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The Effectiveness of Response Prevention in the Reduction of Avoidance Behavior in Young Rats

Sara Hazard
University of Rhode Island

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THE EFFECTIVENESS OF RESPONSE PREVENTION IN THE
REDUCTION OF AVOIDANCE BEHAVIOR
IN YOUNG RATS

BY
SARA HAZARD

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE
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ABSTRACT

A review of the literature on response prevention substantiates that the technique is effective in reducing fear in adult rats. However, the effectiveness of response prevention in reducing avoidance behavior in young rats has not been investigated. The purpose of this study was to assess the effects of response prevention on avoidance behavior in young rats and also to evaluate the persistence of fear reduction as a result of response prevention.

Thirty young (24 and 25 days old) albino rats were randomly assigned to receive or not to receive response prevention or to act as control subjects without any avoidance training. The subjects from each treatment condition were tested for fear retention at 0, 1, 3, 9 and 27 days after the treatment phase. Fear was assessed on two dependent measures: approach latency and time spent on grids.

Results revealed that the response prevention treatment was effective in reducing avoidance behavior. These results are consistent with the major findings in the area of response prevention in adult rats. However, the effectiveness of response prevention in young rats was not as durable as it is in adult rats. The results also revealed that the young rats forgot the traumatic learning experience after the third testing interval. This result supports the literature in the area of the retention function for fear in young rats.

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Avoidance behavior is a process in which a response results in the cancellation of a scheduled delivery of an aversive stimulus. The cancellation of the stimulus increases the probability of the response occurring again. There are many theories explaining this particular type of behavior (Herrnstein, 1969; Rescorla & Solomon, 1967; Schoenfeld, 1950; Seligman & Johnson, 1973; Solomon & Wynne, 1954). One of the most noted is Mowrer's (1947, 1950) two-factor theory of avoidance behavior. This theory combines theoretical concepts from both classical and instrumental conditioning. The first factor of Mowrer's theory postulates that fear is classically conditioned to a neutral stimulus. The second factor states that the actual avoidance response is instrumentally reinforced by fear reduction which occurs as a result of a successful avoidance. An experimental example of this situation would be as follows: a noxious stimulus, a loud noise (UCS), is paired with a neutral exteroceptive stimulus, a light (CS). After a number of pairings, the exteroceptive stimulus begins to take on the properties of a conditioned aversive stimulus, i.e. it elicits fear. Thereafter, when the light comes on, the fear response which is running to another area of the apparatus or jumping up onto a ledge will be elicited as if CS were the noxious stimulus. According to the instrumental conditioning component of the two-factor theory, the avoidance response is reinforced

because it causes the offset of the CS and the reduction of fear. Being reinforced the probability of the avoidance response will increase. The exteroceptive stimulus (CS) has three functions. First, it elicits responses similar to that which were elicited by the UCS. Second, it serves as a negative reinforcer. It is the termination of the CS which increases the probability of the avoidance response. Third, it is a discriminative stimulus. It is the event to which the subject responds.

Although the two-factor theory is the most common account of avoidance behavior, there are some anomalies which have caused other individuals to develop different theories of avoidance behavior. One anomaly, which was discovered by Solomon and his students, is the non-extinction or the resistance to extinction of the avoidance behavior. Solomon and Wynne (1953, 1954) reported that dogs which had been trained a hurdle-jumping response to avoid shock in a shuttle box took up to 650 trials to extinguish the response once the shock was discontinued. The authors also reported that the standard pattern of avoidance responses was several responses with short latencies and then a response with a long latency. Immediately following the long latency response, another series of avoidance responses with short latencies would occur. Solomon and Wynne (1954) proposed the following explanation. First, they believed that fear was

classically conditioned to a neutral stimulus and that fear motivated the avoidance behavior as in the two-factor theory. In addition to these assumptions, Solomon and Wynne hypothesized that fear didn't extinguish because it was "protected" by a well-established avoidance response. The term that Solomon and Wynne used was "anxiety conservation" to describe a state where fear appears only if the well-established avoidance response starts to wane. At the point where the avoidance response wanes, fear emerges to reenergize the response. This is a result of the autonomic nervous system having time to respond to the conditioned stimulus (Solomon & Wynne, 1954). As it was stated previously, the subjects display a series of short latencies (1 or 2 seconds), a long latency and then another series of short latencies. Solomon and Wynne made the supposition that fear doesn't appear during the short latencies because the response time is too short for the autonomic nervous system to respond. Therefore, the latency is too short for the fear to motivate the avoidance behavior. However, as soon as the avoidance behavior starts to extinguish, the fear is reinstated. This accounts for the long latency and the responses with short latencies which follow it. Although Solomon and Wynne stated this as the cause of the unusually strong resistance to extinction of the avoidance response, other theorists believe this explanation is inadequate.

The basic problem with the theory is the claim that fear is not only essential for the acquisition of the avoidance response but also for the maintenance of the behavior. Although fear is acquired through basic Pavlovian conditioning, it doesn't seem to adhere to the principle of Pavlovian extinction. When the avoidance response is well-established, the conditioned stimulus occurs without the unconditioned stimulus. This, in essence, is the standard Pavlovian extinction procedure. Therefore, a well-established avoidance response should extinguish after a relatively short series of extinction trials, but it doesn't. Even though Solomon and Wynne's "anxiety conservation" principle is an interesting conceptual explanation, the basic question of what motivates or reinforces the avoidance behavior, if fear dissipates, still remains.

Another theory of avoidance behavior which divorces itself from the assumptions of fear or drives is the "reinforcement model" proposed by Schoenfeld (1950). Schoenfeld stated that the conditioned stimulus occurs frequently with the unconditioned stimulus. Since the unconditioned stimulus is aversive, it serves as a negative reinforcer during training. By virtue of the pairing of the CS with the UCS, the CS becomes a conditioned negative reinforcer during training. In this learning situation, the subject is not avoiding the shock or escaping the fear, it is escaping the

conditioned stimulus and the termination of the CS is the reinforcing event. This is in contrast to the two-factor theory which states that the reinforcing event is the internal event of fear reduction.

In both the acquired-drive and the reinforcement model the conditioned stimulus becomes meaningful to the subject through Pavlovian conditioning. In addition, the reinforcement of a response which is acquired through the termination of the conditioned stimulus is derived from conditioned fear or an aversive element. Thus, although these theories appear different from one another, they are really quite similar.

