FRUSTRATION REDUCTION OR FRUSTRATION ELICITATION AS A REINFORCING STATE OF AFFAIRS

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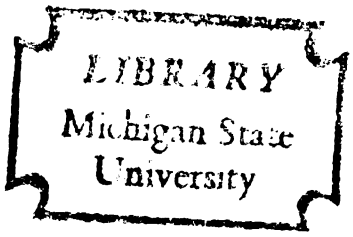

ABSTRACT

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By Barbara K. Sutey

Frustrative nonreward as an active stimulus condition is defined as the behavioral consequence following nonreward, given previous reinforcement in this same situation. Two opposing views on the role of frustration have been examined. One model hypothesizes that cues of the nonrewarded situation take on drive properties, and the removal of these cues is reinforcing in a drive reduction manner. This frustration reduction can mediate new learning. The other model and the one guiding this thesis does not accept the frustration reduction hypothesis. Rather, it views frustration as an active elicitor of specific behaviors, and any response consistently elicited in the frustrating situation will be conditioned to any stimulus paired with the frustration. This study was an attempt to test these two models.

Seventy-two Sprague-Dawley rats were randomly assigned to one of 6 conditions, frustration food, frustration reduction, frustration elicitation, control food, control frustration reduction and control frustration elicitation. For the frustration groups the CS, a mild buzzer, was conditioned to either frustration reduction

or to frustration and a consistently elicited left turn. During test trials in the T-maze the frustration food group learned the correct right turn for food reinforcement. Frustration reduction Ss learned this same response for the CS associated with frustration reduction. The frustration elicitation Ss received the CS that was paired with frustration at the choice point to elicit the left turn, and they could receive food for either turn. The CS was presented to the control groups an equal number of times during training, and they ran during testing for the same reinforcement as their comparable frustration groups.

The frustration reduction group did not differ significantly from the control frustration reduction group. This result tended to support the hypothesis that there is no reinforcement from frustration reduction. The frustration food group did significantly better ($t = 2.82$, $p = .02$) than frustration reduction group which also supports this hypothesis. Frustration elicitation tended to perform better than both frustration reduction group and the control frustration elicitation, but the differences were not significant. Thus, the results only tended to support the position of this thesis, namely, that a response consistently elicited by frustration will continue to be elicited in a new situation by the CS paired to frustration.

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By

Barbara K. Sutey

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INTRODUCTION

The role or nonreward frustration as a generalized drive state has been proposed by Amsel (1954, 1958, 1962). In addition, Amsel, a drive reductionist, suggests that frustration reduction is a reinforcing state (Amsel and Ward, 1954; Amsel, 1958; Amsel and Prouty, 1959; Amsel, 1962). The empirical evidence for the reinforcing properties of frustration reduction, however, is meager. Frustration reduction studies have been confounded with the presentation of primary reinforcement or are open to interpretations other than frustration reduction. This study will attempt to overcome these difficulties and to identify the reinforcing properties of frustration.

The present conceptualization of frustration is narrow. In this restricted view of frustration, the antecedent conditions are nonreward following prior reward in a particular situation. The behavioral consequents are changes in the responses elicited in the previously rewarded situation. Frustration refers to the response changes following nonreward.

Amsel's treatment of frustration is a similarly restricted set of generalizations. In summary, these are:

1. Frustration is defined only with respect to nonrewarded trials interspersed with, or following, rewarded trials.
2. Given frustration trials, an anticipatory frustration reaction is conditioned to the environmental situations or specific stimuli in the environment.
3. This anticipatory frustration response affects overt response strength in three ways, by increasing overall drive strength, that is by motivating immediately subsequent behavior; by serving as a drive stimulus whose reduction may be reinforcing, and to which other responses may be conditioned; by inhibiting overt behavior (Lawson, 1965).

Amsel's analysis is a modified Hullian model in which it is assumed that learned goal oriented responses depend to some extent on classically conditioned implicit responses. Typically, the implicit responses are learned counterparts of the responses elicited by the goal event and are designated fractional anticipatory goal reactions; for frustration these are fractional anticipatory frustration responses (r_f) (Amsel, 1958). Amsel further states that frustration is a primary aversive motivational condition,

ascribing active drive properties to frustrative nonreward. From his conceptualization of frustration as an aversive condition, he deducts that the stimulus component of the fractional anticipatory frustration reaction (s_f) would give rise to responses antagonistic to the original goal oriented response tendencies (Amsel, 1958). Working from this model, Amsel (1962) cited experimentation which demonstrate the motivating effect of frustrative nonreward. Such results presumably support the notion of frustration reduction as reinforcement, as well as describe the inhibitory effects of frustration. The main concern here is with studies supposedly supporting the frustration reduction as reinforcement hypothesis.

