Latent reacquisition and extinction¹

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Abstract

Forty water-deprived albino rats ran a straight alley with differently textured and colored start box, runway, and goal box (GB) for 35 acquisition trials and were then extinguished to criterion. After random assignment to four conditions, Ss received three trials of 30 sec. exposure to either regular GB with reward (Group LRA-1), novel GB with reward (Group LRA-2), regular GB without reward (Group C-1), or hold box without reward (Group C-2). Three test extinction trials in initial runway followed. All acquisition, extinction, treatment, and test trials were given one per day. Control group speeds did not differ significantly at any test trial. LRA-1 group medians exceeded controls at all test trials on both starting and running speeds, significantly so only on the former. LRA-2 group medians were slower than controls on test trial 1, but not on later test trials, and significantly so only for running speed.

Introduction

Latent extinction or the weakening of a learned instrumental response prior to non-rewarded trials has been dealt with in the literature for more than a decade (Seward & Levy, 1949; Deese, 1952; Ratner, 1956; Moltz, 1957; Denny & Ratner, 1959). The learned instrumental response is weakened in latent extinction by exposure to the reward context without the reward forthcoming. Another related procedure, referred to here as latent reacquisition (LRA), has been employed more recently (Stein, 1957; Swift & Wike, 1958; Seward, Jones, & Summers, 1960; Ison, 1961). LRA strengthens rather than weakens the learned instrumental response. Again, S is exposed to the reward area without running through the learning procedure. This time, however, reward is present. It would seem self-evident that LRA effects would be more observable in an animal that had come to *not* associate the reward area with reward (i.e., that had been extinguished) than otherwise. Nevertheless, studies showing small or no significant LRA effects typically did not carry out a thorough extinction procedure before testing. Furthermore, the acquisition process has generally been of great brevity: 9 trials in one case, 12 in another. It was felt that LRA might best be investigated where the initial acquisition was of greater strength, the learned instrumental response was fully extinguished, and test trials following the LRA procedures were extinction trials. This restructured procedure offered a better opportunity to observe the effects on the learning process of "a taste of honey" in the wake of extinction.

Method

Twenty-five male and 15 female albino rats, 169-197 days old, were trained to run a 6.5-ft runway (RW), including start box (SB), into a 4 by 11.5-in goal box (GB). The SB was green with curved aluminum

sides, screen top, and screened wood bottom; the RW was black-painted wood with curved wire ceiling; the GB was white-painted wood with a small cast iron permanent water cup. Thus, all three sections of the apparatus were distinctly different in color and texture. A large burlap cloth hung directly behind and above the GB to supply the differential extra-maze stimuli shown previously to be critical in producing latent extinction (Denny & Ratner, 1959). Access to RW and GB was controlled by guillotine doors.

After three days of handling and a 23-hr. water deprivation schedule, all Ss received one acquisition trial per day for 35 days. All trials were given in the evening to coincide with the normal feeding and activity time of the Ss. Running order was randomized (by card deck) for each trial. One cc water in the permanent cup in the GB served as reward. Latency to a line 6 in beyond the SB and running time from this line until S had all four feet in the GB were recorded. Starting latencies may have been abbreviated by the unique shape of the SB, in which all corners were eliminated by use of the curved aluminum wall plate; rats typically spend inordinate amounts of time cowering in SB corners during the early trials of acquisition.

After the 35 acquisition trials, each S was extinguished, one trial per day, to a criterion of 3 min. in the SB for two successive trials. The number of trials to extinction ranged from 5 to 48. On the 48th or last day of extinction, all Ss received one more unrewarded trial to allay spontaneous recovery.

For the LRA treatments, Ss were then randomly assigned to four groups of 10 Ss each. One group (LRA-1) received 30 sec. exposure to the GB with water reward present; another group (LRA-2) received 30 sec. exposure to a novel GB (iron box opaque on all sides with yellow plastic dipper and sawdust floor) with a water reward present; a control group (C-1) received 30 sec. in the regular GB without water present; a final control group (C-2) received 30 sec. in an empty hold box. This procedure was followed once a day for three successive days.

The test trials consisted of three unrewarded or extinction runs for each S in the original RW apparatus, one run per day, for the three successive days following the LRA and control procedures.

Results and Discussion

All latencies and running times were converted into reciprocals or speed scores (Seward, Jones, & Summers, 1960). Comparing the four groups on the basis of their pretreatment speed scores on the last three acquisition trials (trials 33 to 35), Mann-Whitney U tests (Siegel, 1956) found no two groups to be significantly different at the 5% level for either starting or running speed. It was then assumed that prior to experimental treatments the performance of the four groups was equivalent.

Mann-Whitney U tests were also used to analyze the test trial results. Neither the starting speed nor the running speed differed significantly for Control Groups C-1 and C-2 at any of the three test trials. They were therefore combined to form a control group of 20 Ss (C-1, C-2).

A comparison of the groups in Fig. 1 shows the median starting speed for each of the three test extinction trials. Figure 2 compares the groups on median running speed for the same three trials.

There is good evidence for LRA in the LRA-1 group as gauged by starting speed. On each of three test trials

Fig. 1. Median starting speed in reciprocal seconds for each group on the three extinction test trials following latent reacquisition procedures.

LRA-1 was significantly faster than the controls ($U = 46.5$, $U = 32.5$, $U = 39.0$, $p < .02$ for all three, $n_1 = 10$, $n_2 = 20$). Group LRA-2 did not have starting speed significantly different from the controls on any trial although trial 1 came close ($U = 60.5$, $p < .10$, $n_1 = 10$, $n_2 = 20$).

While both Figs. 1 and 2 show similar relations between the groups over test trials, running speed did not yield the same significance of results as did starting speed. Mann-Whitney U tests did not show running speeds between the LRA-1 group and the controls to be significantly different on any trial; running speed approached border-line significance on test trial 2 ($U = 57.5$, $p < .10$, $n_1 = 10$, $n_2 = 20$). On the other hand, group LRA-2 had significantly slower running speeds on test trial 1 ($U = 50.5$, $p < .05$, $n_1 = 10$, $n_2 = 20$). The running speed of LRA-2 did not differ significantly from the controls on the later test trials.

Thus the LRA treatment in the context of the prior learning situation, the regular GB, facilitated the recovery of the instrumental response in extinction. The LRA treatment in the context of a novel learning situation, the novel GB, briefly depressed the recovery of the instrumental response in extinction. Seward, Jones, & Summers (1960) found a similarly transitory negative transfer effect although their test trials were acquisition trials on unextinguished Ss. This latter study also found a difference in the sensitivity of the speed measures but all the significant differences involved running speed rather than starting speed. On the other hand, Denny & Ratner (1959) used starting speed exclusively in their analysis of latent extinction, hypothesizing that running speed would not be as sensitive a measure due to con-

Fig. 2. Median running speed in reciprocal seconds for each group on the three extinction test trials following latent reacquisition procedures.

tamination by goal box cues.

From the data presented here, it can be seen that both speed measures tell similar stories, but with a differential sensitivity. Running speed was apparently more sensitive to the brief negative effects of LRA in a novel context while starting speed was apparently more sensitive to the more durable positive effects of LRA in the prior learning context.

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