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Retention of Distributed Versus Massed Response Prevention Treatments in an Animal Model

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RETENTION OF DISTRIBUTED VERSUS MASSED

RESPONSE PREVENTION TREATMENTS

IN AN ANIMAL MODEL

BY

PAULA J. MARTASIAN

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE

REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

IN

PSYCHOLOGY

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Abstract

The purpose of this dissertation was twofold. One purpose was to examine the efficiency of escape training as a procedure for conditioning fear. The second and main focus was to investigate the efficacy of repeated response prevention treatments and the retention of these treatment effects. Response prevention (RP) has been shown to significantly decrease avoidance behavior in the laboratory setting. However, past research has also shown the return of avoidance behavior over repeated testings. It was hypothesized that increasing the number of RP treatments, and distributing them, would increase the retention of avoidance reduction over repeated testings. It was predicted that the retention of avoidance reduction would be greatest in a 24-treatment group and least in a one-treatment group. It was also predicted that response prevention treated subjects would exhibit less avoidance behavior than nonresponse prevention subjects (NRP). The escape training procedure of only two trials was shown to be sufficient to condition long lasting fear/avoidance behavior; the avoidance learning persisted over a 30 day period. This animal model for research in investigating the retention of treatment effects is responsive to an increased consciousness for protecting animal's well-being and is arguably a closer analog to the human condition than previously used training models. Response prevention

groups showed less avoidance behavior than nontreated groups. Although there was an increase in avoidance behavior in RP groups over repeated tests, they did not reach the level of avoidance responding of the nontreated groups. There was no difference between massed and distributed treatment groups, supporting the conclusion that when sufficiently long total RP treatment is used, both distributed and massed administration are equally effective.

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Table of Contents

Abstract	ii
Acknowledgements	iv
List of Tables	x
List of Figures	xi
List of Appendices	xii
Introduction	1
Method	11
Subjects	11
Apparatus	11
Procedure	12
Results	17
Discussion	44
References	60
Appendices	66
Bibliography	175

List of Tables

Table 1	Means and Standard Deviations of the Training Variable Total UCS	20
Table 2	Means and Standard Deviations of the Training Variable Trial 1 and Trial 2 UCS	22
Table 3	Means and Standard Deviations of the Testing Variable Approach Latency	23
Table 4	Means and Standard Deviations of the Testing Variable Approach Latency with Control Groups	35
Table 5	Means and Standard Deviations of the Testing Variable Time on Grids	95
Table 6	Means and Standard Deviations of the Testing Variable Time on Grids with Control Groups	105
Table 7	Means and Standard Deviations of the Testing Variable Number of Crossings	113
Table 8	Means and Standard Deviations of the Testing Variable Number of Crossings With Control Groups	124

List of Figures

Figure 1	Incomplete 4 X 2 X 3 X 3 Mixed Design	15
Figure 2	Mean Approach Latency Scores for RP and NRP Groups	26
Figure 3	Mean Approach Latency Scores for RPS	28
Figure 4	Mean Approach Latency Scores for NRPS	30
Figure 5	Mean Approach Latency Scores for Controls, RP1, RP24, NR1, NR24	38
Figure 6	Mean Approach Latency Scores for Controls	40
Figure 7	Mean Time on Grids Scores for RP and NRP Groups	98
Figure 8	Mean Time on Grids Scores for RPS	100
Figure 9	Mean Time on Grids Scores for NRPS	102
Figure 10	Mean Time on Grids Scores for Controls, RP1, RP24, NR1, NR24	108
Figure 11	Mean Time on Grids for Controls	110
Figure 12	Mean Number of Crossings for RP and NRP Groups	116
Figure 13	Mean Number of Crossings for RPS	118
Figure 14	Mean Number of Crossings for NRPS	120
Figure 15	Mean Number of Crossings for Controls, RP1, RP24, NR1, NR24	127
Figure 16	Mean Number of Crossings for Controls	129

List of Appendices

Appendix A	ANOVA Summary for Total UCS	66
Appendices B.1-B.3	ANOVA Summarys for Trial UCS	67
Appendices C-R.2	ANOVA Summarys for Approach	
	Latency	70
Appendix S	Results for Time on Grids	94
Appendix T	Results for Number of Crossings	112
Appendices U-AA	ANOVA Summarys for Time on	
	Grids	133
Appendices AA-OO	ANOVA Summarys for Number of	
	Crossings	143

Retention of Distributed versus Massed Response Prevention Treatments in an Animal Model

Animal models are frequently utilized in basic research to study psychopathology. Several reasons why animal models are important are reviewed by Bond (1984). These include providing frameworks, describing systems and discovering new relationships. Animal models can serve to explore specific features of a disorder under highly controlled conditions which can help us to facilitate the generation of hypotheses about the human disorder. Prior to an in depth look at the parameters involved in an animal model of avoidance behavior some background information will be presented. Aversive classical conditioning is the procedure of pairing a noxious stimulus (UCS) with a neutral stimulus (CS). Laboratory studies have frequently used a tone, bell or light as neutral stimuli and shock and loud noise as noxious stimuli (Church, 1971). Using aversives, the response that is classically conditioned is frequently referred to by theorists as a fear response (CR). When the fear response is classically conditioned an animal will seek to escape from the situation to terminate the aversive stimuli, (CS and UCS), (Catania, 1984). Since the escape response is instrumental in removing the animal from a negative situation it is operantly conditioned. Mowrer (1947, 1950) presents a two-factor theory explaining the relationship of the classically conditioned fear response and the operantly maintained

avoidance response. Although there are problems with this theory (Soloman & Winn, 1954; Rachman, 1976) it does provide a framework in which to begin to understand the learning of fear and avoidance responding. (See Martasian, 1989 for a review of the two-factor theory and criticisms). A typical operant escape procedure involves placing an animal in a chamber with a grid floor, presenting a CS followed by the UCS (electrical footshock) and allowing the animal to remove itself from the gridded chamber.

Common apparatuses used with escape training have included alleyways, the lever box, the shuttle box and the one-way platform avoidance box. In the one-way platform avoidance apparatus, (Martasian, 1989; Neill, 1982), an escape response entails jumping to a ledge protruding above the grid floor when a footshock is presented. In a one-way shuttle box an escape response entails running through an opening between the often identical two halves of the shuttle box. When the animal crosses to the other side, the shock is terminated. Both of these apparatuses exemplify aspects of Bolles' theory of species specific defense reactions (Bolles, 1970). Briefly, Bolles states that when confronted with aversive events animals respond in one of three ways; to flee (run or fly), freeze or fight. Rats among other animals will generally flee if avenues for escape are available, freeze if there is no avenue for escape and fight if an intruder or novel stimuli is presented to them.

In the present study a one-way shuttle box apparatus was used. Electric foot shock was the aversive event (UCS) and the contextual cues, (black side, grids, no light) were used as the neutral stimuli. The contextual cues were paired with the electric shock to classically condition a fear response which was followed by the instrumental escape response. Contextual cues have been used in past studies (Monti & Smith, 1976; Neill, 1980; 1982). Subjects were exposed to the electric shock on the black, gridded side of the shuttle box and were able to terminate the shock by shuttling to the white, lighted side with a solid wood floor. Aversive classical conditioning is a training procedure often used in studying the complex area of avoidance behavior.

The study of avoidance behavior in laboratory rats has often served as an analogue of clinical avoidance behaviors such as the neurotic disorders of phobia and anxiety (Baum 1971, 1986a, 1986b). Response prevention, (RP), the animal analogue of human flooding, has been studied in many laboratories as a technique facilitating the reduction of avoidance responding. Response prevention is the process of exposing the animal to the cues which predict an aversive event (usually shock) without presenting it. The animal is prevented from making the previously acquired avoidance response. This treatment has been widely reported as successful in facilitating the extinction of avoidance responding (Baum 1966, 1970; Mineka, 1979; Monti & Smith, 1976; Neill,

1980, 1982; Neill, Cottrill & Smith, 1982). Flooding is currently being used with some success in humans to treat clinical cases of bulimia and compulsive behaviors (Ordam & Kirschenbaum, 1985; Rossiter & Wilson, 1985).

Many of the variables affecting the efficacy of response prevention, have been investigated. The results of this research suggest the following: the more overall RP time the less avoidance behavior is exhibited in extinction testing, (Baum, 1970, Siegeltuch & Baum, 1971). Baum (1970) found 5 min of RP to be more effective than 0, 1, or 3 min. Siegeltuch & Baum, (1971) found that 30 min of RP was more effective than 0, 5 or 15 min. Baum (1972) demonstrated that RP efficacy was enhanced by a delay period of 30 min between acquisition of the avoidance response and the 5 min RP treatment. The groups receiving 5 min of RP treatment immediately following acquisition engaged in significantly more avoidance behavior than those groups given only a time delay of 30 min between acquisition and testing with no RP or groups receiving 30 min delay with 5 min of RP.

Although RP has been shown to facilitate the extinction of the avoidance responding, complete elimination of the avoidance response has seldom been found, (Neill, Corriveau & Smith, 1980). In fact a body of research exists which illustrates that short RP exposure can actually have a deleterious effect measured as an enhancement of avoidance responding, (Rohrbaugh & Riccio, 1970; Coulter, Riccio & Page, 1969; Linton,

Riccio, Rohrbaugh & Page, 1970; Rohrbaugh, Riccio, & Arthur, 1972). The general finding of these studies is that brief RP exposures, (5 or 15 s) can result in an enhancement of fear as measured in a conditioned emotional response (CER) paradigm. Rohrbaugh, Riccio & Arthur (1972) trained subjects to lick for water reinforcement at a steady rate. Then they were exposed to an aversive CS-UCS (tone then shock) pairing followed by RP exposures of 0, 15 s or 10 min. When tested in an operant chamber, brief RP exposed subjects (15 s) demonstrated suppression of responding. Riccio & Silvestri (1973) discuss the concept of residual fear in depth. They review animal studies which demonstrate that RP is effective in diminishing the frequency of the avoidance response but not in removing residual fear illustrated by CER paradigms.

The way in which fear is tested for is of vital importance for reaching clear conclusions on the parameters leading to the efficacy of response prevention. Gordon and Baum (1987) trained rats to barpress for water on a variable interval 90 s schedule in an operant chamber and then trained them to a criterion of 5 consecutive avoidances in a two-way shuttle box with white noise as a CS and shock as the UCS. Groups received RP for 0, 3 or 9 trials of 10 s each and then were run through active extinction trials. Following the extinction trials they were tested for fear in a CER paradigm. The results were surprising in that

the short RP exposure times, totals of 30 s and 90 s, were effective in extinguishing the active avoidance response as compared to the nontreated group. However, in the CER paradigm the two RP treatment groups displayed significantly higher suppression than the nontreated group which showed no suppression indicating no fear of the CS. This study raises some interesting questions. Such short RP exposure time of 10 s each trial for 3 or 9 trials may not have been effective at all. Gordon & Baum used an active avoidance extinction test. If the short CS exposures in the RP groups increased fear perhaps the animals learned to freeze during the extinction trials. Therefore reaching the avoidance extinction criterion at a fast rate may be indicative of animals learning the competing response of freezing during the short RP exposure trials as opposed to shuttle or fleeing behavior. When placed in the CER paradigm these groups may continue to freeze leading to a high suppression ratio and the appearance of the reinstatement of fear. Perhaps the fear was never effected by the brief RP trials. The nontreated group (no RP) had more extinction trials because they had learned to respond to the CS by "fleeing" during acquisition and they continued that response during the extinction test until the fear was actually extinguished. And when placed in the CER paradigm they continued to respond in the presence of the CS only adapted their response to the environmental cues. They barpressed instead of shuttling.

To avoid the confusion and possible misinterpretation of absence or presence of fear when using active avoidance measures the present study used a passive avoidance measure, approach latency. In a passive avoidance test the animal is placed in the area of the apparatus where there have been no CS-UCS pairings. In this study the safe place was the white, lighted side of the shuttle box with the solid floor. If animals have learned to freeze as a fear response during RP then when placed on the white side of the shuttle box they will continue to freeze as long as they are fearful. If fear has been diminished by the RP treatments the animals will approach the previously fearful stimuli, the black gridded side more quickly and if fear has been eliminated they should not be different from non-shocked controls. The passive avoidance test of approach latency is a more accurate and sensitive measure of fear. See Neill (1982) and Corriveau & Smith (1978) for reviews on active versus passive avoidance testings techniques.

There have also been inconsistent findings when massed versus distributed RP treatments have been investigated. Schiff, Smith, & Prochaska (1972) exposed subjects to RP using a straight-alley runway for 1, 4, or 12 trials of 0, 5, 10, 50, or 120 s. Results showed that when total RP time was held constant, RP was equally effective in reducing avoidance responding for both more trials of shorter duration and a few trials of longer duration ie. it was total RP time that produced the

effect. On the other hand, Berman & Katzev, (1972) manipulated massed vs distributed presentations of response prevention treatment of a shuttle box avoidance response. Their results showed that distributed RP treatments were significantly more effective in eliminating avoidance behavior. All of their treatment was administered on one day and consisted of a massed group of one trial for 200 s and a distributed group of 40 trials for 5 s each. Both of these studies tested the subjects only once after the RP treatment(s).

Usually animal analog avoidance research has employed a training criterion of making a prescribed number (8 or 10) of consecutive avoidance responses (Morokoff & Timberlake, 1971; Neill, 1980, 1982; Richardson, Riccio, & Ress, 1988; Martasian, Smith, & Neill, 1989). The number of traumatic events received is not uniform with this criteria-type procedure. Some of the animals experience several traumatic events when training to reach a criterion while other animals will experience one or two traumatic events. In addition, the criterion trials are actually extinction trials in which the CS is presented without the shock (UCS).

