A preliminary investigation of the effects of sodium amytal, prior reward in G_1 , and activity level on the FE¹

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Twenty-four Ss received partial (50%) and 12 Ss (controls) received no reward in the first goal box of a double alley apparatus during a series of test trials. Injections of sodium amytal and saline placebo were given on alternate 2-day blocks. Experimental Ss displayed "frustration effects" (FEs) which were unaffected by the drug or by two other experimental variables. However, comparisons with the control Ss revealed that the FEs did not result from frustration (R_f). Thus this study illustrates the danger in utilizing the FE as an index of R_f .

Several studies may be interpreted as indicating that sodium amytal (SA) reduces conditioned frustration (r_f), the hypothetical response which, it is assumed, comes to be elicited by cues antedating the occurrence of a frustrative event. Therefore, it seems plausible that this drug might also reduce primary frustration (R_f), the unconditioned emotional response assumed to result from and directly follow the occurrence of a frustrative event. The present study attempted to test this possibility using the double runway commonly employed in studying R_f (Amsel, 1958). Two additional problems were explored: (a) the implication of frustration theory that prior reward in the first goal chamber (G_1) is necessary for the rapid appearance of R_f , and (b) the relationship between performance in the double runway and the amount of activity displayed in an unfamiliar alley prior to the experiment.

The study found that none of the three factors (drug, prior reward, activity level) appeared to affect the magnitude of the commonly-used index of R_f , the frustration effect or FE (Amsel, 1958). However, when evaluated against appropriate controls the FEs did not appear to result from R_f , even under placebo conditions. Therefore, with regard to R_f the results are indeterminate. This investigation, then, is further documentation of the danger of an uncritical acceptance of the FE as a measure of R_f .

Method

The Ss were 36 naive, female, albino rats, 79 days old when placed on a 10 gm/day food regimen on Day 1 of the study. The apparatus was an L-shaped double runway, 3 in. wide x 3-5/8 in. high, consisting of a 1-ft. start box (SB), a 5-ft. alley (A_1), a 1-ft. goal box (G_1), a second, 9-1/2-ft. alley (A_2), and a second, 1-ft. goal box (G_2). Light was provided by a string of 7-W lamps, 7-1/2 in. from center to center, suspended 3 ft. above the apparatus. The light was diffused by a sky of mat acetate lo-

cated 2 ft. above the apparatus. The SB, A_1 , and G_1 segments were differentiated from A_2 and G_2 by reducing the voltage across the lamps of the former to 40 V and eliminating ambient light with opaque curtains. The data of principal interest were A_2 speeds (ft./sec.) based on (1) the time between the opening of the door into A_2 and S's breaking a photobeam 6 in. into A_2 (start speed), and (2) the time taken by S in traversing the next 7-1/2 ft. of A_2 (run speed).

There were three basic groups of Ss designated according to the percent of the trials on which reward was given in G_1 in (1) the 64 acquisition trials, and (2) the 48 test trials. Thus Group 100-50 received reward on all of the acquisition and half of the test trials. All Ss received reward in G_2 on all trials. A reward was three 45-mg food pellets. The Ss received an intra-peritoneal injection of either SA or saline placebo (P) approximately 10 min. before the first of four daily trials. An S received a repeated cycle of one of the drugs for two consecutive days, followed by the other drug for two days. Half of each group began the cycle with SA and half with P on Day 20 on which training began. These subgroups were further split into high and low activity groups based on the amount of activity displayed in a different alley (no reward present) on Day 13. The dosage of SA was 2 ml/kg of a 10 mg/ml saline

Fig. 1. The effect of sodium amytal on A_2 start speed averaged across the factors of prior reward and activity level.

Fig. 2. The effect of sodium amytal on A_2 run speed averaged across the factors of prior reward and activity level.

solution. The repeated schedule of partial reward was RNRN, NRNR, NRRN, RNNR, NNRR, RRNN, where R and N indicate reward and nonreward, respectively. In initiating a trial, the SB start door was opened after S maintained an orientation toward it for 3 sec. Three sec. of orientation were also required after S entered G_1 (and after the pellets were consumed on R trials) before the door leading to A_2 was raised. The intertrial interval within a day was approximately 3 min.

Results and Discussion

In Figs. 1 and 2 are presented the mean A_2 start and run speeds under SA and P following reward (R) and nonreward (N) in G_1 during the test trials. Data for Group 100-50 and the control group (Group 0-0) are presented in the top panels, while data for Group 0-50 and the control are presented in the lower panels. Apparent FEs (positive N-R differences) for Groups 100-50 and 0-50 are shaded. It should be noted that since Group 0-0 never received reward in G_1 the "N" vs. "R" factor simply categorizes this group's trials according to the reward condition received by Ss in Groups 100-50 and 0-50.

Analyses of variance indicated significant FEs both in start and run measures ($p < .001$). Moreover, as expected, since N vs. R was a "dummy" variable for Group 0-0, the Groups by FE effect was also significant ($p < .005$ and $.001$ for start and run speeds, respectively). However, the presence of an FE does not, ipso facto, establish the presence of R_f , since part or all of the FE could result from an "absolute" effect of G_1 reward

magnitude (Hamm, 1967; Ludvigson & McHose, 1967; McHose & Ludvigson, 1965). The effect of R_f is more directly indicated by an elevation of the performance of the experimental groups over the control Ss on N trials. Such observed elevations are designated "EFs" in Figs. 1 and 2 following the terminology of Hamm (1967). Analyses of variance indicated that these EFs were not significant. Analyzing N trials only, the Group effect did not approach significance in either measure, nor did the Group by Drug effect. Even a comparison of the start speeds of Groups 100-50 and 0-0 singly yielded an $F < 1$. Therefore there was no evidence that the conditions of this study resulted in any detectable R_f , and thus the effects of the independent variables on R_f cannot be determined. Results such as these under conditions apparently suitable for the appearance of R_f raise the question of the extent to which frustration has been involved, if at all, in the many runway FE studies which have not controlled absolute effects as well as in certain recent demonstrations of "frustration effects" in lever-pressing tasks (Davenport & Thompson, 1965; Davenport et al, 1966; Staddon & Innis, 1966).

As for the effect of the three independent variables on the FE there appeared to be none, and the analyses suggested none. Sodium amytal did, however, markedly depress the overall level of performance ($p < .001$).

Finally, performance was superior on the second day on a given drug ($p < .001$), especially early in the test phase ($p < .001$). This effect probably represents a type of generalization decrement and subsequent recovery resulting from the change in drug state every other day.

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