A third theory proposed by Sidman (1953) offers another explanation of avoidance behavior. Sidman designed an experimental situation in which the subjects received a brief shock on a regular fixed interval 5 (FI5) second schedule. Shocks were brief so that the subjects were prohibited from escaping them. Subjects who engaged in the appropriate response, bar pressing, could delay or postpone the shock for 30 seconds. If the subject bar pressed continuously within 30 seconds, then it would not receive any shock. In Sidman's experiments, there wasn't any conditioned stimulus, this was a unique characteristic of the experiments. Sidman reported that subjects would bar press up to 500 times in an hour. This was four times the amount needed to avoid the shock. Sidman hypothesized that the critical

element was the proprioceptive consequences of the response itself. The proprioceptive feedback of bar pressing was reinforcing because there wasn't any shock paired with it. Conversely, the proprioceptive feedback from other responses wasn't reinforcing because it was liable to have a shock accompanying it. Sidman (1953) also gave an alternative explanation for the avoidance behavior. He concluded that bar pressing emerges as other types of responses are suppressed. Yet another explanation was put forth by Sidman (1966) which stated that the reinforcing event that serves to increase the avoidance behavior is the reduction of shock frequency.

It was this last explanation that Anger (1963) studied. He argued that subjects could not discriminate between a low rate of shock frequency and a slightly higher one. Anger stated that this reinforcing agent could not shape behavior. Instead, he proposed that the stimulus consequences which occur after a response were the reinforcing agents. Specifically, the time which elapsed between response and presentation of an aversive stimulus was the critical element. He proposed that the subject had a sense of about how much time had passed since the last response. Because of this sense of time, short latencies were reinforcing whereas a longer latency was aversive. In other words, subjects were aware of the fact that as the inter-response latency became longer,

the probability of shock increased. The acquisition of an avoidance response occurs because the short traces are not aversive while the long traces are.

At this point, several different theories of avoidance behavior have been presented. A salient characteristic of these theories is that each has been designed around an experimental situation which supports the respective theory. This apparent fact has led another theorist to propose a theory of avoidance behavior. Herrnstein (1969) asserted that individuals who use the experimental analysis of behavior should focus their energies on the experimental contingencies that control behavior. Their energies should not be focused on hypothesizing about unobservable events such as fear and proprioceptive feedback that other theorists claim as the controlling agent of behavior. With this in mind, Herrnstein and Hineline (1966) looked at one experimental contingency which they felt could influence avoidance behavior. The experimental contingency was rate of shock frequency. In their experiment, subjects received shock randomly in time. However, it was at an average rate dependent on responding. This meant that the subject could receive a shock immediately after responding. The actual response only reduced the probability of the occurrence of an aversive event. Herrnstein and Hineline reported that learning did occur. This caused them to conclude that the reduction in

shock frequency was a sufficient condition for the acquisition of an avoidance response. Furthermore, it was evidence to support the claim that experimental contingencies should be studied and not hypothetical constructs.

The theories which have just been presented are some of the major ones of avoidance behavior. There are other theories which also speculate on the mechanisms of avoidance behavior. However, at this time, the discussion will turn to a procedure which reduces avoidance behavior, response prevention.

Although the study of avoidance behavior is basic research, it is also considered the animal analog of clinical avoidance behaviors such as phobias and anxiety (Baum & Poser, 1971). The characteristics of experimentally-induced avoidance behaviors in laboratory animals and fear-motivated neurotic behaviors in humans may be similar (Baum & Poser, 1971; Stampfl & Levis, 1967). Because of this, a considerable amount of laboratory research has focused on developing therapeutic techniques to eliminate the disorder. Two of the human therapeutic techniques based on the animal research are implosion therapy and flooding. The subhuman analog of these therapies is response prevention.

Response prevention (RP) is a technique used to decrease avoidance behavior in the laboratory setting. In response prevention, the occurrence of the avoidance response is

prevented while the conditioned aversive stimulus is presented. The primary aversive stimulus is not presented. Thus, the procedure forces the subject to experience the warning stimulus which is not followed by the aversive stimulus over a number of trials. Fear to the warning stimulus is theoretically extinguished (classical extinction) and the elimination of fear, the motivation and reinforcement for the instrumental avoidance, results in the cessation of the avoidance response. Thus, following from Mowrer's theory, response prevention causes the extinction of the fear and cessation of the avoidance response.

The use of response prevention can be traced back to the late 1930's. Hull (1938) proposed a hypothesis that could be considered the foundation of response prevention. The hypothesis was the "frustration hypothesis." This supposition stated "... that when an excitatory tendency is prevented, for any reason, from evoking its accustomed reaction, a state ensues substantially like the experimental or internal inhibition long known to be a characteristic of conditioned reactions" (p.10). Williams and Williams (1943) designed an experiment to test this hypothesis. In their experiment, they found that subjects that were prevented from making a goal oriented response for a few trials extinguished faster than those who did not receive the response prevention. Page and Hall (1953) extended the investigation

of response prevention into its effects on a well-learned avoidance response. Although the results of Williams and Williams (1943) and Page and Hall (1953) were similar, Page and Hall introduced two alternative theories to account for the effects of response prevention. They proposed that either diminished drive strength or counterconditioning was the underlying factor explaining the effects of response prevention. This latter idea was in contrast to Hull's frustration hypothesis to which Williams and Williams subscribed. The critical difference to understand when comparing the two alternative theories is that in counterconditioning, the stimulus in the presence of which the subject was shocked still has the capability to elicit fear. However, the subject has acquired a new response to reduce the fear. The diminished drive strength theory contends that the stimulus associated with the primary traumatic event has lost its capability to elicit fear.

Page (1955) was able to demonstrate which of the theories seemed to best explain the results of response prevention. In this study, Page trained two groups of rats to avoid an electric shock in a shuttle box. In the second phase of the study, the extinction series, one group was prevented or blocked from making a response on each trial. The other group was given a standard series of extinction trials where the CS was presented without the UCS. In the

final stage of the experiment, Page deprived the rats of food and then placed food in the shock compartment. He found the response prevention group had a longer approach latency than those rats whose responses were classically extinguished. This was interpreted as evidence for the counterconditioning theory.

There is another theory which has been introduced to account for the effect of response prevention. Seligman and Johnson (1973) proposed that the underlying factor of response prevention is a disconfirmation of an expectancy that not responding leads to shock. In Seligman and Johnson's cognitive theory, conditioned fear facilitates the acquisition of an avoidance response. However, this conditioned fear is replaced by expectancies after the response is established. Seligman and Johnson proposed that there are two expectancies. The first expectancy is that responding produces no shock. The second expectancy is that failure to respond produces shock. Therefore, they state that response prevention is effective because the expectancy that not responding leads to shock is disconfirmed. Thus, the avoidance behavior is discontinued.

