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A Test of Time-Dependent Changes in Human Fear

Joanne Ferme Enright

A Thesis

in

The Department

of

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ABSTRACT

A Test of Time-Dependent Changes
in Human Fear

Joanne Ferme Enright

The present study tested whether between-group enhancement of fear responding found in conjunction with brief nonreinforced stimulus exposure is attributable to temporary changes in control group responding. Sixty female subjects who demonstrated fear and avoidance to a harmless snake served as subjects. The experimental conditions comprised a 3 by 2 factorial design in which either a 50-min, 24-hr, or 7-day pretest-to-posttest interval was crossed with no exposure or 15 min of exposure. The primary findings were: (1) more improvement for treated subjects compared to untreated subjects on behavioral and self-report measures; (2) less improvement at the 24-hr interval compared to the 50-min and/or 7-day intervals on self-report, behavioral, and psychophysiological measures for both treated and untreated subjects. Failure to find a differential response pattern between treated and untreated subjects across the three pretest-to-posttest intervals precluded an explanation of response enhancement in terms of temporary changes in control group responding. The decrement in responding at 50 min followed by apparent response recovery at 24 hr is similar to the response pattern referred to as the Kamin effect. This outcome may be

accounted for in terms of differences in state-dependent retrieval that result from persistent interference generated by initial fear responding. The decrement in responding at 7 days is explained in terms of the decay of memory reactivation. Further research is suggested to test the generalizability of time-dependent changes in fear responding (e. g., with other types of exposure treatments and with clinical populations).

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Mowrer (1947) proposed a two-factor theory to explain fear-motivated avoidance responding. According to this theory, fear is initially acquired via classical conditioning, and this learned fear prompts instrumental behavior in the form of an avoidance response. The consequence of such avoidance behavior is a reduction of fear. Thus, the avoidance response which is motivated by acquired fear is learned and maintained through reduction of fear associated with the cue (CS) preceding the aversive UCS.

According to classical conditioning theory, nonreinforced conditioned stimulus (NCS) presentations should result in the extinction of fear. Avoidance behavior, however, limits exposure to the NCS, thereby conserving fear (Solomon & Wynne, 1954). Therefore, extinction of fear should be more effectively accomplished if the avoidance response can be blocked, forcing the subject to remain in the presence of the CS. This technique has been called response prevention (Baum, 1966) and it has been demonstrated to be an effective technique for reducing avoidance behaviors in animals. Response prevention techniques have been paralleled in the context of human fears by flooding and implosion therapies (Marshall & Gauthier, 1979; Rachman, 1966; Stampfl & Levis, 1967).

The Incubation Hypothesis

Recently, contrary to predictions of classical conditioning theory, Eysenck (1976) has proposed, that under certain conditions, NCS exposure may not only fail to produce extinction but may actually produce an increment in the strength of fear. If this hypothesis is correct, flooding and implosion techniques are potentially dangerous because they may increase rather than decrease fear and avoidance behaviors.

The mechanism which Eysenck has proposed to explain response

enhancement is an incubation model which relies on a single positive feedback loop. According to Eysenck, fear as a conditioned response produces primary negative consequences (e.g., increased heart rate) which function as unconditioned aversive stimuli to reinforce and increase the associative strength of the nominal NCS. The result is an increase in the strength of fear, which perpetuates the aversive feedback. This model predicts that aversive conditioned stimuli can themselves increase responding beyond initial fear acquisition levels.

Two primary parameters of Eysenck's model are the strength of the conditioned response and the duration of NCS presentation. NCS duration below a critical value and response strength above a critical threshold are required in order for incubation to occur. If only one or neither of these parameters is met, however, extinction will be stronger than the aversive feedback and fear will decrease.

Within-subject studies from the infrahuman (Napalkov, 1963; Lichtenstein, 1950; Dykman, Mack, & Ackerman, 1965) and human (Campbell, Sanderson, & Laverty, 1964) literature appear to demonstrate response enhancement and support Eysenck's incubation model. For example, Napalkov (1963) working with dogs found that following a single pairing of a CS and an aversive UCS, repeated presentations of NCS resulted in incremental increases in blood pressure of 30-40 mm. Hg. Lichtenstein (1950) inhibited feeding in dogs by shocking their forepaws while eating. Tremors, ticklike movements, and a conditioned respiratory gasp, not observed directly after shock application, were formed during extinction. These responses increased in strength and fixated over a number of days. Campbell, Sanderson, and Laverty (1964) found similar results with human subjects. For a single trial, a 5 sec buzzer (CS)

was paired with temporary interruption of respiration lasting for about 100 sec. Then, despite repeated extinction trials (to a total of 100), the amplitude of the conditioned GSR increased and the latency of the GSR decreased between blocks of five trials each.

Between-group infrahuman (Rohrbaugh & Riccio, 1970, Exp. I; Gordon, Smith, & Katz, 1979, Exp I; Rohrbaugh, Riccio, & Arthur, 1972) and human studies (Miller & Levis, 1971; Stone & Borkovec, 1975) have also been cited as demonstrating response enhancement. However, in contrast to the within-group evidence, the between-group studies do not directly indicate actual increases in fear responding. Instead, they only demonstrate that short NCS exposure leads to less improvement than long exposure or no exposure. For example Gordon, Smith, and Katz (1979, Exp. I) found that avoidance responding was greater for groups of animals given 15-sec duration exposure as compared to groups given 75-sec or 0-sec duration exposure. In the Miller and Levis study (1971) human subjects who initially refused to touch a live snake were administered either 0-min, 15-min, 30-min, or 45-min exposure to the snake. Fear strength for the 15-min exposure group was greater than that of the 0-min exposure group and neither the 30-min nor the 45-min groups differed from the 0-min group.

Both the within-group and between-group studies have been criticized by Bersh (1980). Criticisms pertaining to the within-group evidence generally concern methodological flaws which raise doubts about the findings. For example, Napalkov (1963) precluded replication of his findings by not presenting sufficient procedural details. Campbell, Sanderson, and Laverty (1964) confounded their results by only administering atropine to experimental subjects. Finally, Dykman, Mack, & Ackerman (1965) may have confounded their results by failing to

control for temporal factors. Thus, these studies provide limited support for the occurrence of response enhancement and incubation.

Bersh (1980) has also criticized the between-group evidence, suggesting that extraneous factors may account for the results. Nonetheless, the replication of greater response reductions for untreated subjects as compared to subjects receiving short duration exposure in both human and infrahuman studies suggests that response enhancement is a reliable empirical phenomenon in need of explanation.

The Reactivation of Memories Model

Gordon, Smith, and Katz (1979) have proposed an alternative model to account for the phenomenon of response enhancement. According to these authors, response enhancement is the result of 2 opposing tendencies: reactivation of memories and extinction. They imply that initial NCS exposure elicits some fear responding and may reactivate memories related to fear acquisition. Then, the external and internal (i.e., response-produced) cues combine to create a compound fear cue. The compound cue facilitates additional reactivation which results in further increases in response strength. Gordon et al. suggest that the reactivation process triggered by the compound fear cue always precedes extinction. Thus, if the NCS is too short, reactivation of memories will occur without extinction and response enhancement will be observed. However, as NCS duration increases, extinction will occur and, consequently, there will be a more pronounced tendency for responding to decrease. This model can account for both within-subject and between-group evidence, but unlike the incubation model, it does not consider response enhancement to be the result of new learning per se.

Kaloupek (1983) conducted an experiment to replicate response

enhancement with human subjects and to test differential implications of the incubation and reactivation models. Subjects fearful of snakes received either 0, 15, or 60 min of in vivo and/or imaginal exposure to a snake. The results demonstrated a generally linear relationship between the amount of nonreinforced exposure (whether in vivo and/or imaginal) and improvement in both behavioral approach to the fear stimulus and self-reports of fear, as well as greater physiological improvement associated with combined in vivo and imaginal exposure. These results were interpreted as being consistent with the Gordon et al. (1979) model on the basis of the assumption that when reactivation of memories occurs rapidly, a direct relationship between amount of exposure and magnitude of fear will be observed.

The finding by Kaloupek (1983) of a monotonic relationship between nonreinforced exposure duration and fear responding is inconsistent with other human studies (Miller & Levis, 1971; Stone & Borkovec, 1975) demonstrating a response enhancement effect. Further examination of these discrepant results reveals that the treated groups responded in a similar way across the three studies. The performance of the untreated groups was dissimilar, however, and the untreated control group responding determined whether or not apparent response enhancement was observed. In the Kaloupek study, untreated subjects demonstrated stable responding and response enhancement was not evident. However, in the Miller and Levis and the Stone and Borkovec studies, the untreated controls demonstrated moderate improvement and response enhancement was claimed.

Two hypotheses can be suggested in order to account for the discrepant control group results and their relationship to response enhancement. First, in the Kaloupek (1983) study, the no-treatment

condition consisted of exposure to all of the contextual cues such as the test apparatus, snake container, etc. In the other studies, subjects in the no-treatment condition were removed from these cues and placed in another room where they read books. Thus, in the former study, the contextual cues may have produced reactivation without any extinction and thus, the no-treatment group demonstrated less improvement than the treated groups.

