near the end of acquisition and on nearly all trials in the early portion of extinction. This finding suggests that, as a result of pretraining and the initial acquisition trials, two response tendencies—approach to the lever and approach to the foodcup—became highly dominant over all other response tendencies. Thus, when lever-approach (highest in the response hierarchy early in acquisition) was weakened by nonreinforcement (on 0-pellet trials in acquisition and all trials in extinction) or small reward (on 1-pellet trials), the Ss reverted to the response tendency which in early acquisition was second-ranked in the hierarchy (foodcup-approach) and did not select lower-ranked members of the hierarchy until both the first- and second-ranked responses were sufficiently weakened in extinction. It remains an interesting question as to whether more extended acquisition training would reveal an eventual decrement in foodcup approaches on 0-pellet trials prior to extinction or whether within-S factors, such as stimulus generalization, operating in differential conditioning situations, would maintain such behavior at a fairly high level.

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NOTES

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2. Now at Rutgers, The State University, New Brunswick, N.J.
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Avoidable punishment and self-punitive behavior¹

ROBERT S. BEECROFT, *University of North Dakota, Grand Forks, N.D. 58201*, and BONNIE G. FISHER, *University of Iowa, Iowa City, Iowa 52240*

In an effort to increase the proportion of Ss displaying self-punitive running, punishment in the last 2 ft of the runway was made avoidable during extinction if the rat reached the goal box in less than 2 sec. Other Ss were punished on every trial or not punished during extinction following avoidance training. Punished animals exhibited persistent running. Eleven of the 20 punishment-avoidance Ss completed the maximum 100 extinction trials. For these nonextinguishing Ss learning of punishment avoidance was similar to ordinary avoidance learning, whereas extinguishers were markedly inferior in avoidance performance.

In the self-punitive behavior experiment which preceded this one, 10 of the 60 punished rats completed the maximum 100 extinction trials (Beecroft, Fisher, & Bouska, 1967, Experiment 3). Since non-punished controls with comparable training extinguish in 10-15 trials, on the average, the rat completing the 100th trial has put on a pretty good show. The animal has kept the E engaged for 2 h and has run an eighth of a mile in short sprints. In the present experiment we sought to increase the proportion of Ss running all the way.

Although self-punitive behavior is basically the phenomenon of increased resistance to extinction of punished behavior (cf. Brown, in press, for a thorough discussion of the literature), it has been observed that running speed increases during punished extinction (Melvin & Smith, 1967; Beecroft & Bouska, 1967a; Beecroft, 1967; Beecroft & Brown, 1967). If there is a positive relationship between running speed and resistance to extinction, as seems likely, then any manipulation which increases running speed for the average S should also increase the persistence of the running response. With a fixed-distance punishment zone (e.g., last 2 ft of the alley), running faster shortens punishment duration and, putatively, the reduction in punishment duration differentially reinforces fast running. If the rat by running very fast could avoid punishment, at least on some trials, then greater resistance to extinction might accompany the increased running speed.

This experiment compared avoidable punishment with punishment on every trial and no punishment. Punishment was made avoidable by delaying the electrification of the punishment zone for 2 sec from the start of the trial. Under this scheme, fast runs go unpunished and runs only slightly slower than the cutoff shrink the punishment zone.

METHOD

The runway consisted of a duplex start box, a 6-ft alley, and a large black goal box (cf. Brown, Martin, & Morrow, 1964, for details). The Ss were handled for 2 days and both trained and tested on the third day. The rat was trained to one avoidance with a 3-sec interval. On the next trial extinction testing began and continued until S failed to enter the goal box within 60 sec or completed 100 trials. For Condition NP there was no punishment during extinction. In the P condition the last 2 ft of the alley were electrified on all extinction trials. In the AP (avoidable punishment) condition onset of the shock in the punishment zone was delayed 2 sec from the start of the trial. The 2-sec value was a nominal one; electronically timed records showed the punishment avoidance interval was 1915 msec. An animal in the AP condition entering the goal box within 1915 msec avoided shock. Training and punishment shock intensity was 55-V ac through 10K resistance. Goal box detention was 30 sec, the intertrial interval was approximately 60 sec, and there was no warning signal. The Ss were 60 female hooded rats 87-102 days old. Twenty were randomly assigned to each condition. Two additional animals were discarded. One extinguished on the first trial before encountering the punishment contingency and the other animal was found to be ill before training.