The animal model used in the study was one in which all subjects experienced two traumatic events in quick succession rather than several spaced over a longer period. This escape procedure creates a more uniform experience and presents a closer analog to the human condition (Baum, 1986a; Bond, 1984), in which a person

typically experiences only one or two traumatic events prior to the onset of avoidance behavior which then persists over time.

Past research has demonstrated that when the retention of a response prevention effect was tested over time there was a recovery in avoidance behavior sometimes to the level of nontreated groups (Benline & Simmel 1967; Neill, Corriveau, & Smith, 1980; Neill, Cottrill, & Smith, 1982). Benline & Simmel (1967) used distributed 20 s RP treatments of 8, 16, or 32 trials/day over five days, meaning there were varying number of RP treatments and varying total RP time for the different groups. When all subjects were tested with 100 extinction trials over a five day period there was an increase in avoidance behavior to the level measured during training. Benline & Simmel suggest that repeated testing (active) serves as a cue to re-establish the avoidance response which was suppressed during treatment.

The purpose of the present research was to explore factors which could enhance the retention of a response prevention effect over time using an escape training procedure which is a closer analog to the human condition than the criterion avoidance procedure used by past research. One study besides Berman & Katzev, (Martasian, Smith & Neill, 1989) has shown that the use of distributed RP treatments holds promise for prolonging the retention of response prevention effects when compared to a single massed RP treatment. Subjects in

the Martasian et al study were trained to a criterion of 10 consecutive avoidance responses in a one-way platform avoidance apparatus. Response prevention treatment was given as either 1 massed treatment of 36 min or one of three distributed treatments; 2 of 18 min, 3 of 12 min or 4 of 9 min. Treatment took place over a four day period. Those subjects receiving the four distributed treatments received treatment on days one, two, three, and four for 9 min each day. The subjects in the three treatment 12 min group received treatment on days two, three, and four, etc. Although the massed and distributed RP groups were not significantly different from each other, there was a lack of increase in avoidance behavior over repeated testings. This lack of increase in avoidance behavior over time was a new finding in this area of research and suggested a possible effect of distributed treatments.

In the present design the distributed RP treatments were all given in one day rather than spaced over several days. It was hypothesized that this procedure would enhance the effects of distributed treatments to the point of demonstrating a significant difference for the retention of RP effects between distributed and massed treatment groups over repeated testings. The present study was designed to address this important parameter.

In summary response prevention (RP) treatment has been shown to significantly decrease avoidance behavior in the laboratory setting. However past research has

also shown the return of avoidance behavior over repeated testings. This study investigated the retention of response prevention effect when distributed RP treatments were compared to massed treatments with the total exposure time to RP held constant. The hypothesis was that increasing the number of RP treatments would contribute to the retention of reduced avoidance behavior over repeated testings. It was predicted that the retention of avoidance reduction would be greatest in a 24 treatment group and least in a one treatment group. It was also predicted that response prevention treated subjects would exhibit less avoidance behavior than nonresponse prevention subjects.

Method

Subjects

The subjects were 160 experimentally naive Sprague-Dawley male rats weighing between 200-484 g purchased from Charles River laboratories. They were housed separately and maintained on ad lib food and water throughout the study. Three rats were replaced because they did not meet the training criteria.

Apparatus

A shuttle-box with dimensions 15.24 cm wide x 48.26 cm long x 24.13 cm high was used. The two compartments were of equal size (15.24 cm wide x 24.13 cm long x 24.13 cm high) and separated by a manually operated guillotine door. One compartment was painted white, lit by a 15 watt bulb and had a solid white floor.

The floor and walls were covered with white Contack paper for ease of cleaning and maintaining a uniform whiteness throughout the study. The other compartment was painted black with no overhead lighting and had a grid floor. The aversive stimulus used was scrambled shock of 1.5 mA and was delivered via a Coulbourn Instruments solid state shocker/scrambler (model E 13-16) which was connected to the grid floor. The shuttle-box was located in a sound attenuated chamber which had a black interior. A ventilation fan was on during all phases of the experiment. A 23 cm long, 20.5 cm wide and 20.5 cm high wooden box was used as a temporary retaining box. The delivery of the shock and timing of the dependent measures; time to approach the black side, total time spent on the black side and number of crosses were recorded by electromechanical equipment.

Procedure

Acquisition Training

The RP and NRP subjects were given two shocked escape learning trials. Any subject receiving more than a total of 60 s of shock over both trials was not used in the study. In the acquisition phase each subject in the RP and NRP groups was placed on the grid floor in the black nonlighted compartment. After a 20 s interval the guillotine door opened and the 1.5 mA scrambled shock was presented. The shock remained on until the subject shuttled to the white, lighted compartment unless the time exceeded 60 s then it was manually turned off and

the subject excluded from the study. At the end of Trial 1 subjects were placed in the retaining box for a 20 s intertrial interval. This escape procedure was repeated for Trial 2. Control subjects were placed in the shuttle-box with the shock off. After 20 s the guillotine door was opened and they were given 15 s to cross to the white side. Pilot research had shown that RP and NRP subjects usually crossed within this time. After 15 s the control subjects were removed from the apparatus and placed in the retaining box for the 20 s intertrial interval even if they had not crossed to the white compartment. This procedure was repeated for trial two.

Ten subjects were randomly selected to test for observer reliability. Two experimenters independently recorded the response data during acquisition yielding 10 points for correlation to establish reliability.

Treatment

Response Prevention. The RP subjects received response prevention treatment immediately following training. They were placed on the grids in the black side of the chamber of the apparatus with the guillotine door closed, fan on and the shock off for a total of 24 min distributed for the different groups as shown in Figure 1. A 20 s intertreatment interval was spent in the retaining box between the distributed treatments. Subjects in the Control-Response Prevention (CON-RP) groups also received RP treatment in the black

Figure Caption

Figure 1. Figure of the incomplete 4 X 2 X 3 X 3 mixed design.

		<u>Massed</u>		<u>Distributed</u>			
<u>Condition</u>		<u>Ratio of Treatments: Min</u>					
		1:24	2:12	3:8	8:3	12:2	24:1
<u>Response Prevention</u>	Test in hrs	.720					
	24						
	0						
<u>Nonresponse Prevention</u>							
<u>Control (RP)</u>							
<u>Control (NRP)</u>							

Note. $n = 10$ per cell; $N = 160$

compartment for either 1 treatment of 24 min, or 24 treatments of 1 min (See Figure 1).

Nonresponse Prevention. The NRP subjects received no response prevention treatment. Immediately following training they were returned to their home cages. To control for handling, they were picked up and replaced in their home cage

according to the distributed groups described in Figure 1. To equate for the time RP subjects spent in the retaining box and removal from it a 20 s inter-treatment interval separated the NRP handlings. For example the NRP subjects receiving 1 treatment of 24 min were placed in the home cage and left for 24 min. The NRP subjects receiving 2 treatments of 12 min each were placed in the home cage, left for 12 min, picked up and put back down and after 20 s picked up again and put back down and left for the second 12 min interval. CON-NRP subjects were also returned to their home cage following acquisition and picked up and replaced in their home cage according to their groups; 1 handling of 24 min, or 24 handlings of 1 min (See Figure 1).

Testing

All subjects were tested using a passive avoidance test; on a test day they were placed in the white nonshocked side of the chamber, lights and fan on. After 5 s the guillotine door opened signalling the start of the testing session. The amount of time it took the subject to cross to the dark side, approach latency (AL)

was recorded along with the total time spent on the dark, grid side, (time on grids, TOG), and the number of crossings (NOC) in the test period of 600 s. All subjects were tested immediately after treatment, and again 1 day and 30 days later. Thirty subjects were randomly selected for inter-rater reliability during testing. Two experimenters independently timed approach latency, time spent on grids (the black side) and the number of crossings giving a total of 90 reference points to correlate for reliability.

Results

This study employed an incomplete 4 (Group) X 2 (Treatment) X 3 (Ratio) X 3 (Test) factorial design. Each subject was randomly assigned to one of the groups; Control-Response Prevention (CON-RP), Control-Nonresponse Prevention (CON-NRP), Response Prevention (RP), or Nonresponse Prevention (NRP) and one of the following ratios: 1 of 24, 2 of 12, 3 of 8, 8 of 3, 12 of 2, or 24 of 1. The second factor was the Treatment (massed vs distributed) factor. The massed groups were defined as the three ratio factors: 1 of 24, 2 of 12, or 3 of 8 treatments. The distributed groups were defined by the three ratios: 8 of 3, 12 of 2, or 24 of 1. These ratios are the third factor in this design. The fourth factor was the retention intervals with repeated tests at Test day 0, 1, and 30 after treatment. See Figure 1 for an illustration of the design. The questions posed in this study were of an exploratory nature therefore the alpha

level set for all inferential results was $p < .05$ and the alpha level set for tests of homogeneity of variance was set at $p < .01$.

The focus of the results was twofold. One focus was to examine the efficiency of escape training as a procedure for conditioning fear. Escape acquisition was analyzed to determine if animals learned the pairing of the shock to the contextual cues and if there was equivalence of learning between the treated and nontreated groups. The second and main focus of the analysis was on determining the efficacy of repeated RP treatments and the retention of these treatment effects.

Three dependent measures, approach latency (AL), time on grids (TOG), and number of crossings (NOC) were taken to measure avoidance behavior and serve as indices of fear. Approach latency has been used as a passive avoidance test measure in past studies (Neill, 1980, 1982; Cottrill, 1986; Corriveau & Smith, 1978; Martasian, Smith & Neill, 1989) and has proven to be a sensitive measure. It was defined in the present study as the amount of time it took an animal to make the first shuttle from the white lighted side to the black gridded side. Shorter AL times would indicate little or no avoidance behavior whereas long AL times would indicate avoidance behavior. Control and RP groups were predicted to show little or no avoidance behavior so short AL times were expected of these groups. Likewise, the nontreated groups (NRPs) were predicted to demonstrate avoidance

behavior and therefore were expected to have long AL times. A second prediction, that retention of avoidance reduction would be greatest in the RP24 treatment group and least in the RP1 treatment group was analyzed by looking at the interaction between treatment group and repeated tests. If the RP24 group maintained treatment effects, then short approach latencies would be measured for each of the test times. If there was a lack of retention of the treatment effects in the RP1 group then an increase in AL times would be measured at each repeated test time, Test Day 1 and Test Day 30.

For the purposes of clarity and precision only the approach latency analysis will be reported in this section. The other two measures, time on grids (TOG) and number of crossings (NOC) will be reported in Appendixes S and T respectively. While the TOG measure has been an inconsistent measure in the past (Neill, Cottrill, & Smith, 1982; Martasian, 1989), in this study the TOG measure has yielded a similar pattern of results and was redundant with the AL measure. The NOC measure was piloted in this study as an activity based measure of avoidance behavior and requires further study to determine its validity. This will be discussed in Appendix T.

Escape Training

To verify equivalent escape training, total UCS time was assessed between the RP and NRP groups. Table 1 shows the means and standard deviations for total shock

Table 1

Means and Standard Deviations of Total UCS Duration
In Seconds by Treatment During Escape Training

Group	Treatment					
	1	2	3	8	12	24
Response						
Prevention						
M	9.87	8.23	6.38	9.63	7.46	6.58
<u>SD</u>	8.76	5.76	4.31	7.76	7.32	5.72
Nonresponse						
Prevention						
<u>M</u>	4.58	5.88	9.51	13.04	7.61	6.38
<u>SD</u>	2.60	3.59	7.28	4.55	4.95	4.87

Note. n = 10 per cell, N = 120.

received. Homogeneity of variance was tested for total UCS using Cochran's C test, (Winer, 1971). There was no violation of homogeneity of variance; $C(12, 9) = 0.184$, ns. A one-way analysis of variance was performed on the total UCS and found to be nonsignificant indicating no differences between the groups; $F(11, 108) = 1.511$, ns. (Appendix A contains the ANOVA summary table).

Possible differences between shock received on Escape Trial 1 and Escape Trial 2 were assessed. Table 2 shows the means and standard deviations for Trial 1 UCS and Trial 2 UCS. A Cochran's C test computed to test for homogeneity of variance was found to be nonsignificant; $C(12, 9) = 0.185$, ns. A 2 (Group) X 2 (Trial) mixed design analysis of variance showed a nonsignificant Group main effect; $F(11, 108) = 1.521$, ns; a significant Trial main effect; $F(1, 108) = 18.842$, $p < .05$ and a nonsignificant Group X Trial interaction; $F(11, 108) = 1.144$, ns. (See Appendix B for the ANOVA summary table). The main effects for Trial UCS was analyzed with a one way ANOVA simple effects test, $F(1, 108) = 18.841$, $p < .05$. Trial 2 had significantly shorter UCS time than Trial 1 demonstrating quicker shuttle times and that learning was occurring.

Avoidance Testing

Approach Latency. The means and standard deviations for all RP and NRP groups for approach latency are presented in Table 3. The figures for mean approach latency times are presented in Figures 2, 3, and 4 for

Table 2

Means and Standard Deviations of Trial 1 and Trial 2
UCS in Seconds by Treatment During Escape Training

Group	Treatment					
	1	2	3	8	12	24
Response						
Prevention						
Trial 1						
<u>M</u>	7.10	4.31	3.65	7.13	5.66	3.39
<u>SD</u>	8.46	4.20	3.09	6.85	6.77	2.87
Trial 2						
<u>M</u>	2.79	3.92	2.73	2.54	1.80	3.19
<u>SD</u>	1.93	4.93	3.34	1.85	1.55	5.03
Nonresponse						
Prevention						
Trial 1						
<u>M</u>	1.71	3.92	7.05	7.58	6.33	4.18
<u>SD</u>	0.90	3.49	6.28	4.65	5.03	4.03
Trial 2						
<u>M</u>	2.77	2.02	2.50	5.46	1.28	2.30
<u>SD</u>	2.35	1.08	1.97	5.04	0.86	2.27

Note. n = 10 per cell, N = 120.