The Seligman and Johnson cognitive theory and the counterconditioning theory, or as it is more commonly called the competing response theory, are only two of the theories which have been proposed. Two additional theories which

could be mentioned are the two-process fear extinction theory and the relaxation theory. Both theories are forerunners in this area.

Numerous investigators have studied the effects of response prevention on avoidance behavior. These investigators have not only studied the efficacy of response prevention in eliminating avoidance behavior, but have also analyzed different parametric issues. One of the most prolific authors in this area is Maurice Baum. Baum (1966) empirically demonstrated the efficacy of response prevention. The avoidance behavior of subjects that had received response prevention extinguished more readily than those subjects who did not receive response prevention. In another study, Baum (1968) looked at the efficacy of response prevention on an overtrained avoidance response. Response prevention was effective in reducing avoidance behavior in subjects who had errorless overtraining sessions. Baum (1969) also investigated two other parametric issues: duration of response prevention and shock intensity. Baum (1969) found that short durations of response prevention were ineffective. However, longer durations were more effective. Baum also found that higher shock intensity during the original learning reduced the effectiveness of response prevention. Sieteltuch and Baum (1971) showed that response prevention was also effective for subjects who had established a sub-

stantially stronger avoidance response. Subjects in this experiment were exposed to unavoidable shock prior to avoidance training. The objective of this study was to establish a substantially stronger avoidance response because it was mediated by previously conditioned fear. Again, the response prevention group's avoidance behavior extinguished faster than the control group's. Baum and Myran (1971) and Baum (1972) investigated the effects of massed versus distributed and immediate versus delayed response prevention on avoidance behavior. The results indicated that distributed and delayed response prevention were significantly more effective than massed and immediate response prevention.

In the University of Rhode Island (URI) Animal Laboratory, response prevention has also been studied extensively. Schiff, Smith and Prochaska (1970) designed an experiment which looked at the relationship between extinction rate and length of each blocked trial and compared it with a number of blocked trials. The results yielded a negative correlation between the number of blocked trials and trials to extinction. In addition, there was a negative relationship between length of blocked trials and trials to extinction. Spring, Prochaska and Smith (1973) examined the effect of various blocking lengths. The data showed that the longer blocking trial lengths were significantly more effective in reducing avoidance behavior than the shorter blocking trial

lengths. The authors also reported that the longer length was probably effective because the subjects exhibited more exploratory behavior.

Recently, three additional studies have been conducted in the U.R.I. laboratory. Neill (1980) examined the persistence or retention of fear reduction after response prevention using a between subjects design. This study was a partial replication of a study done by Benline and Simmel (1967). Their results indicated that fear reduction after response prevention was a temporary phenomenon because there was an increase in fear when tested over a five day interval. In Neill's 1980 study, subjects were tested at days 0, 1, 3, and 10, after response prevention. The results showed that fear reduction persisted unabated over 10 days of testing. Cottrill (1982) replicated this study using a within subjects design instead of a between subjects design. Also, in addition to the testing intervals of 0, 1, 3, and 10 days, subjects were tested 30 days after treatment. The results of her study supported, for the most part, the hypothesis that response prevention facilitates the reduction of fear. However, there was an increase in fear after the first testing interval. The effects of response prevention waned as a function of time. Neill (1982) investigated the effects of delayed presentations of extended response prevention on fear reduction and short durations of response

prevention on fear enhancement. Results of this study showed that there was a significant reduction of fear with the extended durations of response prevention. Also, there was no significant enhancement of fear with the short durations of response prevention. Finally, delayed response prevention was just as effective as immediate response prevention in the reduction of fear.

As this partial review of the literature reveals, many parametric issues have been examined. However, although many experiments have been designed to look at different aspects of the effectiveness of response prevention, there is an issue that has been neglected. The studies which have just been reviewed have all used adult rats. A review of the literature fails to identify any published studies which look at the effects of response prevention in young rats (20 - 30 days old). This is an important parametric issue because response prevention is the subhuman analog to implosion therapy and this therapy is used on many individuals, including children. Without thoroughly investigating the effectiveness of response prevention on young subjects at the subhuman level in the laboratory setting, the therapeutic treatment could be used inappropriately, unethically or ineffectively on children.

Two pilot studies have been done in this area at U.R.I. The objective of both of these preliminary studies was to

determine if the avoidance procedure and apparatus were appropriate for this age group. Typically, experimenters use a shuttle box avoidance apparatus when evaluating acquisition, extinction or retention of avoidance behavior in young rats. However, in the U.R.I. laboratory, most of the work has been done in a one-way platform avoidance apparatus. In the pilot studies, a one-way platform avoidance apparatus was used. This apparatus has two levels and the subject must climb up on a ledge to escape or avoid electric shock. Because of the lack of motor development in young rats, the one-way platform avoidance apparatus has the potential to prohibit the acquisition of avoidance response. However, the results of the two pilot studies confirmed that young rats can readily learn an avoidance response in a one-way platform apparatus.

In experiment 1, subjects were trained to make an avoidance response in a one-way platform avoidance apparatus. The UCS was electric shock and the CS was the recession of the wall above the platform. Once the wall receded completely, the subject had 10 seconds to avoid the onset of shock by jumping up onto the platform. If the subject failed to avoid the shock within 10 seconds, then he received .7 mA of scrambled foot shock until he escaped onto the platform. Once the avoidance criterion of 10 consecutive avoidances was met, subjects either received no response prevention (NRP) or 45 minutes of response prevention (RP). There was a

third group which served as a control group. This group did not receive any avoidance training. Subjects were evaluated on two dependent measures: approach latency and time spent on the grids. Approach latency (AL) is the time that it takes for the subject to step down onto the grids. Time-on-grids (TOG) is the total time spent on the grids of the 60 minute test period. Both measures are considered indices of conditioned fear and avoidance behavior. For example, if a rat has a strong avoidance response then it should have a long approach latency. If, however, the avoidance response has been weakened, then the subject should have a shorter approach latency and a longer time-on-grids. The results of experiment 1 showed a significant difference between the RP group and the NRP group on the approach latency measure. That is, the RP group had a shorter grid approach latency than the NRP group. In other words, it appears that the RP group had greater fear reduction than the NRP group. However, there was no significant difference between the RP and NRP groups on the time-on-grids measure. In the second pilot study, the same procedure was used except for one alteration. Instead of a single avoidance training session, subjects received two avoidance training sessions to an avoidance criterion of 10 consecutive avoidances. Results of this study showed a significant difference between RP and NRP groups on both the AL and TOG

measures. Therefore, the results of the second pilot study indicate that response prevention may be an effective procedure in reducing fear and avoidance behavior in young rats.

