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The effects of pre-frustration discrimination trials on the albino rat's problem-solving ability.

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Maier (1949) has postulated that there are two basic types of behavior, frustrated and motivated, and that these behaviors differ qualitatively. He contends that frustrated behavior may become fixated and can not be modified by subsequent reward and punishment; motivated behavior may be changed by either reward or punishment.

Evidence for this position has been derived largely from experiments with the Lashley jumping-stand. In Maier's procedure, rates are initially forced, by noxious stimuli, to jump from the stand to either of two closed doors. Different symbols (e.g., triangle-circle; dark-bright illumination) are placed on each door, and are randomly alternated between them. On each trial, one door is locked, and one is unlocked. If the S jumps to the unlocked door, it pushes the door open and lands on a platform containing food; if it jumps to the locked door, it bumps against the door and falls into a net. These doors may be locked in a random manner ("frustration" or "insoluble problem" trials), which punishes any consistent response half of the time; or in a consistent manner (learning trials), which allows the S a punishment-avoiding response and food reward. During the frustration trials Ss usually adopt a consistent pattern of responding (stereotyped behavior), and a majority of them (approximately 70-85 percent) continue this response (fixated behavior) during a subsequent discrimination (learning)

problem. Maier has based his theory principally on these results.

Because of the significance that Maier attributes to these jumping-stand experiments, there is a need for additional empirical studies designed to assess how adequately they serve as a basis for his theory. This study was designed to investigate three aspects of problem-solving performance on the Lashley jumping-stand. They are:

a) The effect of discrimination trials before an insoluble problem.

b) The effect of varying the number of these pre-frustration discrimination trials.

c) The effect of one type of discrimination training upon the learning of a subsequent, different discrimination problem.

The effect of discrimination trials before an insoluble problem. Maier and Ellen (1952), working with a group of guided Ss and a group of non-guided Ss, found that Ss which received guidance in a soluble symbol-discrimination problem prior to frustration trials generally learned the soluble problem following the frustration trials. Of more relevance to the present study is the fact that 16 of 45 (35.6 percent) non-guided Ss did not solve the initial soluble problem. With these 16 Ss eliminated, over 60 percent of the non-guided group solved the post-frustration problem.

In contradiction to the above data is the earlier finding

by Maier and Klee (1943) that 19 of 20 Ss initially exposed to a symbol discrimination problem were able to solve it.[1] The differences in these experimental results may be due to differences in the noxious jumping-stand stimuli,[2] in symbols used as the correct response,[3] or in the experimenters who handled the Ss.[4] However, in view of the contradictory results, it is necessary to first determine whether or not the Maier and Ellen results can be reproduced, and, if so, to then inquire into the factors responsible for the marked number of failures to solve an initial discrimination problem.

The fact that 35.6 percent of Maier and Ellen's non-guided animals were unable to solve a pre-frustration symbol-discrimination problem should receive particular attention since the symbol-discrimination problem is the type of solution that a majority of Ss which have undergone frustration trials are required to make. These Ss had exactly the same number of trials to solve the pre-frustration discrimination

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1. Feldman and Neet (1960) have recently obtained similar results, but their Ss received ECS for 16 days prior to exposure to a brightness discrimination problem.

2. Maier and Klee used varying degrees of air blast (10-14 lbs.) and prodded the S with a pointed stick if it remained on the jumping stand three minutes. Maier and Ellen tapped the rat's tails with a ruler.

3. Maier and Klee selected the black disc on a white background, rather than the white disc on a black background, as the correct choice. Maier and Ellen made the correct choice the white disc on the black background.

4. Maier and Ellen (1956) and Maier (1956) mention one experimenter who was unable to develop fixations in rats.

problem as Ss are given to solve a discrimination problem following frustration trials. Thus, if the reliablity of the results of Maier and Ellen can be established, it would indicate that fixations[5] can occur in the absence of an insoluble problem, or, in fact, in the absence of any previous discrimination experiences.

Data by Krechevsky (1938) and Ehrenfreund (1948), investigating jumping-stand discrimination learning in the rat, indicate that rats are capable of forming a discrimination response and of abandoning it for another discrimination response. Thus, either the symbols were not sufficiently discriminable in Maier and Ellen's experiment for some of the rats to learn the correct response, or some factor other than this and the frustration trials, but unique to Maier's experimental procedure, precluded 35.6 percent of the non-guided Ss from solving the original discrimination problem.