Table 3

Means and Standard Deviations for the Approach Latency
Measure in Seconds During All Test Sessions

Treatment Condition	Testing in Days		
	0	1	30
Response Prevention - Massed			
1 <u>M</u>	94.89	124.57	67.75
<u>SD</u>	192.85	201.17	106.27
2 <u>M</u>	56.66	87.67	157.07
<u>SD</u>	110.64	185.53	185.19
3 <u>M</u>	52.06	190.21	189.20
<u>SD</u>	113.84	283.98	235.97
Response Prevention - Distributed			
8 <u>M</u>	134.26	343.24	226.19
<u>SD</u>	247.34	298.80	211.36
12 <u>M</u>	88.07	179.18	206.37
<u>SD</u>	187.88	284.45	200.58
24 <u>M</u>	73.98	212.42	107.49
<u>SD</u>	186.40	260.11	157.87

Table 3 cont'd

		Testing in Days		
Treatment				
Condition		0	1	30
Nonresponse Prevention -				
Massed				
1	<u>M</u>	339.65	294.47	367.78
	<u>SD</u>	171.14	285.08	212.26
2	<u>M</u>	362.82	389.55	371.75
	<u>SD</u>	226.25	276.76	259.04
3	<u>M</u>	375.91	396.92	201.07
	<u>SD</u>	231.04	231.12	176.34
Nonresponse Prevention -				
Distributed				
8	<u>M</u>	362.26	526.26	534.10
	<u>SD</u>	306.94	148.48	138.99
12	<u>M</u>	348.94	352.54	359.47
	<u>SD</u>	279.32	302.95	307.16
24	<u>M</u>	326.05	194.64	257.33
	<u>SD</u>	279.25	238.14	229.40

Note. Total N = 120, n = 10 per cell.

Figure Caption

Figure 2. Mean approach latency scores in seconds for all RP and NRP groups.

Figure Caption

Figure 3. Mean approach latency scores in seconds for RP groups only.

Figure Caption

Figure 4. Mean approach latency scores in seconds for NRP groups only.

all RP and NRP groups, RP only groups, and NRP only groups respectively.

A Cochran's C test was computed to test for homogeneity of variance and found to be nonsignificant; $C(12, 9) = 0.190, ns$. A 2 (Group) X 2 (Treatment) X 3 (Ratio) X 3 (Test) mixed design analysis of variance showed a significant Group, $F(1, 108) = 34.761, p < .05$; Test, $F(2, 216) = 4.595, p < .05$; Group X Test, $F(2, 216) = 3.934, p < .05$; Group X Ratio X Test, $F(4, 216) = 2.736, p < .05$ effects. Ratio main effects; $F(2, 108) = 1.292, ns$; Group X Ratio effects; $F(2, 108) = .601, ns$; were nonsignificant. (See Appendix C for the ANOVA summary table). Follow-up tests were computed to determine where the differences occurred.

To assess the Group X Ratio X Test interaction a series of two-way ANOVA simple effects tests were computed. Only the interaction Group X Test was significant and was analyzed as follows. At Test Day 0 a one-way ANOVA simple effects test showed the RP and NRP groups to differ, $F(2, 216) = 102.435, p < .05$. An Omega-squared showed that Test 0 accounted for 2.89% of the variance, ($W^2 = 0.289$). (See Appendix D for the ANOVA summary table). The RP groups had significantly quicker approach latencies than the NRP groups. At Test Day 1 a one-way ANOVA simple effects test showed the RP and NRP groups to differ, $F(2, 216) = 40.592, p < .05$. An Omega-squared showed that Test day 1 accounted for 15.4% of the variance, ($W^2 = .154$). (See Appendix E for the

ANOVA summary table). The RP groups had significantly quicker approach latency times than the NRP groups. At Test Day 30 a one-way ANOVA simple effects test showed the RP and NRP groups differed, $F(1, 216) = 50.766$, $p < .05$, with the RP groups showing the quicker approach latencies. An Omega-squared showed that Test Day 30 accounted for 18.6% of the variance, ($W^2 = .186$). (See Appendix F for the ANOVA summary table). These results show that at each of the test days the RP groups had significantly quicker approach latency times indicating less avoidance behavior and less fear than the NRP groups.

To assess if groups were behaving differently across the repeated testings, another series of follow-up tests were computed. Simple effects tests for RP groups across the repeated tests were significant, $F(2, 216) = 8.450$, $p < .05$. An Omega-squared showed that RP groups accounted for 6.4% of the variance, ($W^2 = .064$). (See Appendix G.1 for the ANOVA summary table and Appendix G.2 for the collapsed means). Newman-Keuls test determined that for RP groups, Test Day 0 had significantly quicker approach latencies than at Test Day 1 or 30. The simple effects test for NRP groups across repeated testings were nonsignificant, $F(2, 216) = 0.079$, ns. (See Appendix H for the ANOVA summary table. These results show that the NRP avoidance behavior was constant across the repeated tests but for the RP groups there was an increase in avoidance behavior from Test Day 0 to Test Day 1. This

avoidance behavior stayed at the increased level from Test Day 1 to Test Day 30.

The main effects for Test, $F(2, 216) = 4.594$, $p < .05$; were significant. (See Appendix I for the ANOVA summary table). The main effects for Test across Groups, Treatment and Ratio was analyzed with a one-way ANOVA simple effects test, $F(2, 216) = 4.595$, $p < .05$. An Omega-squared showed that Test effects accounted for 3.2% of the variance, ($W^2 = .032$). (See Appendix J.1 for the ANOVA summary table and Appendix J.2 for the collapsed means). A Newman-Keuls test determined that for Test Day 0 there were significantly quicker approach times than on Test Day 1. Test Day 30 was not different from Test Day 0 or Test Day 1.

The main effects for Group across Treatment, Ratio and all Tests was analyzed with a one-way ANOVA simple effects test, $F(1, 108) = 34.761$, $p < .05$. An Omega-squared showed that Group effects accounted for 23.5% of the variance ($W^2 = .235$). (See Appendix K.1 for the ANOVA summary table and Appendix K.2 for the collapsed means). The RP groups had significantly quicker approach times than the NRP groups.

Approach Latency with Controls. Because extensive research has demonstrated that controls behave consistently an incomplete design was employed using nonshocked groups as controls for the extreme levels of massed and distributed conditions for both treated and nontreated groups. These nonshocked groups served to

determine if there was complete extinction of avoidance responding by the RP groups. If no differences were found between the control groups and RP groups this would indicate complete extinction of the avoidance behavior. The means and standard deviations for CON-RP1, CON-RP24, CON-NRP1, CON-NRP24, RP1, RP24, NRP1, NRP24 for approach latency are presented in Table 4. Figure 5 represents these groups and Figure 6 represents all control groups.

A Cochran's C test was computed to test for homogeneity of variance and found to be significant; $C(8,9) = 0.436, p < .05$. Although homogeneity of variance is an underlying assumption of the Analysis of Variance, the ANOVA is a robust test given other assumptions are met such as large N and equal cells. Therefore since the analysis of variance is robust in regards to minor violations of homogeneity of variance no transformation of the data was deemed necessary, (Winer, 1971). A 4 (Group) X 2 (Treatment) X 3 (Repeated Test) mixed design analysis of variance showed significant Group, $F(3, 72) = 22.507, p < .05$; and Group X Test interaction, $F(6, 144) = 2.444, p < .05$. Test main effects were nonsignificant; $F(2, 144) = .051, ns$. (See Appendix L for the ANOVA summary table). Follow-up tests were computed to determine where the differences occurred.

The interaction Group X Test was analyzed as follows. Simple effects tests for CON-RP and CON-NRP groups were not significant across the repeated tests. (See Appendixes M and N for CON-RP ANOVA table and

Table 4

Means and Standard Deviations for the Approach Latency
Measure in Seconds During All Test Sessions With Controls

Treatment Condition	Testing in Days		
	0	1	30
Control - Response Prevention - Massed			
1 <u>M</u>	14.84	18.61	20.87
<u>SD</u>	30.98	25.833	55.00
Control - Response Prevention - Distributed			
24 <u>M</u>	8.46	1.38	5.53
<u>SD</u>	9.46	0.49	9.15
Control - Nonresponse Prevention - Massed			
1 <u>M</u>	6.02	44.81	17.31
<u>SD</u>	5.94	111.78	29.71
Control - Nonresponse Prevention - Distributed			
24 <u>M</u>	6.78	3.65	5.77
<u>SD</u>	6.30	4.13	6.55
Response Prevention - Massed			
1 <u>M</u>	94.89	124.57	67.75
<u>SD</u>	190.85	201.17	106.27

Table 4 cont'd

Treatment Condition	Testing in Days		
	0	1	30
Response Prevention -			
Distributed			
24 <u>M</u>	73.98	212.42	107.49
<u>SD</u>	186.40	260.11	157.87
Nonresponse Prevention -			
Massed			
1 <u>M</u>	339.65	294.47	367.78
<u>SD</u>	171.14	285.08	212.26
Nonresponse Prevention -			
Distributed			
24 <u>M</u>	326.05	194.64	257.33
<u>SD</u>	279.25	238.14	229.40

Note. N = 80, n per cell = 10.

Figure Caption

Figure 5. Mean approach latency scores in seconds for CON-RP1, CON-RP24, CON-NRP1, CON-NRP24, RP1, RP24, NRP1, NRP24 groups.

Figure Caption

Figure 6. Mean approach latency scores in seconds for Control groups only.

CON-NRP ANOVA summary tables respectively). The RP simple effects test (for RP1 and RP24 across repeated tests were significant, $F(2, 144) = 3.728$, $p < .05$. An Omega-squared showed that 3.6% of the variance was accounted for by RP groups, ($\eta^2 = .036$). (See Appendix O.1 for the ANOVA summary table). A Newman-Keuls test demonstrated that Test Day 0 and Test Day 30 did not differ from each other but Test Day 1 had significantly longer approach latencies from both Test Day 0 and 30. (See Appendix O.2 for the collapsed means). The NRP simple effects test (for NRP1 and NRP24) across repeated tests were significant, $F(2, 144) = 3.513$, $p < .05$. An Omega-squared showed that 3.3% of the variance was accounted for by the NRP groups, ($\eta^2 = .033$). (See Appendix P.1 for the ANOVA summary table and Appendix P.2 for the collapsed means). A Newman-Keuls test demonstrated that Test Day 0 had significantly longer approach latencies than Test Day 1 and Test Day 30 did not differ from Test Day 0 or 1. To summarize, the Controls showed no change in behavior across the repeated tests whereas the RP and NRP groups did. RP groups showed an increase in avoidance behavior from Test Day 0 to Test Day 1 which was not maintained at Test Day 30. The NRP groups showed a pattern of behavior opposite to the RP groups. There was a decrease in avoidance behavior from Test Day 0 to Test Day 1 which was not maintained at Test Day 30.

The main effects for Group across Treatment and all Tests was analyzed with a one-way ANOVA simple effects test, $F(3, 72) = 22.507, p < .05$. An Omega-squared showed that Group effects accounted for 45.9% of the variance, ($\omega^2 = .459$). (See Appendix Q.1 for the ANOVA summary table). A Newman-Keuls test determined that the CON-RP and CON-NRP groups did not differ from each other. RP groups had significantly longer approach latencies than the CON-RP and CON-NRP groups and significantly shorter approach latencies than the NRP groups. The NRP groups had significantly longer approach latencies than all other groups. (See Appendix Q.2 for the collapsed means). These results show the Control groups are showing no avoidance behavior, RP groups demonstrate avoidance behavior and NRP groups demonstrate the most avoidance behavior.

An apriori concern was the behavior of RP groups across the repeated tests so a two-way analysis of variance was computed for the RP groups only. A Cochran's C showed no violation of homogeneity of variance, $C(6, 9) = 0.262, ns$. The 6 (Treatment) X 3 (Test) analysis of variance showed a significant Test effect, $F(2, 108) = 7.379, p < .05$. (See Appendix R.1 and R.2 for the ANOVA summary tables). A Newman-Keuls test showed that Test Day 0 had significantly quicker approach latencies than Test Day 1 and Test Day 30, but Test day 1 and 30 did not differ. These results indicate that there was an increase in avoidance behavior from

Test Day 0 to Test Day 1 and this level of avoidance behavior was maintained for Test Day 30. The finding of no difference between the retention of RP distributed groups and RP massed groups specifically RP24 and RP1 was an unexpected one and does not lend support for the prediction.

Inter-rater reliability

Escape Training Reliability. To assess for inter-rater reliability during training a Pearson product-moment correlation was computed between the total UCS time recorded by two independent observers. This data was based on ten randomly selected subjects. The results were as follows; $r(8) = .998, p < .05$.

Avoidance Testing Reliability. To assess for inter-rater reliability during testing a Pearson product-moment correlation was computed between two independent observers for each of the dependent measures; approach latency, time on grids, and number of crosses, at each of the test days, (0, 1 & 30). Ten subjects were randomly selected for each comparison. The results for approach latency were as follows; Test Day 1, $r(8) = .999, p < .05$; Test Day 1, $r(8) = .999, p < .05$, and for Test Day 30, $r(8) = .999, p < .05$. The results for time on grids were as follows; Test Day 0, $r(8) = .999, p < .05$; Test Day 1, $r(8) = .999, p < .05$; and for Test Day 30, $r(8) = .999, p < .05$. The results for the number of crosses is as follows; Test Day 0, $r(8) = 1.0, p < .05$;

Test Day 1.0, $\underline{r}$ (8) = 1, $\underline{p}$ < .05, and for Test Day 30, $\underline{r}$ (8) = 1.0, $\underline{p}$ < .05.

