CASE REPORT

Effects of Preferred and Non-preferred Concurrent Activities during Self-Control Training in a School for Autism

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Abstract

Objectives: Self-control training is comprised of a progressively lengthened delay to reinforcement, during which the individual can engage in some activity until the temporally distant reinforcer is provided. Though availability of an activity concurrent to the delay has been shown to increase self-control, little is known about relative effects of differing qualities of activities. The purpose of the study is to examine differential effects of preferred and non-preferred activities during delays in self-control training.

Methods: Using a multiple baseline design, three students with autism consistently demonstrate impulsive choices and low engagement in tasks. During self-control training, participants choose between a smaller, immediate reinforcer and a larger reinforcer following a short delay with an alternating preferred and non-preferred response requirement. After success is observed in either preferred or non-preferred conditions, the delay associated with that condition is progressively lengthened. Last, participants choose which activity was available during the delay, and choices are monitored as delays associated with chosen conditions were extended.

Results: During training, two participants are demonstrating near-exclusive self-control choices. All three are showing increased delay tolerance at similar rates regardless of activity preference, and are more frequently choosing the progressive/preferred alternative than the progressive/non-preferred alternative though delay requirements were greater.

Conclusions: Self-control can be established by starting with minimal delays to reinforcement and progressively extending the delay after success is observed, regardless of whether a work- or preferred-activity is available during the delay. However, providing an option for a preferred activity may help to "bridge the gap" to more temporally distant reinforcers.

Key Words: *Choice; Delay tolerance; Delayed reinforcement; Impulsivity; Self-control*

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Introduction

Self-control has been defined as behaving in a manner to maximize reinforcement, which typically entails waiting for a larger, delayed reinforcer rather than engaging in behavior to earn a more immediate reinforcer of lesser value [1]. Impulsivity, opposite to self-control, is common in young populations and particularly common in those with autism spectrum disorders (ASD), representing a significant barrier to progress [2]. Training programs including progressive delays have demonstrated success in increasing self-control. For example, including a delay to both smaller and larger reinforcers and then gradually reducing the delay to the smaller reinforcer resulted in acquisition and maintenance of self-control [3]. Similar results were achieved *via* self-control training programs in preschool children [1]. By initially offering a choice between immediate access to smaller and larger reinforcers and subsequently increasing the delay to the larger reinforcer by several seconds at a time, self-control increased and maintained.

Further adaptations of self-control training have often included an activity available concurrent to the delay to "bridge the gap" to delayed reinforcement. Placing a disk in a pigeon's cage increased self-control; although pecking the disk did not reduce the delay or produce grain, it increased self-control compared to simply waiting [4]. Applying this principle to human behavior, promoting engagement in an alternative activity has shown increased tolerance to delays and self-control in participants across several studies. In this way, self-control training has included vocally repeating rules [5], matching-to-sample [6], physical therapy exercises [7], and other response requirements during delays. Further, concurrent activities may prevent re-emergence of impulsive choices [8] [4] and participants frequently prefer an activity rather than simply waiting [6], suggesting added benefits.

Despite the effectiveness of self-control training, programs may hold limited utility due to response cost and time required to implement them. Delays are often increased by several seconds at a time [8] [1] so participants do not discriminate any increase in delay [8], resulting in extensive training sessions to mastery. However, self-control may be increased by additional manipulations that influence choice without training. For example, higher quality reinforcers increased tolerance to delay in children with attention deficit hyperactivity disorder [9], and providing a preferred toy to preschool children during delays achieved similar effects [10]. Manipulations such as these increased the probability of self-control without training, but effects are often temporary. That is, impulsive choices likely re-emerge in the absence of preferred activities.

Because preferred activities increase self-control without training, when included as a concurrent activity in a self-control training program they may allow for greater increases in delay increments, tolerance to delay, reduced time to mastery, and maintained effects. In contrast, if preferred activities do not provide any advantages over work tasks, then programs may be implemented with minimal disruption to classroom or clinical activities, or to increase low-rate target behaviors. Therefore, the present study investigated the differential effects of preferred and non-preferred concurrent activities during a more rapidly progressing self-control training.