Alternatively, in the Miller and Levis (1971) and Stone and Borkovec (1975) studies, the moderate improvement shown by the control group could be attributable to temporary fluctuations in fear (e.g., Kamin 1957) which confound between-group comparisons of treatment effectiveness. Thus, response enhancement may not be due to the aversive effects of exposure, but instead may be accounted for in terms of control subjects demonstrating a temporary decrement in fear. An outcome of this type could give the appearance that short duration exposure is less effective than no exposure.

Kaloupek (1980) conducted a review of other human and infrahuman studies which have examined the effects of duration of nonreinforced exposure on responding. The goal was to further investigate the hypothesis that temporal changes in control group responding in relationship to treated group responding may determine response enhancement. All of the human studies included measures of fear based on a behavioral index of approach to the feared stimulus or on self-reports of anxiety in its presence. One focus was on differences in temporal intervals between acquisition and testing for infrahuman studies or between pretesting and posttesting for human studies. In order to determine diffetential patterns of responding between treated

and untreated subjects, studies were integrated across similar retention intervals.

One infrahuman study which used an acquisition-to-test interval of one or two days (Siegeltuch & Baum, 1971, Exp. II), found a monotonic relationship between responding and total nonreinforced exposure. More specifically, as the duration of NCS exposure increased, avoidance responding decreased. In this study untreated controls demonstrated response levels comparable to acquisition.

Two studies by Rohrbaugh and colleagues (Rohrbaugh & Riccio, 1970, Exp. I; Rohrbaugh, Riccio, & Arthur, 1972) which used acquisition-to-test intervals of less than 24 hr resulted in between-group response enhancement. In these experiments lick suppression was the index of fear. Rohrbaugh and Riccio (1970) found that the group receiving 50-min (i.e., long) exposure demonstrated less suppression than the 0-min NCS exposure group. In contrast, the 5-min (i.e., short) exposure group demonstrated greater lick suppression than the 0-min or 50-min groups. Rohrbaugh, Riccio, and Arthur (1972) found that a 15-sec exposure group demonstrated greater lick suppression than either no-exposure or 10-min exposure groups. In the Rohrbaugh studies, untreated controls demonstrated decreased responding.

Four human studies (Hodgson & Rachman, 1970; McCutcheon & Adams, 1975; Miller & Levis, 1971; Stone & Borkovec, 1975) which used pretest-to-posttest intervals ranging from 35 to 75 min have found some indication of response enhancement, with untreated controls demonstrating moderately decreased fear strength. However, 4 studies (Mylar & Clement, 1972; Ross & Proctor, 1973; Gauthier & Marshall, 1977; Rachman, 1966) which used an interval between 7 and 42 days revealed a monotonic relationship between fear strength and nonreinforced exposure

duration. In these studies, control group responding tended to remain stable.

To summarize, infrahuman and human studies are similar in that retention intervals less than 24 hr in length are associated with decreased control group responding (i.e., less fear). In this context, apparent response enhancement is observed when relatively short duration exposure is compared to the control procedure. At longer intervals, however, control group responding is stable and there is a monotonic relationship between fear strength and nonreinforced exposure duration. Thus, in both the infrahuman and human studies, the occurrence of response enhancement seems to be contingent upon the performance of the untreated controls.

The aim of the present study was to test directly whether the response enhancement effect is determined by temporary changes in control group responding in relationship to treated group responding. Two durations (0 min or 15 min) of in vivo exposure to a fear-eliciting stimulus (snake) were delivered to independent groups of subjects. Within the two exposure durations, subjects were randomly assigned to one of three pretest-to-posttest interval groups (50 min, 24 hr, or 7 days). The pretest-to-posttest interval lengths corresponded with previous infrahuman and human investigations (e.g., Siegeltuch & Baum, 1971, Exp II; Rohrbaugh, Riccio, and Arthur, 1972; Miller & Levis, 1971) and subject activities during the laboratory-based procedures were adapted from those used by Miller and Levis (1971) and Stone and Borkovec (1975) in order to replicate these demonstrations of response enhancement.

The first prediction was that the subjects administered the

exposure treatment would show a greater decrement in fear responding than subjects receiving the control procedure. Secondly, based on a composite examination of human and infrahuman exposure studies (Kaloupek, 1980), it was expected that the untreated subjects in the 50-min interval group would show more improvement than the untreated subjects in the 24-hr and 7-day groups. Thirdly, it was expected that the treated subjects would show a uniform decrement in fear responding at all three pretest-to-posttest intervals. Fourthly, also based on the review by Kaloupek (1980), it was predicted that at the 50-min interval, the untreated subjects would demonstrate more improvement than treated subjects. The fifth prediction was that at the 24-hr and 7-day intervals, the treated subjects would demonstrate more improvement than untreated subjects.

Method

Subjects

Sixty female participants, including 50 university students and 10 junior college (CEGEP) students, were retained in the final sample. They were each selected on the basis of three criteria: (a) a response of 5 (much fear) or more on item 39 ("Snakes") of the Fear Survey Schedule II (FSS; Geer, 1965; Appendix A), (b) a score of 5 or more on the 8 item General Snake Fear factor of the Snake Questionnaire (SNAQ; Klorman, Weerts, Hastings, Melamed, & Lang, 1974; Kaloupek & Levis, 1983; Appendix A), and (c) failure to touch a harmless laboratory snake (3 ft boa constrictor) during a behavioral approach pretest similar to the one developed by Levis (1969).

The FSS and SNAQ were part of a battery of questionnaires administered during a general screening process (described later). A total of 114 females who met the criteria for these two measures (and

who indicated interest in participating in future research) were requested to participate in the study by way of telephone contact. Thirty-four of these potential subjects either could not be contacted (5), refused to come to the lab (17), or did not keep their appointments (12). The remaining 80 potential subjects came into the lab for testing. Three of these individuals refused to participate after reading the consent form and one subject completed the pretest but did not return for the posttest. Sixteen individuals were disqualified because, in the pretest, they were able to touch the 3 ft snake.

Apparatus

The experiment was conducted in 2 adjoining temperature and humidity regulated rooms and a third waiting room in the vicinity of the laboratory. The experimental area contained an 8 ft modified Phobic Test Apparatus (Levis, 1969), a movable curtain separating subjects from the test apparatus, a subject armchair, a video camera, headphones for issuing taped instructions, and connectors for psychophysiological transducers. The experimental area was separated from the control area by a wall which contained a one-way mirror (55 mm X 84 mm). The control area contained a Grass Instruments polygraph (model 7), a Marantz cassette recorder, an electronic timer, a video monitor, and cords to control movement of the curtain in the experimental area. The waiting room contained a small desk and chair.

Heart rate (HR) was recorded via Graphic Controls/trace ECG electrodes that were placed on either side of the subject's back beneath the scapula with a ground electrode below. The signal was processed through a Grass AC preamplifier (7P5-A). Skin conductance was recorded via Beckman standard silver/silver chloride electrodes (#650951; 16 mm

diameter) filled with Unibase creme (Parke-Davis) which was prepared according to the recommendations of Lykken and Venables (1971). The electrodes were attached to hypothenar sites on the nondominant hand by adhesive collars. Skin conductance was recorded directly by way of a Wheatstone bridge device described by Lykken and Venables (1971) for use with a Grass low-level D.C. preamplifier (7P1-A). This device produced a constant 0.5 V. output. Digit (finger) temperature (DT) was measured using a Grass DC preamplifier (7P1-A). Amplification of the temperature measure resulted in 1 mm of pen deflection equalling .25 degrees centigrade. Temperature was transduced by a Yellow Springs Instruments bead thermistor (YSI #44033) which was sewn into the tip of the middle finger of a thin cotton glove worn on the nondominant hand (see Boudewyns, 1976).

Design

The experimental conditions comprised a 3 by 2 factorial design (n = 10) in which the length of the pretest-to-posttest interval (50 min, 24 hr, 7 days) was crossed with two exposure conditions (no exposure or 15 min of exposure). Subjects were randomly assigned to a pretest-to-posttest interval group within blocks of 3 subjects at the point of telephone contact. They were randomly assigned to an exposure duration within blocks of two subjects after the pretest was completed. The CEGEP subjects were distributed so that no more than 2 were assigned to any group.

In order to accomodate subjects' schedules, 4 subjects were tested at a 25-hr pretest-to-posttest interval, 1 subject at a 26-hr interval, and 1 subject at a 27-hr interval. For the 7-day group, 1 subject was tested at an 8-day pretest-to-posttest interval and 1 subject was tested at a 10-day interval.

Procedure

The experiment involved 6 steps which are presented separately.