The correlations are significant for each of the measures taken in escape training and avoidance testing. This indicates that the measures were highly reliable and consistent.

In summary, RP groups demonstrated significantly quicker approach latency times than NRP groups overall and at each of the repeated testings. This indicates that the treated RP groups showed less avoidance behavior than the nontreated (NRP) groups. As predicted RP treated groups showed less avoidance behavior than NRP groups. Although there was a retention of RP effects there was significant increase in avoidance behavior as demonstrated by longer approach latency times at repeated testings. This was an unexpected finding along with the lack of significant difference in retention of avoidance reduction between the RP groups (massed vs distributed).

Discussion

Emphasis in the interpretation of the results of this study will be threefold. One point of interest is the efficiency of the escape training procedure. The second focus will be on the efficacy of response prevention treatment and the retention of its effects using approach latency as a passive avoidance test measure. The third focus will be a comparison of the effects of massed vs distributed response prevention treatments.

In escape training the lack of significant differences between the RP and NRP groups for total UCS (shock) indicates that they had equivalent levels of escape training. Therefore, any subsequent differences in avoidance behavior between these groups should be attributable to the different treatments.

The significant increase in shuttle behavior from Trial 1 to Trial 2 during escape training demonstrates that learning had taken place with the first pairing of the black side of the shuttle box and the shock (UCS). The contextual cues (grids, black, nonlighted) were salient enough to be classically conditioned to the fear response. The escape learning can be explained in terms of negative reinforcement. Negative reinforcement is the procedure where an animal (or person) increases some behavior to terminate or remove itself from aversive stimuli. The shuttle response to the white side removed the animal from the aversive stimuli of the contextual cues of the black side and the shock. The decrease in running time from Trial 1 to Trial 2 illustrates an increase in the performance of the shuttle behavior which had been negatively reinforced.

The avoidance learning that took place was measured in the test phase, immediately, 1 and 30 days after escape training and persisted over this 30 day period after animals experienced only two traumatic events. Avoidance animal analog research (Baum, 1966, 1968, 1972; Gordon & Baum, 1987; Neill, 1980, 1982; Martasian, Smith

& Neill, 1989) has typically employed a training criterion of several (8 or 10) consecutive avoidance responses followed by treatment and testing of the treatment effects. The use of an escape training procedure with the delivery of only two shocks has implications on two levels. First, giving all animals the same number of traumatic events provides the control of having all animals have a more uniform experience during training. Using the criterion training approach, the number of shocks received can vary a great deal from animal to animal, for example, in Martasian et al (1989) the number of shocks varied from 2 - 22. Therefore, more variability is inherent in the criterion approach. The two trial escape training diminishes variability by providing a more controlled procedure than the criterion procedure.

The second implication for this escape training is in the area of the use of animals in research and animal models. There has been an increase in the animal rights movement to establish rights for animals and abolish the use of animals in research. However, science has a long history of results of animal research that have provided longevity and improved quality of living for people. (See Feeney 1987 for a review). Feeney addresses the issue of using animals in research in terms of "human rights and animal welfare". He creates a strong argument that the use of animals in research should be approved by review boards and animal care facilities should meet

strict guidelines. But, denying the use of animals in research is a violation of human rights for those who could benefit from the findings. This could apply to people who learn nonadaptive compulsive behaviors such as phobias. Future research is needed to define the parameters under which this escape training procedure is a viable tool in the study of avoidance learning. The escape training procedure of presenting the least number of traumatic events sufficient to condition long lasting fear and avoidance behavior for research in improving the retention of treatment effects is responsive to an increased consciousness for protecting animal's well-being.

Finally, the escape procedure of two traumatic events is also a closer analog to the human condition. A person typically experiences only one or two traumatic events prior to the onset of avoidance behavior which then persists over time. Taking into account the results from the two shock escape training procedure and the test results indicating long lasting avoidance behavior along with guidelines for using animals in research and animal models there should be a shift away from a criterion training procedure and towards this minimal yet effective aversive conditioning procedure.

The number of RP treatments and the retention of these treatment effects pose important empirical questions and this study investigated them for some of the following reasons. Response prevention has been

demonstrated many times in the laboratory setting to be effective in diminishing avoidance behavior learned from a previously traumatic event or events. (Baum, 1966, 1968, 1970, 1972; Baum & Myran, 1971; Gordon & Baum, 1987). However, the long term efficacy of response prevention is questionable due to the increase in avoidance behavior demonstrated upon repeated testings over time (Benline & Simmel, 1967, Neill, Cottrill & Smith, 1982). The only study that has not shown an increase in avoidance behavior in response prevention treated groups across repeated testings was Martasian, Smith & Neill (1989). Martasian et al. (1989) presented repeated RP treatments across a four day treatment phase and then tested the effects over a 30 day retention period. Although there was no increase in avoidance responding over the 30 days, the predicted differences were not found between the massed and distributed RP groups. The massed group was 1 treatment of 36 min and the distributed treatments were 2 of 18 min, 3 of 12 min and 4 of 9 min. It was concluded that the number of trials separating these treatment groups may not have been great enough to demonstrate the predicted superiority of the distributed treatments procedure. It was also possible that spreading the treatments over a four day period may have weakened the potential distributed treatment effects.

The present study extended the differences between the massed and distributed groups by having massed

treatments, 1 of 24 min, 2 of 12 min, 3 of 8 min and distributed treatments, 8 of 3 min, 12 of 2 min, and 24 of 1 min. Past research has shown that short RP exposure can actually increase avoidance behavior, (Rohrbaugh & Riccio, 1970; Coulter, Riccio & Page, 1969; Linton, Riccio, Rohrbaugh & Page, 1970; Rohrbaugh, Riccio, & Arthur, 1972). At the onset of the present study it was considered possible that the treatment group with 24 RP's of 1 min would actually be too brief an RP time to be effective in reducing avoidance behavior and might actually potentiate it. The theory behind implosive therapy, (Stampfl & Levis, 1967) would predict this to be the case. Response prevention is the animal analog to implosive therapy which theorizes that the phobic person must be presented with the fear establishing cues for a long enough time for that person to reach a peak anxiety level and then as the anxiety level diminishes the connection between the CS and fear will be weakened. According to this premise one would predict a longer, massed response prevention would be the most successful in diminishing avoidance behavior. On the other hand classical conditioning theory would predict that the more presentations of the CS (fear establishing cues) without the paired UCS (aversive, in this paradigm - shock), the quicker a response should extinguish. Hence, the distributed group of 24 response prevention treatments, each being a presentation of the cues that were paired with the shock such as the black side and grids, should

lead to the best extinction (least amount) of avoidance behavior. The results of this study do not support either one of these theories but instead suggests that it is the overall time that seems to be the important parameter in efficacy of response prevention. This finding has been reported in past studies, (Schiff, Smith & Prochaska, 1972; Martasian et al, 1989).

Interpretation of the avoidance results will focus on the approach latency measure as an index of fear and avoidance responding with some summary statements about the other two measures, TOG and NOC. The hypothesis that the number of RP treatments would contribute to the retention of avoidance reduction behavior over repeated testings in a positive monotonic function was not supported by the results. Possible explanations for the lack of this finding will be discussed further on in this section. The prediction that RP subjects would exhibit less avoidance behavior than NRP subjects was supported. The following sections will describe interpretations of the interactions and main effects in relation to the original hypothesis and predictions.

Approach latency was defined as the time it took a subject to approach the black gridded side of the shuttle box in which it had experienced two inescapable traumatic events. This was a passive avoidance test and was similar to the test used in the previous studies in this laboratory (Neill, 1980, 1982; Martasian et al. 1989). In analyzing the Group X Test interaction, RPs showed

quicker approach latencies than NRPs at each of the test days providing evidence of the effectiveness of the RP treatment in reducing avoidance behavior. The NRP groups maintained high levels of avoidance behavior across the repeated tests whereas, the RP groups showed significant increase in avoidance behavior from Test Day 0 to Test Day 1 which was maintained at Test Day 30. It was this increase in avoidance behavior by the RPs that contributed to the pattern observed with the Test main effects. The significant main effect for Test interval for all RP groups versus all NRP groups was attributable to more avoidance behavior exhibited on Test Day 1 and 30 than Test Day 0 by the RP groups. This increase in avoidance behavior upon repeated testings has been observed in some past studies, (Benline & Simmel, 1967; Neill, Cottrill & Smith, 1982) and been referred to as the evidence for residual fear. However, these past studies reported levels of avoidance behavior reaching that of nontreated groups over the retention interval which was not the case in the present study. Although an increase in avoidance behavior occurred with the RP groups in the present study they still demonstrated the benefits of RP treatment by not reaching the level of avoidance behavior shown by the nontreated groups. The number of RP treatments was not significant but the lack of a substantial increase in avoidance behavior to equivalent nontreated groups upon repeated testings is similar in nature to a past study which showed no

increase in avoidance behavior across repeated testings when repeated RP treatments were used (Martasian, Smith, & Neill, 1989).

When comparing all RP groups with all NRP groups the overall Group main effect indicated that RP groups had significantly quicker approach latencies than NRP groups, indicating less avoidance behavior in the RP groups due to a treatment effect. Although avoidance behavior was reduced by the response prevention treatments, it was not eliminated as indicated by the Group main effects for Controls vs RP vs NRP. These results show Controls having the quickest approach latencies with the comparison RP groups having longer approach latencies and comparison NRP groups having the longest approach latency times.

The time on grids (TOG) measure was the total time animals spent on the black gridded side of the shuttle box once a complete crossing was made during the test phase. In the past when used in a jump up box paradigm, this measure has been inconsistent as an index of fear (Neill, Cottrill & Smith, 1982; Martasian, Smith, & Neill, 1989). In the present study the time on grids measure has yielded a similar result pattern as the approach latency measure with Group main effects and Group X Test interaction when comparing RPs and NRPs. Overall RP groups spent more time on the back gridded side than NRP groups at each of the Test Days. Also RP groups spent more time on the black side on Test Day 0

than on Test Days 1 or 30 which did not differ. A slightly different result emerges when comparing RPs and NRPs to Controls. There is a Group main effect with both RPs and Controls spending more time on the black side than NRPs but there was no difference in the amount of time RPs and Controls spent on the black side. As a fear index, this conveys that the only group demonstrating any observable fear as measured by avoidance behavior were the NRPs. This finding is not contradictory to the findings with the approach latency measure but illustrates a subtler observation of what is happening than either measure taken alone could provide. Approach latency times indicated that there was a difference in avoidance behavior when comparing Controls and RPs with RPs demonstrating avoidance behavior. However, the lack of a difference between RPs and Controls when using the time on grids measure can be interpreted as indicating that once the initial approach is made treated groups behave like controls demonstrating no avoidance behavior.

The results from the number of crossings (NOC) dependent measure indicate that it was an insensitive measure for passive avoidance testing. A crossing was defined as the movement of the animal from the white side into the black side when all four feet crossed over the doorway. Although some of the results for this measure were statistically significant, not all were of practical significance. Therefore the discussion of the NOC measure will be limited to the results of practical

significance and unexpected findings. Overall and at each test phase there was no difference between the RP and NRP groups. Finding no differences between the RP and NRP groups was not an expected finding. The other two dependent measures clearly differentiate between these groups with RP groups showing the treatment effects and having less avoidance behavior than the NRP groups. However, when using the number of crossings measure which is activity based there is no difference between the groups. Perhaps this implies that the RP groups have learned that the black side was safe and once they crossed they stayed there. However, the NRP groups did not cross readily to the black side as indicated by the long approach latencies and when they did cross they did not spend much time on the black side as indicated by the short time on grids. If the NRPs did cross to the black side they then crossed quickly back to the white side and stayed there for the remainder of the test phase. Thus both RP and NRP groups showed little activity but for different reasons demonstrating that number of crossings is not a good measure for passive avoidance testing.

When comparing Controls with RP and NRP groups in NOC there was a Group main effect with CON-NRP having more crossings than all other groups and CON-RP having more crossings than RP and NRP groups which did not differ. It was expected that the Controls would have more crossings. The difference between the two Control groups may be explained in terms of exploration and

curiosity. The CON-NRP groups received no shock and spent their non-treatment time in the colony. When placed into the shuttle box for the test phases they behaved in a very curious manner shuttling between the black and white side quickly and often during the 10 min test period. This exploratory behavior is maintained over the 30 days at each of the Test Days. At all Test Days the CON-NRP groups demonstrate more crossings than all other groups. At Test Day 1 CON-RP had more crossings than the RP and NRP groups with these two groups not differing. Finally, when comparing the behavior of the groups across repeated tests, again only the CON-NRP group shows more crosses at Test Day 0 than Test Day 1 or 30. The other groups did not behave differently across the repeated tests.

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Like the other two measures the NOC results do not show any differences between massed and distributed RP groups. However there was a difference in number of crossings when all distributed groups were compared with each other; Ratios 8, 12 and 24. Ratio 24 had more crossings than Ratios 8 and 12, regardless of treatment condition. It seems that, overall, Ratio 24 may promote more activity than the other ratios. However, since it does not differentiate between treated and nontreated groups, this finding is interesting but of little practical significance.

An apriori concern was the effect of the distributed treatments of the RP groups across the repeated tests.

