The effects of incentive shift as a function of training¹

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Abstract

Five groups of rats were trained and extinguished in an 11 ft runway. Either 0, 10, 20, 30, or 40 trials were given with 1 Noyes pellet followed by the remainder of 40 trials with 10 pellets. The increase in response speed following the incentive shift was positively related to the number of 1-pellet trials. Speed during extinction was monotonic with terminal acquisition speed.

Problem

Speed of response in the straight alley during extinction has been found to be nonmonotonically related to the extent of training when a broad range of acquisition trials is used (Ison, 1962; Clifford, 1964). Birch (1961) has attributed this result to the combined effects of goal anticipation and frustration. Theois & Brelsford (1964) account for the finding by hypothesizing that extinction is a positive function of the number of responses but a negative function of the strength of goal anticipation. Under conditions where the total number of trials is held constant increasing strength of goal anticipation is expected to result in nonmonotonicity according to the former position and a monotonic negative relation according to the latter. The present experiment was designed to gain information on this point. The design also allows an evaluation of the change in response speed resulting from an increase in goal magnitude as a function of the number of preshift trials.

Method

Seventy-five male hooded rats, about 90 days old at the beginning of training, were assigned equally to five groups. Three Ss, all from different groups, were eliminated because of illness. A 22-hr. food maintenance schedule was employed throughout the experiment with water always available. Each S was given one trial per day under 22-hr. food deprivation with the order of running randomized across Ss from day to day. Following a run S was returned to his individual home cage where he waited for a minimum of 30 min. before being fed for 1 hr.

A straight runway, 4 in wide by 6 in high by 11 ft long, was constructed to be maximally homogeneous. The 1-ft starting section was designed without a door by using two wooden blocks so attached that S had to go under the first and over the second. S's start and running responses were timed by an arrangement of capacitance operated switches wherein S activated the timing device by stepping on copper plates, one of which was hidden under the start section and the other under the runway floor 4 ft down the alley.

Five groups, labeled G (0-40), G (10-30), G (20-20), G (30-10) and G (40-0), all received 40 rewarded trials down the runway. The groups are identified by the number of initial trials rewarded with 1 Noyes pellet and the number of subsequent trials rewarded with 10 pellets. For example, G (0-40) received 10 pellets on all 40 trials, G (10-30) received the first 10 trials with 1 pellet reward and the last 30 with 10 pellets, etc. Following acquisition Ss were extinguished for 40 trials, also at one trial per day.

Results

Mean start speed (reciprocal of starting latency) for all five groups during acquisition and extinction is shown in Fig. 1. It may be noted that (1) G (0-40), G (10-30), G (20-20) and G (30-10) are similar in terminal acquisition speed and different from G (40-0), (2) G (30-10) increases in speed fastest following the incentive shift, G (20-20) next fastest and G (10-30) least fast, and (3) the order of the groups in terms of start speeds in extinction tends to be the same as their order at the end of acquisition.

Simple analysis of variance of start speeds on the last block of acquisition trials showed the five groups significantly different (F , 2.86; df , 4/67; p < .05). The changes in the start response calculated from the means of the five trials before and after the incentive shift for G (10-30), G (20-20) and G (30-10) were evaluated with reciprocal latency and log latency transformations. Simple analysis of variance showed significant differences among the groups for both measures (F , 4.03; p < .05 for reciprocals; and F , 3.85; df , 2/41; p < .05 for logs).

Start speed in extinction was analyzed over trials 2 to 26 since Fig. 1 indicated the groups had converged at this point. Analysis of variance showed a significant Groups $\times$ Trial Blocks interaction (F , 1.72, df , 16/268; p < .05) but a nonsignificant Groups main effect.

Discussion

Extinction results showed start speed to be directly related to terminal acquisition speed. This outcome does not agree with the monotonic negative relation expected from the hypothesis of Theois and Brelsford (1964). On the other hand the nonmonotonic function called for by Birch (1961) was not obtained either though it is possible that the present data represent the initial rising portion of that function.

Acquisition results suggest a new finding in that the effect of shifting from 1 to 10 pellets incentive appears to depend on the number of 1-pellet trials preceding

Fig. 1. Mean reciprocal starting latency during acquisition and extinction.

the shift. Ss given 30 1-pellet trials increased their start speed faster when shifted to 10 pellets than those given 20 who in turn increased their speed faster than those given 10. Interpretation of this finding is facilitated by consideration of both the reciprocal and log latency analyses (Birch, 1961).

The results from the reciprocal latency analysis can be accommodated under the commonly made assumptions that (1) start speed is linearly related to the product of multiplying the effect of the number of trials by the effect of the goal magnitude, (2) start speed is a negatively accelerated function of the number of trials and (3) the effect of the goal magnitude is constant over trials. On the other hand, the same set of assumptions in conjunction with the log latency measure yields a contradiction with the data. One interesting possibility raised by this finding is that the effect of the magnitude of the goal on start speed does not remain constant over trials. It might be, for example, that the organism is more responsive to a change in goal magnitude, whether upward or downward, the greater the amount of training he has received prior to the change. This hypothesis

would assist in the explanation of both the present data where differential increases in start speed were found to occur and the extended training extinction effect where differential decreases in response speed have been reported.

References

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