One such factor might be the presence of noxious stimulation. In Maier and Ellen's experiment during the pre-frustration discrimination problem, one door was always locked and the rat's tails were tapped "with a ruler at the rate of 1 or 2 taps per second" if they refused to jump from the stand. By contrast, in Ehrenfreund's experiment,

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5. Maier (1949, p.33) has chosen as the criterion of an abnormal fixation "the persistance of an unadaptive response for 200 trials when an adaptive one is possible".

the sole motivation for the Ss to jump was hunger, and the doors were never locked; the S merely received no food when it made an inappropriate response.

The preceding analysis suggests the need for a study using pre-frustration discrimination trials which have sufficient symbol contrast to insure the S's ability to discriminate between the symbols, and which includes noxious jumping-stand stimuli. That the symbols used in the present experiment do differ sufficiently is attested to by the results of several studies by Feldman and his colleagues at the University of Massachusetts. An analysis of the differential latencies of non-solvers in jumping to the correct and incorrect symbols or positions indicate that these non-solvers were able to discriminate the correct response, although they did not solve the discrimination problem. The noxious jumping-stand stimulus is shock rather than tail-tapping with a ruler since this is the procedure most commonly used at present (Neet and Feldman, 1954; Feldman and Neet, 1954; Feldman and Neet, 1957; Feldman, Liberson, and Neet, 1957; Feldman, Ellen, Liberson, and Robbins, 1959).

The effect of varying the number of these pre-frustration discrimination trials. Maier and Ellen's study suggests that Ss that solve the pre-frustration problem are more successful in solving the post-frustration problem and the Ss that most readily solved the post-frustration problem (guidance Ss) received more pre-frustration trials (guidance

Ss received an average of 107.2 trials while non-guidance Ss received an average of 81.7 trials to the criterion; the authors report that this difference is not significant). Since the optimal number of pre-frustration discrimination trials is not known, this experiment was designed to investigate the effects of various numbers of these trials.

The effect of one type of discrimination training upon the learning of a subsequent, different discrimination problem. Several jumping-stand studies (Maier, Glasser, and Klee, 1940; Maier and Klee, 1943; Maier and Klee, 1945; Maier and Ellen, 1956) indicate that even Ss that have previously solved one problem do not always solve a new soluble discrimination problem. It seems that ability to solve is, in part, a function of whether the animals have been exposed to preceeding discriminations and the type of the preceeding discrimination. Maier (1949, p.35) reports that 9 of 10 rats first exposed to a position-discrimination problem to their preferred side and then exposed to a symbol-discrimination problem were able to solve the second problem, while only five of 10 rats first exposed to a position-discrimination response to their non-preferred side were able to solve a subsequent symbol-discrimination problem. The correct symbol in this experiment was a black disc on a white background.

Maier and Klee report that 9 of 10 Ss initially exposed to a symbol discrimination problem (black disc on a white background) and then given a position discrimination problem

were able to solve the subsequent problem. However, since the symbol-discrimination data of the Maier and Klee and Maier and Ellen studies are not completely in agreement, further investigation of transfer from a symbol-to-position discrimination problem would seem of value.

Method

Subjects

The Ss consisted of 52 experimentally naive male albino rats ranging from 99 to 134 days of age at the beginning of the experiment. Throughout the experiment, they were kept in a room which was controlled for temperature and humidity. Their experimental room was illuminated by a 100 watt bulb which was located approximately four feet above the apparatus and three feet in front of it. The room was relatively soundproof; external sounds were heard infrequently and were of a muffled nature.

Apparatus

The apparatus consisted of a modified version of the Lashley jumping-stand, which has been described elsewhere (Feldman, 1948). In brief, it is wired to deliver shock to the jumping stand, and the doors to which the Ss must jump are translucent. Lights behind these doors may be illuminated and directed onto their surface to provide a symbol. For discrimination problems, one door is illuminated and the other door is not illuminated.

Procedure

Training: Phase I. During this period, the Ss were trained to jump from a stand to either of two closed doors, 8½ inches away, with sufficient force to push the door open and land on a food platform which was located behind the

