delayed reinforcer over a smaller immediate one, can be enhanced by either a gradual increase in the length of the delay-to-reinforcement interval preceding the larger reinforcer (Schweitzer & Sulzer-Azaroff, 1988) or by requiring the participant to engage in some intervening activity during the delay (Mischel, Ebbesen, & Zeiss, 1972). Recently, Dixon and Holcoumb (2000) showed that a combination of these two techniques increased both self-control and a desired targeted behavior.

However, it remains unclear from the Dixon and Holcoumb (2000) study which particular component of the treatment, the activity requirement or progressive increases in the delay interval, had a greater impact on the development of self-control. In addition, the participants were verbally instructed about choice options, which may have influenced responding. In the current investigation we increased preference for self-control by gradually increasing the delay to gain access to the reinforcer and by incorporating an intervening activity during the delay.

METHOD

Participants, Materials, and Setting

Three men served as participants. Greg was 21 years old, had severe mental retardation and a seizure disorder, and took 30 mg of lansoprazole, 0.4 mg of clonidine, 4 mg risperidone, and 600 mg of carbamazepine daily. Warren was 19 years old, had moderate mental retardation and a seizure disorder, and took 50 mg of phenytoin sodium and 0.3 mg of clonidine daily. Matt was 40 years old, had profound mental retardation, a psychiatric disorder of major depression, a developmental language delay, and took 1,000 mg of valproic acid, 80 mg of fluoxetine hydrochloride, 6 mg of trihexyphenidyl hydrochloride, and 6 mg of risperidone daily. Greg and Matt did not speak or

use sign language and only sporadically responded correctly to one-word vocal stimuli (i.e., "stand," "sit") presented by caregivers, whereas Warren followed simple commands and occasionally emitted sentences to caregivers that at times were context irrelevant. All sessions were conducted during school hours in a day-training facility in which the participant and experimenter sat facing one another across a small table in a room (3 m by 3 m) containing a one-way observation mirror.

To assess preferences for potential reinforcers, a multiple-stimulus preference assessment without replacement was conducted (Deleon & Iwata, 1996). Warren's most preferred item was a corn chip, Greg's was a pretzel, and Matt's was fruit juice. The quantities used for smaller and larger reinforcers throughout the study were one or two corn chips, one or two pretzels, and 1 oz or 2 oz of juice.

Procedure

Waiting assessment. Sessions began with the experimenter placing the larger amount of the preferred item in front of the participant and walking away. No additional prompts, instructions, feedback, or other reinforcement was given. Each session consisted of one trial and terminated when the participant consumed the item. This phase remained in effect until a relatively stable duration of waiting behavior was obtained for each participant.

Choice baseline. During this condition as well as the one that followed, participants had 14 opportunities to consume one reinforcer per session, four during single-choice trials and 10 during two-choice trials. Before sessions began, mean waiting assessment times were calculated for each participant. These values were multiplied by five and served as the delay associated with the larger reinforcer (hereafter referred to as x s). Next, participants were taught discriminations be-

tween red and black index cards (7.6 cm by 12.7 cm) that were paired with either (a) the smaller immediate reinforcer or (b) the larger delayed reinforcer. The relation between stimuli and consequences was randomized after each session to control for possible color preference.

During single-choice trials, one index card was placed in front of the participant, and the experimenter physically guided him to touch it. Either the reinforcer was delivered immediately (for the card associated with the smaller immediate reinforcer) or the card was removed and the participant needed to wait for x s before receiving the reinforcer (for the card associated with the larger delayed reinforcer). An intertrial interval (ITI) followed every trial. The ITI was the amount of time the participant needed to wait after the reinforcer was consumed prior to beginning the next trial. For trials that resulted in the larger reinforcer, the ITI was always 5 s. For trials that resulted in the smaller reinforcer, the ITI was calculated by adding 5 s to the delay value (x) for the larger reinforcer.

During two-choice trials, both cards (locations randomized across trials) were presented in front of the participant. No prompts were given to initiate a selection. After the participant touched one of the cards, the corresponding consequences were delivered as described above.

Self-control training. During this phase, delay values for the larger reinforcer were set at 0 s and gradually increased every third session. Two types of sessions occurred in an alternating-treatments design. The first type consisted of a choice between a small immediate reinforcer and a large reinforcer that was delivered immediately but then progressively delayed. No activity was required during the delays associated with the larger reinforcer. The second type of session consisted again of a choice between a small immediate reinforcer and a large initially

immediate and progressively delayed reinforcer. In addition, participants were required to engage in an activity during the delays associated with the larger reinforcer. The task consisted of placing foam cubes (5 cm by 5 cm) into a large plastic basket (30 cm in diameter). If the participant stopped the task for more than 2 s, the experimenter physically guided or gesturally prompted completion.