Recruitment

Potential subjects were recruited from Concordia University and from psychology classes at Dawson and Marianapolis CEGEPs by way of a questionnaire screening process. Students were asked to complete a consent form (Appendix A), the FSS, SNAQ, the Autonomic Perception Questionnaire (APQ; Mandler, Mandler, & Uviller, 1958; Borkovec, 1979; Appendix A), and the Repression-Sensitization Scale (R-S; Epstein & Fenz, 1967; Appendix A) as part of a battery of questionnaires in exchange for a chance to win a $100.00 cash prize or one of two $50.00 cash prizes. A form (Appendix A) was included with the questionnaires so that individuals could indicate if they were interested in participating in future research (i.e., the present study).

At Concordia, individuals were adminstered the questionnaires from a table located in a general student area. At the CEGEPS, the experimenter gave a brief rationale concerning the purpose of the questionnaires and distributed them to interested students at the beginning of 5 psychology classes. Then, the experimenter returned the following week to collect the completed packets. Two screenings were conducted in which approximately 550 women and 150 men completed the set of questionnaires.

Initial Telephone Contact

The experimenter contacted eligible females by telephone and explained that the reason for calling was to see if they would like to participate in an experiment concerning human fear. They were told that details of the study could not be given over the telephone, but that it

did not concern drugs, injections, or electric shock. It was further explained that upon coming to the laboratory, they would be given a consent sheet which outlined the procedure. Subjects were promised $10.00 for completion of the experiment, and $2.00 for partial completion or for coming to the lab but choosing not to participate in the experiment. If the subject agreed, they were randomly assigned to a pretest-to-posttest interval group and appointments were made for a pretest and a potential posttest.

Initial Laboratory Contact

Upon arrival at the laboratory, subjects were seated in the waiting room and completed a two-part consent form (Epstein & Lasagna, 1969; Appendix B). Part I briefly described the experimental procedures and included a statement that subjects could withdraw from the experiment at any time. Part II measured comprehension of the experimental procedures by asking subjects four questions concerning critical aspects of the written description. Following completion of the consent form, a questionnaire (Appendix B) was administered to assess medical history, psychiatric history, drug use, and preexperimental activities. The purpose of this questionnaire was to identify individuals with medical or psychiatric conditions which could have been aggravated by the experiment or who were currently taking psychotropic medication. Following completion of the medical questionnaire, the experimenter answered questions concerning the experimental procedures. Also, subjects were told that taped instructions (Appendix C) would explain each step of the procedure before it happened so that there would be no surprises. Then, subjects were escorted to the experimental room.

Pretest

Subjects were seated with headphones and electrodes attached.

Initially, they were asked to remain quiet for a period of 10 min to permit the recording of a psychophysiological baseline. Subjects were then told that the curtain in front of them was to be opened for 1 min and that they were to observe the snake at the far end of the runway. Following this period, the curtain was closed and subjects were given instructions concerning completion of the Fear Thermometer (FT; Walk; 1956; Appendix D) and an Affective Adjective Checklist (AACL; Zuckerman, 1960; Appendix D). These ratings were used to measure subjective reactions during the viewing period. The FT ranged from 0 to 10, with 0 indicating no fear at all and 10 indicating terror. The subjects were asked to circle the number that described the maximum amount of fear they experienced. The AACL consisted of 21 adjectives describing both positive and negative emotional states. Subjects were to mark those adjectives that described their feelings as they viewed the snake. Two minutes were allocated to complete the scales.

Instructions then explained the behavioral approach test. Subjects were told that when the curtain opened, the snake at the far end of the runway would be advanced 1 ft along the runway each time they pressed the control button. They were instructed to advance the snake as close to them as possible and, if they advanced the snake the entire length of the runway, they were to open the lid and attempt to pick up the snake. If the subject requested that the test be terminated, paused 60 sec between presses, exceeded a total latency of 180 sec, or touched the snake, the test was stopped and the curtain was closed.

After the test, subjects again completed the FT and AACL to reflect the maximum level of the emotional reactions they experienced during the test procedure. They were also administered a coping checklist based on

a scale developed by Billings and Moos (1981; Appendix E). The checklist consisted of 19 true-false statements which assessed ways of coping as the subject prepared to come to the laboratory, during the view period and the approach test.

Following completion of the rating scales and checklist, the snake was repositioned at the end of the runway farthest from the subject. Then, subjects were randomly assigned to either a no-exposure group or a 15-min exposure group within blocks of two each.

Exposure Period

Exposure groups. The exposure period began with a 10-min baseline. Next, instructions explained that when the curtain was opened, the experimenter would advance the snake in the plexiglas box by 1-foot steps from the far end of the runway to a position directly in front of them. Subjects were then to observe the snake for a 15-min period.

At the end of the first minute of exposure, subjects rated the maximum amount of fear felt during the previous minute on the FT. At the end of min 15 of exposure, subjects first completed the FT in terms of the maximum amount of fear felt during the previous minute. Then, they again completed the scale in terms of the maximum amount of fear felt during the 14 minutes since the earlier administration of the scale. Following completion of the final FT, the curtain was closed and the snake was returned to the end of the runway farthest from the subject.

Attachments for psychophysiological recording were then removed and subjects were escorted to the waiting room. There they were seated and instructed to keep occupied for 25 min by reading a Wicks cartoon book (Wicks, 1980) and a Doonesbury cartoon book (Trudeau, 1981). At the end of the reading period, subjects in the 50-min interval group were

escorted back to the laboratory. Subjects in the other two interval groups were asked to return to the laboratory in either 24 hr or 7 days for the final experimental phase.

No-exposure groups. Following the pretest and after the snake was returned to the end of the runway farthest from the subject, electrode and headphone attachments were removed. They were then escorted to the waiting room for a 50-min reading period where they were instructed to keep occupied by reading the cartoon books. Arrangements for posttesting were identical to those described for the exposure subjects.[1]

Posttest

Upon returning to the laboratory, all subjects required electrode attachments of the type described earlier. The subsequent posttest procedure was identical to the pretest except for the addition of an avoidance generalization questionnaire based on a measure of self-efficacy developed by Bandura, Adams, and Beyer (1977; Appendix E). This scale was administered following the approach test, after the completion of the two self-report scales, in place of the coping checklist.

The avoidance generalization scale consisted of 10 statements describing diverse encounters with snakes, 5 describing situations inside the laboratory, and 5 describing situations in natural settings. Subjects were to rate these encounters in terms of whether they would stay in the situation and watch what was happening to whether they would leave or look away. Following each statement was a scale from 10 to 100, with 10 indicating completely certain to leave or look away and 100 indicating completely certain to stay and watch.

Following completion of the questionnaire, subjects were told that

the experiment was over and electrode attachments were removed. Subjects were then given a brief explanation of their psychophysiological profiles and the purpose of the experiment. Subjects were also instructed that for control purposes it would be important not to inform other students about the details of the experiment.

Background and Posttest Questionnaires

The R-S scale (Epstein & Fenz, 1967) and APQ (Mandler, Mandler, & Uviller, 1958; Borkovec, 1979) were administered during the general screening process. The R-S measured trait coping style on a repression-sensitization dimension. The range of possible scores was 0-30, with high scores being indicative of sensitization (e.g., vigilance) and low scores being indicative of repression (e.g., distraction). The APQ consisted of 20 items which measured awareness of a variety of autonomic arousal cues during situations which provoke anxiety. Following each item was a 10 point scale (0-9) on which subjects indicated awareness of no change (0) to awareness of a great deal of change (9).

The avoidance generalization scale based on a measure developed by Bandura, Adams, and Beyer (1977) described 10 threatening encounters with snakes both inside the laboratory and in natural settings. For analyses, the items of this measure were divided into two sets established by adding the scores of the five items with highest overall average and the five items with the lowest overall scores. The items with the highest average involved descriptions of three steps along the approach test sequence plus two descriptions of snake photos from television and a book. The items with the lowest average scores concerned four encounters with live snakes that were not enclosed and one description of a movie scene with live snakes.

Dependent Measures

Self-Report

Outcome indices. During the pretest and posttest, following both the view and approach test periods, subjects rated their highest level of anxiety and distress by completing the FT and AACL.

Treatment process indices. The FT was administered 3 times during the exposure period. Following min 1 and min 15, subjects rated their maximum anxiety during the previous minute. Also, following the completion of the FT at the end of min 15, subjects rated the maximum anxiety they experienced between the end of min 1 and the beginning of min 14.

In order to analyze subjective reactions during the exposure process, a peak response index and a habituation index were determined. The peak response variable was the FT score from min 1. The habituation index was a composite variable determined by subtracting the FT score from min 1 (or the FT score from the middle 13 minutes of the exposure period, if it was higher) from the min 15 FT score. Negative scores indicated decreased responding for this measure.

Behavioral Approach

Outcome indices. The approach test was organized in terms of 11 steps which were: (step 1) opening the curtain; (steps 2-9) 8 button presses, with each button press advancing the snake 1 ft along the runway; (step 10) opening the lid of the plexiglas box; and (step 11) touching the snake.

The latency for each button press and between the 8th button press and touching the snake was measured by an electronic timer. Resolution to a tenth of a second was obtained.