The Amsel and Ward (1954) study was cited as the first study which demonstrated the reinforcing properties of frustration reduction. The pretraining apparatus consisted of a double straight alley, two alleys in succession. Each alley had a black goal box, and all Ss during initial training were reinforced in both goal boxes. The first straight alley then served as the stem of a T-maze in which the rat learned a discrimination task based on the reinforcement cues and nonreinforcement cues of the stem. On half the trials reinforcement was available in the goal box at the end of the stem; on the other half of the trials all Ss were not reinforced. Amsel and Ward's hypothesis was that selective learning could develop on the basis of the differential reward vs. nonreward cues, namely, the rat would

learn to go one way after nonreward and the other way after reward. Also it was hypothesized that responses followed by frustration reduction (removal of cues associated with nonreward) would tend to be fixated. After reinforcement in the first goal box, a response toward the white arm and white goal box produced further reinforcement; a response toward the black side was not rewarded. When S was non-reinforced in the first goal box, the reverse conditions existed; a response toward black was reinforced, and a response toward white was not reinforced. All Ss learned this discrimination. Namely, by the end of training all Ss made a response to black following non-reinforcement and a response to white following reinforcement. Early in T-maze training many more responses (fixation) were made to the black side than to the white. Amsel and Ward interpreted the preference for black, since it followed nonreward, as having been reinforced by frustration reduction as well as having been reinforced by food (Amsel and Ward, 1954). This result is open to another interpretation. The primary reinforcer was always available and black goal box had strong approach value as a secondary reinforcer from prior straight alley training. As discrimination learning proceeded fixation for the black side disappeared.

Amsel and Prouty (1959) attempted to correct these above difficulties by introducing a group which was never reinforced in the first straight alley goal box, and by having both T-maze goal boxes black for both groups and,

thus, different from the white boxes of both straight alleys. All alleys were grey. The new group, since it had never been reinforced in the first goal box, should, according to Amsel and Prouty, exhibit no early fixation due to frustration reduction. The fixation should occur only after several discrimination trials, i.e., after they had been intermittently reinforced in the first goal box. However, this group did not show this expected fixation. Further, the frustration reduction group did not significantly fixate to the frustration reduction side early in training, as a similar group did in the earlier study (Amsel and Prouty, 1959).

Wagner's study (1963) is often cited as further evidence for the frustration reduction hypothesis. This study is credited with demonstrating that cues may be conditioned to frustration and themselves take on drive properties. The removal or termination of the cue then constitutes drive reduction reinforcement (Amsel, 1962). Wagner paired a CS with nonreward for several trials. Following this Ss were run in a hurdle box; crossing led to termination of the CS. The group responded with decreasing latency for cessation of CS (Wagner, 1963). A frustration reduction hypothesis is not necessary to explain these data. Earlier, the CS had been paired with frustration-elicited responses and was applied in the test sessions until similar escape-type responses occurred. That is, according to Denny and

Adelman (1955), frustration consistently elicits a response. Thus, the Wagner results may be explained as due to pairing a consistently elicited response by frustration with a neutral stimulus (CS). This latter interpretation is described in more detail below.

Nonreward does serve an active stimulus function. That is, frustrative nonreward is an eliciting stimulus for responses. "Once a behavioral sequence has been established to some degree, and the response no longer leads to the goal object . . . then there exists a condition for the elicitation of a new class of characteristic responses" (Denny and Adelman, 1955). The nonreward frustration is a consistent elicitor of responses, and because it is a consistent elicitor of behavior it acts like a reinforcer so that responses emitted in the frustration situation will be learned. It should be pointed out, that reinforcement according to this view, does not mean strengthening of a closely preceding response, but rather reinforcement occurs, in the frustration situation, as in any situation, simultaneously with the eliciting of the response. In the frustration situation the characteristic response emitted, and thus reinforced, is a recoil or escape-type response. Since omission of a goal object consistently elicits escape-type responses, and since the elicitation of these responses constitutes an instance of reinforcement, the cues associated with nonreward acquire the property to elicit avoidance.

This view can explain in a fairly simple manner the results of the frustration and frustration reduction studies. The increased performance in the double straight alley is simply a summation of two consistently elicited responses. A strong approach response toward the second alley and second goal box occurs. Given nonreward in the first goal box, a second response, namely, an escape response is elicited. The summation of these responses is reflected in the increased running time in the second alley. As mentioned above, the frustration reduction explanation of early fixation following nonreward in the T-maze is quite readily explained by the strong approach elicited during pretraining in the runway. When the elicited approach was eliminated the fixation disappeared. Likewise, Wagner's results can be interpreted in an elicitation framework. This interpretation was given above.

While it appears that the most typical response to frustration is an escape response, the response does not necessarily have to be an escape. The elicitation position would, in fact, have to allow that any response consistently elicited in the frustration situation could be learned. This is the case; any type of response emitted may be learned. Two studies are relevant to this point.

Adelman and Maatsch (1955) demonstrated that the type of response elicited by nonreward in extinction did not necessarily interfere or compete with the previously learned

response. After training in a runway, the Ss were divided into three extinction groups. One group was allowed to recoil from the empty goal box; one group could jump out of the goal box; and the final group ran standard extinction, i.e., short confinement in the goal area. The reasoning was that a response tendency interfering with the original response if highly incompatible would produce rapid extinction. If the response were not incompatible, extinction would proceed slowly. The results supported these ideas. The jump-out group, the compatible response group, recoil, extinguished in the fewest trials. The confined group extinguished in an intermediate time (Adelman and Maatsch, 1955). This study implies that any response consistently elicited by frustration may be learned; in other words, the response elicited by frustration need not be compatible with a previously learned response.