Three novel discriminative stimuli (blue, yellow, and brown index cards) were used during self-control training. One card served as a discriminative stimulus associated with the smaller reinforcer, a second card was paired with trials that required the participant to engage in a concurrent arbitrary task during the delay, and a third card was paired with trials that did not require the concurrent task. The experimenter randomly alternated the colors of the stimuli associated with each alternative across sessions to control for any color preference. As before, participants had 14 opportunities to consume one reinforcer per session, four during single-choice trials and 10 during two-choice trials. This condition was terminated when the participant displayed a 20% or greater difference between alternating-treatments conditions (activity or no activity) in the percentage of choices made for the larger reinforcer for two consecutive sessions at the same delay value.

Interobserver Agreement

Reliability data were collected on 25% of all sessions by a second observer. Interobserver agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100%. The percentage of agreement for waiting assessment in seconds was 100%, and agreement for choices between the smaller or larger reinforcer during choice baseline and self-control training was also 100%.
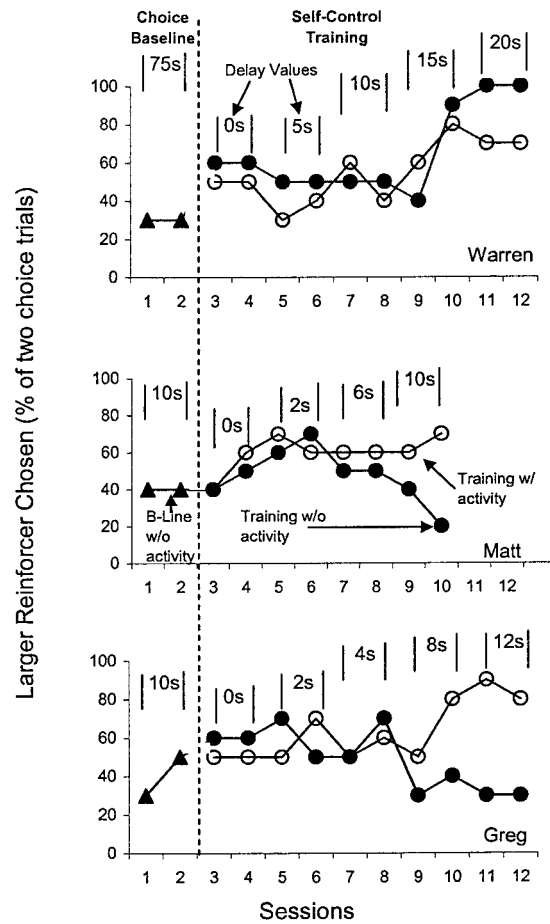

Figure 1. The percentage of each participant's choice for the larger reinforcer during baseline and across the changing delay values for the two trial types during self-control training.

RESULTS AND DISCUSSION

The waiting assessment times averaged 15 s (range, 10 to 20 s) for Warren, 2 s (range, constant) for Matt, and 2 s (range, 1 to 5 s) for Greg. This resulted in delays of 75 s for Warren, 10 s for Matt, and 10 s for Greg. Response allocations for the larger reinforcer during the two subsequent choice baseline sessions were 30% for Warren, 40% for Matt, and 40% for Greg.

Figure 1 displays the percentage of each participant's choice for the larger reinforcer during choice baseline and across the changing delay values for the two trial types dur-

ing self-control training. Regardless of the type of training trial preferred, all participants showed an increase from choice baseline in the percentage of trials in which he chose to wait for the larger delayed reinforcer over the smaller immediate one.

Warren initially showed a slightly greater preference for the larger reinforcer during sessions without the intervening activity, and this preference became more pronounced at delays longer than 15 s. This may have been due to the observed enjoyment (smiling, laughing) he obtained by staring at the female experimenter. Future researchers may wish to consider alternative sources of intervening activities such as experimenter attention or self-stimulation when designing interventions. Matt showed no preference at low delays, but as delays increased a preference was demonstrated for trials that required the intervening activity. A similar pattern was observed with Greg.

Some limitations of the current study were that (a) the length of the choice baseline was short (i.e., two sessions), (b) baseline lengths were not staggered across participants, (c) Greg's data were on an upward trend in baseline, and (d) the effects of the intervening activities were not consistent across participants. Thus, these findings should be regarded as preliminary, and future research should address these limitations.

Results suggested that progressively increasing the length of the delay preceding the availability of the larger reinforcer is an effective procedure for shifting preference in favor of larger delayed reinforcers. These results support those of Schweitzer and Sulzer-Azaroff (1988) and Dixon and Holcoumb (2000) and further our understanding by illustrating that requiring an intervening activity during the delay preceding the availability of the larger reinforcer may produce greater increases in self-control. Care providers should strive to increase the percentage of responses that a participant will select to wait to receive a larger delayed reinforcer. The resulting self-control will strengthen the life-enhancing skills for clients who often encounter reinforcers that are not available immediately.

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