There are studies that examine avoidance behavior in young rats. However, the main focus of these studies are rate of acquisition and retention compared to the adult rat. A review of the literature reveals a lack of consistent results in previous studies. Specifically, McLaughlin, Eller, and Korol (1975), and Kirby (1963) have reported that the rate of acquisition is relatively invariant with age. However, Brunner (1969), Riccio, Rohrbaugh and Hodges (1968), and Schulenburg, Riccio, and Stikes (1971) state that rate of acquisition changes with age. These latter authors suggest that adult rats have a faster rate of acquisition than young rats. All the literature seems to agree that retention of the avoidance response is poorer in the young rats than in adult rats (Brunner, 1969; Campbell & Campbell, 1963; Kirby, 1963; McLaughlin, Eller, & Korol (1975).

Thus far this review has focused on avoidance behavior, response prevention and the effects of response prevention on avoidance behavior in the laboratory setting. Given the tacit assumption of behavior theory that what is true for animals also may be true for humans, the focus will now turn to the effects of a response prevention

technique on a fear motivated neurotic behavior, a phobia, in children. The objective of this is to try to evaluate the validity of generalizations based on facts obtained from the experimental setting when they are applied to the clinical setting.

As stated previously, response prevention is the sub-human analog to the two techniques of flooding and implosive therapy, which are used to treat phobic behaviors. The objective of these therapies is to create a situation where the patient experiences the frightening stimuli in imagination and, from this experience, create a maximum level of fear in the patient. The result of such an experience is said to cause a reduction in fear to a particular object, event or situation. These two behavioral methods have three distinct characteristics. They are: the patient must imagine a fearful or threatening scene; the fearful scene is presented for a prolonged period of time; and there is no relaxation training like some other behavioral therapies such as systematic desensitization. Although both techniques are similar, they do have applied and theoretical differences.

Implosive therapy (Stampfl & Levis, 1967) is derived from the principles of learning and psychodynamic theory. Therapists who use this technique, as well as flooding, believe that the fear-motivated neurotic behavior is learn-

ed via classical conditioning. Stampfl and Levis state that an individual can unlearn an irrational fear by utilizing a method derived from the extinction model. Specifically, this is achieved by presenting to the individual the fear-producing stimuli without the reinforcement (primary aversive stimulus) which elicits the fear. This procedure should lead to the reduction in the anxiety response through extinction. Thus, the objective of the therapist is to represent, reinstate or symbolically reproduce the conditioned stimuli or stimulus cues which have been conditioned to the anxiety response. The stimulus cues are hypothesized cues which the therapist has acquired through the intake process with the patient and interviews with individuals who are close to the patient. These cues are seen as contributing to the fear. It should be noted that these cues are usually situational. In addition to the situational cues, the implosion therapist develops cues based on psychodynamic principles. The psychodynamic cues are related to themes of aggression, punishment, rejection, sexual material or loss of control. In the therapeutic setting, an individual will be instructed to vividly imagine the stimulus cues presented. The therapist starts with situational cues and ends with the psychodynamic cues. Of course, the investigation of psychodynamic cues is impossible when working with animals.

The other fear reduction method is flooding. Like implo-

sive therapy, the therapist uses a prolonged exposure through imagination of an extremely fearful situation. However, unlike implosive therapy, it does not utilize psychodynamic cues. The technique uses situational cues which are derived from the intake process.

Supportive research in the area of flooding techniques is scarce. Whereas the most investigated fear reduction technique is systematic desensitization, the least investigated technique is flooding. In addition, studies which have been published are generally uncontrolled and descriptive case studies (Handler, 1972; Hersen, 1968, 1969; Olenndick & Gruen, 1972; Yule, Sacks, & Hersov, 1974). An example of an uncontrolled and descriptive study is a study by Handler (1972). Handler used a combination of a relationship approach and implosive therapy to treat an 11-year-old boy who had an intense fear of sleeping alone and/or with the lights off. Although the treatment was acknowledged as being successful, the methodology of the study was uncontrolled. For example, baselines, reported after the intervention and at 6 month follow-up, were subjective observations from the mother. In addition to the intervention being a combination of two approaches, it did not adhere to standard implosive therapy technique. That is, there wasn't any hierarchical order of stimulus cues. In another published article, Hersen (1968) treated a 12-year-old male with a school

phobia. Again, treatment was acknowledged as successful. However, treatment was initiated immediately after traditional psychoanalytically-oriented methods of free association, catharsis, interpretation and dream analysis without proper assessment. In addition, baseline and follow-up were done after the intervention was completed. These methodological problems seriously weaken any statements which assert the effectiveness of flooding techniques. There are some published articles (Kandel, Ayllon, & Rosenbaum, 1977; Smith & Sharpe, 1970) which do implement some experimental control. Kandel, et al. (1977) used flooding technique on two boys who exhibited extreme social withdrawal from other children. The authors wanted to investigate the feasibility of carrying out flooding in situ. In the first experimental situation, the subject was a four-year-old boy. He was diagnosed as suffering from chronic anxiety and extreme emotional problems which led to three dismissals from school. It was reported that he was consistently avoiding interactions with his peers. The authors targeted two responses, interaction with peers and self talk, to which treatment was directed. The experimental design was a multiple baseline design and the setting for the study was the child's classroom and playground. The measurement procedure was standard interval recording of the boy's interaction and self talk. After the completion of 10 baseline sessions, the

treatment was implemented in the classroom, but not in the playground. Flooding consisted of several children functioning as social stimuli, i.e. stimulus cues. These children were told to interact with the target child for a period of a half hour. There were five treatment sessions. Treatment was started on the playground after an additional nine baseline sessions were completed. The objective of this delay was to investigate whether or not there was a generalization effect of the treatment from the classroom to the playground on the child's target behaviors. Results of the flooding revealed an increase in interaction from 0% of the time to 60% of the time. In addition, there was a decrease in self talk in the classroom setting. Prior to treatment, the boy engaged in self talk 70% of the time and after treatment, he engaged in it only 20% of the time. On the playground setting, there was an increase in interaction from 10% to 40% of the time and a decrease in self talk from 85 to 20% of the time. There wasn't any generalization from the classroom to the playground.