doors. This was accomplished by first placing the stand close to the open doors and training the Ss to step from the stand through the open doors. Gradually, the stand was moved back until the Ss were jumping a distance of 8½ inches through the open doors. Then the doors were gradually closed, the doors being closed slightly more on successive days, as the Ss continued jumping to them. During the entire experiment one of the doors was illuminated by a 40 watt bulb, and the other door was not illuminated. On every day, each symbol (i,e., level of illumination; dark or bright) appeared in each door on half of every S's trials. During this phase of the experiment, this was accomplished by switching the symbols on odd numbered trials; in subsequent phases of the experiment the symbols were alternated in a predetermined random sequence. Each S received 10 trials per day throughout the experiment. During this phase of the training, each S was allowed to jump to the position of its choice on odd-numbered trials and was manually guided to the opposite position (door) on even-numbered trials. In this way, the Ss received equal experience in jumping to both doors and to both symbols. Food was present on the platform in all phases of the experiment. A S was allowed approximately 10 seconds to consume food after making a correct jump. In addition, a cup of dry mash was placed in the Ss' cages immediately following their trials for the day. The Ss were allowed to consume food for 45 minutes, following

which the food cup was removed from their cages. Thus, the Ss were 23 hours hungry prior to their trials on each experimental day.

Training: Phase II. After the Ss were jumping to the closed doors, the jumping-stand was wired to deliver a scrambled shock of .50 ma.[6] The shock was activated 30 seconds after the S was placed on the stand and continued until the S jumped to one of the doors. This experimental condition continued through all subsequent phases of the experiment. On the first experimental day, the Ss were allowed 10 free (non-guided) jumps to the closed, but unlocked, doors. This procedure was followed in order to ascertain each S's position or symbol preference, if any. The S's correct response for the next phase of the experiment was determined from these data; the correct response was the S's least preferred symbol. If the S manifested no preference for either symbol (i.e., jumped to each symbol 50 percent of the time) the dark symbol was arbitrarily chosen as correct.

Experiment. Following this, the Ss were subjected to a period of symbol-discrimination trials in which the door containing the correct symbol was always unlocked and the door containing the incorrect symbol was always locked. Half of these Ss received these trials for 20 days (200 trials), and the other Ss received these trials for 30

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6. The stand was also wired to deliver a shock of 1.00 ma. if the S did not jump within one minute. Only two Ss received shocks of this amplitude---one S receiving the shock only once and the other S receiving the shock on approximately 50 percent of its trials.

days (300 trials). Upon the completion of this, the Ss were exposed to an intermediate phase of the experiment in which half of the Ss in each group were subjected to 16 days of frustration trials while the other Ss continued in their symbol-discrimination trials for another 16 days. At the completion of this period, all Ss were exposed to a discrimination problem (position or symbol) which permitted them 50 percent reward if they retained their present response. For the Ss that solved the first problem the correct response to the second discrimination problem was the S's least preferred position, as manifested by its non-guided jumps on the first experimental day. A certain percentage of the Ss could not solve the first discrimination problem. At the end of the first problem the non-solvers received 16 days of either an insoluable problem or a continuation of the original discrimination problem. Following this they were continued on the original symbol-discrimination during the period of the final problem. The final (second) discrimination problem lasted for 40 days or until the Ss met the criterion for solution of the problem. The criterion for solution in both the first and second discrimination problem was 29 correct jumps in three consecutive days. The experimental design is depicted in Table 1. There are 13 Ss in each group.

In order to permit a statistical analysis an equal number of these Ss were placed in each of the four groups. Thus,

Table 1

Summary Of The Experimental Design

(13 Ss in each group)

Groups	First Discrimination Problem	Intermediate Phase		Final Discrimination Problem	
	Number of Pre-frustration Symbol-discrimination Trials (10 per day)	Number of Discrimination Trials (10 per day)	Number of Frustration Trials (10 per day)	Number of Discrimination Trials (10 per day)	Type of Reward
F_1	200	0	160	400	50% reward for old response
NF_1	200	160	0	400	50% reward for old response
F_2	300	0	160	400	50% reward for old response
NF_2	300	160	0	400	50% reward for old response

the final assignment of Ss to the experimental groups was a stratified random sample made on the basis of the Ss' ages and problem solving ability.

Results

The major experimental results are depicted in Tables 2 and 3. In addition, a tabulation of the Ss' initial (position or symbol) preferences, the degree of these preferences as manifested by percentages of jumps to these symbols or positions, and the Ss' correct symbols in the first discrimination problem may be found in the Appendix, Table 4. Table 2 indicates the number of Ss in each of the four experimental groups and their problem-solving performance on the first and final discrimination problem. Table 3 depicts the days on which the problem-solving Ss first behaviorally indicated they would solve the final problem, (i.e., the day on which they first jumped to the correct position or symbol on more than 50 percent of the trials).

