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An Investigation of the Effects of Specific Parameters on an Experimental Analogue of the Anxiety Relief Hypothesis

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AN INVESTIGATION OF THE EFFECTS OF SPECIFIC PARAMETERS ON AN EXPERIMENTAL ANALOGUE OF THE ANXIETY RELIEF HYPOTHESIS

(TITLE)

BY

Gary W. Hardy

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ABSTRACT

Thirty-two, naive, albino rats were randomly assigned to one of the eight treatment groups with four members per group. The apparatus used was a modified one-way avoidance chamber developed by Baum (1965). The variables studied were the effects of a pretraining anxiety relief condition, a hierarchical presentation of tone with the anxiety relief condition, different inter-trial intervals, and the interactions of these variables. All subjects were given anxiety training to a ninety decibel tone and one-half of the subjects were given anxiety relief training. All subjects were trained to a criterion of ten consecutive avoidance responses in a one-way avoidance situation and were then subjected to one of several different treatment combinations of reciprocal inhibition, response prevention, and flooding. Twelve hours after treatment all subjects were extinguished to a criterion of ten consecutive failures to respond in the avoidance situation. This extinction series was repeated twenty-four hours later to test for spontaneous recovery. The number of responses was taken as the dependent variables.

The statistical analyses revealed that none of the variables of: pretraining anxiety relief, hierarchical presentation of tone with anxiety relief conditions, and different inter-trial intervals or their interactions, were capable of affecting the measures of extinction.

The results were discussed in terms of learning theory and reciprocal inhibition. Some explainations were given for the unusually rapid extinction obtained.

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CHAPTER I

HISTORICAL BACKGROUND

Behavioral therapies can be traced back to basic works of Pavlov, Watson, Guthrie, Hull, and Skinner. One of the first application of behavior theory and principles in a controlled laboratory situation was the acquisition of a fear of white rats by Albert and reported by Watson and Rayner (1920). They were able to experimentally develop a phobia that was complete with generalization. A similar procedure was used to establish food aversions in two children by Moss (1924).

Dollard and Miller (1950) had a significant impact on behavior therapy with their learning model translation of Freudian theory. Their study put a great deal of emphasis on the application of learning theory in understanding and controlling human behavior. Another significant contribution to behavior therapy was made by Skinner (1953) when he rejected the existence of a central neurotic state within an individual. He believes that the reason people behave the way they do is because of the environmental contingencies which can be observed, controlled, and manipulated. And because of this,

aberrant behavior can be significantly and permanently modified.

The term "behavior therapy" was coined by Eysenck (1959) to denote those approaches to psychotherapy that depend upon direct behavioral manipulation and are based primarily on principles of learning theory. He described behavior therapy as follows:

> 1. Behavior therapy is based on consistent, properly formulated theory leading to testable deductions.
>
> 2. Behavior therapy is derived from experimental studies specifically designed to test basic theory and deductions made therefrom.
>
> 3. It considers symptoms as unadaptive conditioned responses.
>
> 4. It regards symptoms as evidence of faulty learning.
>
> 5. It believes that Symptomatology is determined by individual differences in conditionability and autonomic liability, as well as accidental environmental circumstances.
>
> 6. All treatment of neurotic disorders is concerned with habits existing at present; their historical development is largely irrelevant.
>
> 7. Cures are achieved by treating the system itself, that is by extinguishing unadaptive conditioned responses (CR's) establishing desirable CR's.
>
> 8. Interpretation, even if not completely subjective and erroneous, is irrelevant.
>
> 9. Symptomatic treatment leads to permanent recovery provided autonomic as well as skeletal

surplus CR' are extinguished.

10. Personal relations are not essential for cures of neurotic disorder, although they may be useful in certain circumstances.

(Eysenck, 1959)

Since the 1960's, there have been increasing attempts to extend the principle of learning theory and behavior therapy to our natural environment. One approach has been the use of reciprocal inhibition and response prevention as techniques in behavior therapy.

A direct application of learning principles to a therapeutic technique was Wolpe's paper on reciprocal inhibition therapy (1954), and his book, The Practice of Behavior Therapy (1969). Included in these writings was the use of learning principles in developing a new therapeutic technique of psychotherapy.

Reciprocal inhibition is the method by which unadaptive conditioned anxiety responses can be eliminated by reinforcing a response that is antagonistic to the anxiety response. This is done by presenting the anxiety eliciting stimulus in gradual increments until it reaches the full-strength of the original anxiety eliciting stimulus. This method makes use of the assumption that there is some type of connection between the autonomic nervous system and other systems that

have the ability to control certain responses that have either an inhibiting or suppressing effect on those autonomic responses. Support for this assumption and its behavioral correlates come from the areas of conditioning and extinction (Farber, 1948; Moltz, 1954; Wolpe, 1954; Hall, 1955; and Baum, 1969).

