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Children's Response Speed as a Function of Omission and Delay of a Customary Reward

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A. INTRODUCTION

Both absence and delay of reward in a situation where it had been present previously are considered frustrating events.[1] Studies of children's response speeds have been conducted where a few immediately rewarded trials were suddenly followed by nonrewarded trials,[2,7] or where a sudden shift from immediate reward to delayed reward occurred.[4,5,9] The results of these studies do not clearly indicate that omission and delay of reward have identical effects on children's performance. Since these studies were conducted by different experimenters using different subjects and tasks, one cannot conclude with certainty that withholding and delaying of reward are two completely different variables, and their effects cannot be interpreted in the same manner. To have a better understanding of these two variables, the present study manipulated the two conditions within the same experiment.

B. METHOD

The Ss were 45 third and fourth grade children (16 girls and 29 boys) from a public school in Milwaukee, Wisconsin. All Ss were given 30 trials on a lever-pulling, marble-despensing apparatus similar to the one described by Ryan and Cantor.[6] The Ss were invited to play a "game" and were told that if they won enough

marbles, they could trade them for a toy of their choice. Each *S* was shown a collection of eight toys and was asked to choose the toy he would like to try to win.

The Ss were divided into three subgroups: (a) the Delayed Reinforcement Group (DL) received 20 immediately reinforced trials that were followed by 10 trials with delayed (15-second) reward; (b) the Partial Reinforcement Group (PR) received 20 immediately reinforced trials that were followed by 10 nonrewarded trials; (c) a Control Group that was immediately rewarded (Group IM) on all 30 trials. The distribution of sexes and third and fourth grade children was approximately equal in all three groups.

The interval between successive stimuli (signal light to pull the lever) was kept constant and was about 20 seconds in duration. On each trial, *E* recorded the starting time (the interval from the onset of the stimulus light to the initial movement of the lever) and the movement time (the time taken to pull the lever all the way down).

C. RESULTS

The starting and movement times were converted to speeds (1/t second) and combined into blocks of three trials each. The first seven blocks were the preshift blocks, and the last three were the postshift blocks. In the case of Groups DL and PR. the first delay trial or the first nonreward trial (21st trial) was included among the preshift trials. Since the *S* presumably did not know until after he had responded that the reward was delayed or omitted, it was, in effect, an immediate reward trial.

In order to compare the changes in speed over trial blocks of the three subgroups, separate Lindquist Type 1 (3) analyses of variance were performed on the seven preshift blocks and the three postshift blocks of trials. The starting and movement speeds were subjectrd separately to these analyses. For between-Ss the main effect was reinforcement condition, and for within-Ss the main effect referred to trial blocks.

In addition, for each group, correlated *t* tests compared the speeds on the last preshift block (7th block) with the first postshift block (8th block).

No significant effects were obtained on the preshift blocks of trials for both starting and movement speed measures. The results on postshift measures for the starting and movement speeds are listed below separately.

l. Starting Speeds

On the three postshift blocks of trials, a significant main effect was obtained for the reinforcement condition ($F = 3.193, df\ 2/42, p < .05$). Subsequent individual comparisons indicated that the only significant difference occurred between Groups PR and DL ($p < .05$). Group IM did not differ from either of the other two groups. Neither the main effects for trial blocks ($F = 2.589, df\ 2/84$) nor the trial blocks X reinforcement condition interaction ($F == 2.410, df\ 4/84$) was significant.

The *t* tests, comparing the speeds on 7th and 8th trial blocks, indicated that Group DL decreased and Group PR increased their speeds significantly from the 7th to the 8th trial block ($p < .05$).

2. Movement Speeds

The only significant result on the movement speed measures was a mam effect for the trial blocks ($F = 4.900, df\ 2/84, P < .05$).

D. DISCUSSION

The results concerning starting speeds are generally in agreement with previous findings.[5,8,9] When the Ss are used to immediate reward, the delay of reward leads to a decrement, and nonreward leads to an increment in starting speeds. The faster starting speeds following nonreward for Group PR are readily

explainable in terms of Amsel's theory.[1] He postulated that nonattainment of an expected reward leads to the occurrence of frustration, which in turn results in increased motivation: hence, faster speeds.

In accordance with Amsel's (I) suggestion, one would also expect that delayed attainment of an immediately expected reward would also be frustrating and lead to faster speeds. However, the present data do not support this notion. It is possible that, in the case of delay, whatever increment in drive level is produced is dissipated by the arrival of the delayed reward. Consequently, when the *S* makes the next response, no evidence of this frustration is present. In the case of Group PR, on the other hand, no reward arrives, and this frustration-produced motivation is probably carried over to the next trial.

One other major difference between the two reinforcement conditions has been pointed out.[8,9] In a delayed reinforcement situation, whatever competing responses are produced during the delay interval are reinforced by the delayed reward. These competing responses become conditioned to the apparatus cues and are elicited during the subsequent trials and interfere with the response speed. Such competing responses in a nonreward situation are not followed by any reinforcement; hence, they do not become stronger.

Apart from a significant main effect for trial blocks, none of the other effects was significant on the movement speed measures. However, a closer examination of the mean speeds of all subgroups for each postshift block of trials indicated a trend similar to that for starting speeds. No explanation for this discrepancy in the starting and movement speed results is advanced here.

E. SUMMARY

The effects of omission and delay of a customary reward on children's starting and movement speeds in a lever-pulling task were investigated. The results indicate that the omission of reward has a facilitating effect on starting speed, whereas the delay tends to inhibit the same speed. Movement speed measures did not reveal significant difference although the results pointed in the same direction.

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