The indices for approach behavior were the mean latency between steps and the final recorded latency. For the mean latency measure, opening the lid of the plexiglas box was not considered a step. Thus, the last step was touching the snake. The mean of the latencies between steps was determined by the total time of the button press latencies plus 60 sec (i.e., the criterion for ending the test due to the subject not moving the snake) divided by the total number of steps (1-10). The final latency measure was the number of seconds recorded for initiation of the final completed button press. In addition, the total number of completed steps (max. = 11) and a measure of whether or not subjects were able to touch the snake was recorded.

Psychophysiological

Outcome indices. The periods and the interval lengths scored for the psychophysiological measures during both the pretest and the posttest were: the end of the baseline period (60 sec), the view period (60 sec), and the instructional period prior to the approach test 30 sec).

The values for HR were the number of heart beats recorded during each period and values for the 30 sec interval were doubled. Two parameters of skin conductance were scored. One parameter, level (SCL), was computed by averaging minimum conductance levels derived from consecutive 10 sec segments of the overall interval. The second parameter was the number of responses (SCR) which were equal to or exceeded 0.2 micromhos in each interval. Values for 30 sec intervals were doubled. DT was scored by averaging the highest temperature values in each 10 sec segment per interval. Absolute temperature values could not be determined from the recordings, therefore, DT was analyzed with respect to relative change from the baseline value.

Exposure process indices. The minute intervals scored for the psychophysiological measures during the exposure period were: the last minute of the baseline, the first and last minutes of the exposure, and a variable minute containing the highest value (HR, SCR, DT) or lowest value (SCL) between the end of min 1 and the beginning of min 14.

Two composite process variables were created for each psychophysiological measure to assess peak response and habituation of responding. The peak response measure was derived by subtracting the baseline score for each measure from the min 1 score and from the variable minute score. Then, the higher value resulting from the 2 subtractions was used as the peak response index. Positive scores indicated increased responding. The habituation measure was determined in the same way as the self-report habituation measure.

Results

There were 7 steps in the data analysis. First, the screening, general background, and pretest measures for the 50 university subjects were compared with the 10 CEGEP subjects. Second, comparisons were made on the screening, background, and pretest measures between the 60 subjects who completed the study and the 16 subjects who were disqualified because they were able touch the snake. Also, simple descriptive statistics were calculated to provide a general indication of the subjects under study. Third, the dimensions of coping assessed by the coping checklist were determined by principal components analysis. Fourth, preliminary analyses were conducted in which the screening, background, and pretest measures and the coping factors for the 60 subjects were analyzed to determine if the groups were equivalent with respect to these variables prior to experimental manipulation. Fifth, pretest-to-posttest changes in responding were examined by way of

both parametric and nonparametric analyses to determine the outcome associated with the experimental manipulation. Also, the two sets of generalization scores with the highest and lowest averages were examined to determine if the groups differed with respect to the self-efficacy ratings for avoidance behaviors. Sixth, psychophysiological and self-report measures from the exposure period were examined in order to determine the response accompaniments of the exposure process. The composite indices for habituation and peak response were used to assess whether responding during the exposure period differed across the pretest-to-posttest intervals. Also, the composite indices were correlated with outcome measures to determine whether responding during exposure would predict improvement. Seventh, correlations were calculated between the pretest coping factors and outcome measures for the 30 exposure subjects to determine whether style of initial coping was related to improvement.

University vs. CEGEP subjects

The screening, background, and pretest measures of the 50 university subjects and the 10 CEGEP subjects were compared by way of t tests. There was a significant difference in age between the 2 groups, $t(58) = 2.28$, $p < .001$, with the CEGEP students being younger (M = 19.8 yr) than the university students (M = 25.6 yr). The university subjects (M = 18.6 sec) also took a longer average time per step to advance the snake in comparison to the CEGEP subjects (M = 11.0 sec), $t(58) = 3.5$, $p < .01$, and the university subjects (M = 7.4) advanced the snake a fewer number of steps than the CEGEP subjects (M = 8.7), $t(58) = 2.4$, $p < .01$. There were no other significant differences between the two groups.

Touch vs. No Touch Subjects and Descriptive Statistics

The screening, background, and pretest measures for the 60 subjects who completed the study (no-touch subjects) and the 16 subjects who were disqualified (touch subjects) were compared by way of *t* tests. Table 1 displays summary information for the demographic, self-report, and behavioral variables from the screening and pretreatment assessments. As indicated in the table, none of the screening measures showed significant differences between groups. In contrast, the two self-report measures from the view period and the three behavioral indices from the approach test all indicated significant differences. In general, mean scores on these five measures indicated greater fear for the no-touch group.

Table 2 displays summary information for the psychophysiological variables. HR, DT, and SCL showed no significant differences during any of the 3 periods monitored. SCR only showed a significant difference between groups during the test instruction period, indicating less arousal for the no-touch group.

Table 1 and Table 2 also present some noteworthy descriptive statistics for the 60 subjects who completed the study. It can be seen that these subjects reported moderate to high fear of snakes, given that the mean score for item 39 from the FSS in this study is greater than the 75th percentile of item 39 scores from 1067 females in a study conducted by Kaloupek, Peterson, and Levis (1981).

Also, reported awareness of autonomic arousal was relatively high for the present subjects, with the mean APQ score being greater than the 75th percentile of APQ scores for females reported by Kaloupek et al. (1981). In addition, psychophysiological arousal was relatively high for these subjects. The view period in this study elicited

Table 1

Descriptive Statistics and T-test Comparisons for Demographic, Self-report, and Behavioral Variables from the Screening and Pretreatment Sessions for No Touch Subjects (N = 60) and Touch Subjects (n = 16)

Variable	Subjects: No Touch Mean	No Touch SD	Touch Mean	Touch SD	t	p<
Age	24.6	7.6	25.3	8.6	.31	ns
FSS						
Total score	202.1	3.31	191.4	28.9	1.18	ns
Item 39	5.9	.8	5.6	.8	1.61	ns
SNAQ factor	6.6	1.1	6.1	1.1	1.44	ns
R-S Scale	15.7	4.1	14.9	3.7	.70	ns
APQ	101.4	31.9	98.0	29.3	.38	ns
View						
FT	4.1	2.4	1.9	2.0	3.38	.001
AACL	11.3	3.5	8.9	2.6	2.55	.01
Approach Test						
Mean Latency[a]	17.4	12.9	9.1	2.4	4.70	.001
Final Latency[a]	15.4	16.0	8.1	8.4	2.48	.05
Number of steps	7.6	2.6	11.0	0.0	5.28	.001

Note. FSS = Fear Survey Schedule; SNAQ = Snake Questionnaire; R-S = Repression-Sensitization Scale; APQ = Autonomic Perception Questionnaire; FT = Fear Thermometer; AACL = Affective Adjective Checklist.

[a]T-test adjusted for unequal variances between groups.

Table 2

Descriptive Statistics and T-test Comparisons for Psychophysiological Variables from the Screening and Pretreatment Sessions for No Touch Subjects (N = 60) and Touch Subjects (n = 16)

Variable	Subjects: No Touch Mean	No Touch SD	Touch Mean	Touch SD	t	p<
Heart rate						
Baseline	75.7	10.1	73.4	9.3	.80	ns
View	.3	6.3	- 1.4	4.8	1.04	ns
Test	6.5	7.2	7.1	7.8	.28	ns
Digit temperature[a]						
Baseline	34.5	15.0	29.3	12.0	1.23	ns
View	8.0	16.3	8.4	23.6	.07	ns
Test	57.1	67.8	65.9	77.4	.43	ns
Skin cond. level						
Baseline	2.8	2.5	2.0	1.4	1.50	ns
View	1.4	1.4	1.4	1.2	.02	ns
Test	2.1	1.9	2.5	1.7	.62	ns
Skin cond. response						
Baseline	1.1	1.6	.4	1.1	1.30	ns
View	1.7	2.5	1.7	2.1	.01	ns
Test	2.7	3.3	5.7	3.8	3.07	.003

Note. The baseline values are raw scores. The view and test values are difference scores determined by subtracting the baseline value of a variable from the equivalent test period score. The heart rate scores reflect beats per minute, digit temperature is scaled in mm of pen deflection during recording, skin conductance level values are in micromhos, and skin conductance response values reflect frequency.

[a]For digit temperature, n = 56 for No Touch Subjects and n = 15 for Touch subjects.

significantly greater HR and SCR responding than was found for 102 no-touch females in a study conducted by Kaloupek and Levis (1983) $t(160) = 4.2$, $p < .001$ and $t(123) = 2.92$, $p < .01$, respectively.

Coping Checklist

Initially, the dimensions of coping assessed by the coping checklist were determined by a principal components analysis (unities on the diagonal; no iteration) using varimax rotation of factors. Determination of factor solutions was based on the eigenvalue-one criterion and the Scree test (Cattell, 1966). The criterion for inclusion in a factor was an item loading greater than or equal to 0.4473 (i.e., 20% shared variance). All item communalities were greater than 0.25.

The factors resulting from this analysis and the notation indicating the item classification according to Billings and Moos (1981) are presented in Table 3.