The use of reciprocal inhibitions with humans has been demonstrated by the case of Peter reported by Jones (1924). Some of Wolpe's (1954) original work on the experimentally induced neurotic behavior of cats let him to assume that neurotic behavior was a complex of learned unadaptive conditioned anxiety responses. The one unique factor of this neurotic behavior was its unusual resistance to traditional extinction procedures. Wolpe then tried to find a method which would facilitate the extinction of these neurotic behaviors. His results supported the findings of Jones in that the most efficient procedure was one that used a hierarchial presentation of the conditioned stimulus while the animal was engaged in eating behavior. Wolpe believed that both of their results could be explained by the process of reciprocal inhibition: that the responses occurring during eating are incompatible with the occurrence of anxiety. He states that if such a procedure is repeated several times along with the

anxiety eliciting stimulus, then the tendency of the conditioned stimulus to elicit anxiety would be gradually replaced by the eating response. In relating these findings to the problem of the human neurosis, Wolpe believed that the feeding procedures could be replaced by other procedures that could be dealt with in a clinical situation. At this point, Wolpe then began to make extensive use of the progressive muscle relaxation technique investigated and developed by Jacobson (1938). When dealing with human Ss, they are asked to voluntarily relax and imagine the anxiety producing stimuli in the progressive hierarchy. Wolpe believed that these results were best explained by use of his concept of reciprocal inhibition. In contrast to more traditional therapies, this method appeared to be a more direct attack on neurotic anxiety and was less time consuming (Wolpe, 1958; Lazarus, 1961; Lang and Lazovik, 1963; Lang, Lazovik, Reynolds, 1965; Lazarus, 1963).

Response prevention, and flooding have the same goal as reciprocal inhibition, but in these conditions the subject is forced to remain in the presence of the anxiety producing stimulus while avoidance responses extinguish very rapidly after a few sessions of response prevention (Page and Hall, 1953; Baum, 1966). Furthermore, the anxiety producing stimulus is presented

at its full-strength during several sessions and not by hierarchial presentation. This method is most like implosive therapy and has been found to be effective in the treatment of phobias (Wolpin and Raines, 1966; Hogan and Kirchner, 1967). The method of response prevention, and flooding as reported by Baum (1970), seems to be an even more direct and less time consuming attack on neurotic behavior than the procedure of reciprocal inhibition.

The three theories of response prevention are: two- process theory, competing response theory, and relaxation analysis.

One of the first theories to explain how response prevention occurs, was Mowrer's two-process theory of avoidance learning (Mowrer, 1951). This theory contends that avoidance learning occurs in two phases. In the first phase the acquisition of a fear response follows the classical conditioning paradigm. In the second phase an avoidance response is reinforcement by fear reduction. This theory has wide acceptance among therapists using the response prevention technique. Most of the data related to the efficiency of response prevention is compatible and explainable with the two-process theory (Baum, 1970). How-

ever, it does not explain why fear still exists after response prevention even though the avoidance response has been extinguished. It also gives no accounting of why social or mechanical facilitation of response prevention occurs (Baum, 1970).

The competing response theory was first promoted by Page (1955). He found that even after the active avoidance response had been extinguished through response prevention, the rat still showed signs of passive avoidance to the situation. A further study by Benline and Simmel (1967) found similar results. However, they carried out extinction trials over a number of days and found that the avoidance response reappeared. They assumed that the fear itself had not been extinguished, only the avoidance response was temporarily extinguished. Their explanation was that response prevention only "confused" the animal and that this caused the rapid extinction. This means that the fear component of the conditioned stimulus did not extinguish during response prevention, but still existed. What did occur was that the animal had learned a new response to cope with the fear. This new behavior was exhibited by the animals crouching or freezing after the avoidance response had been extinguished.

Another study (Baum, 1969b) found results that were contradictory; the new learned response was really an undifferentiated exploring or grooming response and not a specific freezing response. This shows an inability of the competing response theory to specify the origin of the new competing response. It also does not offer an explanation of the various parameters affecting the efficiency of response prevention. These questions are more compatible with Mowrer's two-process theory.