RESULTS

Figure 1 shows the familiar self-punitive phenomenon, viz, punished Ss exhibited greater resistance to extinction than nonpunished Ss. The mean number of extinction trials completed was 15.8 for the NP group compared with 67.0 and 67.2 for the P and AP groups. The medians were 9.5 for NP, 69 for P, and 100 for AP. The ogival curves for P and AP conditions cross twice. For 50 or so trials more P Ss continued running. Beyond Trial 54 no AP animal extinguished, while roughly one P rat dropped out in each block of 10 trials. At the end of 100 trials, six of the Ss punished on every trial were still running, while 11 of the AP animals were still on their feet.

Fig. 1. Number of Ss still running after 10-trial blocks in extinction.

Performance in the AP condition can be examined in more detail. For these Ss the transition from the avoidance criterion trial to the first punished extinction trial was a shift from a 3-sec avoidance interval to a 2-sec punishment-avoidance interval. All but one of the 20 AP Ss were punished on the first extinction trial (i.e., running times were greater than 2 sec) and the sole exception was punished on the second trial. For the 11 Ss who ran all the way, the number of punishment avoidances ranged from 52 to 94. The mean was 73.2 avoidances and the median was 78. For these Ss the percentage of punished trials fell from 64% in the first block of 10 extinction trials to a low of 14% in the fourth block, thereafter rising somewhat irregularly to 32% in the last block. Ten of the 11 Ss achieved strings of 10 or more avoidances; the longest avoidance run for the other S was 8. The median picture of performance prior to 10 consecutive punishment avoidances was: first punishment avoidance on the 5th trial, last shock on the 17th or 18th trial, four reversals, and nine shocks preceding the 10-avoidance run. The learning of punishment avoidance was quite similar to ordinary avoidance learning (cf. Beecroft & Bouska, 1967b, for comparable data).

Nine of the AP rats extinguished. They made from 0 to 26 avoidances, with a mean of 10.4 and a median of 5. One S had a string of 10 avoidances and another had a run of 9. The extinguishers did exhibit an increase in both running speed and the number of avoidances prior to extinction, although they ran more slowly than the Ss who did not extinguish. Thus, speed increments occurred during punished extinction even

for the subgroup which extinguished. However, it must be emphasized that their punishment avoidance performance was notably inferior to that of nonextinguishing Ss.

Finally, it is worth noting that the resistance to extinction in the P condition was greater than in the comparable punishment condition of the preceding experiment (Beecroft, Fisher, & Bouska, 1967, Experiment 3), whereas the performance of nonpunished Ss in the two experiments was almost identical. The only difference in the P conditions was the increase in the punishment zone from 1 to 2 ft in this experiment.

DISCUSSION

The original purpose of increasing the proportion of Ss completing 100 trials was achieved insofar as a (bare) majority of the Ss in the AP condition ran all the way. Despite the perfect persistence of the median animal in this condition, there were signs of a performance regression (sometimes called backsliding or avoidance decrement) in that the number of trials in which running times were greater than 2 sec was increasing and avoidance runs were becoming shorter. This trend appeared in most individual records. E-assigned punishment percentages ranging from 20 to 100% have been found to be more or less equally effective in promoting and maintaining self-punitive running (Beecroft, Fisher, & Bouska, 1967, Experiments 2 and 3; Bender & Melvin, 1967; Martin & Moon, 1968). The present data indicate that after the first 20 extinction trials running was sustained by punishment on less than 20% of the trials for six of the AP rats.

The difference between avoidance training and punishment avoidance should be explicated. From a procedural standpoint they differ only after the interval expires if the S has not reached the goal box. At the end of the avoidance interval the entire alley (including start box) is electrified; at the expiration of the punishment avoidance interval only the punishment zone is electrified. So far as we know only the avoidance procedure is effective in establishing the behavior of running to the goal box whereas both procedures will maintain running. If the punishment zone is contiguous with the goal box and the rat is running goalward within the zone whenever shock onset occurs, it is impossible for the animal to form a discrimination between avoidance and punishment avoidance training. Thus, for Ss who penetrate the punishment zone, punishment avoidance and avoidance are functionally equivalent. Nevertheless, punishment avoidance is more than avoidance training continued in extinction, because entry into the punishment zone is contingent upon running. As long as the rat remains in the start box or part of the alley which is not in the punishment zone, no shock is given.

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NOTE

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