Preliminary Analyses

Initial 3 x 2 (interval length x exposure duration) ANOVAs were conducted on the screening, background, and pretest measures to determine whether chance differences between groups existed prior to the experimental manipulation.

Screening and background measures. There were no differences between groups on age, R-S, APQ, the total score from the FSS, or the snake item of the FSS. However, the SNAQ factor revealed a significant interval by exposure interaction, $F(2,54) = 3.5$, $p < .05$. Both the 50-min ($M = 6.2$) and 7-day exposure groups ($M = 6.5$) had lower ratings in comparison to the 50-min ($M = 7.4$) and 7-day no-exposure groups ($M = 7.0$), while the 24-hr exposure group ($M = 6.4$) had higher ratings

Table 3

Factors Resulting from Principal Components Analysis of the Coping Checklist (N = 60)

Factor	Item number	Item content	Response	Billing and Moos classification[a]
Passive Coping	3	I prayed or hoped for guidance and strength.	True	C E
	5	I considered several alternatives for handling the situation.	True	C P
	12	I felt angry about the way I was treated, although, I probably felt this way because I was afraid.	True	(M)
	16	I didn't worry about it; figured everything would work out fine.	True	E
	17	I thought about leaving, reminded myself I could leave at any time.	True	M
Suppression	7	I talked with the experimenter to find out more about the situation.	True	(A E)
	13	I tried to reduce tension by not thinking about the situation.	True	(A E)
	14	I tried to reduce tension by imagining that I was elsewhere.	True	(A E)
	19	I got busy with other things in order to keep my mind off the situation.	True	(A E)
Flexible Behavior	1	I tried to see the positive side.	True	C E

Table (con't)

Factors Resulting from Principal Components Analysis of the Coping Checklist

	8	I concentrated on the instructions for the task and the task itself.	True	M
	10	I tried to relax myself.	True	M
	15	I kept my feelings to myself.	True	A E
Rational Cognition	2	I tried to step back from the situation and be more objective.	True	C E
	11	I prepared for the worst.	True	C E
	18	I thought about the money and how much I wanted or needed the full amount.	True	M
Simple Support	4	I took things one day at a time.	True	C P
	9	I talked with a friend about the situation.	True	B

Note. C = Cognitive method; B = Behavioral method; A = Avoidant method; P = Problem focus; E = Emotion focus; M = Modified item not listed by Billings and Moos; ( ) = Modified item similar to Billings and Moos.

[a]Classification based on endorsement of the item as true.

than the 24-hr no-exposure group (M = 5.9).

Pretest measures. There were no differences between groups for the AACL from the view period or the FT and AACL from the approach test period. However, the FT from the view period showed an interval by exposure interaction, $F(2,54) = 6.3$, $p < .01$. The 50-min (M = 4.1) and 7-day (M = 3.2) exposure groups reported less anxiety than the 50-min (M = 5.3) and 7-day no-exposure groups (M = 4.5), while at the 24-hr interval the exposure subjects reported more anxiety (M = 5.3) than the no-exposure subjects (M = 2.3).

The mean and final latency measures indicated no initial significant effects. However, the completed steps measure indicated a significant exposure effect, $F(1,54) = 4.3$, $p < .05$. The exposure subjects (M = 8.3) completed more steps initially than did the no-exposure subjects (M = 6.9).

HR, DT, and SCL indicated no differences between groups on any of the 3 periods monitored. However, the SCR measure indicated a significant interval effect, $F(2,54) = 3.1$, $p < .05$, during the view period. Less of an increase in SCR frequency from the baseline was shown by the 24-hr group (M = .95) in comparison to the 50-min (M = 2.75) and 7-day groups (M = 1.35).

Coping factors. ANOVAs applied to the coping factors revealed no significant effects.

Outcome Analyses

Parametric Statistics

Parametric analyses followed a 3 step procedure. Initially, analysis of covariance was used to test the assumption of homogeneity of regression. If this assumption was supported, 3 x 2 (interval length x exposure duration) covariance analyses (ANCOVA) were conducted to

examine outcome effects. Posttest scores for each measure were analyzed with the corresponding pretest score as the covariate. If the homogeneity assumption was not supported, 3 x 2 ANOVAs were applied to scores which reflected changes in responding from pretest-to-posttest. For the behavioral measures, change scores were derived by subtracting the posttest value of a variable from its pretest equivalent. For the psychophysiological measures, in order to reflect responding during the test periods rather than absolute values, the baseline value of a variable was first subtracted from the equivalent test period score. Then, change scores were determined by subtracting the posttest difference score from the pretest difference score. In this form positive change scores indicated reduction in responding from pretesting-to-posttesting.

Self-report. Preliminary analyses indicated that the homogeneity of regression assumption was supported for the FT and AACL from the view and approach test periods. The ANCOVA applied to the posttest FT scores from the view period indicated a significant exposure effect, $F(1,53) = 4.5$, $p < .05$. The exposure subjects ($M = 4.4$) reported less fear than the no-exposure ($M = 5.5$) subjects. ANCOVAs applied to the posttest AACL scores from the view period indicated a marginal exposure effect, $F(1,53) = 3.1$, $p < .08$. Likewise, the approach test FT and AACL both demonstrated marginal exposure effects, $F(1,53) = 3.0$, $p < .09$, and $F(1,59) = 3.1$, $p < .09$, respectively. For all three marginal effects, the exposure subjects had lower fear ratings than the no-exposure subjects.

Behavioral measures. The homogeneity of regression assumption was supported for the mean and final latency measures, but not for the completed steps measure. The ANCOVAs applied to the latency measures

indicated a significant exposure effect for mean latency $F(1,53) = 4.0$, $p < .05$, but no significant effects for the final latency index. The subjects receiving exposure took a shorter average time per step ($M = 9.2$ sec) to advance the snake than the no-exposure subjects ($M = 17.5$ sec). The ANOVA conducted on the change scores for the completed steps measure indicated no significant effects.

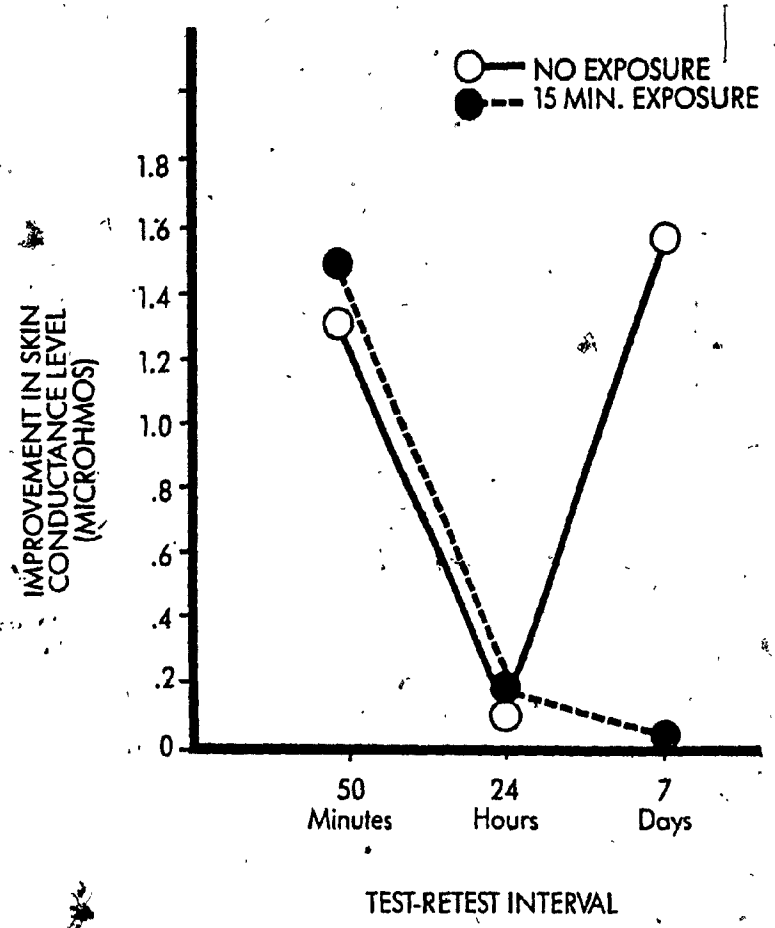
Psychophysiological Measures

The homogeneity of regression assumption was not supported in several of the periods monitored for HR, SCL, SCR, and DT. Therefore, 3 x 2 ANOVAs were conducted on change scores for these measures in order to facilitate uniform comparisons across periods.

Heart rate and digit temperature. Separate ANOVAs applied to HR and DT change scores indicated no significant effects for either measure during the view or test instruction periods.