None of the dependent measures, approach latency, time on grids, and number of crossings showed any differentiating behavior between the RP groups. This does not support the original prediction that the group with the most RP treatments, RP 24, would demonstrated the least avoidance behavior and maintain the treatment effects over a 30 day test period. This lack of difference between distributed and massed treatments has been reported in two other past studies (Schiff, Smith & Prochaska, 1972; Martasian et al., 1989). Two past studies which do not support the present findings of no difference between the distributed and massed treatments are Baum & Myran (1971) and Berman & Katzev (1972). Baum & Myran trained rats in a platform apparatus to a criterion of 10 consecutive avoidances. They gave the distributed group RP treatment for 3 min, following training and on days 2 and 3. The massed group received RP for 9 min either immediately after training or on day 3 and one group received no RP treatment. An active avoidance test, trials to extinction criterion (5 min of no responding) was used. They reported that both RP groups extinguished avoidance responding faster than the nontreated group and that the distributed RP groups extinguished the quickest. However they report that this was a weak effect. Berman & Katzev used a shuttle box and administered treatment on one day of either 40 trials of 5 second RP treatments or one trial of a 200 second RP. They also used an active avoidance of 50 extinction trials. There is one major parameter in particular

which differentiates between the present study, Martasian et al. and these two studies which report benefits of distributed treatments. In the present study and the Martasian et al study the overall RP time was 24 and 36 min respectively whereas the overall RP time in Baum and Myran was 9 min and Berman & Katzev was 3 min and 20 s. Perhaps when shorter overall RP time is used the distributed parameter is important in potentiating the RP effects but when the overall RP time is of a much longer duration both distributed and massed administration of the treatment are equally effective. This finding has several important implications. One should be cautious when using short amounts of RP treatment and to potentiate its effects may need to deliver the treatments in a distributed fashion. When possible it is best to use longer amounts of RP treatment since its effects are more stable and equally effective when administrated in one long session of several shorter ones.

In terms of human flooding therapy, several concerns are raised. When working with phobic clients it might be more cost effective and safer for the client to receive massed sessions when possible. If it is the overall RP time which is the important parameter, then a therapist would want to ensure that a client received enough of the treatment to be effective. If treatment is given in one massed session, dropping out is less likely than when they have to come back for several sessions. If a client dropped out before the completion of treatment and had

received several long sessions they would be better off than if they had received the same number of short sessions. Also it might be more cost effective and time efficient for the client to have a massed weekend of therapy, of perhaps 24 hrs than to have a one hour a week session for 24 weeks (almost half a year). These implications for treatment of human neurosis such as phobic and compulsive disorders need further research.

In summary, the response prevention treated groups showed less avoidance behavior than nontreated groups on two passive avoidance measures, approach latency and time on grids but no difference was found with an activity measure, number of crossings. The number of crossings measure piloted in this study was deemed an insensitive measure for passive avoidance testing. Although there was an increase in avoidance behavior in RP treated groups over repeated tests they did not reach the level of avoidance responding of nontreated groups demonstrating the retention of the RP effects. Reviewing the results of this study and past research perhaps the important parameter in the effectiveness of RP treatment appears to be the overall time, with longer overall time being more effective than shorter sessions. When sufficiently long treatment sessions are used both distributed and massed administration are equally effective. Since flooding therapy is currently being used with obsessive compulsive disorders such as phobias and bulimia (Baum, 1986a; Ordam & Kirschenbaum, 1986;

Rossiter & Wilson, 1985) illuminating the parameters around the issue of retention of treatment effects is of relevance and importance in generating hypothesis for testing in human clients.

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Appendix A

Analysis of Variance Summary for Total UCS

Source	SS	df	MS	F
Group	577.279	11	52.480	1.511
Error	3750.589	108	34.728	
Total	4327.868	119		

Appendix B.1

Analysis of Variance Summary for UCSTrial 1 vs Trial 2

Source	SS	df	MS	F
Group	291.036	11	26.458	1.521
Error	1879.100	108	17.399	
Trial	343.443	1	343.443	18.842*
G X T	229.305	11	20.846	1.144
Error	1968.606	108	18.228	
Total	4711.492	239		

* $p < .05$.

Appendix B.2

Analysis of Variance Summary for UCSFor Trial Main Effects

Source	SS	df	MS	F
Trial	343.443	1	343.443	18.841*
Error	1968.606	108	18.228	
Total	2312.049	109		

* $p < .05$.

Appendix B.3
Collapsed UCS Scores for
Trial Main Effects

Trial	Overall UCS
Trial 1	
<u>M</u>	5.47
<u>SD</u>	5.21
Trial 2	
<u>M</u>	2.77
<u>SD</u>	3.09

Note. n = 120 per cell; N = 120.

Appendix C

Analysis of Variance Summary for Approach LatencyFor RP vs NRP

Source	SS	df	MS	F
Group	3948509.521	1	3948509.521	34.761*
Treatment	141130.430	1	141130.430	1.242
G X TR	42130.938	1	42130.938	.371
Ratio	293429.893	2	146714.946	1.292
G X R	136507.764	2	68253.882	.601
TR X R	498285.664	2	249142.832	2.193
G X TR X R	24940.156	2	12470.078	.110
Error	12267617.188	108	113589.048	
Test	195172.412	2	97586.206	4.595*
G X T	167105.381	2	83552.690	3.934*
TR X T	43311.943	2	21655.972	1.020
G x TR X T	74983.330	2	37491.665	1.765
R X T	124747.979	4	31186.995	1.469
G X R X T	232408.115	4	58102.029	2.736*
TR X R X T	194087.891	4	48521.973	2.285
G X TR X R X T	101594.678	4	25398.669	1.196
Error	4587230.643	216	21237.179	
Total	230731930.930	359		

* $p < .05$.

Appendix D

Analysis of Variance Summary for Approach LatencyFor Group X Test Interaction at Test 0

Source	SS	df	MS	F
Group	2175432.338	1	2175432.338	102.435*
Error	4587230.643	216	21237.179	
Total	6762682.981	217		

* $p < .05$

Appendix E

Analysis of Variance Summary for Approach Latency
For Group X Test Interaction at Test 1

Source	SS	df	MS	F
Group	862060.052	1	862060.052	40.592*
Error	4587230.643	216	21237.179	
Total	5449290.695	217		

* $p < .05$

Appendix F

Analysis of Variance Summary for Approach LatencyFor Group X Test Interaction at Test 30

Source	SS	df	MS	F
Group	1078122.502	1	1078122.503	50.765*
Error	4587230.643	216	21237.179	
Total	5665353.145	217		

*p < .05

Appendix G.1

Analysis of Variance Summary for Approach Latency

For Group X Test Interaction for RP Groups

Source	SS	df	MS	F
Group	358923.502	2	179461.751	8.450*
Error	4587230.643	216	21237.179	
Total	4946154.145	218		

*p < .05

Appendix G.2
Collapsed Approach Latency Scores for
RP Groups

Test Day	Overall Approach Latency
Test 0	
<u>M</u>	83.32
<u>SD</u>	173.74
Test 1	
<u>M</u>	189.55
<u>SD</u>	258.06
Test 30	
<u>M</u>	159.00
<u>SD</u>	- 188.05

Note. n = 60 per test; N = 60.

Appendix H.1

Analysis of Variance Summary for Approach Latency
For Group X Test Interaction for NRP Groups

Source	SS	df	MS	F
Group	3354.272	2	1677.136	.0789
Error	4587230.643	216	21237.179	
Total	4590584.915	218		

Appendix H.2

Collapsed Approach Latency Scores forNRP Groups

Test Day	Overall Approach Latency

Test 0	
<u>M</u>	352.61
<u>SD</u>	242.62
Test 1	
<u>M</u>	359.06
<u>SD</u>	262.07
Test 30	
<u>M</u>	348.58
<u>SD</u>	- 241.50

Note. n = 60 per test; N = 60.

Appendix I

Analysis of Variance Summary for Approach LatencyFor Ratio X Test Interaction

Source	SS	df	MS	F
Ratio	932845.986	5	186569.197	1.295
Error	12267617.188	108	113589.048	
Test	195172.412	2	97586.206	4.595*
R X T	362147.793	10	36214.779	1.070
Error	4587230.643	216	21237.179	
Total	18345014.01	341		

* $p < .05$

Appendix J.1

Analysis of Variance Summary for Approach LatencyFor Test Main Effects RP vs NRP

Source	SS	df	MS	F
Group	195172.40516	2	97586.202	4.595*
Error	4587230.643	216	21237.179	
Total	4782403.048	218		

*p < .05

Appendix J.2

Collapsed Approach Latency Scores for

Test Main Effects

Test Day	Overall Approach Latency
Test 0	
<u>M</u>	217.96
<u>SD</u>	249.86
Test 1	
<u>M</u>	274.31
<u>SD</u>	272.60
Test 30	
<u>M</u>	253.80
<u>SD</u>	- 235.60

Note. n = 120 per test; N = 360.

Appendix K.1

Analysis of Variance Summary for Approach LatencyFor Group Main Effects RP vs NRP

Source	SS	df	MS	F
Group	3948509.521	1	3948509.521	34.761*
Error	12267617.188	108	113589.048	
Total	16216126.709	109		

*p < .05

Appendix K.2

Collapsed Approach Latency Scores for
Group Main Effects

Group	Overall Approach Latency
RP	
<u>M</u>	143.96
<u>SD</u>	213.45
NRP	
<u>M</u>	353.42
<u>SD</u>	247.55

Note. n = 180 per cell; N = 360.

Appendix L

Analysis of Variance Summary for Approach LatencyWith Controls

Source	SS	df	MS	F
Group	3223934.542	3	1074644.848	22.507*
Treatment	18042.273	1	18042.273	.378
G X TR	91487.300	3	30495.767	.639
Error	3437754.492	72	47746.590	
Test	1251.849	2	625.925	.051
G X T	178545.924	6	29757.654	2.444*
TR X T	2065.428	2	1032.714	.085
G X TR X T	60830.479	6	10138.413	.833
Error	1753234.321 -	144	12175.238	
Total	8767146.609	239		

* $p < .05$

Appendix M

Analysis of Variance Summary for Approach Latency
With Controls for Group X Test Interaction
For CON-RP Group

Source	SS	df	MS	F
Test	307.804	2	153.902	.012
Error	1753234.321	144	12175.238	
Total	1753542.125	146		

-

Appendix N

Analysis of Variance Summary for Approach Latency

With Controls for Group X Test Interaction

For CON-NRP Group

Source	SS	df	MS	F
Test	3369.097	2	1684.549	.138
Error	1753234.321	144	12175.238	
Total	1756603.418	146		

Appendix O.1

Analysis of Variance Summary for Approach LatencyWith Controls for Group X Test Interaction

For RP1 and RP24 Groups

Source	SS	df	MS	F
Test	90779.956	2	45389.978	3.728*
Error	1753234.321	144	12175.238	
Total	1844014.277	146		

* $p < .05$

Appendix O.2
Collapsed Approach Latency Scores for
RP1 and RP24 Groups

Test Day	Overall Approach Latency

Test 0	
<u>M</u>	84.44
<u>SD</u>	183.92
Test 1	
<u>M</u>	168.50
<u>SD</u>	230.76
Test 30	
<u>M</u>	87.62
<u>SD</u>	- 132.55

Note. n = 20 per test; N = 20.

Appendix P.1

Analysis of Variance Summary for Approach LatencyWith Controls for Group X Test Interaction

For NRP1 and NRP24 Groups

Source	SS	df	MS	F
Test	85545.957	2	42772.979	3.513*
Error	1753234.321	144	12175.238	
Total	1838780.278	146		

* $p < .05$

Appendix P.2

Collapsed Approach Latency Scores forNRP1 and NRP24 Groups

Test Day	Overall Approach Latency

Test 0	
<u>M</u>	332.85
<u>SD</u>	225.52
Test 1	
<u>M</u>	244.56
<u>SD</u>	260.73
Test 30	
<u>M</u>	312.56
<u>SD</u>	- 222.44

Note. n = 20 per test; N = 20.

Appendix Q.1

Analysis of Variance Summary for Approach LatencyWith Controls for Group Main Effects

Source	SS	df	MS	F
Group	3223934.542	3	1074644.848	22.507*
Error	3437754.492	72	47746.590	
Total	6661689.034	75		

*p < .05

Appendix Q.2

Collapsed Approach Latency Scores with ControlsFor Group Main Effects

Group	Overall Approach Latency
RP	
<u>M</u>	113.52
<u>SD</u>	187.72
NRP	
<u>M</u>	296.65
<u>SD</u>	235.91
CON-RP	
<u>M</u>	11.62
<u>SD</u>	- 28.04
CON-NRP	
<u>M</u>	14.06
<u>SD</u>	47.68

Note. n = 60 per cell; N = 240.

Appendix R.1

Analysis of Variance Summary for Approach Latency
For Response Prevention Across Repeated Tests

Source	SS	df	MS	F
Treatment	383402.505	5	76680.501	.910
Error	4549241.439	54	84245.212	
Test	358923.191	2	179461.754	7.379*
TR X T	236938.191	10	23693.819	.974
Error	2626652.204	108	24320.854	
Total	8155157.850	179		

* $p < .05$

Appendix R.2

Analysis of Variance Summary for Approach Latency
For Response Prevention for Test Main Effects

Source	SS	df	MS	F
Test	358923.502	2	179461.751	7.378*
Error	2626652.204	108	24320.854	
Total	2985575.706	110		

* $p < .05$

Appendix S

Results for Time on Grids

Time on Grids. The time on grids measure was the total amount of time a subject spent on the gridded black side of the shuttle box. The more time spent indicated less avoidance behavior. The means and standard deviations for all RP and NRP groups for time on grids are presented in Table 5. The figures for mean time on grids are presented in Figures 7, 8, and 9 for all RP and NRP groups, RP only groups and NRP only groups respectively.

