Performance to varied reward following continuous reward training in the runway*

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Depressed runway performance of rats to varied large and small reward following consistent high-incentive training was found. Ss shifted to varied reward displayed a depression effect following both large- and small-reward trials, a finding particularly nonsupportive of Capaldi's stimulus aftereffect theory and supportive of Amsel's frustration theory.

Depressed performance to small reward following high-incentive training is a reliable finding, occurring with several parameters of preshift reward (cf. Black, 1968). More recently, postshift reward conditions have received attention in an attempt to relate the depression effect to other literature (e.g., extinction) employing reward shifts in simple instrumental conditioning (Gonzales & Bitterman, 1969). The present study provides further information on the generality of the depression effect with respect to postshift reward by employing a previously neglected postshift incentive value, varied large and small reward. Theoretically, depressed postshift performance following a shift from continuous to varied reward is expected by several interpretations of reward shift effects (e.g., Amsel, 1958; Capaldi, 1967).

According to Amsel's (1958) conditioned frustration theory, Ss shifted from continuous large magnitude of reward to varied large and small magnitude of reward should run more slowly during postshift training than a control group maintained on varied large and small magnitude of reward. The experimental Ss should show depressed postshift speeds as a consequence of conditioned interfering responses elicited by frustration stimuli, which, in turn, result from the small magnitude of reward experienced following preshift training. Control Ss, however, should have learned to run in the presence of frustration cues (rf-sf) that result from repeated experience with large and small magnitude of reward during the preshift period.

Capaldi's (1967) stimulus aftereffect theory would also predict a "depression" effect in the present study. According to Capaldi (1967), the reward magnitude received on any trial provides magnitude-specific stimuli present when the organism responds on the next trial. Ss shifted from consistent large magnitude of reward to varied large and small magnitude of reward should run more slowly than control Ss, because the novel aftereffect of the new reward for experimental Ss has not had as much habit strength accrued to it as has the small-reward aftereffect present for control Ss.

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METHOD

The Ss were 20 experimentally naive male albino rats, approximately 90 days old at the beginning of the experiment and bred at West Virginia Wesleyan College.

The runway apparatus was essentially the same as that employed by Ludvigson & Gay (1966), except that only one of the multiple parallel alleys was used. The alley comprised a 33.02-cm white startbox, a 66.04-cm white run section, and a 33.48-cm white goalbox. The inner width and height of each section of the runway was 7.62 cm. Photocell and clock circuitry provided independent traversal times over the first 20.32-cm segment (start time), the second 30.48-cm segment (run time), and the third 20.32-cm segment (goal time) of the alley. The apparatus above contained a solenoid-operated opaque guillotine-type retrace door, separating goal from alley sections, and an opaque Plexiglas ceiling.

All Ss were given preliminary training, which consisted of exploration of the alley, 14 days on a 23-h food-deprivation schedule, and 1 g of 45-mg Noyes pellets, identical to the subsequent reinforcement pellets, being incorporated into Ss' daily food ration. During experimental training, all Ss were deprived of food for 23 h and received 60 preshift and 30 postshift trials at the rate of 2 trials/day. The experimental group (C-V) received constant large reward (16 pellets) during preshift training and varied large and small (1 pellet) reward during postshift training, whereas the control group (V-V) received varied large and small reward throughout the study. A varied reinforcement schedule, which allowed large and small reward to be counterbalanced over 4 days, was employed.

Trials were administered to two squads of 10 Ss each, consisting of five Ss per group. The running order of Ss within a squad was randomized from day to day. The intertrial interval was approximately 7 min.

RESULTS AND DISCUSSION

As the pattern of results did not differ across measures, only reciprocated run times are reported. Group mean speeds as a function of blocks of six trials are presented in Fig. 1. As may be seen, terminal acquisition performance (Block A) did not differ, and continuous and varied reward produced comparable levels of performance. These preshift data are inconsistent with previous reports of faster or of slower speeds for varied relative to continuous reward, being consistent only with the similar observation that the relative performance levels for percentage of reward, in simple instrumental conditioning, also presently defy description (McHose, 1970).