In the second experimental case, an 8-year-old boy with speech, hearing and emotional disorders was the subject. The authors used essentially the same procedure. They targeted the same two behaviors, interaction with peers and self talk. Results of the flooding technique were similar to those in the first case. A six month follow-up revealed that

the treatment was still effective.

Smith and Sharpe (1970) used the implosive therapy technique on a 13-year-old boy with a school phobia. The symptoms of the phobia developed following a three week absence from school due to an illness. At the time of the intake meeting, the individual had been absent from school for seven weeks. This period of time was used as the baseline period. During the intake meetings and the meetings with the parents and teachers, a composite of relevant anxiety-evoking stimulus cues was developed. These cues were incorporated into scenes which the investigator used during the treatment. Treatment consisted of six consecutive daily sessions in which the subject was to vividly imagine the scenes. In addition to the therapy session, the individual was asked to attend school for 3 hours after the second and third session. After the fourth session, he was instructed to attend full time. Results of the study revealed that the treatment was effective. Although there are not many controlled published studies of this nature, those studies which have been published do substantiate that fear-reducing techniques are effective.

The objective of the present study is to empirically demonstrate the efficacy of response prevention in reducing avoidance behavior in young rats. The persistence of fear reduction caused by response prevention is also measured

over several retention intervals to determine whether or not the effects of response prevention are temporary in young rats. The experiment employ a 3 x 5 mixed factorial design. The design of the experiment is displayed in Table 1. Subjects which completed the avoidance training either received or did not receive the response prevention treatment. The subjects were tested for fear immediately after treatment 0, 1, 3, 9, and 27 days after treatment. Subjects that did not receive the avoidance training were tested at the same retention intervals. These subjects served as the control for maturation and other time related variables.

The principle hypothesis of the experiment is that response prevention facilitates the reduction of avoidance behavior in young rats, but that the reduction is temporary. The prediction was that young rats would show a shorter approach latency and a longer time on grid after the response prevention than young rats that did not receive response prevention. It was also expected that the response prevention group would show a longer approach latency and less time on grid than the control group. A second hypothesis was that there is an increase in avoidance behavior over a retention interval. The associated prediction was that approach latency would increase and time on grid would decrease in the response prevention group over time. That is, the response prevention group would not differ from the

Table 1

3 x 5 Factorial Design for Testing the Persistence of

Response Prevention

Treatment Group	Retention Interval in Days				
	0	1	3	9	27
No Response Prevention					
Response Prevention					
Control					

note: n per cell = 10

N = 30

no response prevention group on approach latency or time on grids at the end of the longest retention interval tested.

Method

Subjects

Thirty experimentally naive Sprague-Dawley male rats obtained from the Charles River Breeding Laboratory were used as subjects. When the subjects arrived at the U.R.I. animal laboratory, they were 15 days old and were housed in gang cages with a mother until the beginning of the experiment. On the first day of the experiment, subjects were housed separately in cages for the duration of the study. Subjects were supplied ad libitum food and water. The range of weights at the start of the experiment was 60 to 90 grams. The range of age was 24 to 25 days old. Three subjects were removed and replaced for failure to meet avoidance criteria and four were replaced due to equipment failure.

Apparatus

All avoidance training and fear testing were conducted in a one-way platform avoidance apparatus (Lafayette Instrument Company model 85200), which was housed in a sound attenuated chamber. The grid chamber was 23 cm long, 20.3 cm wide and 20.3 cm high. The platform, located 4.5 cm above the grid floor, through an 11 cm by 20 cm opening in an end wall of the grid chamber, was 20.3 cm wide and 11.5 cm deep when the door separating the platform from the chamber was fully open. A wooden chamber of dimensions equal to the grid

chamber was used as a temporary retaining cage. Shock was delivered by a Coulbourn Instruments solid state shocker (model E13-16) through the grid floor. All procedures except placing and removing the subjects from the apparatus were automated with standard electromechanical programming equipment.

Procedure

Avoidance Training. Twenty randomly selected subjects
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were trained to a criterion of 10 consecutive avoidance responses. The avoidance response was defined as the subjects jumping onto the platform within 10 seconds of the opening of the platform door. The subjects remained on the platform for 15 seconds, after which they were pushed from the platform by closing the door. A variable 30 second inter-trial interval was used. The UCS was a scrambled shock registering 0.7 mA on the shocker's amp meter. Subjects failing to make the 10 consecutive avoidances within 60 trials on day 1 were removed from the study and were replaced. Avoidance training occurred each of two consecutive days. Thus, subjects had two avoidance training sessions prior to the treatment phase. Treatment occurred immediately after the second avoidance training session. The total amount of UCS received during avoidance training and the total number of trials to criterion were the two measures recorded during both days.

Ten subjects were assigned to the Control group. Control group subjects were placed inside the avoidance apparatus with the platform door open for 15 minutes. This was approximately the amount of time it took for avoidance training.

Treatment. Ten of the 20 avoidance trained subjects received the standard RP procedure. After successfully completing training, the subjects remained in the apparatus on the grids with the platform door closed for 45 min. After the 45 minutes, the subjects were removed and placed in the retaining chamber for 1 minute.

Nonavoidance trained (Control) subjects also received 45 minutes of RP using the procedure described above.

The ten subjects in the no response prevention group were removed immediately from the apparatus, after completing the avoidance criterion on the second day and placed in the retaining chamber. They spent a total of 46 min. in the retaining cage.

Fear Assessment. Subjects were tested immediately after treatment (day 0) and on day 1, 3, 9 and 27. During testing, 2.5 cm of the ledge was available to the subjects. Subjects were placed on the 2.5 cm ledge and were kept from coming off for 10 seconds. Following this, subjects were tested for 1 hour. There were two dependent measures: Approach latency (AL); the total time the subject took to step down onto the grids and total time spent on the grids (TOG) during the 60

minute test period. Both dependent measures were recorded in seconds.