Thirty-seven of the 38 Ss that made at least one correct jump away from their preferred position solved the pre-frustration-discrimination problem. The additional S made seven correct jumps on the third experimental day but later returned to its position preference. All pre-frustration problem solvers began to solve the problem within seven days. Of the 37 Ss solving this problem, 36 (69 percent of the total n of 52) solved it within the number of trials (200) usually allowed by Maier for its solution. Thus, 31 percent of these Ss were unable to solve the symbol-discrimination problem within the number of trials prescribed by Maier, even though they had not previously been exposed to any other

Table 2

A Tabulation of Solvers and Non-solvers in

the First and Final Discrimination Problems

Groups	N	Number of First Discrimination Trials	Number of Solvers-First Discrimination Problem	Intermediate Phase Problem (160 Trials)	Number of Solvers-Final Discrimination Problem
F_1	13	200	9	frustration	2
NF_2	13	200	9	discrimination	5
F_2	13	300	9	frustration	3
NF_2	13	300	10	discrimination	4
Totals			37		14

Table 3

Days on which Final Discrimination Problem-solvers Began to Solve the Problem

	Non-Frustration Ss (Groups NF_1 and $N\bar{F}_2$)	Frustration Ss (Groups F_1 and $\bar{F}_2$)
Days	Number of Solvers on Each Day	Number of Solvers on Each Day
1	3	
2	3	1
3	3	
4		
5		
6		
7		
8		1
9		1
10		1
-		
-		
34		1
Totals	9	5

experimental problem.

Fourteen Ss (27 percent) were able to solve the final discrimination problem. None of these Ss that were unable to solve the first discrimination problem during the first 300 trials were able to alter their position response for the duration of the experiment. As can be seen in Table 3, all non-frustration Ss that solved the final discrimination problem began to do so within three days. However the five frustration Ss that solved the final discrimination problem generally took longer; one of these Ss beginning to solve the problem on each of the following days: second, eighth, ninth, tenth, and thirty-fourth. This difference between these two groups was tested for significance by a Mann-Whitney U test and is significant beyond the .002 level. The difference in number of solvers (5 and 9) was not significant ($X^2 = .79$, $p > .30$).

The number of these pre-frustration discrimination trials seemed to have no effect on subsequent problem solving ability. As Table 2 indicates, a total of seven Ss with 200 pre-frustration-discrimination trials (5 Ss in NF_1 and 2 Ss in F_1) solved the subsequent problem, and a total of seven Ss with 300 pre-frustration-discrimination trials (4 Ss in NF_2 and 3 Ss in F_2) also solved the subsequent problem.

In summary, 31 percent of all the Ss were unable to solve a pre-frustration-discrimination problem within the number of trials allocated by Maier. None of the Ss that

were unable to solve this problem within 300 trials manifested any subsequent problem-solving ability. The number of pre-frustration-discrimination trials did not seem to influence subsequent problem-solving ability. Both frustration and non-frustration Ss had difficulty transferring from one response to another response.

Discussion

The results of the present experiment agree with those of Maier and Ellen (1952) in indicating that approximately 30 percent of the Ss faced with a symbol-discrimination problem, under the experimental conditions present in the usual Maierian study, are incapable of solving this type of problem even when they have not previously been exposed to frustration or discrimination trials. These data seem explainable by either of two approaches. Maier and Ellen suggest that such non-solving animals are "low frustration" Ss, (i.e., Ss that will fixate under conditions of minimal noxious stimulation). Wolpe (1953) hypothesizes that the Ss' motivation to avoid the noxious jumping-stand stimuli (electric shock or air blast) is a primary drive to which all other drives are secondary. According to Wolpe's line of reasoning, if the Ss have not begun to perform the correct response prior to the time that this primary drive reaches maximal strength, they will not perform the correct response. Regardless of the relative merits of the two explanations, both are agreed upon the importance of the role of noxious stimuli. The present data also suggest that fixations are a product of the noxious jumping-stand stimuli and jumping to locked doors, since other studies (Krechevsky, 1938; Ehrenfreund, 1948) have demonstrated that rats are capable of solving such discrimination problems when these noxious stimuli are absent.