Looking at the postshift period, the shift from continuous to varied reward (Group C-V) resulted in speeds slower than those for the condition maintained on varied reward (Group V-V). As may be seen in Fig. 1, this difference occurred early in the postshift period, and, following the point of maximal depression at

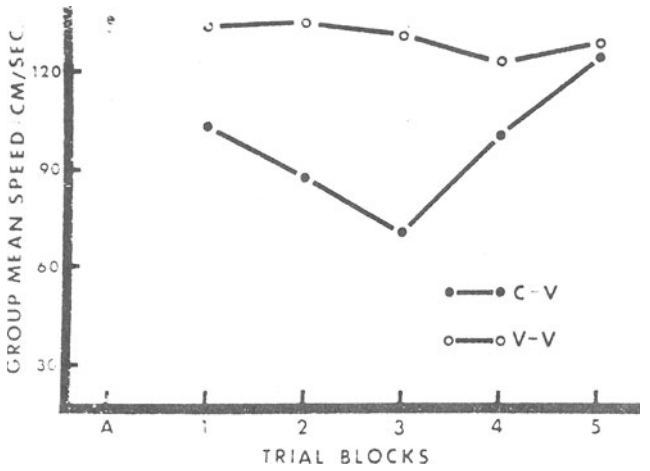

Fig. 1. Group mean run speeds as a function of trial blocks.

Block 3, dissipated by Block 5. Analysis of variance, including preshift reward and blocks (1-2 vs 4-5) as factors, yielded significant preshift reward and Preshift Reward by Blocks effects, $F = 19.85$, $df = 1/18$, $p < .01$, and $F = 6.13$, $df = 1/18$, $p < .05$, respectively. A comparison (t test) of Groups C-V and V-V over Blocks 4-5 was not significant. These analyses support the conclusion that a depression effect occurred for Group C-V and that this effect was markedly attenuated at the end of the preshift period.

As can be seen in Fig. 2, a significant "depression" effect occurred and dissipated following both small reward (S1) and large reward (S16). Analyses of variance, including preshift reward and blocks (1 vs 3) as factors for the S1 data, yielded significant preshift reward and Preshift Reward by Blocks effects, $F = 23.21$, $df = 1/18$, $p < .01$, and $F = 7.23$, $df = 1/18$, $p < .05$, respectively. The analyses of the S16 data also yielded significant preshift reward and Preshift Reward by Blocks effects, $F = 20.83$, $df = 1/18$, $p < .01$, and $F = 6.54$, $df = 1/18$, $p < .05$, respectively.

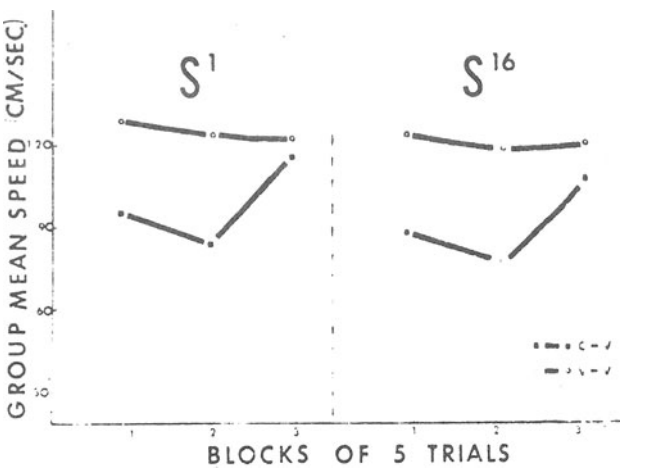

Fig. 2. Group mean run speeds as a function of trial blocks following small-reward trials (left frame) and large-reward trials (right frame).

The finding of depressed speeds early in the postshift period following a shift to varied reward is analogous to previous findings with shifts to small or nonreward (Gonzales & Bitterman, 1969) and is consistent with contemporary interpretations of the effects attending changes in reward. Thus, these data seem to be consistent with the notions of frustration-produced disruptions in performance (Amsel, 1958) and with the view that the depression effect is produced by a stimulus generalization decrement (Capaldi, 1967). However, the present findings that a "depression" effect occurred following both large- and small-reward trials is particularly nonsupportive of Capaldi's stimulus aftereffect theory, which would predict a "depression" effect following small-reward trials only (S1), since habit strength for experimental Ss has accrued only to the stimulus present following large-reward trials (S16). This finding of a pervasive "depression" effect is supportive of frustration theory, since the alley cues should elicit frustration-interfering responses regardless of the immediately preceding reward. In essence, the present "depression" effect is best explained by Amsel's frustration theory. It should be mentioned that Calef (1972) also found evidence that the "depression" effect is a frustration phenomenon rather than a result of a stimulus generalization decrement.

To conclude, Amsel's frustration theory also easily incorporates the absence of a "depression" effect following both large- and small-reward trials late in the postshift period. In other words, experimental Ss should learn to run in the presence of frustration cues (rf-sf) late in the postshift period, resulting in the attenuation of the "depression" effect.

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