Adelman and Maatsch's results, though predicted from a frustration elicitation framework, have generally been interpreted as providing support for a frustration reduction model. Presumably the jumping out response removes the cues of the frustration situation, and, thus, this response is reinforced by frustration reduction. Such an interpretation, however, is questionable on several grounds. The evidence for learning being mediated by frustration reduction is meager at best (Amsel and Ward, 1954; Amsel and Prouty, 1959; Wagner, 1963): such evidence is based upon a summation of food or water reinforcement and the

hypothesized frustration reduction, and/or can also be interpreted in terms of frustration elicitation. Even though there was no food reward available in the Adelman and Maatsch study, after S made the jump-out response, this learned response, which appeared to be elicited by frustration, was a strong enduring one. In fact, the directly elicited jump-out response was learned significantly faster than the same jump-out response which was reinforced in a control group in the traditional manner, namely, through finding food (wet mash) on the ledge that the animal jumped to (Adelman and Maatsch, 1956).

In this study, three groups were taught the jump-out response by different methods. In one group the jump was elicited by frustration. In another, the jump was reinforced by food. The third group only jumped to explore the ledge around the top of the box. The exploration group did not learn. Likewise, learning by the food group was slow, whereas acquisition of the response elicited by frustration was rapid. That the frustration elicited jump-out response was learned faster than the food reinforced response makes good sense in the frustration elicitation framework because the response did not have to chain back to the inside of the "goal" box in the jump-out group; it was elicited there, but the jump-out response would have to chain back in the food reinforced group. From a drive reduction view food reinforcement would be as good if not

better than the more tenuous process of frustration reduction. Thus, given the Adelman and Maatsch results, the present position favors the frustration elicitation hypothesis.

PROBLEM

If frustration reduction is reinforcing, then a neutral stimulus paired with frustration reduction should take on secondary reinforcing properties. If Amsel is correct that removal from the frustration situation constitutes frustration reduction, then pairing a stimulus CS) with entrance into the frustration reduction situation should become a secondary reinforcer, that is, a secondary reinforcer not because it was paired with food but because it was paired with frustration reduction. In a new learning situation this stimulus, should, if frustration reduction is a reinforcing state of affairs, mediate new learning. On the other hand, a neutral stimulus paired with the occurrence of frustration should become conditioned to responses consistently elicited by the frustration situation. Thus, such a stimulus could also mediate learning if presented just prior to the opportunity to respond. Using the CS during the test trials eliminates the necessity for presenting a primary reinforcer which could confound the results.

This study attempted to test the above models. Two groups, experimental and control, each containing three subgroups, will be used to explore the predictions of each model. All experimental subjects will be exposed to

frustration by receiving pretraining consisting of early food reinforced trials followed by nonreward. Two groups will receive the neutral stimulus paired with frustration reduction. During test trials, one group will run for primary reinforcement. The reason for exposing the food group to frustration and the CS is to see if this pretraining has any unexpected effect on performance in a typical learning situation. In addition, the performance of the food group can serve as a standard against which to judge the performance of the frustration reduction group which during the test trials runs the maze for the CS, the conditioned reinforcer for frustration reduction. The third experimental group will be the frustration elicitation group. For this group the CS will be paired with frustration and a consistently elicited response. During testing, the CS can be presented prior to the opportunity to respond, and should elicit the characteristic response. To provide a test for both models the frustration elicitation group can be compared with both the frustration food group and the frustration reduction group. Since the frustration elicitation group and the frustration reduction group are performing for a conditioned reinforcer, it is critical to examine the responses emitted early in training, i.e., before CS-US extinction occurs. It is expected that the frustration reduction group will show no learning, performance will never differ significantly from chance. The frustration elicitation Ss will differ from chance only

early in training when the CS has eliciting value. The food group will show standard increase in performance over all trials.

Because all the experimental Ss are exposed to frustration during pretraining it would seem necessary to have one control group which did not experience frustration for each of the experimental groups. The control groups would be exposed to the same procedure. The only difference would be that during pretraining these Ss would receive no food and, thus, no frustration. The CS could not assume reinforcing properties for these groups. The effects of frustration and frustration reduction could easily be assessed by comparing experimental and control groups. The food group should not differ from the control food group. The frustration reduction group could perform better than its control if it were in fact performing for a conditioned reinforcer. As mentioned above, it seems doubtful that this will be the case. Likewise, the frustration elicitation group could perform, emit the characteristic response, more than its control, and it is expected to do so. Again, performance early in training for the groups performing for a CS is more critical than overall performance.

METHOD

Subjects

Seventy-two Sprague-Dawley rats of the Department of Psychology at Michigan State University served as subjects. The 23 males and 49 females ranged in age from 90 to 150 days. These Ss had previously been subjects for one day only in a simple avoidance study.

Each S was randomly assigned to one of 6 conditions; each group of 12 Ss contained 8 females and 4 males.

Apparatus

A T-maze with 2 sets of arms constituted the apparatus. The measurements of the various parts were as follows: Start box, 9 inches; Stem, 18 inches; Choice point, 3 inches; Arms, 18 inches; Goal boxes, 12 inches. The start box was painted a neutral grey. The stem and the goal boxes were unpainted. In one set of arms both arms were 1 inch diagonal black and white stripes. In the discriminative set one arm was white and one was black.