Using the theory of relaxation analysis (Denny, 1964) suggests that what is occuring during response prevention is that the animal learns to relax. This is contrary to both of the previously mentioned theoretical explanations of what occurs during response prevention. Animals learning to relax during response prevention has been causually observed (Baum, 1968). These casual observations were later experimentally investigated yielding results that support the relaxation theory. Baum's (1969b) study indicated that during the first minute of response prevention, fear behavior was at a high level, but "relaxation", or the level of general activity, continued to increase throughout successive minutes of response prevention. The study of social facilitation during response prevention (Baum, 1969c) showed that the presence of other rats also decreases the level

of fear behavior while at the same time increasing the level of relaxation. This was correlated with the improved efficiency of response prevention in producing extinction. The same results were found when mechanical facilitation was used (Lederhendler and Baum, 1970).

Baum (1970) reports that this theory, like the others, is confronted with the problem of failure to explain the presence of fear behavior and no relaxation following response had been extinguished. All three theories seem to contain partial explanations of why the fear behavior and the lack of relaxation still persist after the avoidance response has been extinguished.

There have been two excellent reviews of research on response prevention by Lomont (1965) and Baum (1970). The latter author suggests:

> "It is conceivable that three main theories are partly correct, that response prevention involves Pavlov fear extinction, competing-response learning and active relaxation. Which process is reflected in the results may depend on particular parameters, apparatus, and specific procedure employed." (Baum, 1970)

Purpose Of The Study

The purpose of this study will be to further investigate the variables of; reciprocal inhibition, flooding, and response prevention, in combination, as a therapeutic technique of behavior therapy. A review of the literature appears to indicate that the techniques of reciprocal inhibition, flooding, and response prevention in anxiety relief conditioning have been used in clinical treatments, however, there appears to be only a minimal amount of experimental animal research done to support these techniques of treatment.

This study will be an attempt to further investigate reciprocal inhibition and response prevention in an experimental analogue. The value of a study of this type lies in its ability to generate more precise quantitative statements concerning the role of treatment variables usually designated as clinical, and therefore considered outside of experimental investigation.

CHAPTER II

EXPERIMENTAL DESIGN AND PROCEDURE

Subjects

The Ss were thirty-two, naive, male albino rats. The rats were from a colony maintained by the Psychology Department at Eastern Illinois University. The subjects were approximately fifty-five to sixty days old at the beginning of the experiment. They were maintained on an ad lib schedule of water and laboratory chow and were handled each day by the experimenter during the experimental sessions. All subjects were randomly assigned to one of eight treatment groups.

Apparatus

The apparatus used for investigating the variables of reciprocal inhibition, flooding, and response prevention, was a modfied version of the automated avoidance conditioning apparatus described by Baum (1965).

The chamber consists of a three-eighths inch unpainted plywood box measuring 12x12x15$\frac{1}{2}$ inches high (inside dimensions). At a height of four and one-half inches above the bottom of the box there was placed a grid floor. The grid was wired so that scrambled shock could be administered at an intensity of .5 ma. This shock was produced by a Grason

and Stadler Shock Generator, model #E1064GS, West Concord, Mass.

At a height of six and one-half inches above the grid floor, a one-half inch wide slot was cut parallel to the grid floor along the entire length of one side of the apparatus and continued to a depth of three and one-half inches into each of the adjacent sides. Through this slot, a ledge could be positioned within the apparatus. The ledge consisted of two layers of one-quarter inch plywood and measured six and one-half inches by sixteen inches. It was painted a flat black in contrast to the rest of the apparatus. The ledge was held in position by two guides on each side of the box and prevented any lateral movement of the ledge. The ledge was inserted and retracted manually by the experimenter. The ledge was connected with two microswitches, one of which was used in automatically starting the stimulus conditions and the other was used in measuring response latencies.

The ceiling of the apparatus was a sliding Plexiglas panel through which the Ss were placed in the chamber. A white seven and one-half watt unshielded light bulb was mounted in the center of the ceiling.

Opposite the ledge a small sixteen ohm speaker was mounted flush with its center four inches above the grid floor. Wired to the speaker was an RCA Audio, sign square,

Generator, model WA-44C, which produced a one thousand cycle sign tone at an intensity of ninety decibels unless otherwise stated.

A fifteen watt unshielded green Christmas tree light was mounted on the wall to the left of the speaker. It was centered at a height of seven and one-half inches. The experimental room was dark except for the green Christmas tree light within the apparatus.

The programming of the apparatus was done by using Grason and Stadler digital relay components: timers, relays, counters, shock generator, power supply, control panel, and several Decade Interval Timers (models 100-B, 100-C, all series D).

Procedure

The thirty-two subjects were randomly divided into eight groups, with four members per group designated as Group Ia, Ib, IIa, IIb, IIIa, IIIb, IVa, and IVb. The five phases needed to complete the experimental sessions were; pretraining, acquisition, treatment, extinction, and spontaneous recovery. These sessions were conducted over a period of four days.