Skin conductance level. ANOVA applied to SCL change scores from the view period indicated a significant interval effect, $F(2,54) = 2.7$, $p < .05$. Follow-up t tests were applied to the interval length groups collapsed across the exposure variable to determine specific effects. Comparisons were made between the 50-min and 24-hr groups, the 24-hr and 7-day groups, and between the 50-min and 7-day groups. The results indicated a significant difference between the 50-min and 24-hr groups $t(31.6) = 2.8$, $p < .01$ and no significant differences between the other comparisons. Figure 1 displays mean SCL change scores for each group indicating that both 24-hr groups showed less improvement in SCL responding than both 50-min groups. In addition, it appeared that there was less improvement in SCL responding for the no-exposure 24-hr group in comparison to the 7-day no-exposure group. A further t test comparison confirmed the difference between the 24-hr and 7-day

Figure 1. Improvement in view skin conductance level between pretest and posttest for each group.


NO EXPOSURE
15 MIN. EXPOSURE
IMPROVEMENT IN SKIN CONDUCTANCE LEVEL (MICROHMOS)
1.8
1.6
1.4
1.2
1.0
.8
.6
.4
.2
0
50 Minutes
24 Hours
7 Days
TEST-RETEST INTERVAL

no-exposure groups, $t(18) = 3.26$, $p < .01$. ANOVA (3 x 2) conducted on the SCL change scores from the test instruction period indicated no significant effects.

Skin conductance response. ANOVA applied to the SCR change scores revealed a significant interval effect, $F(2,54) = 5.1$, $p < .01$. Follow-up t tests for the interval length groups collapsed across exposure indicated significant differences between the 50-min and 24-hr groups, $t(38) = 3.2$, $p < .01$, and a marginal difference between the 24-hr and 7-day groups, $t(38) = 1.8$, $p < .08$. Figure 2 displays mean changes in SCR frequency for each group. The figure indicates that the 24-hr group showed less improvement in SCR frequency than either the 50-min or 7-day groups. ANOVA applied to SCR change scores from the test instruction period indicated no significant effects.

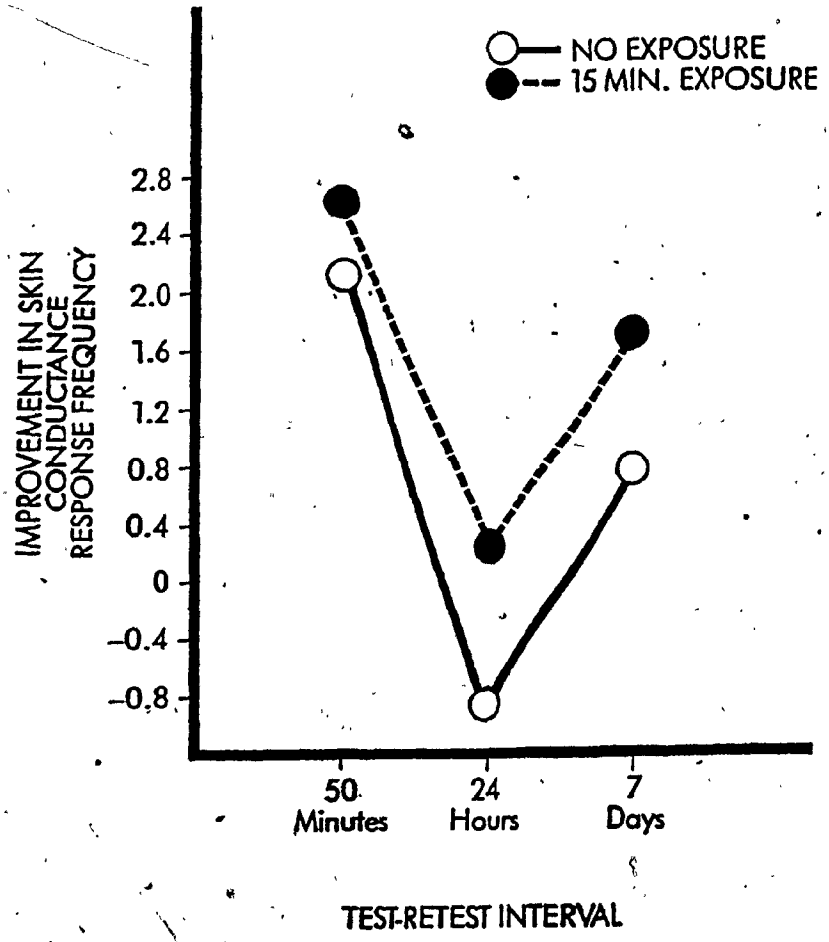
Nonparametric Statistics

Given the relatively small magnitude of anticipated effects and the inclusion of only 10 subjects per cell, nonparametric analyses were applied to further assess the outcome associated with the experimental manipulation.

Initially, a criterion score was determined for improvement for each measure and for each period monitored (Appendix F). One standard deviation from the overall pretest mean was used as a reference point for each criterion. Then, the number of subjects who met the criterion during the posttest but not during the pretest, was determined.

In order to reduce the number of analyses, the results were combined for variables that were highly correlated within the same period. For example, the number of subjects who met improvement criteria for the view FT and AACL, both of which measure subjective anxiety, were added together. The results for the mean and final

Figure 2. Improvement in view skin conductance response frequency between pretest and posttest for each group.


NO EXPOSURE
15 MIN. EXPOSURE
IMPROVEMENT IN SKIN CONDUCTANCE RESPONSE FREQUENCY
2.8
2.4
2.0
1.6
1.2
0.8
0.4
0
–0.4
–0.8
50 Minutes
24 Hours
7 Days
TEST-RETEST INTERVAL

latency measures were also combined as were the SCR and SCL measures.

One difficulty arose with the measures during and after the approach test because of the change in the proximity of the fear stimulus associated with change in the number of steps completed. This confound reduces the comparability of the conditions under which the latency indices and especially the self-report measures were obtained. Therefore, the proximity of the snake was controlled in a way analogous to analysis of covariance; the improvement criteria outcome for the completed steps measure was combined with the results for the latency measures in one analysis and with the results for the self-report scales in a second analysis.

A test for significance of the difference between two proportions (Bruning & Kintz, 1977) was applied to the results from the combined variables to determine significant effects. A p value of .025 was selected as a moderately conservative statistical criterion for these analyses.

Self-report and behavioral measures. Separate tests of significance applied to the results for the combined view self-report, combined test self-report (and completed steps) measures and the combined behavioral measures indicated the equivalent of an exposure main effect ($z > 2.47$, $p < .025$) for all 3 analyses. As Figures 3, 4, and 5 depict, the subjects in the exposure group met more improvement criteria than the no-exposure group for all 3 analyses.

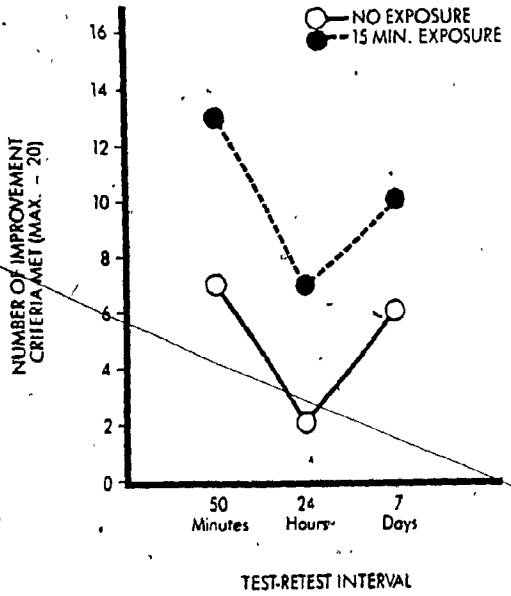
Further analyses on interval length collapsed across the exposure variable indicated several significant effects for the 3 combinations of variables. For the view self-report measures, there was a significant difference between the 50-min groups and 24-hr groups ($z = 2.56$, $p < .025$). For the test self-report (and completed steps) measures, and

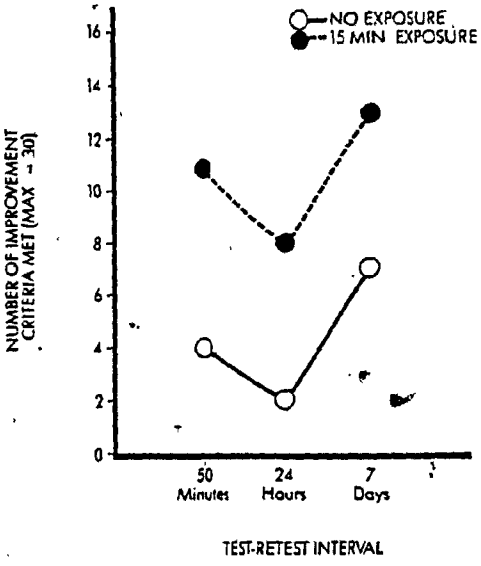
(counter clockwise from the left)

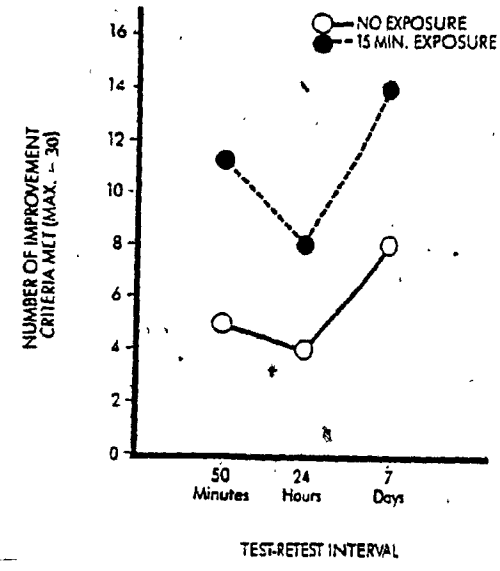
Figure 3. Number of improvement criteria met by subjects in each group for view self-report measures.