RESULTS

Avoidance Training

The acquisition variables of avoidance training, total UCS time and total trials to criterion, were analyzed to determine if the response prevention and no response groups were equivalent. Because of very similar scores for all groups on day 2, acquisition scores for each variable were collapsed over the two training sessions. The means and standard deviations for total duration of the unconditioned stimulus and the total trials to the avoidance criterion are displayed in Table 2. An F max test was performed on both acquisition variables to detect if there was a violation of homogeneity of variance. Results of the test showed that there was no violation ($\alpha > .01$). One-way analyses of variance performed on each variable failed to reveal any significant differences between the two groups. From these results, it was assumed that the groups received equivalent training. The results of these analyses are given in Tables 3 and 4.

Fear Assessment

Approach Latency. Means and standard deviations for the approach latencies for each group at each retention interval are displayed in Table 5. Figure 1 illustrates the average approach latency time for the three groups at each

Table 2

Means and Standard Deviations of the Two Avoidance Training

Variables

Treatment Group	Variable			
	Trials to Avoidance		Total UCS (in sec)	
	Acquisition		Duration	
	M	SD	M	SD
No Response Prevention	36.90	8.48	30.39	18.54
Response Prevention	41.10	12.29	32.39	19.25

Note: n per cell = 10

Table 3

Analysis of Variance Summary Table for the Trials to Avoidance
 Acquisition

Source	SS	df	MS	F
Treatment	88.20	1	88.20	0.79
Error	2005.80	18	111.43	
Total	2094.00	19		

Table 4

Analysis of Variance Summary Table for Total UCS Duration

Source	SS	df	MS	F
Treatment	20.20	1	20.20	0.06
Error	6428.49	18	357.14	
Total	6448.69	19		

Table 5

Means and Standard Deviations for Approach Latency (sec.)

Treatment Group	Retention Interval (Days)				
	0	1	3	9	27
No Response Prevention	M 826.58	1424.59	343.64	47.38	24.08
	SD 1043.08	1640.33	400.05	76.02	17.76
Response Prevention	M 188.86	274.27	62.65	18.53	22.65
	SD 325.32	416.10	142.34	11.76	20.89
Control	M 472.29	1291.	15.38	12.85	16.99
	SD 879.66	5.76	10.06	3.17	7.37
Total	M 495.91	569.39	140.55	26.25	21.24
	SD 825.26	1730.67	278.76	45.46	16.12
Total					533.25
					1006.32
					112.79
					255.65
					108.00
					419.77
					250.72
					672.84

Note: n per cell = 10

Figure Caption

Figure 1. Mean approach latency for treatment groups
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at each treatment retention interval.

retention interval. Cochran's test for homogeneity of variance indicated that the cell variances were severely heterogeneous [$C(15,9) = .5361$, $p < .001$]. Although the analysis of variance is robust to some degree of violation of the homogeneity assumption, the small sample sizes in combination with the severity of the violation suggested the need for a variance stabilizing transformation. A common log transformation was performed and was successful in removing the heterogeneity of variance (Cochran's $C(15,9) = .1908$, $p > .05$). Table 6 displays the means and standard deviations of the transformed data.

A 3×5 (group $\times$ day) repeated measures analysis of variance was performed on the transformed approach latency data using the BMDP2V program. The results of this analysis revealed a significant interaction effect. Also, both main effects were significant. These results are given in Table 7. Omega-squared was computed for all significant effects. These results are also given in Table 7.

To further investigate the significant interaction effects, simple effects tests were performed. Because both main effects were significant, simple effects tests were performed on levels of Day at Group and on levels of Group at Day. The results of the simple effects test for day within response prevention group revealed statistical significance, $F(4,108) = 3.946$, $p < .01$. Statistical significance

Table 6

Means and Standard Deviations of Log Transformed Scale for Approach Latency

Treatment Group	Retention Interval (Days)					Total
	0	1	3	9	27	
No Response Prevention						
M	2.49378	2.56233	2.05064	1.41859	1.30023	1.50554
SD	.83141	.96925	.78536	.42056	.26213	.5906
Response Prevention						
M	1.71858	1.98276	1.34770	1.20837	1.27029	1.96511
SD	.72891	.71817	.50300	.22479	.24079	.8605
Control						
M	1.76747	1.08552	1.13825	1.09832	1.19657	1.25722
SD	.96192	.14057	.18914	.09826	.17648	.5056
Total						
M	1.97328	1.87687	1.51220	1.24176	1.25570	
SD	.8925	.9163	.6622	.3030	.2257	

Note: n per cell =10

Table 7

Analysis of Variance Summary Table for Approach Latency

Source	SS	df	MS	F	ω^2
Treatment	12.90	2	6.45	12.35**	.061
Error	14.10	27	0.52		
Retention Interval	14.79	4	3.62	12.95**	.169
Interaction	7.10	8	0.89	3.71*	.150
Error	30.21	108	0.28		

Note. Data Transformed before analysis: common log transformation

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* $p < .01$

** $p < .001$

was also detected in the simple effects test for day within the no response prevention group and the control group, respectively, $F(4,108) = 12.369$, $p < .001$ and $F(4,108) = 2.975$, $p < .05$. Newman-Keuls analyses were performed to further investigate each simple effects test. For day differences within the response prevention group, approach latencies on Day 0 and Day 1 were significantly longer than the approach latencies on Day 9, 27 and 3, $p < .01$. For day differences within the no response prevention group, approach latencies on Day 0 and Day 1 were significantly longer than the approach latencies on Day 3, 9, and 27, $p < .01$. Also, the approach latency on Day 3 was significantly longer than the approach latencies for Day 9 and 27, $p < .01$. For day differences within the control group, the approach latency on Day 0 was statistically longer than the approach latencies on Day 1, 3, 9 and 27, $p < .01$.

The simple effects tests for group at day revealed statistical significance for Day 0 ($F(2,124) = 5.742$, $p < .01$), Day 1 ($F(2,124) = 16.868$, $p < .001$), and Day 3 ($F(2,124) = 6.959$, $p < .01$). A Newman-Keuls analysis for group differences at Day 0 revealed that the no response prevention group had a significantly longer approach latency than the response prevention group and the control group, $p < .01$. Analysis for group differences at Day 1 revealed that the no response prevention and response prevention had

Table 8

Means and Standard Deviations for Time on Grid

Treatment Group	Retention Interval (Days)					
	0	1	3	9	27	Total
No Response Prevention						
M	847.47	1868.37	2565.92	3115.94	3361.51	2351.94
SD	1286.90	1503.27	1352.90	948.96	138.44	1439.73
Response Prevention						
M	2363.80	2390.46	2529.37	3086.40	3211.10	2716.33
SD	1387.74	1307.70	1265.62	847.22	270.77	1113.31
Control						
M	2073.88	2205.76	2558.12	3013.32	3074.34	2585.08
SD	1587.58	1283.78	1175.86	526.68	342.75	1123.57
Total						
M	1761.88	2154.86	2551.30	3071.89	3215.65	2551.12
SD	1530.46	1338.60	1222.78	768.28	289.63	1235.83

Note: n per cell = 10

Figure Caption

Figure 2. Mean time on grids for treatment groups at
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each treatment retention interval

a significantly longer approach latency than the control group, $p < .01$ and the no response prevention group's latency was significantly longer than the response prevention group's, $p < .05$. For Day 3, the no response prevention group had a significantly longer approach latency than the response prevention group and the control group, $p < .01$.