Procedure

Deprivation and Habituation

Fourteen days before the first day of pretraining all Ss were placed on a food deprivation schedule of one hour

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EAST LANSING, MICHIGAN

free feeding per day, and were later run at approximately this time of day. During this 2-week period E handles all Ss once a day. On the last day of this time period, each S was allowed to explore the stem of the maze for 15 minutes. A food cup full of food was available for the frustration animals only. Introduction to the maze was done to allow Ss to habituate to the novel environment.

Running Order

Ss were trained and tested in groups of six. Frustration and control conditions were run separately. All 6 Ss would be run in succession, giving a constant ITI of 10 minutes for pretraining, frustration and test trials. When not running Ss rested in a holding cage in a soundproof chamber.

Pretraining

Only the stem of the maze was used in this phase of the experiment. The door leading into the choice point area was always closed. The food cup for the frustration group was located in the corner of the stem near the choice point door. The food cup was never in the stem for the control group.

Each S ran 6 trials per day for 7 days, or a total of 42 pretraining trials.

Frustration Group.--This group included Ss in the frustration food, frustration reduction, and frustration

elicitation groups. All Ss in this group ran the straight alley for 4 pellets of standard .45g. food pellets of reinforcement.

Control Group.--This group included control food, control frustration reduction and control frustration elicitation groups. The control Ss received no reward but were allowed to explore the stem for 15 sec., the approximate time it took for the frustration Ss to traverse the alley and eat the reinforcement.

Frustration Trials

In addition to the stem, the striped arms of the T-maze were used during these trials. The door at the choice point, and the door at the beginning of each arm could be raised or lowered as dictated by the procedure given below. The doors to the goal boxes were always open during this phase of the experiment.

This procedure lasted 4 days for a total of 20 frustration or CS-present trials.

Frustration Group.--The first trial of any day was a straight alley (stem) reinforced trial for all frustration Ss. The second trial was a frustration trial; no reinforcement was given. Each frustration trial was followed by a reinforced trial. Running order was a frustration trial for S_1, frustration trial for S_2, reinforced trial for S_1, frustration trial for S_3, reinforced trial for S_2, and so on until all Ss received 5 frustration trials per day.

The last trial on a day was always a reinforced trial. On frustration trials all Ss were confined in the stem for 5 sec.

Frustration Food and Frustration Reduction Conditions: To condition the CS to the frustration reduction, .5 sec. before S was allowed into the striped arms of the T-maze, a mild buzzer sounded. The buzzer terminated when S entered either arm of the maze. S was allowed to explore either arm of the maze for 15 sec. before being replaced in the holding cage. On rewarded trials, these Ss received 4 pellets of food in the stem.

Frustration Elicitation: The CS was conditioned to the frustration in this group by being sounded as S entered the frustration situation. The CS continued for the 5 sec. confinement; .5 sec. before the S was allowed into the T-maze the buzzer terminated, the choice point door raised, and S allowed into the left arm of the maze. Thus, a left turn was consistently elicited by frustration and the buzzer conditioned to this response. On rewarded trials, after receiving the 4 pellets of reinforcement, the choice point door was raised and these Ss allowed to explore the right arm of the maze. This was done to provide these Ss with equal exposure to both sides of the maze.

Control Group.--The first trial of each day was a trial on which each S was allowed 15 sec. exploration in the stem. The second trial corresponded to a frustration trial. On these trials all control Ss were exposed to the CS. The

running order was similar to the order for the frustration group, i.e., a CS trial for S_1, CS trial for S_2, exploration trial for S_1, CS trial for S_3, exploration trial for S_2, until all Ss received 5 CS trials per day. The last trial on a day was always an exploration trial.

Control Food and Control Frustration Reduction: On a CS trial after 5 sec. confinement in the stem, and .5 sec. before S was allowed into the arms of the T-maze, the buzzer sounded. The CS terminated when S entered either arm of the maze. S was allowed to explore either arm of the maze for 15 sec. before being replaced in the holding cage. On the alternate exploration trials, these Ss were allowed 15 sec. exploration in the stem.

Control Frustration Elicitation: On CS trials, the buzzer sounded as S entered the stem. The CS continued for the 5 sec. confinement; .5 sec. before the S was allowed into the T-maze the buzzer terminated, the choice point door raised, and S was allowed into the left arm of the maze. On exploration trials, after 15 sec. in the stem, the choice point door was raised and these Ss allowed to explore the right arm of the maze to give equal exposure to both sides of the maze.

Test Trials

The black and white arms were used for the testing trials. The choice point door and the arm doors were always open. For half the Ss black was on the right and

white on the left. The arms were in the reversed position for the other half of the Ss. The correct response was a position choice so that color was only an additional cue. The food cup was no longer in the stem.

Six test trials per day for 6 days for a total of 36 trials were run.

Frustration Food.--The correct response for this group was a right turn. This response was reinforced with 4 pellets of food in the right goal box. This group served as the group running for primary reinforcement against which the other groups' performances could be evaluated.

Frustration Reduction.--The correct response for this group was also a right turn, and this response was reinforced by sounding the buzzer as the S entered the right goal box. The CS terminated after 5 sec. in the goal box. No food was present in the goal box. If the CS had in fact become a conditioned reinforcer, these Ss should show early learning, then, as CS-US extinction proceeded, performance should fall to chance.