On the other hand the finding of Maier and Klee (1943), that 19 of 20 Ss can solve a pre-frustration problem, suggests that the use of noxious stimulation is not sufficient to cause fixated behavior. A possible explanation of the difference between the Maier and Klee data and those of both the Maier and Ellen (1952) and the present study lies in difference in the types of correct responses required in these studies. Maier and Klee required Ss to respond to a black disc on a white background, Maier and Ellen used a white disc on a black background, and the present experiment used the least preferred of the two distinctly different illuminations. Maier and Klee (1943) have suggested that the black disc on a white background is a discrimination which is "much more readily formed because the positive card has a greater total brightness than the negative card". Additional evidence that the Maier and Klee problem was easier than the one of Maier and Ellen comes from an unpublished study of Feldman[7], who presented animals with an insoluble problem where both symbols were the same (bright or dark) and then exposed them to a symbol-discrimination problem. Few Ss solved when the dark window was correct, while all Ss solved when the bright window was correct. Differential latencies demonstrated that Ss could discriminate the stimuli. Then, in a follow-up study, where the difference between the bright and dark window was made less,

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fewer Ss solved the bright discrimination even though the symbols were clearly discernible.

Further support for the hypothesis that difficulty of the problem is a factor in the number of fixations is found in the results of another study by Maier and Ellen (1956). After finding that 24 of 49 Ss fixated in a symbol-discrimination problem following reinforcements for responding to their preferred side (no frustration trials were involved), they concluded that the most logical explanation for this high percentage of non-solvers was the fact that the discrimination (white disc on a black background) problem used in their study was made "more difficult than formerly". They also indicate that Maier (1939), in a previous study, had shown that 145.6 trials are required to learn this discrimination, while 86.3 trials are required to learn the black disc on a white background discrimination.

Differences in the required correct response in the initial problem may also account for the failure of 17 of 26 non-frustration Ss to solve a subsequent position discrimination problem in this study as compared to 9 of 10 solvers of such a problem in the Maier and Klee (1943) study. Similarly, the failure to find a larger difference between frustration and discrimination Ss in the number of final problem solvers[8] may be due to the difficulty of the pre-frustration problem.

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8. More discrimination Ss than frustration Ss transferred successfully as Maier would predict (1956), but the difference does not approach significance.

Difficulty (e.g., white disc on black background vs. black disc on white background) of the discrimination problem is probably not the only factor responsible for discrepencies in results. Feldman and Neet (1960), using the apparatus of the present experiment, found that all Ss solved a symbol-discrimination problem which had not been preceded by frustration trials. Systematic manipulations of problem difficulty, experimenters, and type of noxious stimulation should be carried out. Number of successes on both an original solvable problem and on a subsequent different problem should be investigated as a function of the single and joint effects of these variables.

The possibility that Ss may fixate in Maier's experimental situation, even when frustration trials have not preceded the problem, has important implications for experimentation of fixations. Whenever any variable has been found to effect the number of fixations, it may not be clear whether it has interacted with the noxious stimuli, the level of difficulty of the final discrimination problem, or the insoluble problem. There are several ways to study the interaction of variables with the factors involved in fixations. Feldman and Neet (1960) used a control group exposed to the same discrimination problem as the experimental group were subjected to after the insoluble problem. They were able to conclude that there was no "deleterious effects of ECS on subsequent learning ability". Subsequent experiments

should follow the example of these investigators. More work should also be undertaken in which the noxious stimuli are partially and completely removed in order to assess the degree to which, and how, the noxious stimuli effect the Ss. An example of such experimentation is Klee's (1944) study in which he exposed rats to an insoluble problem and a subsequent discrimination problem with only hunger as a motivation for the Ss to jump to the windows. After prolonged training he found a low percentage of fixations. This supports the previously stated hypothesis that noxious stimulation is a factor in fixations.

The results of the present study indicate that the amount of practice on the first discrimination problem has no effect on ability to solve the second discrimination problem. However, this conclusion can only hold for a large number of first discrimination problem trials, since 360 and 460 pre-frustration-discrimination trials were used in the present study. The S's performance has stabilized long before 360 trials have elasped, and an additional 100 trials should make no difference. In contrast to the present experimental method, Krechevsky (1938), Ehrenfreund (1948), and Maier and Ellen (1952) only trained their animals to a minimal criterion on one problem before exposing them to another problem. In general, these Ss learned the second problem much more readily than did Ss in the present experiment. The amount of practice on the initial problems should

be further explored, using levels below those of the present study. Possibly, levels well below 360 trials will improve subsequent performance, since less overlearning will be involved. Along these lines, one study (Maier and Feldman, 1948) indicates there is little difference in strength of position habit between Ss with 80, 160, and 240 position-rewarded trials. However, Ss in this experiment were guided to the correct response on alternate trials. More experimentation on this factor with guided trials omitted would seem to be of value.