Time on Grid. The means and standard deviations for time-on-grid are displayed in Table 8. Figure 2 illustrates the mean time spent on the grid for the three groups at each retention interval. Cochran's test for homogeneity of variance was performed. Results revealed that there was no violation of the homogeneity assumption. [Cochran's $C(15,9) = .135$, $p > .05$].

A 3×5 (group $\times$ day) repeated measures analysis of variance was performed on the time on grid measure. A significant main effect (day) was revealed. Results are given in Table 9. Omega-squared was computed for the significant effect. This result is also given Table 9.

To investigate the significant retention interval effect, a Newman-Keuls analysis was performed. The results revealed that the amount of time spent on the grid floor on Day 9 and Day 27 was significantly greater than on Day 0 and Day 1, $p < .01$. In addition, a greater amount of time was spent on grid floor on Day 27 than on Day 3, $p < .05$.

Table 9

Analysis of Variance Summary Table on Time on Grid

Source	SS	df	MS	F	ω^2
Treatment	3405956	2	1702978	1.01	
Error	45361183	27	1680043		
Retention Interval	44781877	4	11195469	9.86*	.165
Interaction	11420215	8	1427527	1.26	
Error	122593892	108	113512		

* $p < .001$

DISCUSSION

The results support the hypothesis that response prevention facilitates the reduction of avoidance behavior in young rats. These findings are consistent with other studies which have investigated the effects of response prevention on avoidance behavior (Baum, 1966; Baum, 1968; Benline & Simmel, 1967; Neill et al., 1980, Neill et al., 1982; Schiff et al., 1972). However, the results do not support the hypothesis that the reduction in avoidance behavior due to response prevention is a temporary phenomenon. Notwithstanding, the results of this experiment are not only consistent with the response prevention literature, but also are consistent with the literature which investigates the retention of avoidance behavior in young rats (Brunner, 1969; Campbell & Campbell, 1963; Kirby, 1963; McLaughlin, Eller & Korol, 1975).

Although approach latency and time-on-grid are the two dependent measures used in the experiment, approach latency is a more sensitive measure for evaluating avoidance behavior because it assesses how long the subjects refrain from stepping down onto the grids. In essence, it measures the duration of avoidance behavior. The focus of the discussion will center on the approach latency measure for assessing avoidance behavior.

The results revealed that the group which received response prevention had a shorter approach latency than the group which did not receive the response prevention treatment immediately after treatment on Day 0. In addition, the response prevention group did not differ significantly from the control group at this testing interval. Although the no response prevention group and response prevention group had a significantly longer approach latency than the control group on Day 1, the basic relationship was maintained. That is, the no response prevention group had a longer approach latency than the response prevention group. On the third day of the retention interval, the same relationship that occurred on Day 1 among the three groups was present. That is, the response prevention group along with the control group had a significantly shorter approach latency than the no response prevention group.

Since there were no statistical differences after the third day of the retention interval, one could conclude the hypothesis that the reduction in avoidance behavior is a temporary phenomenon is supported. However, since there was a significant decrease in the approach latency measure for both the no response prevention and response prevention groups, the hypothesis is not supported. To support this hypothesis, the results would have to reveal an increase in the approach latency measure for the response prevention

group while the approach latency for the no response prevention group remained unchanged. This type of result has been documented in several studies (Benline & Simmel, 1967; Neill et al., 1980).

From the results of the follow up tests, it appears that the retention of the original learning had dissipated. The Newman-Keuls analysis for day within the response prevention group revealed that the approach latency of Day 0 and Day 1 was significantly longer than Day 3, 9, and 27. This suggests that the subjects were forgetting the fear associated with the grid floor. The other results of the Newman-Keuls analyses for day differences within the no response prevention and control groups are similar. The analysis for the no response prevention revealed that the approach latencies were significantly longer on Day 0 and Day 1 than Day 3, 9, and 27. Also, the approach latency for Day 3 was significantly longer than Day 9 and 27. About the third day of the retention interval, approach latency decreased significantly for both the response prevention and no response prevention group. For the control group, the approach latency for Day 0 was significantly longer than any other day. These results are congruent with the literature which focuses on the pattern of fear retention in young rats. This literature states that such retention is poor (Kirby, 1963; Riccio, Rohrbaugh, & Hodges, 1968; Riccio, Schulenburg & Stikes,

1971). Campbell and Campbell (1962) demonstrated that the relative retention of fear increases greatly as the age of the subject increases.

One of the most cited articles in the infant retention literature is a paper published by Kirby. Kirby (1963) performed an experiment that assessed the relative persistence of learned avoidance response at different age levels. In Kirby's experiment there were three experimental groups: one group of 25 day old rats, one group of 75 day old rats, and one group of 100 day old rats. Each group consisted of 30 subjects. All three groups received 60 avoidance training trials in a shuttle box apparatus. The UCS was shock and the CS was a buzzer. Subjects were assessed 1, 25 and 50 days after avoidance training. During assessment, subjects were placed in the shuttle box and the CS was presented without the UCS. If the subject responded by running to the other side of the shuttle box, it was recorded as an avoidance response. The results of the experiment revealed that the retention of the avoidance response in the infant rat decreased as a function of time since training. Although retention of the avoidance response was observed at the first test interval in the 25-day-old group, it was not observed at the second or third test intervals. In contrast to this result, the avoidance response was observed in the older rats at the second and third test intervals. These

results are typical of those obtained from other retention studies. In other studies which focus on the specific length of retention, the retention rate of infant rats is often cited to be not more than a couple of days (Brunner, 1969; Campbell & Campbell, 1962). The literature in the area of retention in young rats certainly facilitates an understanding of the results in the present study. That is, the decrease in the approach latency measure instead of the typical increase is a result of the inability of the subjects to retain learned avoidance responses for more than a few days.