Pretraining

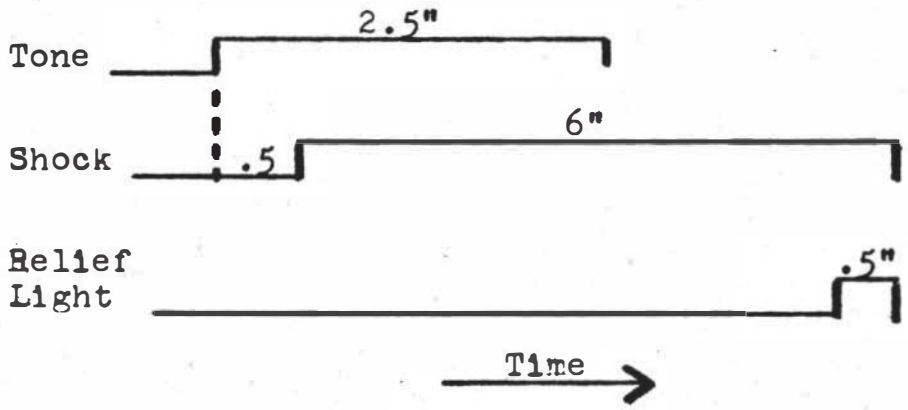
The chamber for the pretraining session was void of the ledge and tape covered the slot. The "house light" green

Christmas tree light was on. Each bar of the grid was electrified one-half second after the onset of the tone. The shock was of a scrambled nature.

On the day of pretraining each of the subjects in group Ia, Ib, IIIa, and IIIb was taken from his home cage, and placed in the chamber. Upon placement in the chamber, a 90db. one thousand cycle tone was emitted from the speaker for two and one-half seconds. One-half second after tone onset the subject was given .5 m.a. shock of six second duration. The ceiling light designated as "relief light" was turned on one-half second prior to offset of shock (see figure 1).

Figure 1

Pretraining Stimulus Conditions
For Groups Ia, Ib, IIIa, and IIIb

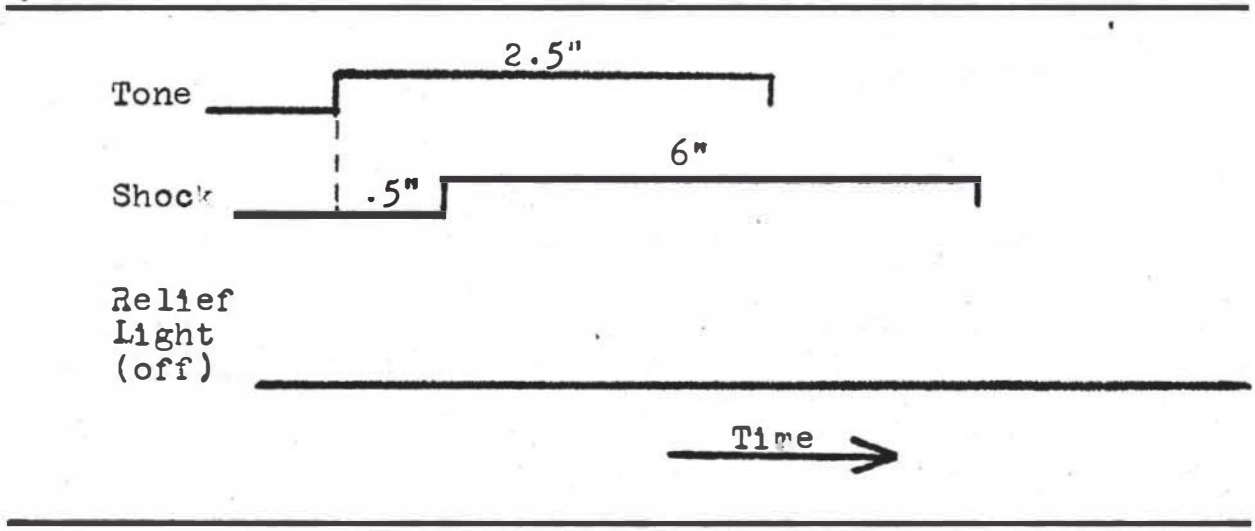


There was a five second interval between the fifteen shock presentations. After which the animal was returned to his home cage.

Each subject of groups IIa, IIb, IVa, and IVb was given the same treatment described above without the "relief light" i.e. tone and shock (see figure 2).