In this study, as well as in others (Maier, Glasser, and Klee, 1940; Maier and Klee, 1945), Ss not exposed to the insoluble problem that were able to solve the discrimination problems began to do so within a short number of trials; frustration Ss required a larger number of trials to begin solving the subsequent discrimination problem. This seems understandable since frustration Ss have to first learn there is an appropriate response before learning that response. This may be difficult for frustration Ss to learn since their stereotyped responses still receive the same amount of reward and punishment during the soluble problem as during the insoluble problem. Learning Ss, in contrast, are exposed to a degree of punishment at the beginning of a new discrimination problem that they have not received after solving the prior problem. Bearing out the hypothesis about the rate of perceived change is the fact that "100 percent punishment either causes a very rapid learning of the new

response, or causes fixation of the initial response, whereas 50 percent punishment results in slower learning of the new response". (Maier and Ellen, 1951, p.445) This should favor non-frustration Ss more than frustration Ss when they are exposed to a new problem. The longer an S takes in learning the correct solution, the more experience it has with the noxious stimuli of the jumping-stand. Thus, according to Wolpe's suggestion, the S's primary drive to escape the noxious situation should be stronger, and fewer Ss would be expected to perform the correct solution.

This experiment is only a first step in studying discrimination learning under the conditions present in the usual Maierian study. Much information is needed on the conditions under which learning occurs in the Maierian paradigm before one can adequately assess the conditions under which learning does not occur. The relative difficulty of the various soluble problems, the number of trials Ss receive with these soluble problems, and the ability of the Ss to transfer from one soluble problem to another are areas which need to be better understood before one attempts to evaluate the effects of an insoluble problem on soluble discrimination learning.

Summary

Fifty-two rats were tested for problem solving ability on the Lashley jumping-stand after having been subjected to previous jumping-stand problems. Half of these Ss had previously been exposed to a symbol-discrimination problem, while the remaining Ss had been exposed to both the discrimination problem and a frustration problem. The major experimental results are:

1) Thirty percent of the Ss who had not been exposed to prior frustration or discrimination trials were unable to solve a symbol-discrimination problem under the conditions present in the usual Maierian study.

2) Both frustration and discrimination Ss have difficulty transfering from one pattern of responding to another. There was no significant difference between the number of final problem solvers in these two groups.

Thus, fixations seem to be due not only to the insoluble problem, but, to the noxious stimuli of jumping to locked doors and jumping-stand shock. Further research seems needed to more clearly delineate the degree to which these and other factors contribute to fixations.

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Appendix

Table 4

Degree and Type of Ss' Jumping Preferences on the First Experimental Day, The Ss' Correct Symbol for the First Discrimination Problem, and a Distribution of Ss into Groups of Problem-solving Ability

		Degree of Original Preference								
		60% Preference for		80% Preference for		90% Preference for		100% Preference for		
		S*	P**	S	P	S	P	S	P	
Correct Symbol for First Problem Non-solvers	bright							3		3
	dark			1	1	1	1	2	6	12
Correct Symbol for Ss Solving Only the First Problem	bright	1		2	1	3	3			10
	dark				1		2	1	9	13
Correct Symbol for Ss Solving Both Problems	bright				2	2		1		5
	dark		1		3		2	2	1	9
		1	1	3	8	6	8	9	16	52

*symbol
**position

Table 5

Chi Squares Tests: Tables and Significance Levels

1. The Effects of the Number of Pre-frustration discrimination Trials on Final Problem-solving Ability

		f_o Table		
		solvers	non-solvers	both
Frustration Ss: (first problem solvers)	200 trials	2	7	9
	300 trials	3	6	9
	Totals	5	13	18

$p > .99$

		f_o Table		
		solvers	non-solvers	both
Non-frustration Ss: (first problem solvers)	200 trials	5	4	9
	300 trials	4	6	10
	Totals	9	10	19

$p > .80$

2. A Comparison of the Number of Frustration and Non-frustration Ss Solving the Final Discrimination Problem

		f_o Table		
		solvers	non-solvers	both
Frustration Ss vs. Non-frustration Ss (first problem solvers)	frustration	5	13	18
	non-frustration	9	10	19
	Totals	14	23	37

$p > .30$

Table 6

A Comparison of the Trials on which Frustration and Discrimination Ss Began to Solve the Final Problem

Discrimination Ss		Frustration Ss	
trials	rank order	trials	rank order
4	1	19	7
6	2	72	11
7	3	90	12
11	4.5	93	13
11	4.5	332	14
13	6	Sum	57
23	8		
24	9		
26	10		
Sum	48		

$U = 3, \quad p < .002$

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