The most noteworthy result is the significant interaction for the approach latency measure. As figure 1 indicates, the difference among the no response prevention group, response prevention group and the control group differ for the different retention intervals. That is, the differences among the three groups across the five retention intervals was not consistent. Because there was not a consistent trend of difference among the three groups, the results revealed an interaction. Based on the pattern of data, the significant interaction effect comes primarily from the more rapid forgetting of the learning in the no response prevention group. However, in addition to this, the different trends of each group's approach latency over the first two testing intervals is also implicated in the interaction

effect. For the no response prevention group, the approach latency increases while the control group's decreases. For the response prevention group, it remains essentially the same.

Although the results have revealed a significant interaction and significant main effects for approach latency and a significant main (day) effect for time on grid, the results only confirm that the differences among the means of the three groups can not be attributed to error. The results fail to reveal how much of the overall variability is attributed to the treatment effect. Therefore, calculations for omega squared were performed on the significant effects. The results revealed omega-squared calculations of .15, .17, and .06 for the approach latency group, day and interaction effects respectively. Therefore, 15%, 17%, and 6% of the variance was accounted for in the group, day and interaction effects, respectively. For time on grid, the value was .16 or 16% of the variance was accounted for. Although these values do not appear particularly high, they do fall within the medium to large range for this type of calculation.

Although the results of this experiment are interesting in and of themselves, another important contribution of the study is to allow the comparison of these results with results of similar studies using adult rats. There are four studies which can be compared to the present study (Benline

& Simmel, 1967; Crawford, 1977; Neill, 1980; Neill, Cottrill & Smith, 1982).

Benline and Simmel (1967) were the first to investigate the persistence of fear reduction resulting from response prevention. In their study, adult rats were trained to avoid an electric shock in a shuttle box apparatus. After avoidance training, half of the subjects received the response prevention treatment. The other half of the subjects did not receive any response prevention treatment. Instead of the treatment, they were placed in a retaining cage. After the treatment stage was completed, subjects received 100 extinction trials over five days. The results revealed that the response prevention group avoided less on the first day than the no response prevention group. However, the differences in avoidance between the groups decreased as time passed. By the fifth day, extinction performance was similar for the two groups. That is, the response prevention group was avoiding as consistently as the no response prevention group. Benline and Simmel concluded that the effects of response prevention were a temporary phenomenon. Crawford (1977) attempted to replicate the study. However, instead of using a shuttle box, she used a platform avoidance apparatus. The basic procedure for avoidance training, treatment and testing was essentially the same. The results of her study revealed that response prevention

was effective in reducing avoidance behavior as it was in the Benline and Simmel study. However, the frequency of avoidance behavior did not increase over the five day interval.

To investigate the persistence of fear reduction further, Neill (1980) employed a 3 x 5 analysis of variance design. The experiment's design and methodology were similar to those in this paper. The main differences between this and Neill (1980) are that he used adult rats and a between subjects design. Subjects were tested at 0 hours, 3 hours, 1, 3, and 10 days after treatment. The results study revealed that response prevention reduced but did not eliminate completely avoidance behavior. The response prevention group differed significantly from the control group over all the retention intervals. However, there also were statistically significant differences between the response prevention and no response prevention groups. The fear reduction resulting from response prevention was stable over a 10 day period. The no response prevention group's approach latency remained essentially the same.

Neill, Cottrill and Smith (1982) replicated Neill et al. (1980) with the exception of using a within subject design and an additional 30 day test interval. The results of this experiment were similar to the results of those of Neill (1980). That is, response prevention was effective in

reducing avoidance behavior, but it did not eliminate it completely. However, the effects of response prevention waned as a function of time since treatment. Specifically, there was an increase in approach latencies after the first testing interval. Again, the approach latency for the no response prevention group remained unchanged.

When the results of the last two studies are compared with the results of the present study, two important observations can be made. First, response prevention is effective in reducing avoidance behavior in young as well as adult rats. However, it seems that response prevention may be more effective in reducing avoidance behavior immediately after treatment in the young rats than the old, because in this study the response prevention group did not differ significantly from the control group over the first few test intervals. In previous studies with adult rats (Neill et al. 1980, 1982), this has not been the case; response prevention groups have consistently been significantly different from the control groups in the retention interval. Therefore, it may be that response prevention has a greater effect on avoidance behavior in the infant population than the in adult population at least shortly after acquisition.

The second observation is that there is a dramatic difference between the response prevention groups between ages during the retention interval. In adult rats, the

effects of response prevention itself seem to dissipate because the approach latency increases over time for the response prevention group. The approach latencies of the response prevention group usually do not differ significantly from the approach latencies of the no response prevention group by the end of the test interval (Neill et al, 1980, 1982). In the young rats, the entire traumatic experience is forgotten. The fact that all approach latencies decrease significantly as a function of time substantiates this assertion. This is a major difference between the two populations. Since the fear retention pattern of young rats is well documented, the faster forgetting of young rats is a reasonable explanation for this finding.

Although the efficacy of response prevention has been substantiated in the laboratory setting, it has not been demonstrated as clearly in the clinical setting. The primary reason for this is the lack of published articles which use sound experimental control. Most of the articles are descriptive uncontrolled studies, as stated previously. Although many published articles proclaim the effectiveness of flooding and implosive therapy, most of these studies have serious methodological problems.

There are two additional considerations that should be noted as reasons why the applied techniques of response prevention have not been substantiated. The first concerns

the ethical use of fear reduction techniques. One must be mindful that these techniques are stress enhancing procedures which have a greater potential than other techniques (i.e., systematic desensitization) for causing a traumatic experience during the actual treatment. Although these techniques can be effective in reducing fear, they also have the potential of creating more fear if used incorrectly. Because of this, these techniques are often considered as a last resort. The second consideration is that the aversiveness of the technique often interferes with the patient cooperating totally in imagining the anxiety-provoking scenes. If the patient does not cooperate totally, the effectiveness of the treatment is hindered. Therapists will often select another behavioral technique which ensures the total cooperation of the patient. Because of the two considerations, the two techniques have been used far less often than other techniques. This, in turn, has had a significant impact on research in this area. Because the techniques are not used as often, they are not a focus of applied research.

In conclusion, although the efficacy of response prevention has been demonstrated in the laboratory setting, it has not been demonstrated in the clinical setting. A significant amount of work must be done in the applied area before the fear reducing techniques are deemed safe and effective.

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