Effects of changes in shock intensity following extensive training in the discriminated avoidance paradigm

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Two groups of rats (N = 10) were given 300 trials of avoidance training on 5 consecutive days with either .4 or 1.2 mA electric current. Half of the rats received 5 additional days of identical training, while the other half were trained with the opposite shock intensity. Animals trained with .4 mA learned reliably faster than those using 1.2 mA. Those Ss switched from high to low shock exhibited an immeidate increase in performance, and the opposite switch produced a decrease. No reliable elation or depression effects were obtained.

Several studies (e.g., Crespi, 1942; Zeaman, 1949) have shown that performance in instrumental appetitive conditioning was directly related to the magnitude of reward contingent upon the response. Further, these studies have indicated that shifts in the amount of reinforcement (e.g., food, water) led to rapid and positively correlated changes in performance.

When aversive rather than appetitive stimuli are used, the results are not so clear. Bower, Fowler, & Trapold (1959), for example, examined shifts in the amount of shock reduction in escape training and obtained the appropriate changes, but without finding reliable elation or depression effects. Woods (1967) also used an escape paradigm with water temperature as the aversive stimulus, and observed performance changes in the expected directions as well as a significant depression effect.

The purpose of the present study was to investigate the effects of changes in shock intensity in the discriminated avoidance paradigm. This seemed particularly germane, since the earlier studies all used escape conditioning.

METHOD

Subjects

The Ss were 20 naive male albino rats that weighed 275-325 g at the time of testing. They were housed individually and maintained on ad lib food and water throughout the entire experiment.

Apparatus

A standard BRS-Foringer double-lever rat test chamber was used with the appropriate electromechanical modules to automate data collection. The test chamber was placed in a sound-attenuated room separate from the programming equipment.

Procedure

Phase I consisted of giving Ss 5 days of discriminated escape-avoidance training with either low (.4 mA) or high (1.2 mA) electric current for 300 trials per day in a randomized blocks design. Ten Ss were trained with each intensity. A leverpress during the 10-sec light/buzzer compound warning signal terminated the signal and prevented the shock from occurring; or, if not avoided, the same response simultaneously terminated both signal and the shock.

Phase II consisted of randomly switching half of the Ss in each group to the intensity of the other group while maintaining the other half at their original level; the switch occurred after 1,500 trials to help insure asymptotic performance in Phase I. Then all Ss were given 5 additional days of training at 300 trials per day. All trials were presented on a VI 120-sec schedule.

RESULTS AND DISCUSSION

The data for the present study have been displayed as mean percentage of anticipatory responses by days in Fig. 1, where an anticipatory response was defined as one occurring before the shock was presented. A mixed analysis of variance performed on the first 5 days yielded a reliable shock effect ($F = 22.79$, $df = 1,18$, $p < .01$). That 1.2 mA generates inferior performance when compared with .4-mA shock was obvious from the data. The analysis also produced a significant days effect ($F = 20.83$, $df = 4,72$, $p < .01$) indicative of the daily improvement by both groups. The Days by Shock interaction was also reliable ($F = 4.94$, $df = 4,72$, $p < .01$), suggesting that improvement was differential over days. After breaking each day of 300 trials into six blocks of 50 trials, the blocks effect was significant ($F = 5.18$, $df = 5,90$, $p < .01$). This finding was indicative of a warm-up effect on each day's trials and was in line with earlier data (e.g., Hoffman, Flesher, & Chorny, 1961).

A similar analysis run on the last 5 days yielded a

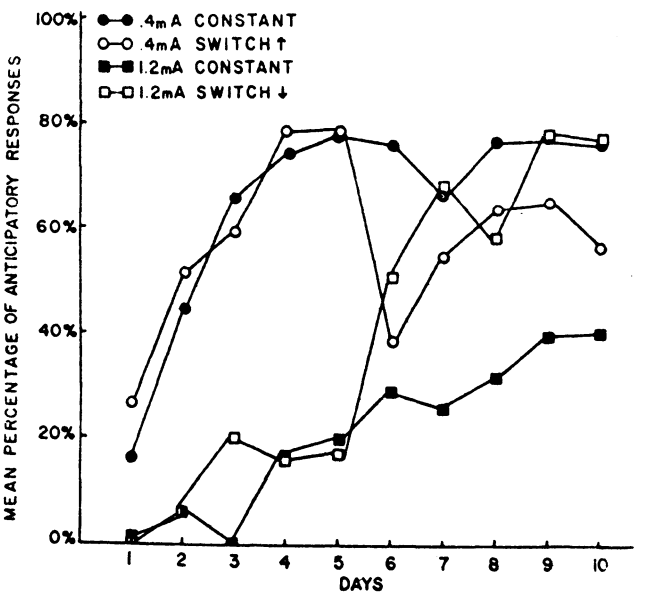

Fig. 1. Mean percentage of anticipatory responses over days for rats (N = 5 per group) for .4-mA constant and switched and for 1.2-mA constant and switched conditions.

reliable days effect ($F = 3.50$, $df = 4,72$, $p < .01$), which appeared due primarily to the improvement in the two groups that were switched. No other findings were significant. An examination of Fig. 1, however, shows a decrease from 80% avoidances to 40% avoidances by Ss switched from low to high shock intensity, suggesting that high shock intensity interferes with performance even on well-practiced responses (i.e., after 1,500 trials of training). Animals switched from high to low shock intensity displayed an immediate improvement, jumping from 18% avoidance on Day 5 to 52% avoidances on Day 6. Such results are analogous to findings in escape learning (Bower, Fowler, & Trapold, 1959) and instrumental appetitive conditioning (Crespi, 1942).

A final observation was that .4-mA Ss reached asymptote by Day 4 and sustained that level of performance for the duration of the experiment. This level replicates the finding by Olson, Davenport, & Kamichoff (1971). The 1.2-mA Ss, however, were performing at only the 40% level by Day 10, but were still improving. It was expected that, given sufficient trials, they would also approach or exceed the 80% asymptote achieved by the .4-mA Ss, a level apparently indicative of maximum performance with the present parameters.

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