Materials and Methods

Participants and Setting

Three students at a school for autism participated. None received regular medication; all had an autism diagnosis and no physical impairments. Preferred and non-preferred concurrent activities were selected based on staff and participant interviews, and reinforcers were selected based on participants' most frequent edible reinforcer choices. Participant 1 (11, male) spoke in complete sentences with persistent echolalia. Coloring and basic addition were selected as preferred and non-preferred activities, respectively. His larger reinforcer was two Cadbury mini eggs, while the smaller reinforcer consisted of one. Participant 2 (18, female) spoke in sentences of 1-3 words and demonstrated limited conversational skills. Drawing and handwriting worksheets served as her preferred and non-preferred activities, respectively. Her larger reinforcer was four skittles, and her smaller reinforcer was two skittles. Participant 3 (21, male) spoke in complete sentences with persistent echolalia. Reading books was his preferred activity and handwriting worksheets were his non-preferred activity. His reinforcers included a full taffy (larger) and half of a taffy (smaller). Sessions were conducted in a private 3x3m room with a desk and chairs for 20-60 minutes total each school day.

Procedure

Dependent Variables and Interobserver Agreement

A second observer was present for 34% of sessions. Choices were recorded by checking "sooner/smaller" or "larger/later" on a data sheet. Observers checking the same column counted as an agreement. Duration of engagement in the concurrent activity was scored using whole-interval recording. Agreement was recorded if both observers indicated that the participant engaged in the target behavior throughout the entire delay. Inter-observer agreement was calculated by dividing agreements by disagreements plus agreements and multiplying by 100%. Interobserver agreement was 100% on both variables.

Experimental Design and General Procedures

A multiple baseline across participants with embedded multi-element components compared the effects of preferred and non-preferred activities on self-control. First, natural baseline determined initial levels of activity engagement. Next, choice baseline determined initial rates of impulsive choice. Third, self-control training was implemented in multi-element fashion to increase self-control and compare rates of increase when preferred and non-preferred concurrent activities were included. Last, a self-control training multi-choice phase presented all choices to determine relative strength of concurrent activities. In all phases, problem behaviors were ignored or blocked. Sessions ended if the participant did not engage in the concurrent activity within one minute, asked to stop, or ceased engagement for 30s consecutively. The concurrent activity (preferred or non-preferred) available each session was determined quasi-randomly by a coin flip. Positions of the choices were randomly alternated.

Natural Baseline (NBL)

The experimenter provided the instruction, "When I say 'begin' I want you to [do activity] for as long as you can. You can stop when you feel like you cannot do it any longer," then provided the materials. Sessions ended according to the

general criteria, or if participants engaged in the target activity for 300s (staff judged this duration to represent mastery and a functional goal within the setting).

Choice Baseline (CBL)

Choices were presented *via* two cards, one labeled "Now" and one "Later," and participants chose by pointing toward or verbally indicating their choice. The smaller reinforcer was positioned near the "Now" card and the larger reinforcer and materials available during the delay to reinforcement were presented near the "Later" card. The experimenters prompted the participant to choose among alternatives by saying, ''Do you want [small reinforcer] now, or do you want [larger reinforcer] after doing [target behavior] for [target duration]?'' and pointing to each when mentioned. If the immediate choice were selected, the experimenter provided the smaller reinforcer and the session ended. If the participant chose "Later," the experimenter provided activity materials and instructed the participant to engage in the activity until the reinforcer was provided. The target delay duration for each participant was the total average time of engagement during NBL multiplied by ten, up to a maximum of 300s. CBL lasted six sessions.

Self-Control Training (SC-Tx)

Participants again chose between "Now" and "Later" alternatives. The delay duration for the larger reinforcer began at each participant's NBL average. After choices were presented, the experimenter stated, ''Do you want [small reinforcer] now, or do you want [larger reinforcer] after doing [target behavior] for [delay duration]?'' Sessions then proceeded similarly to CBL.

The progressive delay schedule associated with the non-preferred and preferred concurrent activities advanced independently. When a participant chose the larger reinforcer in two consecutive presentations for either the preferred or non-preferred activity, the delay for that schedule increased by 20s or 1/2 the participants' NBL average duration. If the participant failed to engage in the activity for the designated time duration, no reinforcement was provided and the trial counted as a failure toward the criterion to increment the delay.

Self-Control Training Multi-Choice (SC-Tx Multi-Choice)

Procedures were the same as SC-Tx with several exceptions. Three response options, including the preferred and non-preferred concurrent activities and the immediate reinforcement option, were presented simultaneously. Starting delay values carried over from SC-Tx and advanced independently according to the same criteria. Session instructions were edited to include all three options.

