Instrumental and consummatory behavior as a function of length of reward-period

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Abstract

Three experiments are described in which rats were trained to run a straight alley, the reinforcement being 10 or 30 sec. access to wet mash. In each study, Ss trained with 10 sec. reward ran faster than 30 sec. Ss. In the second and third studies, in which food consumption during the reward-period was recorded, the 10 sec. Ss were found to eat, as well as run, faster than the 30 sec. group. Possible interpretations of these data are indicated.

Problem

Experiment 1 was designed for purposes unrelated to the present report. The results of that experiment, however, suggested that under some circumstances a nominally "small reward" may act as a more effective incentive than a "larger" reward. The subsequent investigations were conducted to determine the reproducibility of these initial results and to provide a basis for interpreting them.

Method

In Experiment 1, 18 male, hooded rats, about 130 days old, were trained to run a 3 ft straight alley for food reward. The Ss were maintained on a diet of 8 gm of standard laboratory chow and ad lib. water for 10 days before and throughout training. Four trials were given daily for 12 days with an intertrial interval of about 8 min. For half the Ss, reinforcement on each trial was 30 sec. access to a caster in the goal box filled with wet mash, while for the other group the reward-period was 10 sec. Running speed was recorded electronically on each trial over the second 6 in of the alley. Experiment 2 constituted a replication of Experiment 1 with the exceptions that the Ss were 16 female, hooded rats, approximately 120 days old at the beginning of training and the amount of food eaten by each S was measured on the last three days of training. Experiment 3 was a replication of Experiment 2 except that the amount eaten during the reward-period was recorded for each S throughout the experiment and the groups consisted of five female Ss each.

Results

Figure 1, representing acquisition running speeds for the combined experiments (i.e., 22 Ss per group), indicates that, at least over the final five days of training, the "small reward" (10 sec.) group run faster than the "large reward" (30 sec.) group. This superiority of the 10 sec. Ss was observed in each experiment and was statistically reliable over Days 7-11 for the combined data, $F(1,43) = 5.11$; $p < .05$.

Fig. 1. Running speed as a function of daily blocks of four trials.

Figure 2 indicates "average rate of eating" in Experiment 3 (i.e., gms of food consumed per trial divided by the length of the reward-period). It is apparent that while average eating rates were initially equivalent for the two groups, the 10 sec. Ss came to subsequently eat at a substantially faster rate than the 30 sec. Ss. A similar effect was also observed on the last three days of the second experiment and in both cases the difference in eating rate on those days was statistically reliable, $t(14) = 3.16$; $p < .01$ in the second, and $t(8) = 3.72$; $p < .01$ in the third experiment. Nevertheless, although

Fig. 2. Average eating rate as a function of daily blocks of four trials.

Ss in the 10 sec. group showed a higher average rate of eating, Ss in the 30 sec. group consumed more food per trial (.31 gm vs. .20 gm per trial on Days 9-11).

Discussion

The primary results of the present experiments were that Ss trained with a 10 sec. reward-period appeared to perform both the consummatory $R(R_G)$ and the instrumental $R(R_I)$ more vigorously than Ss trained with a longer (30 sec.) reward-period. With respect to R_G , however, it is uncertain whether it was the actual rate of eating—while eating—or merely the consistency of eating which was greater in the 10 sec. group. Observations of Ss' behavior in the goal box, however, strongly suggested that consistency of eating was at least one of the factors involved, since Ss in the 10 sec. group appeared to spend a much smaller percentage of their reward-period in nonconsummatory behavior than the 30 sec. Ss.

A possible interpretation of the fact that Ss in the 10 sec. group ate more vigorously or consistently is that with long reward-periods, nonconsummatory Rs in the goal box will have a relatively high probability of being reinforced (i.e., followed by an opportunity for further eating). With a shorter reward-period, there is increased probability that a nonconsummatory R will "terminate" the trial and, hence, not be reinforced. Thus, the acquisition of differential degrees of consistency of eating may indicate the extent to which nonconsummatory Rs have extinguished. If it is further assumed that such nonconsummatory Rs may generalize from the goal box to the runway and compete with R_I , then this interpretation would also account for the faster running of the 10 sec. Ss. On the other hand, if it is assumed that the "vigor" of R_G was greater for the 10 sec. Ss than in the 30 sec. group, then the present

results would also follow from Spence's (1956) interpretation of "incentive motivation" based on the strength of conditioned, implicit consummatory behavior (r_g-s_g) and a related analysis of primary and secondary reinforcement suggested by Black (1964).

The finding that rats run faster to nominally "small rewards" than to "larger" ones is, of course, contrary to the result consistently reported in the psychological literature. It should be noted, however, that the present study employed both an atypical method of varying reward magnitude (eating-time rather than food-quantity) and a rather atypical maintenance procedure (fixed-quantity of food rather than fixed-hours of deprivation). It is possible that Ss maintained on a fixed-eating-time schedule learn to eat rapidly or consistently as a consequence of that schedule, with the result that no rate-of-eating difference develops between short and long reward-period groups. A fixed-food-quantity schedule, however, might not be expected to produce such rapid or consistent eating behavior and, hence, different reward-periods would have the opportunity to result in different eating rates. The present finding may, thus, depend upon the interaction of the specific maintenance procedures employed and the method of varying "reward magnitude." In any event, research currently being conducted by the writers suggests the preliminary conclusion that the strength of both R_I and R_G are decreasing functions of the length of reward-period over a range of from 5 to 60 sec.

References

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