Frustration Elicitation.--Ss received the CS at the choice point and the CS terminated as Ss entered one of the arms. If the CS had assumed eliciting properties of frustration these Ss should respond with the characteristic left turn. In addition, 4 pellets of food was available in both goal boxes. The left turn was the correct response.

Control Food.--Four pellets of food, located in the right goal box, reinforced the correct response. This group's performance could be compared with the frustration-food group's performance to assess whether the frustration trials affected later performance.

Control Frustration Reduction.--CS sounded as Ss entered the right goal box, and it terminated after S had been in the goal box for 5 sec. No food was present. If the CS was a conditioned reinforcer for frustration reduction, then this group, which had never been frustrated should provide a comparison group for the frustration reduction condition.

Control Frustration Elicitation.--The CS was presented at the choice point and terminated as Ss entered one of the arms. A left turn was the correct response. This group was to the frustration elicitation group as the control frustration reduction was to the frustration reduction.

A condensed representation of the entire experimental design is shown in Table 1.

TABLE 1.--Reinforcement, stimuli conditions, number of trials and apparatus used in the experimental design.

Phase of Study and Apparatus	Frustration			Control		
	Food	Frus. red.	Frus. elic.	Food	Frus. red.	Frus. elic.
Pretraining stem	← 4 food pellets →			← 15 sec. exploration in stem → No food		
	← 42 Trials →			← 42 Trials →		
Frustration Stem and striped arms	Rewarded and frustration trials alternate beginning with a rewarded trial each day. 4 food pellets			CS and exploration trials alternate beginning and ending with an exploration trial each day. No food		
	CS on frustration trials paired with frustration reduction.		CS paired with frustration and left turn.	CS presented before entering the striped arms.		CS presented when entering the stem and before left turn.
	On rewarded trials, food given in stem.		On rewarded trials food given in stem and 15 sec. exploration in right arm.	On alternate trials 15 sec. exploration in stem.		On alternate trials, 15 sec. exploration in stem followed by 15 sec. in right arm
	← 20 Frustration Trials →			← 20 CS-Present Trials →		
Test Black and White arms	4 pellets of food in right arm goal box.	CS in right goal box. No food.	CS at choice point 4 pellets food in both goal boxes	4 pellets of food in right goal box.	CS in right goal box. No food.	CS at choice point. 4 pellets food in both goal boxes.
	← 36 Trials →			← 36 Trials →		

RESULTS AND DISCUSSION

Mean number of correct responses during T-maze test trials was the measure of performance. Five Ss were lost or discarded during the experiment; one died and the procedure was modified after 4 had been run. The mean number correct, computed from the remaining Ss, for the six conditions are given in Table 2.

TABLE 2.--Correct responses out of 36 trials for the 6 experimental conditions.

Group	N	Mean	Standard Deviation
Frustration			
Food	11	26.36	5.98
Frustration Reduction	12	18.00	7.96
Frustration Elicitation	10	22.3	11.73
Control			
Food	12	26.16	7.53
Frustration Reduction	12	18.33	6.30
Frustration Elicitation	10	20.7	10.58

The performance across days is depicted in Figure 1.

When comparable frustration and control groups are compared, there are no significant differences between the means. These t-values are given in Table 3.