A Cochran's C test was computed to test for homogeneity of variance and found to be nonsignificant, $C(12, 9) = 0.195$, ns. A 2 (Group) X 2 (Treatment) X 3 (Ratio) X 3 (Repeated Test) mixed design analysis of variance showed a significant Group, $F(1, 108) = 37.473$, $p < .05$; and Group X Test interaction effects, $F(92, 216) = 6.693$, $p < .05$. There was no significant Test main effects; $F(2, 216) = 2.546$, ns. (See Appendix U for the ANOVA summary table). Follow-up tests were computed to see where the differences occurred.

The interaction Group X Test was analyzed as follows. At Test Day 0 a one-way ANOVA simple effects test showed the RP and NRP groups to differ significantly, $F(1, 216) = 116.516$, $p < .05$. An Omega-squared showed that Test 0 accounted for 34.6% of the variance, ($\eta^2 = .346$). (See Appendix V.1 for the ANOVA summary table). The RP groups spent significantly

Table 5

Means and Standard Deviations for the Time on GridsMeasure in Seconds During All Test Sessions

Treatment Condition	Testing in Days		
	0	1	30
RP - Massed			
1 <u>M</u>	457.45	453.08	428.99
<u>SD</u>	211.18	196.16	172.55
2 <u>M</u>	411.16	455.85	343.99
<u>SD</u>	175.38	172.16	179.61
3 <u>M</u>	528.19	401.76	375.36
<u>SD</u>	128.91	278.78	247.97
RP - Distributed			
8 <u>M</u>	459.57	254.44	341.31
<u>SD</u>	247.20	295.92	215.37
12 <u>M</u>	487.02	400.86	314.67
<u>SD</u>	189.56	275.26	184.44
24 <u>M</u>	475.43	316.81	407.49
<u>SD</u>	189.04	245.32	207.53

Table 5 cont'd

Treatment Condition	Testing in Days		
	0	1	24
NRP - Massed			
1 <u>M</u>	189.74	256.35	167.26
<u>SD</u>	153.27	276.99	172.60
2 <u>M</u>	153.42	455.85	176.29
<u>SD</u>	203.26	172.16	219.25
3 <u>M</u>	157.61	194.98	322.07
<u>SD</u>	179.63	228.47	208.56
NRP - Distributed			
8 <u>M</u>	165.67	45.26	57.02
<u>SD</u>	249.63	102.88	120.28
12 <u>M</u>	192.61	240.19	239.26
<u>SD</u>	267.52	308.20	305.54
24 <u>M</u>	237.57	343.90	252.84
<u>SD</u>	255.12	222.33	196.20

Note. Total N = 120, n = 10 per cell.

Figure Caption

Figure 7. Mean time on grids scores in seconds for all
RP and NRP groups..

Figure Caption

Figure 8. Mean time on grids scores in seconds for RP groups only.

Figure Caption

Figure 9. Mean time on grids scores in seconds for NRP groups only.

longer on the gridded black side. At Test Day 1 a one-way ANOVA simple effects test showed the RP and NRP groups to differ, $F(2, 216) = 40.702$, $p < .05$. An Omega-squared showed that Test Day 1 accounted for 15.4% of the variance ($W^2 = .154$). (See Appendix V.2 for the ANOVA summary table). The RP groups spent significantly longer time on the gridded black side than the NRP groups. At Test Day 30 a one-way ANOVA simple effects test showed that RP and NRP groups differed, $F(1, 216) = 39.054$, $p < .05$, with the RP groups spending significantly longer time on the gridded black side. An Omega-squared showed that Test Day 30 accounted for 14.9% of the variance, ($W^2 = .149$). (See Appendix V.3 for the ANOVA summary table and the collapsed means). To summarize, at each of the test days the RP groups showed less avoidance behavior than the NRP groups.

To assess if groups were behaving differently across the repeated testings another series of follow-up tests were computed. Simple effects tests for RP groups across the repeated tests were significant, $F(2, 216) = 8.653$, $p < .05$. An Omega-squared showed that 7.0% of the variance was accounted for by the RP groups, ($W^2 = .070$). (See Appendix W.1 for the ANOVA summary table and for the collapsed means). A Newman-Keuls test determined that RP groups spent significantly more time on the gridded black side on Test Day 0 than on Test Day 1 and 30 and Test Day 1 and 30 were not different from each other. The simple effects test for NRP groups across repeated

testings were nonsignificant. (See Appendix X for the ANOVA summary table). To summarize, the RP groups showed an increase in avoidance behavior from Test Day 0 to Test Day 1 which was maintained to Test Day 30. NRP groups showed consistent avoidance behavior across the repeated testings.

The Group main effects across Treatment, Ratio, and all Tests was analyzed with a one-way ANOVA simple effects test, $F(1, 108) = 16.304$, $p < .05$. An Omega-squared showed that Group effects accounted for 12.2% of the variance ($\omega^2 = .122$). See Appendix Y for the ANOVA summary table and for the collapsed means). The RP groups spent significantly longer time on the gridded black side than the NRP groups.

Time on Grids with-Controls. The means and standard deviations for CON-RP1, CON-RP24, CON-NRP1, CON-NRP24, RP1, RP24, NRP1, and NRP24 for time on grids are presented in Table 6. Figure 10 represents these groups and Figure 11 represents all control groups.

A Cochran's C test was computed to test for homogeneity of variance and found to be significant; $C(8, 9) = .304$, $p < .05$. No transformation was deemed necessary, (Winer, 1971). A 4 (Group) X 2 (Treatment) X 3 (Repeated Test) mixed design analysis of variance showed significant Group Main effects, $F(3, 72) = 14.212$, $p < .05$. (See Appendix Z for the ANOVA summary table).

Table 6

Means and Standard Deviations for the Time on GridsMeasure in Seconds During All Test Sessions With Controls

		Testing in Hours		
Treatment				
Condition		0	1	24
CRP - Massed				
1	<u>M</u>	497.63	481.77	478.15
	<u>SD</u>	151.09	115.28	87.31
CRP - Distributed				
24	<u>M</u>	541.93	512.38	501.19
	<u>SD</u>	68.59	98.24	113.93
CNRP - Massed				
1	<u>M</u>	482.75	428.58	416.36
	<u>SD</u>	74.49	136.22	99.91
CNRP - Distributed				
24	<u>M</u>	458.27	471.23	459.00
	<u>SD</u>	75.76	87.07	121.59
RP - Massed				
1	<u>M</u>	457.45	453.08	428.99
	<u>SD</u>	211.18	196.16	172.55
RP - Distributed				
24	<u>M</u>	475.43	316.81	407.49
	<u>SD</u>	189.04	245.32	207.53

Table 6 cont'd

		Testing in Days		
Treatment				
Condition		0	1	24
NRP - Massed				
1	<u>M</u>	189.74	256.35	167.26
	<u>SD</u>	153.27	276.99	172.60
NRP - Distributed				
24	<u>M</u>	237.57	343.90	252.84
	<u>SD</u>	255.12	222.33	196.20

Figure Caption

Figure 10. Mean time on grids scores in seconds for
CON-RP1, CON-RP24, CON-NRP1, CON-NRP24, RP1, RP24, NRP1,
NRP24 groups.

Figure Caption

Figure 11. Mean time on grids scores in seconds for
Control groups only.

The main effects for Group across Treatment and all Tests was analyzed with a one-way ANOVA simple effects test, $F(3, 72) = 14.845$, $p < .05$. An Omega-squared showed that Group effects accounted for 35.3% of the variance ($W = .353$). (See Appendix AA for the ANOVA summary table). A Newman-Keuls test determined that the NRP groups spent significantly less time on the gridded black side than all other groups and none of the other groups differed from each other. This comparison indicated that Controls and RP groups demonstrated no avoidance behavior but NRP groups did.

Appendix T

Results for Number of Crossings

Number of crossings. The measure number of crossings was the total number of times the animal crossed from the white side to the black side. This measure was one of overall activity and of importance because avoidance behavior is often accompanied by freezing. The means and standard deviations for the number of crosses for all RP and NRP groups are presented in Table 7. Figure 12 presents all groups, Figure 13 presents just RP groups and Figure 14 presents just NRP groups.

A Cochran's C test was computed to test for homogeneity of variance and found to be nonsignificant, $C(12, 9) = 0.163$, ns. A 2 (Group) X 2 (Treatment) X 3 (Ratio) X 3 (Repeated Test) mixed design analysis of variance showed a significant Test main effect, $F(2, 216) = 6.677$, $p < .05$; Group X Ratio interaction, $F(2, 108) = 3.130$, $p < .05$; Treat X Ratio interaction, $F(2, 108) = 4.188$, $p < .05$; and a Group X Ratio X Test $F(4, 216) = 3.664$, $p < .05$. There were no significant effects for Ratio, $F(2, 108) = 1.265$, ns; Treatment, $F(1, 108) = .144$; Group x Test, $F(2, 216) = 1.278$, ns or Ratio X Test $F(4, 216) = .315$, ns. (See Appendix BB for the ANOVA summary table. Follow-up tests were computed to see where the differences occurred.

To assess the Group X Ratio X Test interaction several two-way ANOVA simple effects test were computed. The first Group X Ratio collapsed across the Test

Table 7

Means and Standard Deviations for the Number of Crosses
During All Test Sessions

Treatment Condition	Testing in Days		
	0	1	30
RP - Massed			
1 <u>M</u>	2.000	1.400	3.300
<u>SD</u>	2.005	1.17	2.006
2 <u>M</u>	4.500	3.600	4.000
<u>SD</u>	3.34	1.900	2.94
3 <u>M</u>	1.700	1.100	1.700
<u>SD</u>	1.89	1.200	1.25
RP - Distributed			
8 <u>M</u>	1.100	0.600	2.200
<u>SD</u>	1.100	0.700	2.300
12 <u>M</u>	2.000	1.400	2.900
<u>SD</u>	2.58	1.43	2.56
24 <u>M</u>	2.900	2.500	2.300
<u>SD</u>	4.07	2.72	1.49

Table 7 cont'd

Treatment Condition	Testing in Days		
	0	1	30
NRP - Massed			
1 <u>M</u>	2.70	1.30	1.60
<u>SD</u>	2.71	1.57	1.58
2 <u>M</u>	2.40	1.70	1.90
<u>SD</u>	2.46	2.63	1.79
3 <u>M</u>	2.30	0.90	3.20
<u>SD</u>	3.68	0.99	3.16
NRP - Distributed			
8 <u>M</u>	1.90	1.30	0.50
<u>SD</u>	4.36	2.75	1.08
12 <u>M</u>	1.40	0.50	0.60
<u>SD</u>	2.32	0.53	0.70
24 <u>M</u>	2.20	2.70	3.30
<u>SD</u>	2.49	2.67	2.79

Note. Total N = 120, n = 10 per cell.

Figure Caption

Figure 12. Mean number of crosssings for all RP and NRP groups.

Figure Caption

Figure 13. Mean number of crossings for RP groups only.

Figure Caption

Figure 14. Mean number of crossings for NRP groups only.

variable showed only a significant Ratio main effects, $F(5, 108) = 2.605$, $p < .05$. (See Appendix CC for the ANOVA summary table and for the collapsed means). An Omega-squared showed that 6.6% of the variance was accounted for by Ratio main effects, ($W^2 = .066$). (See Appendix DD for the ANOVA summary table and for the collapsed means). A Newman-Keuls test showed that Ratio 8 had significantly fewer crossings than Ratio 2 and none of the other ratios differed from each other.

The second two-way ANOVA simple effects was Ratio X Test collapsed across the Group variable. Only the Test main effects were significant, $F(2, 216) = 6.676$, $p < .05$. (See Appendix EE.1 for the ANOVA summary table). The Ratio main effects were analyzed as follows. At Test Day 0, $F(5, 108) = 0.930$, ns; at Test Day 1, $F(5, 108) = 1.270$, ns; at Test Day 30, $F(5, 108) = 0.725$, ns. (See Appendixes EE.2 for the ANOVA summary tables). None of the Ratios were different from each other at each of the Test Days.

To determine if the different ratios were effected by repeated tests another series of follow-up tests were computed. No differences were found for Ratio 1 or for Ratio 2. (See Appendix FF.1 for the ANOVA summary tables). For Ratio 3 a one-way ANOVA simple effects test was significant, $F(2, 216) = 3.837$, $p < .05$. (See Appendix FF.2 for the ANOVA summary table and for the collapsed means. An Omega-squared showed Ratio 3 accounted for 2.52% of the variance, ($W^2 = 0.252$). A

Newman-Keuls test determined that Test Day 1 and 30 differed with fewer crosses at Test Day 1. Test Day 0 did not differ from Test Day 1 or 30. Ratios 8, 12 and 24 did not differ across the repeated tests. (See Appendixes FF.3 for the ANOVA summary tables).

The third two-way simple effects ANOVA was Group X Test collapsed across the Ratio variable which showed only a significant Test effect, $F(2, 216) = 6.676, p < .05$. (See Appendix GG.1 for the ANOVA summary table). Since the Test main effects were analyzed as follows. The main effects for Test across Groups, Treatment and Ratio was analyzed with a one-way ANOVA simple effects test, $F(2, 216) = 6.677, p < .05$. An Omega-squared showed that Test effects accounted for 4.9% of the variance, ($\omega^2 = .049$). (See Appendix GG.2 for the ANOVA summary table and for the collapsed means). A Newman-Keuls test determined that Test Day 1 had significantly fewer crosses than Test Day 0 or 30 which did not differ from each other.