Figure 2

Pretraining Stimulus Conditions
For Groups IIa, IIb, IVa, and IVb



The chamber for the acquisition sessions had the "house light" on and the ledge positioned so that it could be inserted into the chamber when needed.

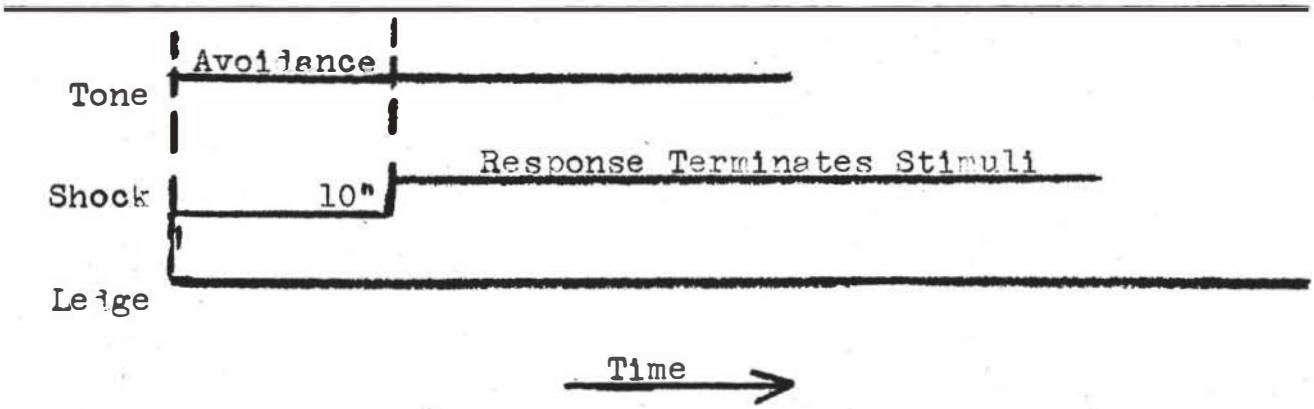
Acquisition

Approximately twelve hours after pretraining each of the subjects in each group was given the same stimulus conditions. The subject was taken from his home cage and placed in the chamber. At the time of placement in the chamber simultaneously the tone of 90db. was presented and the ledge was projected into the chamber by the experimenter. The subject was shocked after ten seconds. When the subject jumped

to the ledge the tone and the shock were terminated. After allowing the subject to remain on the ledge for thirty seconds, the experimenter then removed the ledge and the subject dropped to the uncharged grid floor. At which time the tone and ledge was again simultaneously presented. (see figure 3)

Figure 3

Acquisition Stimulus Conditions For All Groups



This procedure was continued until the subject reached a criterion of ten consecutive avoidance responses. An avoidance response consisted of jumping to the ledge following onset of tone and prior to onset of shock. The subject was then returned to his home cage.

Treatment

The chamber for the treatment sessions was void of the

ledge and tape covered the slot. The "house light" was on and the grid floor was not electrified. The relief light and tone were turned on as required during treatment.

Twenty-four hours after each of the subjects had reached acquisition criterion of ten consecutive avoidance responses, treatment began.

The techniques of treatment used were, reciprocal inhibition, response prevention, and flooding.

Reciprocal inhibition was defined as the hierarchical presentation of tone. The tone was presented at 65db. for the first block of five trials and then increased in 5db. increments, i.e., the next block would be 70db., until a 90db. tone had been presented for five trials. The total being thirty trials.

Response prevention, (R.P.) was defined as the blocking of the avoidance response. The experimenter assumed that the blocking occurred because of the absence of the ledge.

Flooding (F.) was defined as the massing of the trials during treatment. The massing of trials occurred by shortening the inter-trial interval from thirty seconds to three seconds. The different treatment combinations are illustrated in Table 1.

Table 1

Group Treatment Combinations

Group	Reciprocal Inhibition	Response Prevention	Flooding
Ia	X	X	X
Ib	X	X	
IIa	X	X	X
IIb	X	X	
IIIa		X	X
IIIb		X	
IVa		X	X
IVb		X	

Each animal was then taken from his home cage and placed in the chamber and returned at the end of his treatment combination, thirty trials in all. The number of responses and response latencies were recorded during treatment, extinction, and spontaneous recovery. Response latencies were measured in tenths of seconds from onset of tone until the animal jumped to the ledge.

Group Ia, and IIa, received reciprocal inhibition, response

prevention, and flooding. Each subject received the hierarchial presentation of tone with the "relief light" for ten seconds. During the inter-trial interval of three seconds the ledge was removed.