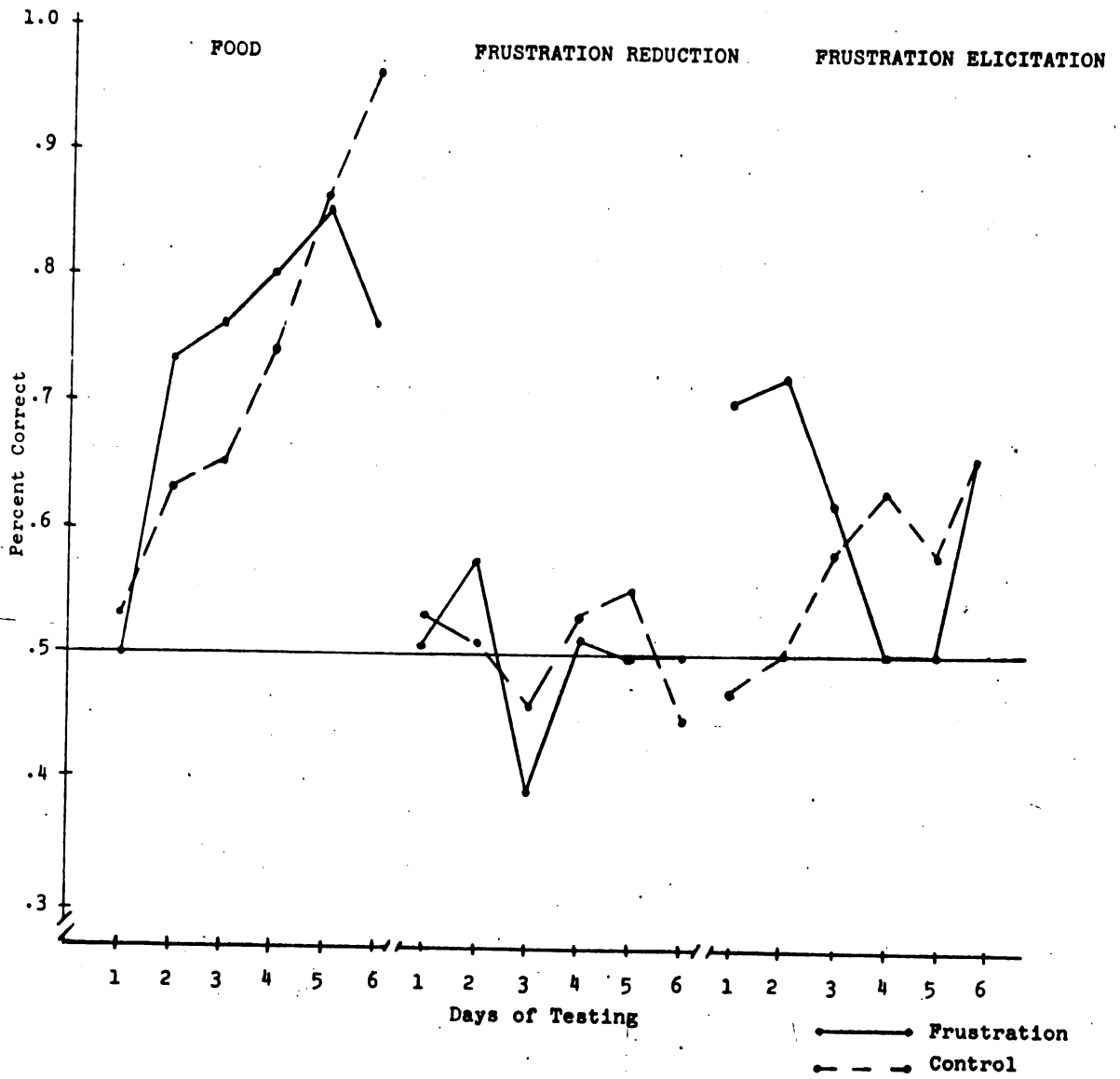

Figure 1.--Performance of frustration and control groups over 6 days of testing.

TABLE 3.--t-values for comparisons between comparable frustration and control groups.

Group	Food	Frus. Red.	Frus. Elic.
Frustration	26.36	18.00	22.3
Control	26.16	18.33	20.7
df	21	22	18
t	.070	.114	.32

The lack of significant difference between the two food groups simply demonstrates that the preliminary food association plus frustration in the stem did not affect performance in the test situation. The lack of significant difference between the frustration reduction group and its control implies that frustration reduction is not a reinforcing state. The lack of difference between the frustration as an eliciting stimulus is not a strong stimulus condition.

On the other hand, the frustration food group performed significantly better than the frustration reduction group ($t=2.82$, $p= .02$). Again, there is no clear support for the frustration reduction hypothesis. One could argue that the frustration reduction group was only performing for a secondary reinforcer and consequently its performance would not be as good as the performance of the food group which was running for primary reinforcement. However, if

Amsel's frustration reduction hypothesis were correct, the frustration reduction group should perform at better than chance. The mean correct, 18.00, is exactly chance. As can be seen in Figure 1, performance of the frustration reduction Ss remained at chance across all 6 days of testing. In summary, there is no support for the frustration reduction hypothesis anywhere in the data.

The frustration elicitation hypothesis can be evaluated by comparing the frustration reduction group with the frustration elicitation group. The difference in means is not significant. Any difference that might be obtained, however, would more likely appear in the first half of the testing trials before the CS has lost its eliciting value. The mean difference between the frustration reduction and frustration elicitation groups for the first three days of testing is not significant ($t = 1.55$, $p > .05$). The trend in the data was in the direction of greater response elicited in the frustration elicitation group. The response to frustration, the left turn response, was initially elicited in the first days of testing. As the CS extinguished the performance of this group drops to chance. This trend is shown in Figure 2.

In Figure 2 there is also a comparison between the frustration elicitation group and its control for the first half of the test trials. Again there is no significant difference ($t = 1.32$, $p > .05$); however, the trend is

