Magnitude of G_2 reward and the frustration effect in a between-subjects design

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An investigation failed to indicate that differential second task reward magnitude was a salient determinant of the frustration effect (FE). However, the influence of variations of second task reward magnitudes on second task speed measures was observed.

Numerous studies generated by Amsel's theory of frustrative nonreward (1962) have indicated that after several trials of receiving reward for running to the goal boxes (G_1 , G_2) of two consecutive alleys (A_1 , A_2), rats run faster in A_2 following G_1 nonreward than following G_1 reward. This increase in speed following G_1 nonreward has been termed the "frustration effect" (FE). Generally, studies have concentrated on manipulating the incentive conditions in G_1 that subsequently determine the strength of FE. However, the possible role that G_2 incentive conditions may have on demonstrations of FE has been ignored. Thus, the purpose of the present study was to explore whether variations in G_2 reward magnitude affect FE.

At least three theoretical notions can be offered for the possible effects of G_2 reward magnitude on FE: (1) According to a "ceiling effect" hypothesis, demonstrations of FE might be more difficult if G_2 incentives are increased. Large G_2 incentives might produce sufficiently high A_2 running speeds such that further increments in speed following G_1 nonreward would not be possible.

(2) According to a "competing approach tendencies" hypothesis, demonstrations of FE might be more difficult if the magnitude of G_1 reward is small relative to G_2 rewards. It can be assumed that variations in the relative magnitudes of reward presented in G_1 and G_2 alter the strengths of competing approach-tendency tendencies toward G_1 and G_2 . The findings of McHose & Ludvigson (1965), and trends in the data of Peckham & Amsel (1964) and Krippner, Endsley, & Tacker (1967) that A_2 speed measures are depressed by increasing amounts of G_1 rewards, could be interpreted as reflecting stronger tendencies of Ss under large G_1 reward to return to or stay in G_1 instead of approaching G_2 (Krippner et al, 1967). A competing tendencies hypothesis could also help explain the failure of McHose and Ludvigson, and Barrett, Peyser, & McHose (1965) to demonstrate FE following incomplete G_1 reward reduction. Briefly, it is possible that Ss in these two studies did not show the FE following nonzero reduction in G_1 as compared with control group Ss because of stronger

competing tendencies in the former Ss to remain in or return to G_1 . This result would be expected since the Ss receiving reward reduction were accustomed to relatively larger G_1 rewards than G_2 rewards in comparison with control Ss.

(3) According to an "incentive-summation" hypothesis, demonstrations of FE might be enhanced as the size of G_2 reward is increased. According to the characteristics customarily accorded the hypothetical anticipatory goal response (r_r) and its attendant stimulus (s_r), the anticipatory goal responses elicited in G_2 (r_{r2}) should eventually be aroused in the beginning portions of A_2 . If it can be further assumed that $R_{r1}-s_{r1}$ elicited in G_1 carry over into A_2 (Bower, 1962), then conditioning of $S_{r1}-r_{r2}$ would be expected. Granted these assumptions, A_1 would eventually come to elicit both r_{r1} and r_{r2} ($A_1-r_{r1}-s_{r1}-r_{r2}$). Therefore, it would be predicted that increasing G_2 reward magnitude would amplify FE because of summated approach tendencies present in A_1 preceding G_1 nonreward.

Method

The Ss were 18 experimentally naive, male Long-Evans hooded rats ranging in age from 100-110 days at the start of the experiment. The apparatus was an L-shaped double runway with a startbox (S_1), alley (A_1), and goalbox (G_1) comprising the first runway and an alley (A_2) and goalbox (G_2) comprising the second runway.

At the start of the experiment, the 18 Ss were randomly assigned to three groups, 5-1, 5-5, and 5-10. The group numbers represented the respective number of 45 mg Noyes pellets Ss would receive in G_1 and in G_2 on any rewarded trial. After 10 days of handling and familiarization with the apparatus, Ss were given 72 acquisition trials followed by 72 test trials. The Ss were given four trials a day during acquisition and testing phases. On each trial during acquisition and testing, measures of start time and running time were taken in A_2 . The procedure for test trials was identical with that on acquisition trials except that nonreward was introduced in G_1 on half of the test trials. During each block of four test trials, all groups received G_1 reward (R) or nonreward (N) trials according to the following repeating sequence: RNRN/RNNR/NRNR/NRRN.

Additional details regarding the apparatus, maintenance schedule, and pretraining, acquisition, and testing procedures may be found in Krippner et al (1967).

Fig. 1. Mean A_2 starting speeds as a function of trial blocks.

Results and Discussion

The start and running time data were reciprocalized and treated as start and running speeds. Performance of the start speeds of Groups 5-1, 5-5, and 5-10 is shown in Fig. 1.

A two factor analysis of variance with repeated measures on one factor was performed on the acquisition start speed data. The analysis yielded a significant Groups effect ($F=8.8$, $df=2/15$, $p<.01$), Trial Blocks effect ($F=28.7$, $df=2/30$, $p<.01$), and Groups by Trials interaction ($F=4.21$, $df=4/30$, $p<.01$). Inspection of Fig. 1 indicates that the Groups effect was due to a positive relationship between amount of G_2 reward and A_2 starting speed, while the Groups by Trials interaction was reflected in increasing differences among Groups 5-10, 5-5, and 5-1 over successive trials. The increasing divergence among groups over trials reflected the positive relationship between running speed and magnitude of reward.

A three factor analysis of variance with repeated measures on two factors was performed on the test trial starting speeds, with Groups, Reward Conditions (reward-nonreward) and Trial Blocks as the main effects. Just preceding the test trials, one S from Group 5-5 died due to a respiratory illness. Therefore, the mean raw score for each trial of the five remaining Ss in Group 5-5 was assigned to the

deceased S, and one degree of freedom was subtracted from the total and from the error sums of squares in order to correct for the missing data. The analysis yielded significant effects of Trial Blocks ($F=4.1$, $df=2/28$, $p<.05$). Reward Conditions ($F=190.9$, $df=1/14$, $p<.001$), and the Reward Conditions by Trial Blocks interaction ($F=4.5$, $df=2/28$, $p<.05$). None of the other effects was significant.

Inspection of Fig. 1 indicated that the significant Reward Conditions effect reflected the appearance of FE in each group. However, as reflected in the nonsignificant Reward Conditions by Groups interaction, there is no evidence in Fig. 1 that variations in G_2 magnitude differentially affected the demonstration of FE.

Analysis of variance of the acquisition and test running speed data produced significant effects identical to those found in the start speed analysis with one exception. The Groups by Trials interaction was not significant in the acquisition running data.

On the basis of the present results it must be concluded that while increases in G_2 reward magnitudes generally increase start and running speeds both following G_1 reward and nonreward, there is no evidence to support any of the hypotheses regarding the role of G_2 reward magnitude on demonstrations of FE.

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Note

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