Partial reinforcement with a small number of acquisition trials: Modified extinction procedures¹

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Abstract

One group of rats received six trials with 50% reinforcement, another received 100% reinforcement. Each group was given six extinction trials; each extinction trial was preceded by a reinforced trial which was given under new stimulus conditions. The 50% group ran slower than the 100% group in extinction and faster when the new stimulus was present.

Problem

Capaldi (Bloom & Capaldi, 1961; Capaldi & Stanley, 1963) has revised the aftereffects analysis of partial reinforcement. The partial reinforcement effect (PRE) is assumed to occur due to locomotor responses (R_{loc}) being followed by reinforcement while the stimulus aftereffects of nonreinforcement (S^N) are present for partial reinforcement groups (P_{gps}). S^N are present in the stimulus compound during extinction and since P_{gps} have been reinforced previously when these stimuli were present, they run more vigorously during extinction. Consistent reinforcement groups (C_{gps}) have not experienced S^N in conjunction with reinforcement and extinguish relatively rapidly.

From these assumptions it is reasonable to predict that blocking or confounding S^N by the aftereffects of reinforcement (S^R) during the extinction period would result in decreased resistance to extinction for P_{gps} . This decreased resistance to extinction could result in a situation where there was no difference between P and C_{gps} in extinction. A decrease in resistance to extinction by a P_{gp} which made that group less resistant than a C_{gp} would be easier to interpret. The present study was run to test the effect of a procedure designed to interfere with the capacity of S^N to evoke R_{loc} during extinction.

Method

The Ss were 90-day-old albino rats.

The straight alley was 24 in long, with a guillotine door 8 in from the end of the alley forming a start box. The timer was started by opening the start box door and was stopped by a photoelectric cell 1-1/2 in from the goal box. A guillotine door 7 in from the goal box prevented retracing. The alley and goal boxes were made of plywood, painted medium gray, with a plexiglass lid.

The goal boxes were L-shaped with a food cup in the L arranged so that it could not be seen until S entered the goal box. There were four goal boxes, two black and two white, arranged so that the interior of only one goal box was visible from the alley at any time.

Ss were placed on deprivation on Day 1, and handled for 1 hr. daily on Days 2 through 6. Days 3 through 6,

Ss were fed wet mash during the handling period. Days 7 through 10, Ss explored the maze. Description of the typical exploration procedure may be found in McCain et al (1962). On Day 11, Ss were divided into two groups on a random basis and fed for 20 min., 24 hr. before they were to be run on Day 12.

Phase I. Ss in Group C ($N=19$) received six reinforced trials (R_{trials}). Group P ($N=20$) received six trials with an NRNRNR reinforcement pattern. Each S was run to either a black or white goal box, but not both. A dish of mash was available on R_{trials} ; the dish was empty on nonreinforced trials (N_{trials}). Usual balancing procedures were used.

Phase II. Phase I was followed immediately by a 12 trial period. Both groups received six extinction trials, each preceded by an R_{trial} to the brightness not used in Phase I. For example, Ss run to black in Phase I were reinforced on runs to white on odd numbered trials of Phase II. Even numbered trials in Phase II were extinction trials to black. The purpose of R_{trials} to the new brightness was to interfere with S^N and produce S^R . Ss remained in the goal box 20 sec. on all trials with a 15 sec. intertrial interval. Ss failing to reach the goal box in 30 sec. in Phase I, or 45 sec. in Phase II, were guided to the goal box.

Results

Figure 1 shows the data from Phase II plotted in blocks of three trials. Data were transformed by taking a logarithm of ($X \text{ sec.} + 1$) and analyzed using a trend analysis (Edwards, 1960). Group P ran significantly slower on extinction trials than Group C ($t(37)=2.15$; $p < .05$) while running significantly faster than Group C

Fig. 1. Performance of the groups on extinction trials and trials to the new stimulus.

on trials to the new brightness ($t(37)=6.00$; $p<.001$).

Ss in the combined groups ran significantly faster on trials to the new stimulus in Phase II as compared to extinction trials ($F(1/111)=9.50$; $p<.005$). This indicates Ss discriminated between the brightnesses.

Discussion

In the case of Group C, it was assumed that following each R_{trial} S^R were present and were available as stimuli with which R_{loc} could be associated on the succeeding R_{trial} of Phase I. The situation was different for Group P. Each N_{trial} in Phase I produced S^N and since each N_{trial} was followed by an R_{trial} , R_{loc} was associated with S^N . Each R_{trial} resulted in S^R but an N_{trial} followed so that recurrence of S^R was less likely to evoke R_{loc} .

In Phase II each extinction trial was preceded by an R_{trial} to the new brightness. This affected the groups differently. Group C responded vigorously on extinction trials since S^R was part of the stimulus compound and R_{loc} had been associated with S^R . Prior to Phase II, Group P had not been reinforced when S^R were present from the previous trial. On trials to the new stimulus both groups had S^N present. Prior to Phase II, S^N had not been accompanied by reinforcement for Group C but had been accompanied by reinforcement for Group

P. In summary, Group P was expected to run as slow or slower than Group C on extinction trials and as fast or faster than Group C on trials to the new stimulus. The results agree with these predictions. Such results, taken together with the usually expected PRE in extinction, point to the difficulty of considering the PRE as a phenomenon. An analysis based on individual events leads to new predictions and emphasizes the need for analysis of each trial condition.

Finally, the PRE has been obtained when a small number of acquisition trials were used (McCain et al, 1962), so that the extinction results of the present study are not solely due to the number of acquisition trials used.

References

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Note

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