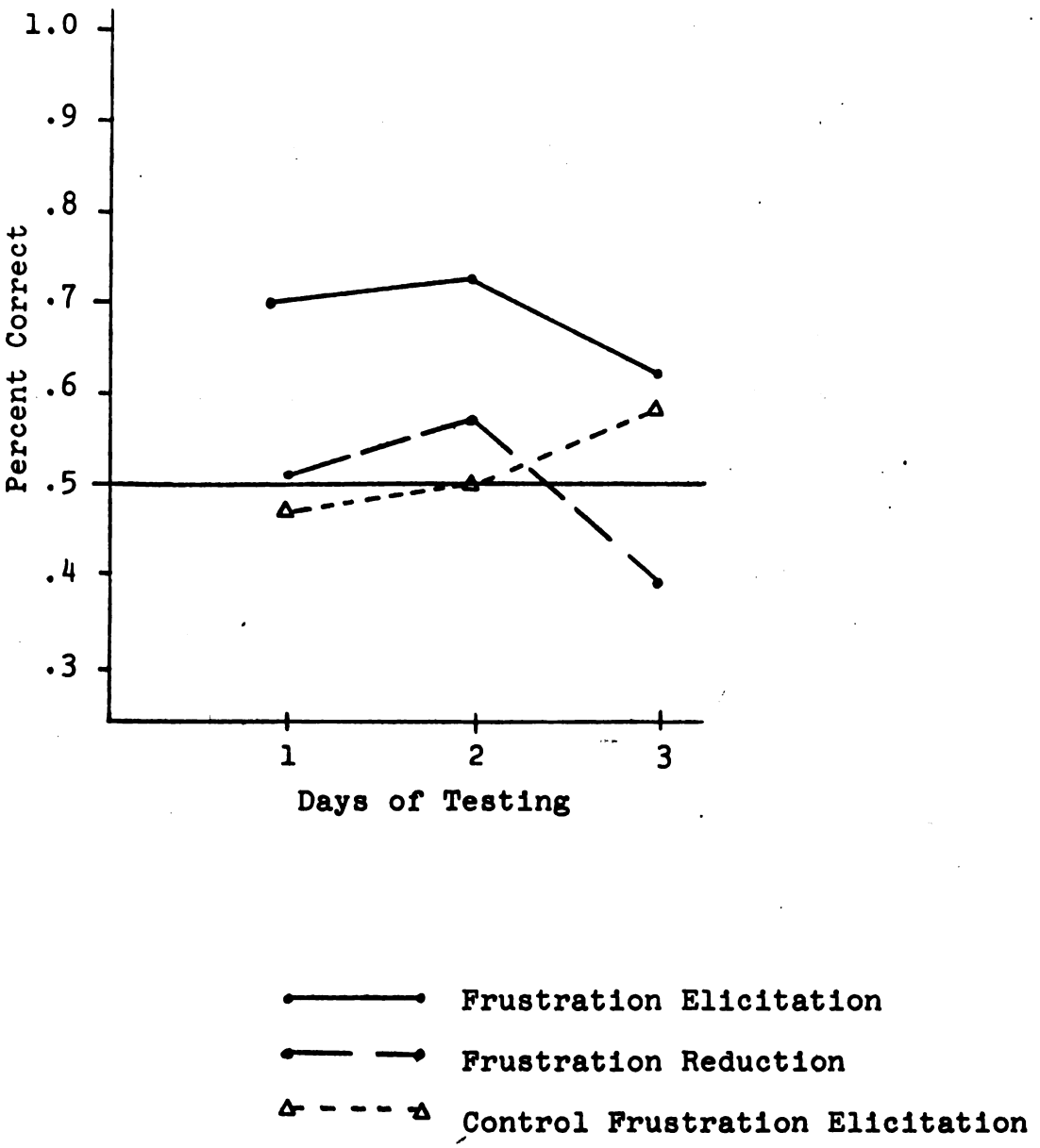

Figure 2.--Frustration reduction, frustration elicitation, and control frustration elicitation on first 3 days of testing.

obvious. The left turn response which had been paired with the CS during the frustration trials was especially evident on the first three days of testing, whereas, the frustration elicitation's control did not differ from chance during this time. That is, the frustration elicitation group performed at a higher level than the control frustration elicitation group during this initial three day period. Presumably as the left turning eliciting properties of the CS extinguished, as it was no longer paired with frustration, the number correct (left turns) decreased to a chance level of performance. This was the expected result. Higher order conditioning, of which this seems to be an example, is always difficult to maintain; so that, while not a strong case for the frustration elicitation hypothesis, the data do tend to support the position of this thesis. Perhaps with a substantially larger N the effect could have been significant.

In summary, the data from this study did not support a frustration reduction model. The group designed to meet Amsel's position that frustration is a generalized drive, that the cues of the frustration situation can take on drive properties, and that the removal of these cues would be reinforcing in a drive reduction manner, never performed above chance level. The frustration food group performed significantly better than the frustration reduction group as further evidence for this point. In support of the position of this paper, the frustration

elicitation group, Ss which learned a response consistently elicited by frustration, in testing tended to make the response that had been elicited by frustration and paired with the buzzer CS. The trend in the data was for this group to be superior to its control and to the frustration reduction group. In short, there is some small support for the notion that frustration does consistently serve as a stimulus and thereby mediate learning. There is no support whatsoever for the hypothesis that frustration reduction is reinforcing in a drive reductionist manner.

Final comments that would be relevant to this thesis are suggestions for improving the study. In this regard, three changes are indicated: (1) giving more reinforcement during pretraining, (2) allowing exploration of the arms of the T-maze during pretraining, and (3) eliminating the food from the goal boxes during testing of the frustration elicitation Ss.

The first suggestion, providing more reinforcement during pretraining, was suggested by observations of the rats' behavior during the frustration trials. It was noted that there was a great deal of variability in the animals' responses to nonreward. Some animals showed no observable reaction to the nonreward, while others could be considered very "active" in their response to the same nonreward, i.e., running back and forth in the stem, clawing and biting at the choice point door, urinating, and defecating. The "passive" animals displayed none of

these reactions. If these response differences are indicators of frustration, then there was a great deal of variability in the experiencing of frustration. This difference could mask any effect of frustration, and frustration reduction, for that matter, on performance. The obvious way to insure reliable frustration would be to increase the amount of reinforcement given during the pretraining trials. More reinforcement would possibly reduce the variability in frustration reaction across Ss.