Figure 4. Number of improvement criteria met by subjects in each group for behavioral approach test self-report and completed steps measures.

Figure 5. Number of improvement criteria met by subjects in each group for behavioral approach test latency and completed steps measures.


NO EXPOSURE
15 MIN. EXPOSURE
NUMBER OF IMPROVEMENT CRITERIA MET (MAX. = 20)
16
14
12
10
8
6
4
2
0
50 Minutes
24 Hours
7 Days
TEST-RETEST INTERVAL


NO EXPOSURE
15 MIN EXPOSURE
NUMBER OF IMPROVEMENT CRITERIA MET (MAX. = 30)
16
14
12
10
8
6
4
2
0
50 Minutes
24 Hours
7 Days
TEST-RETEST INTERVAL


NO EXPOSURE
15 MIN. EXPOSURE
NUMBER OF IMPROVEMENT CRITERIA MET (MAX. = 30)
16
14
12
10
8
6
4
2
0
50 Minutes
24 Hours
7 Days
TEST-RETEST INTERVAL

for the latency and completed steps measures, there was a marginal difference between the 24-hr and 7-day groups ($z = 2.09$, $p < .05$) and ($z = 2.03$, $p < .05$), respectively. Overall, Figures 3, 4, and 5 indicate a similar pattern across the 3 analyses; the number of improvement criteria met by the subjects in the 24-hr group was less than the number met by the 50-min and/or 7-day groups.

Heart rate and digit temperature. The tests of significance applied to the nonparametric HR and DT results indicated no significant effects for either period monitored.

Skin conductance level and response. Tests of significance conducted on the combined skin conductance measures indicated no significant exposure effects. Further analyses on interval length collapsed across exposure indicated several significant effects. For the view period, there was a significant difference between the 50-min and 24-hr groups ($z = 5.33$, $p < .01$) and between the 24-hr and 7-day groups ($z = 3.76$, $p < .01$). For the test instruction period, there was a significant difference between the 50-min and 24-hr groups ($z = 3.62$, $p < .01$) and a marginal difference between the 7-day and 24-hr groups ($z = 2.14$, $p < .05$). Inspection of Figures 6 and 7 indicates a consistent pattern; the number of improvement criteria met by subjects in the 24-hr groups was less than the 50-min and/or 7-day groups.

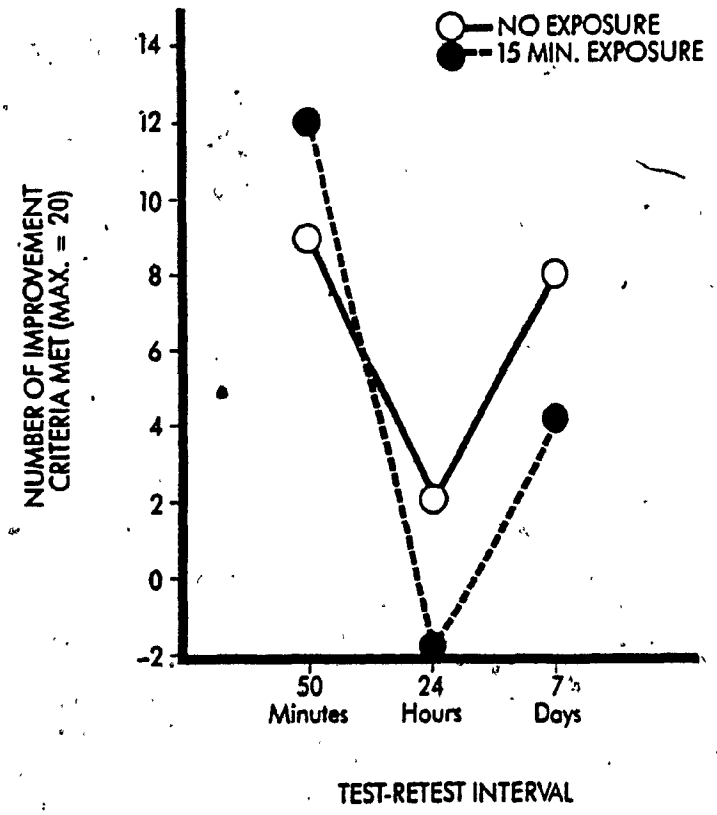
Avoidance Generalization Scale

Separate ANOVAs (3 x 2) were conducted on the two sets of self-efficacy scores with the lowest and highest overall averages. For the scores with the highest average, there was a significant exposure by interval interaction, ($F(2,54) = 3.6$, $p < .03$). Figure 8 which displays group means for this analysis, indicates that the exposure 50-min and 7-day groups reported higher self-efficacy scores in comparison to the

(from the upper left)

Figure 6. Number of improvement criteria met by subjects in each group for the combined skin conductance response and skin conductance level measures from the view period.

Figure 7. Number of improvement criteria met by subjects in each group for combined skin conductance response and skin conductance level measures from the test instruction period.


NO EXPOSURE
15 MIN. EXPOSURE
NUMBER OF IMPROVEMENT CRITERIA MET (MAX. = 20)
14
12
10
8
6
4
2
0
-2
50 Minutes
24 Hours
7 Days
TEST-RETEST INTERVAL

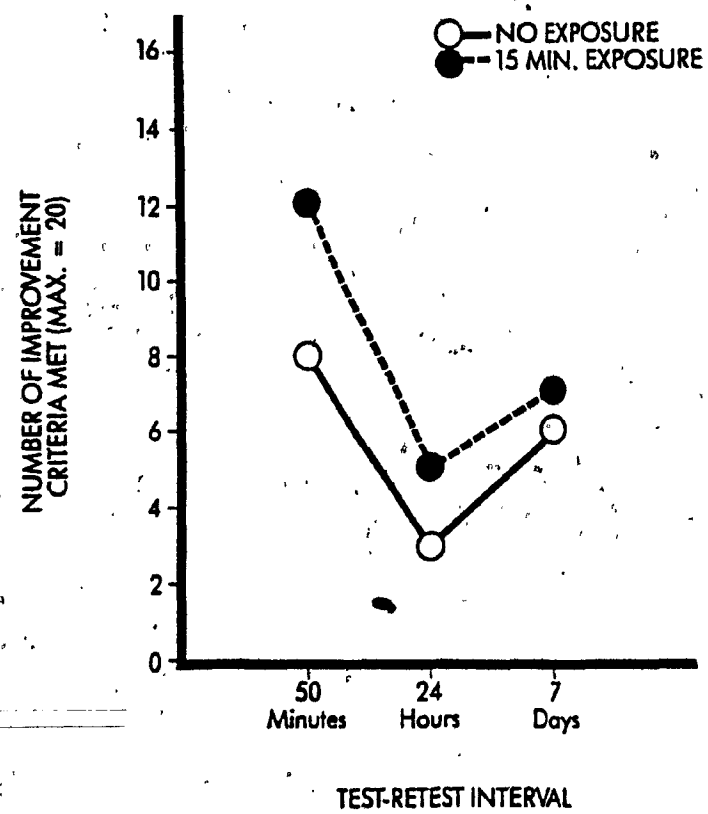
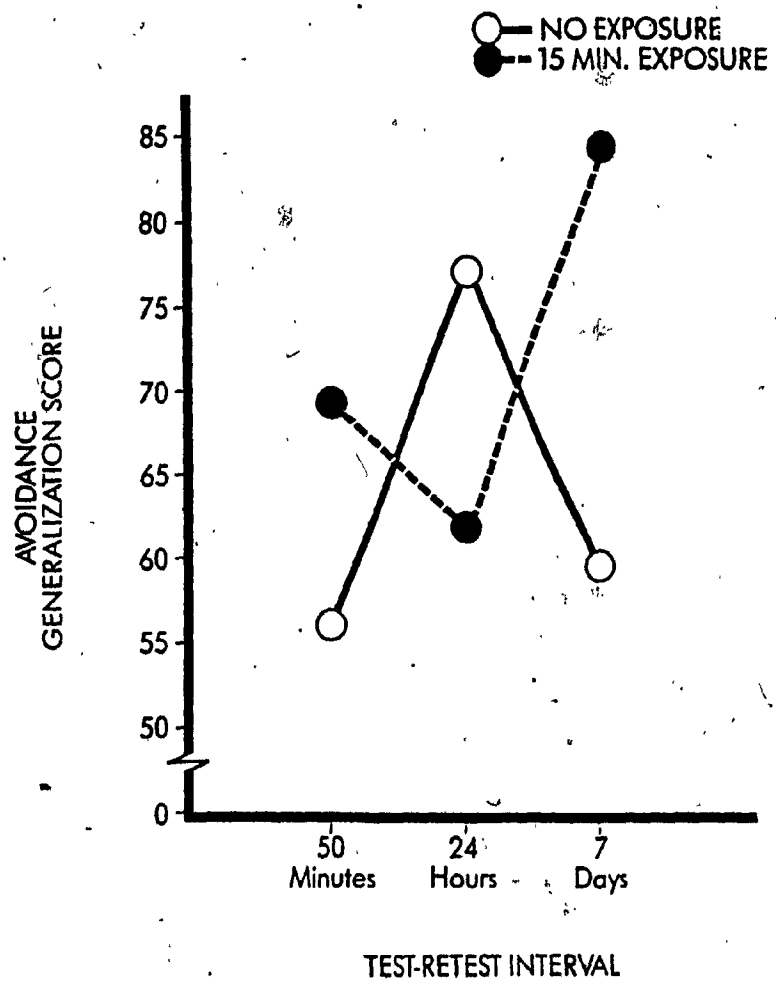