Group Ib and IIb received reciprocal inhibition and response prevention. Each subject received the hierarchial presentation of tone simultaneously with the "relief light" for ten seconds, the ledge was absent, and the inter-trial interval was 30 seconds.

Group IIIa and IVa received response prevention and flooding. Each subject received a 90db. tone for ten seconds, with the ledge absent, and an inter-trial interval of three seconds.

Group IIIb and IVb received response prevention. Each subject received a 90db. tone for a ten second duration with the ledge absent, and an inter-trial interval of thirty seconds (see Table 2).

Table 2

Schematic Of Design

A_1 Pretraining Anxiety Relief Light				A_2 Pretraining Anxiety No Relief Light			
B_1 Variable Tone		B_2 Regular Tone		B_1 Variable Tone		B_2 Regular Tone	
C_1 3 sec ITI	C_2 30 sec ITI	C_1 3 sec ITI	C_2 30 sec ITI	C_1 3 sec ITI	C_2 30 sec ITI	C_1 3 sec ITI	C_2 30 sec ITI
Grouos Ia	Ib	IIa	IIb	IIIa	IIIb	IVa	IVb
S_1	S2	S3	S4	S5	S6	S7	S8
S_9	S10	S11	S12	S13	S14	S15	S16
S_{17}	S18	S19	S20	S21	S22	S23	S24
S_{25}	S26	S27	S28	S29	S30	S31	S32

Extinction

The chamber for extinction sessions had the "house light" on, the ledge was positioned so that it could be inserted with the onset of tone, and the shock disconnected.

Approximately twelve hours after treatment each subject of each group was placed on the ledge. The inter-trial interval for each subject of group Ia, IIa, IIIa, and IVa was to last for a duration of three seconds. Each subject of groups Ib, IIb, IIIb, and IVb received inter-trial intervals of thirty seconds. After the three second or thirty second inter-trial interval each subject was dropped by the experimenter removing the ledge, to the grid floor. At which time the tone of 90db. and ledge were simultaneously presented for ten seconds. Each subject was required to reach a criterion of ten trials without a jump onto the ledge. The number and latencies of responses was recorded.

Spontaneous Recovery

Twenty-four hours after the extinction sessions each subject was returned to the chamber, placed on the ledge, and the extinction procedure was repeated. If the subject did not reach the criterion of ten consecutive trials without a jump within thirty trials, the session was discontinued.

Hypotheses

1. That there would be no significant difference in the number or mean latency of responses between pretraining anxiety relief and no pretraining anxiety relief during treatment, extinction, and spontaneous recovery.
2. That there would be no significant difference in the number or mean latency of responses between variable tone with "relief light" and regular tone presentations during treatment, extinction, and spontaneous recovery.
3. That there would be no significant difference in the number or mean latency of responses between the three second and thirty second inter-trial interval during treatment, extinction, and spontaneous recovery.
4. That there would be no significant differences in the number or mean latency of responses for the interactions of the three main effects during treatment, extinction, and spontaneous recovery.

CHAPTER III

RESULTS

For each of the thirty-two subjects, both the number of responses and the latency of these responses were recorded as the dependent measures during treatment, extinction, and spontaneous recovery. For all of the statistic analyses a .05 level of confidence was used to establish a significant effect.

It was not possible to run an analysis of variance test on treatment, extinction, or spontaneous recovery data because of the lack of responding by the subjects. Out of a possible 960 opportunities to jump during treatment, there were only 4 responses (.4% of the total possible responses). Only 19 responses were made during extinction, and 1 response during spontaneous recovery (see Table 3). This limited number

Table 3

Analysis of Data

	B_1 Variable Tone & Light		B_2 Regular Tone		B_1 Variable Tone & Light		B_2 Regular Tone	
	C_1 3 sec	C_2 30 sec	C_1 3 sec	C_2 30 sec	C_1 3 sec	C_2 30 sec	C_1 3 sec	C_2 30 sec
Groups	Ia	Ib	IIa	IIb	IIIa	IIIb	IVa	IVb
TRT # R's.	0	0	0	0	1	0	1	2
$\bar{x}$ Latency					3.5		6	3.75
Extin # R	3	0	4	2	2	2	1	5
$\bar{x}$ Latency	4.33		3.25	6.25	4.5	5	4	4.9
Sp Rec # R's	0	0	0	1	0	0	0	0
$\bar{x}$ Latency				7				

of responses, produced data that could not completely fulfill the necessary assumptions for use of the analysis of variance. However, an ad hoc decision was made to run Chi-squares on the number of jumping responses to see if they were affected by the three main independent variables. The results were as follows: pretraining anxiety relief (x^2=.53, N.S., df=1), variable tone and "relief light" (x^2=1.32, N.S., df=1), and inter-trial interval (x^2=.53, N.S., df=1).

