Reminiscence and partial reinforcement in a discrete bar press situation¹

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On the day following varied number of discrete trials under 100% or 50% reinforcement in an operant conditioning chamber, rats were given nonreinforced trials until an extinction criterion of no bar press in 5 min. was reached. An analysis of relative speed scores revealed significantly more reminiscence for the 100% Ss. The data also indicated a reversal of the PRE when relative speed scores were analyzed and no significant difference between the 100% and 50% groups when trials to criterion constituted the dependent variable.

In view of the large number of studies dealing with the effect of partial reinforcement upon extinction it is surprising that very little is known about the effect of reinforcement schedules upon such related phenomena as spontaneous recovery and reminiscence. A recent study by Thompson (1966) provided some additional information on spontaneous recovery and partial reinforcement. The present investigation was designed to secure data regarding reminiscence as a function of reinforcement schedules where the total number of acquisition trials as well as the number of reinforced trials could be equated.

Method

An operant conditioning chamber 10-1/2 in. high, 10-1/2 in. wide, and 16 in. long was enclosed in a sound-shielded box and was controlled by programming equipment located 4 ft. from the box. The chamber was equipped with a Foringer retractable response bar located at one end and a food cup located at the other end into which .045 gm food pellets could be delivered. A floor switch located below the food cup released the bar 2 sec. following depression of the switch. Response time (total time between bar presses) was measured by two Hunter Silent Klockcounters, which were alternated at the end of each trial by a flop-flop switch. White noise was delivered through a speaker located behind the end of the chamber upon which the food cup was mounted.

The Ss, 80 naive male albino rats of the Holtzman strain 70 to 108 days old at the start of the experiment, were housed in individual living cages with ad-lib water. Following five days of 23 hr. food deprivation schedule each S was trained for two days by the method of approximation to press the bar and approach the food cup. On the third day Ss were given acquisition training and on Day 4 they were given nonreinforced trials until an extinction criterion of no bar press in 5 min. was reached.

The design included two levels of percentage reinforcement (100% vs. 50%) with the 100% Ss receiving 12, 24, 36, 48, or 72 acquisition trials and the 50% Ss

receiving 24, 48, or 72 acquisition trials. The design may be schematized as two 2 by 3 factorials, in one of which the number of acquisition trials (24, 48, 72) is equated for the two reinforcement conditions, while in the other the number of reinforced trials (12, 24, 36) is equated. Ten Ss were randomly assigned to each of the eight experimental groups.

Results and Discussion

All time measures were converted to speed scores by a reciprocal transformation and the median of each block of five trials was determined. Since the performance levels at the end of acquisition differed significantly (the 50% Ss were faster) this data was then transformed to provide a measure of relative extinction with unity and zero based upon the reciprocals of the medians of each individual S's last five acquisition trials and last five extinction trials, respectively (see Anderson, 1963).

Two indices of reminiscence were employed: median relative speed for the first five extinction trials and relative speed of the first extinction trial. When the first of these measures was tested with the Kruskal-Wallis H test, the 100% groups showed significantly more reminiscence, with $H = 18.59$, $df = 5$, $p < .01$, when the groups were equated for total number of acquisition trials (see Fig. 1). The 100% groups were also superior (nonsignificant) when equated for number of reinforced

Fig. 1. Relative reminiscence (median median relative speed of first five extinction trials) as a function of number of acquisition trials and reinforcement condition.

trials, $H = 7.63$, $df = 5$. Reminiscence scores based upon the relative speed of the first extinction trial also indicated that the 100% groups were significantly superior ($p < .05$) when equated either for total number of acquisition trials or for number of reinforced trials, $H = 11.11$ and 12.70 , $df = 5$, respectively.

Whether as a result of this differential amount of reminiscence, or the reduction of secondary reinforcement (by the elimination of multiple bar presses and the consequent forcing of a visit to the food cup on every trial), or both, the effect upon the PRE was pronounced. The 100% Ss showed significantly greater median relative speed for the first 25 extinction trials with $H = 21.76$, $df = 5$, $p < .001$, when the two reinforcement schedule groups were equated for total number of acquisition trials, and $H = 11.42$, $df = 5$, $p < .01$, when equated for number of reinforced trials. A second measure of PRE, number of extinction trials to criterion, yielded no difference between the two reinforcement schedules. When subjected to a two-way analysis of variance test, neither the reinforcement condition variable nor the interaction was significant, although a significant trials

effect was found, with $F = 3.18$, $df = 2/54$, $p < .05$, when the groups were equated for total number of trials, and $F = 5.29$, $df = 2/54$, $p < .01$, when the groups were equated for number of reinforced acquisition trials.

If, as suggested by the results of this study, the introduction of partial reinforcement results in a reduction of reminiscence, and if similarly, as indicated by Thompson (1966), partial reinforcement results in a reduction of spontaneous recovery, then studies of the PRE may be confounded when a 24 hr. time period elapses between acquisition and extinction, or when extinction is not completed in one session.

References

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