Results

Figure 1 displays participants' choices and activity engagement. During NBL, Participant 1 engaged in the preferred concurrent activity for an average of 139s and did not engage in the non-preferred activity for an overall average engagement of 70s. Participant 2 did not differentiate between activities and engaged in the preferred and non-preferred activities for a mean of 17 and 24.5s, respectively, for a total average of 20s. Participant 3 engaged in the preferred activity for a mean of 59.4s and the non-preferred activity for a mean of 39.6s, for an overall average of 50s. In CBL, all participants demonstrated exclusive choice for the smaller, immediate alternative. In SC-Tx, Participant 1 chose the larger reinforcer

and successfully engaged in either concurrent activity in all sessions. Participant 2 showed a similar pattern but chose the smaller, immediate alternative once. Participant 3 selected the larger, delayed reinforcer for 45% (9/20) of sessions and did not differentiate between concurrent activities. In SC-Tx Multi-choice, Participant 1 chose only the preferred activity and increased delay tolerance to a total of 290s. Participant 2 selected the preferred activity on all but one session and increased tolerance to 200s. Participant 3 allocated 50% (4/8) of responses to the smaller, immediate reinforcer, 38% (3/8) to the delayed/preferred alternative, and 12% (1/8) for the delayed/non-preferred alternative. His maximum successful delay value was 150s.

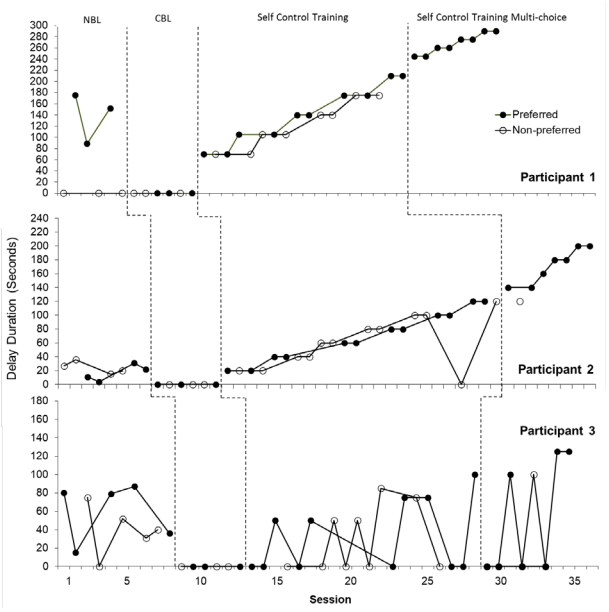

Figure 1) *Time (s) engaged in the concurrent activity during delays across natural baseline (NBL), choice baseline (CBL), self-control training, and self-control training multichoice phases. Solid and open circles indicate that the preferred or non-preferred concurrent activity was available, respectively. In self-control training and self-control multi-choice phases, zero value data indicate the participant chose the small, immediate reinforcer or the larger, later option and failed to engage in the concurrent behavior for the designated time delay.*

Discussion

Overall, the results support previous research on the effectiveness of self-control training including progressive delays to reinforcement [1] and concurrent activities [8]. Further, as Participants 1 and 3 engaged in preferred activities longer than non-preferred activities in NBL, the results are supportive of momentary increases in self-control through the provision of preferred activities [10]. The present study extended the literature by investigating differential effects of preferred and non-preferred concurrent activities in a self-control training program. In SC-Tx, both activities achieved similar effects: participants increased delay tolerance and chose each alternative over the immediate reinforcer at a similar rate. However, in SC-Tx Multi-choice, clear preferences for the delayed/preferred alternative emerged and maintained even when the delay was longer than that of the delayed/non-preferred activity. These results suggest that in self-control training, a progressive delay may include a work task or rehabilitative activity so regular programming is minimally disrupted with little negative impact on success. Similarly, a preferred activity may be offered to accommodate client preferences or provide extra support to self-control in situations where very long or uncertain delays are present.

Several limitations must be noted. First, delays increased by greater intervals than in previous studies which incremented delays by several seconds [1]. Larger increases did not produce differentiation between preferred and non-preferred activities in training, but Participant 3 chose the delayed alternative on only about half of training trials. Some participants may require shorter increments to maintain self-control choices, and larger increments may yet cause differentiation in self-control between tasks. Future research may wish to examine methods to determine how to increase the time delay and designate a starting delay value for the larger reinforcer so that success is maintained. Second, concurrent activities were identified

via interview. More systematic preference or reinforcer assessments would strengthen confidence in the relative preference of the selected tasks. Additionally, whether similar results could be obtained with aversive tasks remains unanswered.

Conclusion

Results suggest that self-control training including concurrent activities and a progressive delay can be used to increase self-control and delay tolerance. Preference of the concurrent activity had little effect on training outcomes, so the procedures may be implemented within regular programming or as a program in its own right. However, preferred concurrent activities may further bolster self-control on a momentary basis and aid in tolerating extended delays. Last, some participants-maintained success with the more rapidly increasing delays, and more research is required to refine current practices to achieve maximum gains.

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