In addition, t-tests for uncorrelated data, and unequal N's were run on the mean latencies of those jumping responses to see if the three main independent variables had any effect. The results were as follows: pretraining anxiety relief (t=.07, N.S., df=17), variable tone and "relief light" (t=1.4, N.S., df=17), and inter-trial interval (t=.09, N.S., df=17).

Promoted by earlier observations, the experimenter thought that it might be of interest to record the number of "freeze" responses made during treatment. The main effects of pretraining anxiety relief and inter-trial interval were found to be significant (see Tables 4 & 5).

Table 4

Treatment "Freeze" Response Data

	A1				A2			
	B1		B2		B1		B2	
	C1	C2	C1	C2	C1	C2	C1	C2
# of "Freeze" Responses	0	11	3	3	19	1	20	6
	0	0	20	3	19	4	13	2
	0	0	21	7	27	8	22	16
	0	0	0	13	0	4	6	0
	0	11	47	26	65	17	61	24

Table 5

Analysis of Variance Results of "Freeze" Response Data

Source		df	MS	F
Total		31		
Treatment		7		
(Pretraining Anxiety Relief)	A	1	215.28	4.26*
(Variable Tone and "Relief Light")	B	1	132.03	2.62
(Inter-trial Interval)	C	1	281.98	5.59*
	AB	1	108.90	2.16
	AC	1	175.85	3.48
	BC	1	13.84	.27
	ABC	1	57.59	1.14
Within		24	50.53	

*p<.05

Figure 4

Number of "Freeze" Responses and Anxiety Relief Conditions

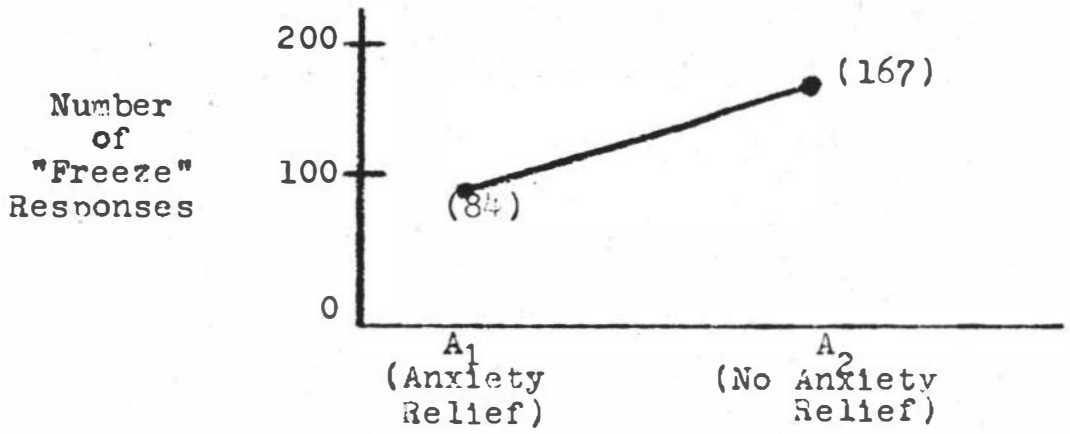


Fig. 4 illustrates that those subjects who received pretraining anxiety relief made almost one-half as many "freeze" responses (84) during treatment as did those subjects that had no pretraining anxiety relief (167) responses.

Figure 5

Number of "Freeze" Responses and Inter-trial Intervals.

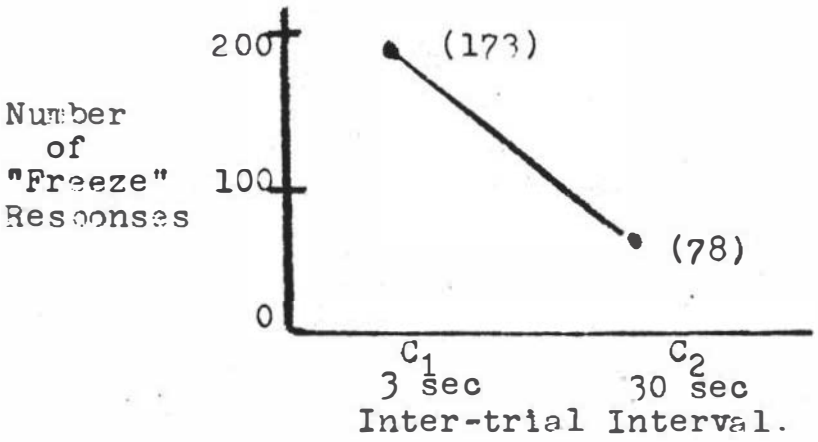


Fig. 5 illustrates that those subjects that were on a thirty-second inter-trial interval made significantly fewer "freeze" responses (78) as compared to (173) "freeze" responses by the subjects with a three-second inter-trial interval.

