Near-goal punishment of avoidance running¹

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A fixed-distance punishment near the goal box increased resistance to extinction of avoidance running.

In a recent study, Campbell, Smith, & Misanin (1966) found that avoidance-trained rats given a fixed-duration punishment immediately outside the goal box exhibited less resistance to extinction of running than nonpunished control rats. Their results contrast with studies in which a fixed-distance punishment near the goal has increased resistance to extinction for escape-trained Ss (e.g., Brown, Martin, & Morrow, 1964; Brown, Anderson, & Weiss, 1965). The difference may relate to: (1) fixed-duration vs. fixed-distance punishment; (2) escape vs. avoidance training; (3) other variables. In the last category, two aspects of the Campbell et al study deserve attention. The first is their procedure of interchanging start and goal boxes. Though the rat runs in only one direction, he shuttles between two identical end boxes. The box to which the S runs may be aversive enough that the addition of punishment in its locale is sufficient to induce extinction. The second feature relates to the fact that their punishment was a 150-msec shock which the rat encountered 8 in. outside the goal box. If the S runs this distance in less than 150 msec, he will be punished inside the goal box as well as outside.

In the present study, resistance to extinction of avoidance-trained rats punished for a fixed distance outside a distinctive goal box was compared with that of nonpunished control Ss.

Method

The apparatus has been described in detail by Brown, Martin, & Morrow (1964). It consists of a duplex start box, a 6-ft alley, and a large black goal box. The start box and alley are gray. The rat is placed in the top half of the start box from which, after a few seconds, he is dropped onto the grid floor of the lower half. Running time is printed for 2-ft segments as S runs to the goal box. Starting times were not recorded.

The Ss were handled for two days and both trained and tested on the third day. Avoidance training was conducted in the full alley with a 3-sec avoidance interval to a criterion of three consecutive avoidances. The shock which came on 3 sec after the animal's drop was 55 V ac given through 10K resistance. There was no warning signal. The rat was permitted to remain in the goal box for 40 sec following a run. The intertrial interval was 70-80 sec. During extinction testing a 55-V shock was present for the experimental Ss in the 1-ft segment immediately outside the goal box. Control Ss had no shock during

extinction. The extinction criterion was 60 sec without entering the goal box. A 0.1 ft/sec score was assigned to extinguished Ss. An arbitrary limit of 100 extinction trials was imposed.

For a time during the conduct of the study it appeared that there might be no overlap in the resistance to extinction of experimental and control Ss. Testing was continued until overlap appeared. Five Ss were discarded during avoidance training. One was injured, one shorted the shock out on the first trial without reaching the goal box, and three failed to learn. Two experimental Ss were discarded during extinction. In one case, the E had to terminate running the S after 39 extinction trials in order to attend class. In the other case, there was a lengthy equipment breakdown after the rat had completed 15 trials. There were 15 control and 13 experimental Ss in the analysis. Assignment to conditions was randomized. The Ss were female hooded rats 80-95 days old when trained.

Results

The two groups were comparable in performance during the avoidance learning phase. Taking the median performance, the first avoidance appeared on the fourth trial, the third consecutive avoidance occurred on the ninth trial, and five shocks were received before meeting the criterion.

The median trial on which the extinction criterion was met was 11 for the nonpunished controls and 81 for the punished Ss. The means were 15.6 and 65.6. Only two control Ss completed more than 26 trials and only two experimental Ss ran less than 41 trials. Statistical evaluation is unnecessary with such gross differences. It is worth noting that the two control Ss showing the most resistance to extinction (43 and 49 trials) had been the slowest to learn (19 and 37 trials) and had received the most shocks (14 and 26). On the other hand, there was nothing remarkable about the training records of the least-resistant punished Ss, both of whom extinguished on Trial 10.

Figure 1 shows the speed in the first 4 ft of the alley for the three criterial trials (left) and the first 10 extinction trials (right). This is a shock-free performance measure for both groups. Mean speeds on criterial avoidance trials and the first extinction trial (experimental Ss did not encounter punishment until after traversing this part of the alley) were similar for the two groups. Thereafter, speed increased for the punished Ss from 4 to 5 ft/sec and decreased for control Ss from 4 to 1.5 ft/sec.

Discussion

This study shows that resistance to extinction can

Fig. 1. Mean running speed in the shock-free portion of the alley during avoidance criterion trials (left) and the first 10 extinction trials (right) for punished and nonpunished rats.

be heightened by near-goal punishment following avoidance training. This requires an explanation as much as the reduced resistance to extinction demonstrated by Campbell et al does. There are a number of differences between the two studies besides those mentioned earlier. Two should be noted. First, their rats took longer to learn and received more shocks. This may have increased resistance to extinction of non-punished Ss. Second, their rats were trained with a 5-sec avoidance interval, an interval which probably leads to slower avoidance running. The rat running

slowly into a punishment zone may be more likely to backtrack and meet an extinction criterion.

The increment in running speed during extinction for punished Ss agrees with the speculation that self-punitive running is learned during extinction (Beecroft & Bouska, 1967). The major difference is that the avoidance-trained Ss were running faster at the outset of extinction than the escape-trained animals, so speed did not increase as much. The source of reinforcement for faster running with fixed-distance punishment may be the reduction in punishment duration that faster running produces. Running faster does not alter a fixed-duration punishment except to get the animal to it sooner.

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Note

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