The interaction Treatment X Ratio was analyzed as follows. A one-way simple effects ANOVA for Treatment (massed vs distributed) was nonsignificant; $F(1, 108) = 2.122, ns$. (See Appendix HH.1 for the ANOVA summary table). A one-way simple effects ANOVA for massed ratios was computed, $F(2, 108) = 2.290, ns$. (See Appendix HH.2 for the ANOVA summary table). A one-way simple effects ANOVA for distributed ratios was significant, $F(2, 108) = 3.163, p < .05$. An Omega-squared showed that

distributed ratios accounted for 3.7% of the variance ($W^2 = .037$). (See Appendix HH.3 for the ANOVA summary table and for the collapsed means). A Newman-Keuls test showed that Ratio 24 had significantly more crosses than Ratio's 8 and 12 and Ratio's 8 and 12 did not differ.

Crosses with Controls. The means and standard deviations for CON-RP1, CON-RP24, CON-NRP1, CON-NRP24, RP1, RP24, NRP1, NRP24 for the number of crosses made during the 600 s test periods are presented in Table 8. Figure 15 presents these groups and Figure 16 presents just the controls.

A Cochran's C was computed to test for homogeneity of variance and found to be nonsignificant; $C(8, 9) = 0.138$, ns. A 4 (Group) X 2 (Treatment) X 3 (Repeated Test) mixed design analysis of variance showed significant Group, $F(3, 72) = 10.468$, $p < .05$ and significant Group X Test, $F(6, 144) = 3.922$, $p < .05$. (See Appendix II.1 for the ANOVA summary table).

The interaction Group X Test was analyzed as follows. At Test Day 0 a one-way simple effects ANOVA showed differences, $F(3, 144) = 31.759$, $p < .05$. An Omega-squared showed that Test 0 accounted for 38.4% of the variance, ($W^2 = .384$). (See Appendix JJ.1 for the ANOVA summary table and for the collapsed means). A Newman-Keuls test showed that CON-NRP had significantly more crosses than all other groups with none of the other groups differing from each other. At Test Day 1 a

Table 8

Means and Standard Deviations for the Number of Crosses
During All Test Sessions With Controls

Treatment Condition	Testing in Days		
	0	1	30
CRP - Massed			
1 <u>M</u>	4.20	5.30	4.10
<u>SD</u>	4.80	4.97	2.13
CRP - Distributed			
24 <u>M</u>	2.80	4.20	3.70
<u>SD</u>	2.57	3.46	2.83
CNRP - Massed			
1 <u>M</u>	7.30	6.00	4.90
<u>SD</u>	3.89	3.62	2.23
CNRP - Distributed			
24 <u>M</u>	7.70	6.10	4.90
<u>SD</u>	2.95	2.81	3.07
RP - Massed			
1 <u>M</u>	2.00	1.40	3.30
<u>SD</u>	2.05	1.17	2.06
RP - Distributed			
24 <u>M</u>	2.90	2.50	2.30
<u>SD</u>	4.07	2.72	1.49

Table 8 cont'd

Treatment Condition	Testing in Days		
	0	1	30
NRP - Massed			
1 <u>M</u>	2.70	1.30	1.60
<u>SD</u>	2.71	1.57	1.58
NRP - Distributed			
24 <u>M</u>	2.20	2.70	3.30
<u>SD</u>	2.49	2.67	2.79

Note. N = 80, n per cell = 10.

Figure Caption

Figure 15. Mean number of crossings for CON-RP1, CON-RP24, CON-NRP1, CON-NRP24, RP1, RP24, NRP1, NRP24 groups.

Figure Caption

Figure 16. Mean number of crossings for Control groups only.

Pages are numbered incorrectly, no page 130

one-way simple effects ANOVA showed differences, $F(3, 144) = 23.085$, $p < .05$. An Omega-squared showed that Test Day 1 accounted for 30.9% of the variance, ($\eta^2 = .309$). (See Appendix JJ.2 for the ANOVA summary table and for the collapsed means). A Newman-Keuls test showed that CON-NRP groups were different from all other groups with significantly more crosses and CON-RP had significantly more crosses than RP and NRP groups but RP and NRP groups did not differ. At Test day 30 a one-way simple effects ANOVA showed differences, $F(3, 144) = 6.813$, $p < .05$. An Omega-squared showed that 8.9% of the variance was accounted by Test Day 30, ($\eta^2 = .089$). (See Appendix JJ.3 for the ANOVA summary table and for the collapsed means). A Newman-Keuls test showed that the CON-NRP group had significantly more crosses than the RP and NRP groups and no other groups differed. Overall the control groups showed more activity than other groups at each of the Test Days indicating no avoidance behavior.

To determine if the different groups were differently effected by the repeated tests another series of follow-up tests were computed. A one-way simple effects ANOVA for CON-RP showed no differences across the repeated tests. (See Appendix KK.1 for the ANOVA summary table). A one-way simple effects ANOVA for CON-NRP was significant, $F(2, 144) = 9.347$, $p < .05$. An Omega-squared showed that CON-NRP effects accounted for 10.2% of the variance ($\eta^2 = .102$). (See Appendix KK.2 for the ANOVA summary table and for the collapsed means).

A Newman-Keuls test demonstrated that Test Day 0 had significantly more crosses than Test Day 1 and 30 and that Test Day 30 and 1 did not differ. A one-way simple effects ANOVA for RP groups showed no differences. (See Appendix KK.3 for the ANOVA summary table). A one-way simple effects ANOVA for NRP groups also showed no differences. (See Appendix KK.5 for the ANOVA summary table).

The main effects for Group across treatment and all tests was analyzed with a one-way ANOVA simple effects test, $F(3, 72) = 10.468$, $p < .05$. An Omega-squared showed that Group effects accounted for 27.2% of the variance, ($\omega^2 = .272$). (See Appendix LL for the ANOVA summary table and for the collapsed means). A Newman-Keuls test determined that CON-NRP groups had significantly more crosses than all other groups, CON-RP groups had significantly more crosses than RP and NRP groups and RP and NRP groups did not differ. This measure showed that the controls had significantly more activity than the RP and NRP groups indicating no avoidance behavior.

An a priori concern was the behavior of RP groups across the repeated tests so a two-way analysis of variance was computed for the RP groups. A Cochran's C to test for violation of homogeneity of variance was significant, $C(6, 9) = 0.369$, $p < .05$. The 6 (Treatment Ratio) X 3 (Repeated Test) analysis of variance showed a significant Treatment Ratio, $F(5, 54) = 3.058$, $p < .05$;

Test, $F(2, 108) = 5.322, p < .05$. (See Appendix MM for the ANOVA summary table).

The main effect for Treatment Ratio was analyzed with a one-way simple effects ANOVA, $F(5, 54) = 3.058, p < .05$. An Omega-squared test showed that Treatment Ratio accounted for 14.6% of the variance, ($\eta^2 = .146$). (See Appendix NN for the ANOVA summary table and for the collapsed means). A Newman-Keuls test showed that Ratio 2 had significantly more crosses than Ratios 8 and 3 and no other treatment Ratios differed. Ratio 2 showed the most activity indicating the least amount of avoidance behavior.

The Test main effects was analyzed with a one-way simple effects ANOVA, $F(2, 108) = 5.322, p < .05$. An Omega-squared showed that Test main effects accounted for 6.4% of the variance, ($\eta^2 = .064$). (See Appendix OO for the ANOVA summary table and for the collapsed means). A Newman-Keuls test showed that Test Day 1 had significantly fewer crosses than Test Day 0 or 30. Test Day 30 and 0 did not differ. This indicates that there is an decrease in activity on Test Day 1 demonstrating more avoidance behavior but this is not maintained to Test Day 30.

Appendix U

Analysis of Variance Summary for Time on GridsFor RP vs NRP

Source	SS	df	MS	F
Group	3879525.078	1	3879525.078	37.473*
Treatment	50379.287	1	50379.287	.487
G X TR	38149.102	1	38149.102	.368
Ratio	228005.996	2	114002.998	1.101
G X R	111985.918	2	55992.959	.541
TR X R	301052.236	2	150526.118	1.454
G X TR X R	46713.115	2	23356.558	.226
Error	11181003.875	108	103527.814	
Test	108031.592	2	54015.796	2.546
G X T	283975.850	2	141987.925	6.693*
TR X T	94544.893	2	47272.446	2.228
G x TR X T	58804.258	2	29402.129	1.386
R X T	101592.773	4	25398.193	1.197
G X R X T	161691.729	4	40422.932	1.906
TR X R X T	124300.996	4	31075.249	1.465
G X TR X R X T	121591.797	4	30397.949	1.433
Error	4582002.184	216	21212.973	
Total	21473350.695	359		

* $p < .05$.

Appendix V.1

Analysis of Variance Summary for Time on Grids

For Group X Test Interaction at Test 0

Source	SS	df	MS	F
Group	2471644.028	1	2471644.030	116.515*
Error	4582002.184	216	21212.973	
Total	7053646.212	217		

*p < .05

Appendix V.2

Analysis of Variance Summary for Time on Grids

For Group X Test Interaction at Test 1

Source	SS	df	MS	F
Group	863399.744	1	863399.744	40.701*
Error	4582002.184	216	21212.973	
Total	5445401.928	217		

*p < .05

Appendix V.3

Analysis of Variance Summary for Time on GridsFor Group X Test Interaction at Test 30

Source	SS	df	MS	F
Group	828457.159	1	828457.159	39.054*
Error	4582002.184	216	21212.973	
Total	5410459.343	217		

* $p < .05$ Collapsed Time on Grids Scores forGroup X Test Interaction

Group	Test Time		
	Test 0	Test 1	Test 30
RP			
<u>M</u>	469.80	380.47	368.64
<u>SD</u>	188.53	248.45	198.19
NRP			
<u>M</u>	182.77	210.82	202.46
<u>SD</u>	214.46	247.35	218.70

Note. n = 60 per cell; N = 360.

Appendix W

Analysis of Variance Summary for Time on GridsFor Group X Test Interaction for RP Groups

Source	SS	df	MS	F
Group	367121.213	2	183560.607	8.653*
Error	4582002.184	216	21212.973	
Total	4949123.397	218		

*p < .05Collapsed Time on Grids Scores forRP Groups

Test Day	Overall Time on Grids
Test 0	
<u>M</u>	469.80
<u>SD</u>	188.53
Test 1	
<u>M</u>	380.47
<u>SD</u>	248.45
Test 30	
<u>M</u>	368.64
<u>SD</u>	198.19

Note. n = 60 per test; N = 60.

Appendix X

Analysis of Variance Summary for Time on GridsFor Group X Test Interaction for NRP Groups

Source	SS	df	MS	F
Group	24886.251	2	12443.125	.586
Error	4582002.184	216	21212.973	
Total	4606888.435	218		

Collapsed Time on Grids Scores forNRP Groups

Test Day	Overall Time on Grids
Test 0	
<u>M</u>	182.77
<u>SD</u>	214.46
Test 1	
<u>M</u>	210.82
<u>SD</u>	247.35
Test 30	
<u>M</u>	202.46
<u>SD</u>	218.70

Note. n = 60 per test; N = 60.

Appendix Y

Analysis of Variance Summary for Time on Grids

For Group Main Effects RP vs NRP

Source	SS	df	MS	F
Group	1687962.634	1	1687962.635	16.304*
Error	11181003.875	108	103527.814	
Total	12868966.509	109		

*p < .05

Collapsed Time on Grids Scores for

Group Main Effects

Group	Overall Time on Grids
RP	
<u>M</u>	425.09
<u>SD</u>	181.58
NRP	
<u>M</u>	187.88
<u>SD</u>	210.06

Note. n = 180 per cell; N = 360.

Appendix Z

Analysis of Variance Summary for Time on GridsWith Controls

Source	SS	df	MS	F
Group	2331302.500	3	777100.8348	14.212*
Treatment	23988.037	1	23988.037	.439
G X TR	112108.359	3	37369.453	.683
Error	3937036.219	72	54681.059	
Test	34120.947	2	17060.474	1.183
G X T	157913.291	6	26318.882	1.826
TR X T	6980.693	2	3490.347	.242
G X TR X T	78419.463	6	13069.910	.907
Error	2076046.814	144	14416.992	
Total	8757916.324	239		

* $p < .05$

Appendix AA

Analysis of Variance Summary for Time on Grids
With Controls for Group Main Effects

Source	SS	df	MS	F
Group	2435308.213	3	811769.405	14.845*
Error	3937036.219	72	54681.059	
Total	6372344.432	75		

*p < .05

Collapsed Time on Grids Scores with Controls
For Group Main Effects

Group	Overall Time on Grids
RP	
<u>M</u>	423.21
<u>SD</u>	202.96
NRP	
<u>M</u>	241.28
<u>SD</u>	215.40
CON-RP	
<u>M</u>	508.96
<u>SD</u>	101.28
CON-NRP	
<u>M</u>	456.66
<u>SD</u>	93.57

Note. n = 60 per cell; N = 240.

Appendix BB

Analysis of Variance Summary for Number of CrossesFor RP vs NRP

Source	SS	df	MS	F
Group	21.511	1	21.511	.153
Treatment	22.500	1	22.500	.144
G X TR	.900	1	.900	.085
Ratio	26.839	2	13.419	1.265
G X R	66.372	2	33.186	3.130*
TR X R	88.817	2	44.408	4.188*
G X TR X R	5.817	2	2.908	.274
Error	1145.200	108	10.604	
Test	38.339	2	19.169	6.677*
G X T	7.339	2	3.669	1.278
TR X T	5.017	2	2.508	.874
G x TR X T	3.617	2	1.808	.630
R X T	3.611	4	.903	.315
G X R X T	42.078	4	10.519	3.664*
TR X R X T	8.367	4	2.092	.729
G X TR X R X T	4.767	4	1.192	.415
Error	620.200	216	2.871	
Total	2111.289	359		

*p < .05.