Cochran's test for homogeneity of variance was also run, ad hoc, and the result (C=.796) was found to be significant at the .01 level, thus indicating an extreme heterogeneity of variance.

CHAPTER IV

DISCUSSION

The major finding of this study was that under the present conditions the anxiety relief operations were not capable of developing a response that was antagonistic to that of anxiety. This lends support to Lomont's (1965) argument that reciprocal inhibition has not been unequivocally demonstrated as separate from extinction.

This study is in agreement with studies conducted by; Moltz (1954), Wolpe (1958), Noblin and Maher (1962), and Campbell (1966), they found that a hierarchical presentation failed to have an affect upon extinction. The analysis of avoidance data in the present investigation failed to reject any of the null hypotheses.

Rapidity of extinction in this study may have been due to any one or more of the following; (1) the effects of treatment trials, (2) nature and topography of the avoidance response required, (3) possible punishing effects of dropping the rat after he made a response, and (4) the changes between the acquisition and treatment conditions.

The treatment trials, in effect, were essentially extinction of the jumping response. This expectation has been supported empirically by Hall (1955), and Carlson and Black (1959).

The nature and topography of the response required of the animal may have also been conducive to facilitation of rapid extinction. The jumping response required in this study appeared to be rather difficult and taxing for the animals to perform with much consistency.

The dropping of the animal to the grid floor after responding may have had a punishing effect on the subjects and as a result caused a decreased probability of the jumping response occurring in the future. Solomon, Kamin, and Wynne (1953) have found some evidence that punishing of an avoidance response sometimes causes a hastening of extinction.

The changes of conditions between acquisition and treatment may also have had some influence on the extinction of the jumping response. In acquisition, after a ten second failure to respond to the tone and ledge stimuli, the animal was punished by being shocked. In contrast with the treatment phase, where failure to respond, if anything, may have been reinforced. In other words, during extinction, a failure to respond may have actually been reinforcing to the animal and thus caused a reduction in the anxiety.

Several modifications of the apparatus and design may have increased the number of jumping responses emitted during extinction. The apparatus may have been improved by lowering the height of the ledge, thus increasing the probability and like-

lihood of more jumping responses. Increases of intensity and/or duration of shock may have also increased the number of jumping responses. The design might also have included an avoidance reconditioning phase following the treatment phase.

The results of very few jumping responses may have been viewed as an indication of effective therapy. However, this was not done, because in this study there were no differences between levels of the three main treatment effects. Therefore, the stated null hypothesis can not be rejected.

The ad hoc, Chi squares that were run on the number of jumping responses revealed that, pretraining anxiety relief, variable tone and "relief light", and the inter-trial interval had no differentially significant affect on reducing the number of jumping responses.

A "freeze" response during treatment was designated as when the subject remained in one position without any observable movement during the ten seconds of tone presentation. An examination of the results of the ad hoc analysis of variance of "freeze" responses reveals significant effects for pretraining anxiety relief and inter-trial intervals. Relating these findings to the treatment combinations, anxiety relief seems to reduce the number of "freeze" responses. In other words, the pretraining "relief light" component did act as a signal for the termina-

tion of shock. However, the results for the inter-trial intervals show a counter therapeutic effect. This means that subjects with shorter inter-trial intervals make more responses. A possible artifact producing this unexpected result is the rapid presentations of tone in the three second inter-trial interval condition. Thus, extended crouching may be counted as several "freeze" responses with the three second inter-trial interval but would only be counted as a single response in the longer inter-trial interval. Because of the results of Cochran's test, that shows an extreme heterogeneity of variance, the significance of the effects of anxiety relief and inter-trial interval may be questionable.

The significant heterogeneity of variance positively biases the reported F test. An F test, that assumes heterogeneity of variance, (1/3 df) is nonsignificant at α.05 (Myers, 1966). Using this conservative F test would impugn the significant results of figure 4 and 5, and make them even more tenuous. Although these differences are probably spurious, due to the heterogeneous variance, it may provide a fruitful hypothesis for subsequent investigations.

In conclusions, it is quite possible that the design selected in this study was not an adequate experimental analogue of Wolpe's technique of reciprocal inhibition used in treating humans. The task of developing an experimental analogue of this technique is still open to further investigations.

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