Somewhat related to this first suggested change is the second modification which would allow Ss on the last six pretraining trials to explore the striped arms of the T-maze. Familiarity with this environment following reward could eliminate the tendency for the Ss not to approach this area on the first few frustration trials. On the first frustration trial, after experiencing the novel nonreward, the animal is faced with another novel environment which it is to approach. As was observed, some animals will not immediately move into the arms. This hesitation certainly would weaken the conditioning of the CS both for the frustration reduction and, particularly, for the frustration elicitation groups. Approach to the arms was established within a few trials, but if it could be consistent even on the first trials, the conditioning of the CS would be stronger, and a stronger effect might be obtained during testing.

The final suggestion for changing the design is to eliminate the food from the goal boxes when testing the frustration elicitation group. In terms of equality of conditions for the frustration reduction and frustration elicitation groups, no food during testing would be advisable.

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APPENDICES

TOTAL NUMBER CORRECT FOR 56 TRIALS FOR ALL 6 CONDITIONS

Ss	Frustration			Control		
Ss	Food	Frus. red.	Frus. elic.	Food	Frus. red.	Frus. elic.
1	9	23	discarded	31	22	discarded
2	died	13	discarded	36	25	discarded
3	26	23	16	29	18	8
4	29	26	7	28	22	13
5	28	29	3	35	25	13
6	28	26	26	32	26	12
7	32	13	35	30	15	15
8	27	2	36	14	15	35
9	26	10	31	24	17	34
10	28	14	19	21	20	34
11	29	21	17	14	8	16
12	28	16	33	20	7	27
TOTAL	290	216	223	314	220	207

TOTAL CORRECT FOR EACH DAY OF TESTING
FOR FRUSTRATION FOOD

	Trials					
Ss	1-6	7-12	13-18	19-20	24-30	31-36
1	2	0	5	0	2	0
2	4	5	4	4	5	4
3	5	5	4	5	5	5
4	4	3	5	5	5	6
5	4	6	4	5	5	4
6	2	6	6	6	6	6
7	2	4	5	5	6	5
8	1	5	4	6	5	5
9	4	5	3	6	5	5
10	3	4	5	6	6	5
11	2	5	5	5	6	5
TOTAL	33	48	50	53	56	50

TOTAL CORRECT FOR EACH DAY OF TESTING
FOR CONTROL FOOD

	Trials					
Ss	1-6	7-12	13-18	19-24	25-30	31-36
1	3	5	6	6	5	6
2	6	6	6	6	6	6
3	4	4	5	5	5	6
4	3	4	4	6	5	6
5	5	6	6	6	6	6
6	5	6	5	5	5	6
7	2	5	5	6	6	6
8	1	0	2	2	5	4
9	2	3	4	5	5	5
10	2	4	2	2	5	6
11	3	1	0	0	4	6
12	2	1	2	4	5	6
TOTAL	38	45	47	53	62	69

TOTAL CORRECT FOR EACH DAY OF TESTING
FOR FRUSTRATION REDUCTION GROUP

	Trials					
Ss	1-6	7-12	13-18	19-24	25-30	31-36
1	5	5	2	2	5	4
2	4	4	1	2	1	1
3	4	4	3	4	3	5
4	5	4	4	4	5	4
5	5	5	6	6	3	4
6	4	5	3	5	4	5
7	3	3	0	1	3	2
8	1	1	0	0	0	0
9	2	3	2	2	3	2
10	2	1	2	2	2	1
11	3	4	2	5	4	3
12	1	2	3	4	3	5
TOTAL	39	41	28	37	36	36

TOTAL CORRECT FOR EACH DAY OF TESTING FOR CONTROL FRUSTRATION REDUCTION

	Trials					
Ss	1-6	7-12	13-18	19-24	25-30	31-36
1	5	5	1	3	4	4
2	4	5	5	5	4	2
3	3	2	2	4	4	3
4	3	3	3	3	6	4
5	5	4	4	4	4	3
6	6	5	4	4	3	4
7	1	3	4	3	3	1
8	2	2	4	3	3	1
9	3	3	2	3	3	3
10	3	4	3	4	3	3
11	1	2	0	1	2	2
12	2	1	1	1	1	1
TOTAL	38	39	33	38	40	31

TOTAL CORRECT FOR EACH DAY OF TESTING
FOR FRUSTRATION ELICITATION

	Trials					
Ss	1-6	7-12	13-18	19-24	25-30	31-36
1	3	3	2	1	3	1
2	1	1	3	0	0	2
3	1	1	0	0	0	1
4	6	6	4	2	4	5
5	5	6	6	6	6	6
6	6	6	6	6	6	6
7	3	5	3	3	2	3
8	5	5	6	6	4	5
9	6	4	1	1	1	4
10	6	6	6	5	4	6
TOTAL	42	43	37	30	30	39

TOTAL CORRECT FOR EACH DAY OF TESTING FOR CONTROL FRUSTRATION ELICITATION

	Trials					
Ss	1-6	7-12	13-18	19-24	25-30	31-36
1	3	0	1	0	3	1
2	2	2	2	4	1	2
3	1	1	2	1	2	4
4	1	2	3	2	2	2
5	1	1	2	6	0	5
6	6	6	6	6	6	5
7	4	6	6	6	6	6
8	4	6	6	6	6	6
9	1	1	3	4	4	3
10	5	5	4	3	5	5
TOTAL	28	30	35	38	35	39