Appendix CC

Analysis of Variance Summary for Number of CrossesFor Group X Ratio

Source	SS	df	MS	F
Group	21.511	1	21.511	2.209
Ratio	138.156	5	27.631	2.606*
G X R	73.089	5	14.618	1.378
Error	1145.200	108	10.604	
Total		119		

*p < .05

Collapsed Number of Crosses Scores forGroup X Ratio Effects

Group	Ratio					
	1	2	3	8	12	24
RP						
<u>M</u>	2.23	4.03	1.50	1.30	2.10	2.57
<u>SD</u>	1.92	2.72	1.46	1.62	2.26	2.86
NRP						
<u>M</u>	1.87	2.00	2.13	1.23	0.83	2.73
<u>SD</u>	2.05	2.26	2.92	2.99	1.44	2.60

Note. n = 30 per cell, N = 360.

Appendix DD

Analysis of Variance Summary for Number of CrossesFor Ratio Effects RP vs NRP

Source	SS	df	MS	F
Test	138.156	5	27.631	2.606*
Error	1145.200	108	10.604	
Total	1283.356	113		

* $p < .05$

Appendix DD Cont'd

Collapsed Number of Crosses Scores for

Ratio Effects

Ratio	Number of Crosses
1	
<u>M</u>	2.05
<u>SD</u>	1.98
2	
<u>M</u>	3.02
<u>SD</u>	2.68
3	
<u>M</u>	1.82
<u>SD</u>	- 2.31
8	
<u>M</u>	1.27
<u>SD</u>	2.39
12	
<u>M</u>	1.47
<u>SD</u>	1.99
24	
<u>M</u>	2.65
<u>SD</u>	2.71

Note. n = 60 per cell, N = 360.

Appendix EE.1

Analysis of Variance Summary for Number of CrossesFor Ratio X Test Interaction

Source	SS	df	MS	F
Ratio	138.156	5	27.631	2.606*
Error	1145.200	108	10.604	
Test	38.339	2	19.169	6.677*
R X T	16.994	10	1.699	0.591
Error	620.200	216	2.871	
Total	1958.889	341		

*p < .05

Appendix EE.2

Analysis of Variance Summary for Number of CrossesFor Ratio Effects at Test Day 0

Source	SS	df	MS	F
Ratio	49.342	5	9.868	0.930
Error	1145.200	108	10.604	
Total	1194.542	113		

Analysis of Variance Summary for Number of CrossesFor Ratio Effects at Test Day 1

Source	SS	df	MS	F
Ratio	67.367	5	13.473	1.270
Error	1145.200	108	10.604	
Total	1212.567	113		

Analysis of Variance Summary for Number of CrossesFor Ratio Effects at Test Day 30

Source	SS	df	MS	F
Ratio	38.442	5	7.688	0.725
Error	1145.200	108	10.604	
Total	1183.642	113		

Appendix FF.1

Analysis of Variance Summary for Number of CrossesFor Ratio X Test Effects for Ratio 1

Source	SS	df	MS	F
Test	14.800	2	7.400	2.577
Error	620.200	216	2.871	
Total	635.000	216		

Analysis of Variance Summary for Number of CrossesFor Ratio X Test Effects for Ratio 2

Source	SS	df	MS	F
Test	6.533	2	3.267	1.137
Error	620.200	216	2.871	
Total	626.733	218		

Appendix FF.2

Analysis of Variance Summary for Number of CrossesFor Ratio X Test Effects for Ratio 3

Source	SS	df	MS	F
Test	22.033	2	11.017	3.837*
Error	620.200	216	2.871	
Total	642.233	218		

* $p < .05$ Collapsed Number of Crosses forRatio X Test Interaction for Ratio 3

Ratio	Test Time		
	Test 0	Test 1	Test 30
1			
<u>M</u>	2.00	1.00	2.45
<u>SD</u>	2.87	1.08	2.46

Note. n = 20 per cell, N = 20.

Appendix FF.3

Analysis of Variance Summary for Number of CrossesFor Ratio X Test Effects for Ratio 3

Source	SS	df	MS	F
Test	3.233	2	1.617	0.563
Error	620.200	216	2.871	
Total	623.433	218		

Analysis of Variance Summary for Number of CrossesFor Ratio X Test Effects for Ratio 12

Source	SS	df	MS	F
Test	8.033	2	4.017	1.399
Error	620.200	216	2.871	
Total	628.233	218		

Analysis of Variance Summary for Number of CrossesFor Ratio X Test Effects for Ratio 24

Source	SS	df	MS	F
Test	0.700	2	0.350	.1219
Error	620.200	216	2.871	
Total	620.900	218		

Appendix GG.1

Analysis of Variance Summary for Number of Crosses
For Group X Test Interaction

Source	SS	df	MS	F
Group	21.511	1	21.511	2.328
Error	1145.200	108	10.604	
Test	33.339	2	19.169	6.677*
G X T	7.339	2	3.699	1.277
Error	629.200	216	2.871	
Total				

* $p < .05$

Appendix GG.2

Analysis of Variance Summary for Number of CrossesFor Test Main Effects RP vs NRP

Source	SS	df	MS	F
Test	1377.956	1	1377.956	6.677*
Error	629.209	216	2.871	
Total	658.539	217		

* $p < .05$ Collapsed Number of Crosses Scores forTest Main Effects

Test	Overall Number of Crosses
Test day 0	
<u>M</u>	2.26
<u>SD</u>	2.89
Test day 1	
<u>M</u>	1.58
<u>SD</u>	1.98
Test day 30	
<u>M</u>	2.29
<u>SD</u>	2.27

Note. n = 120 per cell; N = 120.

Appendix HH.1

Analysis of Variance Summary for Number of Crosses
For Treatment X Ratio Interaction

Source	SS	df	MS	F
Treatment	22.500	1	22.500	2.122
Ratio	26.839	2	13.419	1.265
TR X R	89.817	2	44.409	4.183*
Error	1145.200	108	10.604	
Total		113		

* $p < .05$

Appendix HH.1 Cont'd
Collapsed Number of Crosses for
Treatment X Ratio Interaction

	Ratio		
Treatment	1	2	3
Massed			
<u>M</u>	2.05	3.02	1.82
<u>SD</u>	1.98	2.68	2.31

	Ratio		
Treatment	8	12	24
Distributed			
<u>M</u>	1.27	1.47	2.65
<u>SD</u>	2.39	1.99	2.71

Note. n = 60 per cell, N = 360.

Appendix HH.2

Analysis of Variance Summary for Number of Crosses
For Treatment X Ratio Interaction for Massed Groups

Source	SS	df	MS	F
Ratio	48.578	2	24.289	2.290
Error	1145.200	108	10.604	
Total	1193.778	110		

Appendix HH.3

Analysis of Variance Summary for Number of CrossesFor Treatment X Ratio Interaction for Distributed Groups

Source	SS	df	MS	F
Ratio	67.978	2	33.539	3.163*
Error	1145.200	108	10.604	
Total	1212.278	110		

* $p < .05$

Appendix II

Analysis of Variance Summary for Number of CrossesWith Controls

Source	SS	df	MS	F
Group	586.350	3	195.4508	10.469*
Treatment	0.600	1	0.600	.032
G X TR	26.767	3	8.922	.478
Error	1344.133	72	18.669	
Test	8.725	2	4.362	1.201
G X T	85.475	6	14.246	3.922*
TR X T	2.775	2	1.388	.382
G X TR X T	27.958	6	4.660	1.283
Error	523.067	144	3.632	
Total	2605.350	239		

* $p < .05$

Appendix JJ.1

Analysis of Variance Summary for Number of CrossesWith Controls for Group X Test InteractionFor Test Day 0

Source	SS	df	MS	F
Group	346.353	3	115.353	31.759*
Error	523.367	144	3.632	
Total	869.117	147		

* $p < .05$

Appendix JJ.1 Cont'd

Collapsed Number of Crosses with ControlsFor Test Day 0

Group	Overall Number of Crosses
RP	
<u>M</u>	2.45
<u>SD</u>	3.17
NRP	
<u>M</u>	2.45
<u>SD</u>	2.54
CON-RP	
<u>M</u>	3.50
<u>SD</u>	3.82
CON-NRP	
<u>M</u>	7.53
<u>SD</u>	3.36

Note. n = 20 per cell; N = 80.

Appendix JJ.2

Analysis of Variance Summary for Number of CrossesWith Controls for Group X Test InteractionFor Test Day 1

Source	SS	df	MS	F
Group	251.538	3	83.846	23.985*
Error	523.067	144	3.632	
Total	774.605	147		

*p < .05

Appendix JJ.2 Cont'd

Collapsed Number of Crosses with ControlsFor Test Day 1

Group	Overall Number of Crosses
RP	
<u>M</u>	1.95
<u>SD</u>	2.11
NRP	
<u>M</u>	2.33
<u>SD</u>	2.25
CON-RP	
<u>M</u>	4.75
<u>SD</u>	4.20
CON-NRP	
<u>M</u>	6.05
<u>SD</u>	3.15

Note. n = 20 per cell; N = 80.

Appendix JJ.3

Analysis of Variance Summary for Number of CrossesWith Controls for Group X Test InteractionFor Test Day 30

Source	SS	df	MS	F
Group	74.238	3	24.746	6.813*
Error	523.067	144	3.632	
Total	597.305	147		

*p < .05

Appendix JJ.3 Cont'd

Collapsed Number of Crosses with ControlsFor Test Day 30

Group	Overall Number of Crosses
RP	
<u>M</u>	2.80
<u>SD</u>	1.82
NRP	
<u>M</u>	2.45
<u>SD</u>	2.37
CON-RP	
<u>M</u>	3.90
<u>SD</u>	2.45
CON-NRP	
<u>M</u>	4.90
<u>SD</u>	2.61

Note. n = 20 per cell; N = 80.

Appendix KK.1

Analysis of Variance Summary for Number of CrossesWith Controls for Group X Test InteractionFor CON-RP

Source	SS	df	MS	F
Test	16.300	2	8.150	2.244
Error	523.067	144	3.632	
Total	539.367	146		

Appendix KK.2

Analysis of Variance Summary for Number of CrossesWith Controls for Group X Test InteractionFor CON-NRP

Source	SS	df	MS	F
Test	67.903	2	33.950	9.347*
Error	523.367	144	3.632	
Total	593.967	146		

* $p < .05$ Collapsed Number of Crosses forGroup X Test Interaction for CON-NRP

Group	Test Day		
	0	1	30
CON-NRP			
<u>M</u>	7.53	6.05	4.90
<u>SD</u>	3.36	3.15	2.61

Note. n = 20 per cell, N = 20.

Appendix KK.3Analysis of Variance Summary for Number of CrossesWith Controls for Group X Test InteractionFor RP

Source	SS	df	MS	F
Test	7.300	2	3.650	1.005
Error	523.067	144	3.632	
Total	530.367	146		

Appendix KK.4

Analysis of Variance Summary for Number of Crosses

With Controls for Group X Test Interaction

For NRP

Source	SS	df	MS	F
Test	2.700	2	1.350	0.372
Error	523.067	144	3.632	
Total	525.767	146		

Appendix LL

Analysis of Variance Summary for Number of Crosses
With Controls for Group Main Effects

Source	SS	df	MS	F
Group	586.350	3	195.450	10.469*
Error	1344.133	72	18.669	
Total	1930.483	75		

* $p < .05$

Appendix LL Cont'd

Collapsed Number of Crosses Scores with Controls
For Group Main Effects

Group	Overall Number of Crosses
RP	
<u>M</u>	2.43
<u>SD</u>	2.42
NRP	
<u>M</u>	2.30
<u>SD</u>	2.36
CON-RP	
<u>M</u>	4.05
<u>SD</u>	3.55
CON-NRP	
<u>M</u>	6.15
<u>SD</u>	3.19

Note. n = 60 per cell; N = 240.

Appendix MM

Analysis of Variance Summary for Number of CrossesFor Response Prevention Groups

Source	SS	df	MS	F
Treatment	142.773	5	28.556	3.058*
Error	504.200	54	9.337	
Test	28.573	2	14.239	5.322*
TR X T	23.422	10	2.342	
Error	290.000	138	2.685	
Total	988.973	179		

* $p < .05$

Appendix NN

Analysis of Variance Summary for Number of CrossesFor RP Treatment Main Effects

Source	SS	df	MS	F
Treatment	142.778	5	28.556	3.058*
Error	504.200	54	9.337	
Total	646.973	59		

* $\underline{p} < .05$

Appendix 'NN' Con't

Collapsed Number of Crosses forRP Groups

Treatment Group	Number of Crosses
RP1	
<u>M</u>	2.23
<u>SD</u>	1.92
RP2	
<u>M</u>	4.03
<u>SD</u>	2.72
RP3	
<u>M</u>	1.50
<u>SD</u>	1.46
RP8	
<u>M</u>	1.30
<u>SD</u>	1.62
RP12	
<u>M</u>	2.10
<u>SD</u>	2.26
RP24	
<u>M</u>	2.57
<u>SD</u>	2.86

Note. n = 30 per cell, N = 180.

Appendix OO

Analysis of Variance Summary for Number of CrossesFor Test Main Effects for RP Groups

Source	SS	df	MS	F
Test	28.578	2	14.289	5.380*
Error	290.000	108	2.685	
Total	318.578	110		

*p < .05

Collapsed Number of Crosses forRP Groups Across Repeated Tests

Treatment Group	Test		
	Day 0	Day 1	Day 30
RP			
<u>M</u>	2.37	1.77	2.73
<u>SD</u>	2.80	1.87	2.22

Note. n = 60 per cell, N = 60.

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