NO EXPOSURE
15 MIN. EXPOSURE
NUMBER OF IMPROVEMENT CRITERIA MET (MAX. = 20)
16
14
12
10
8
6
4
2
0
50 Minutes
24 Hours
7 Days
TEST-RETEST INTERVAL

Figure 8. The avoidance generalization score from the items with the highest average for each group.


NO EXPOSURE
15 MIN. EXPOSURE
AVOIDANCE GENERALIZATION SCORE
85
80
75
70
65
60
55
50
0
50 Minutes
24 Hours
7 Days
TEST-RETEST INTERVAL

exposure 24-hr group, while the reverse pattern was shown by no-exposure groups.

Follow-up *t* test analyses (adjusted for unequal variances if necessary) were used for individual group comparisons. They indicated only a significant difference between the exposure 24-hr and 7-day groups, $t(11) = 2.37$, $p < .05$. There were no significant effects for the set of scores with the lowest average.

Exposure Period Measures

Initially, chance differences among interval length groups were tested for exposure subjects. One-way ANOVAs were conducted on the score from the last minute of the exposure baseline period for each psychophysiological measure. Then, the issue of differential effects of exposure across interval length was examined. One-way ANOVAs were conducted on the peak response and habituation measures for the FT and for each of the psychophysiological variables.

ANOVAs conducted on the baseline values for each psychophysiological measure revealed no differences between groups. Similarly, the ANOVAs conducted on the peak response and habituation indices for the FT and psychophysiological measures all indicated no significant effects.

Exposure Period Measures and Outcome Measures

An issue of secondary interest to this study was the relationship between responding during exposure and improvement. Thus, the habituation and peak response indices for the FT and psychophysiological variables were examined for correlation with change scores for each outcome measure.

Table 4 presents the correlation coefficients for the self-report and behavioral measures. Examination of the table reveals significant

Table 4

Pearson Product-moment Correlation Coefficients among Exposure Process Indices and Self-report and Behavioral Change Scores

Process measure	Outcome measure: View FT	View AACL	Test FT	Test AACL	Latency Mean	Latency Final	Number of steps
Heart rate							
Response	.31	.41*	.22	.41*	.08	-.05	-.04
Habituation	-.07	-.11	.05	-.22	-.27	-.37*	.07
Digit temperature							
Response	-.29	-.11	.16	.32	.08	-.12	-.11
Habituation	.20	.20	.19	-.09	-.13	.22	.16
Skin cond. level							
Response	.09	.13	.24	.13	-.06	.19	.29
Habituation	.18	.17	-.00	.15	-.09	-.15	-.00
Skin cond. response							
Response	.26	.24	.37*	.22	-.07	.32	.31
Habituation	.31	.28	.35	.44*	-.18	.01	.23
Fear Thermometer							
Response	-.01	.23	.03	.46*	.05	-.32	-.26
Habituation	.04	-.06	-.05	.11	.03	-.02	-.04

Note. All coefficient signs have been standardized so that positive values indicate greater improvement associated with greater response or greater habituation. FT = Fear Thermometer; AACL = Affective Adjective Checklist. N = 30 for all measures except for Digit temperature ($n = 29$).

*$p < .05$.

positive relationships between the HR response index and the view AACL, between the SCR response index and the approach test FT, and between the response indices for both HR and FT and the approach test AACL. Also, there was a significant negative relationship between the HR habituation index and the final latency measure and a significant positive relationship between the SCR habituation index and the approach test AACL. In general, these results indicate that increased responsivity and habituation of responding during exposure is associated with decreases in reported fear and somewhat decreased improvement in behavioral approach.

Table 5 presents the comparable correlation coefficients for the exposure period psychophysiological measures. As indicated in the table, there were significant positive associations between the HR response index and the view HR change scores, between the response index for SCR and the view SCL and SCR change scores, and a significant negative association between the FT response index and the test instruction SCL and SCR. In addition there were significant positive associations between the DT habituation index and the test instruction HR change scores, and between the habituation indices for DT and SCR and the SCL change scores. There was also a significant negative association between the FT habituation index and the test instruction SCL and SCR. In general, these results indicate that other than the Fear Thermometer process measure, increases in responding and habituation of responding are associated with increased improvement on psychophysiological measures.

Coping Factors and Outcome Measures

A final issue of interest was the relationship between style of coping and improvement. Thus, the change scores from the outcome

Table 5

Pearson Product-moment Correlation Coefficients among Exposure Process Indices and Change Scores for Psychophsyiological Measures

Process measure	Outcome measure: Heart rate View	Heart rate Test	Digit temperature View	Digit temperature Test	Skin Conductance Level View	Skin Conductance Level Test	Skin Conductance Response View	Skin Conductance Response Test
Heart rate								
Response	.36*	.00	.06	-.00	.01	-.26	-.09	-.21
Habituation	.15	.18	.10	.12	-.07	.02	-.09	-.22
Digit temperature[a]								
Response	.02	-.15	-.03	.15	-.21	.07	.06	.15
Habituation	.30	.48**	-.13	.18	.38*	.26	.25	.17
Skin cond. level								
Response	-.05	.06	.21	.01	.32	.32	.25	.13
Habituation	-.16	-.06	-.08	-.17	-.15	.15	.08	.35
Skin cond. reponse								
Response	.11	.32	.07	-.06	.47**	.27	.41*	.21
Habituation	.11	-.03	-.02	-.01	.43*	.11	.20	.22
Fear Thermometer								
Response	.05	-.13	.02	.12	-.09	-.36*	.21	-.40*
Habituation	-.17	-.25	.08	.02	.10	-.40*	-.22	-.37*

Note. N = 30 for all measures except Digit Temperature (n = 29). All coefficient signs have been standardized so that positive values indicate greater improvement associated with greater response or greater habituation.

[a]Digit temperature was scored so that higher values reflected lower temperature, therefore habituation reflects temperature increase.

*$p < .05$. **$p < .01$.

measures for the 30 exposure subjects were examined for correlation with the coping factors. The results are presented in Table 6.

Inspection of the table indicates that the Flexible Behavior factor was negatively related to the view FT and AACL. The Rational Cognition factor was positively related to the mean latency measure and the Simple Support factor was negatively related to the approach test FT. The Passive Coping and Suppression factors were not related to any of the measures during any of the periods.

Discussion

Before beginning the primary discussion concerning the outcome results, the preliminary analyses require brief mention. The comparisons between the university and CEGEP subjects indicated a few significant differences. The university subjects were older, took a longer time to advance the snake, and advanced the snake fewer steps than the CEGEP subjects. However, since the CEGEP subjects were randomly and equally distributed across groups, these differences would not be expected to affect the outcome. Secondly, the results for comparisons between no-touch subjects and touch subjects indicated that the no-touch subjects were as fearful as the touch subjects on global questionnaires. Following pretest exposure to the live snake, however, no-touch subjects were more fearful in terms of behavioral and self-report responding compared to touch subjects. These results indicate that a more homogeneous sample of high fear individuals was identified by the addition of the approach test to the selection criteria. This result is consistent with previous findings (Kaloupek, 1980).

Paradoxically the no-touch subjects were less responsive in terms of SCR responding during the test instruction period. No explanation

Table 6

Pearson Product-moment Correlation Coefficients among Coping Factors and Outcome Measures for Exposure Subjects

Outcome measure	Coping factor				
	Passive	Suppress	Flexible	Rational	Support
FT					
View	.14	-.14	-.42*	.08	.02
Test	.12	-.13	.08	.23	-.39*
AACL					
View	.22	-.03	-.50**	.06	.13
Test	.16	-.03	.14	-.01	-.10
Latency					
Mean	.10	.26	-.22	.44*	.26
Final	-.02	-.04	-.21	.21	.24
Number of steps	.11	-.16	.13	-.04	-.15
Heart rate					
View	-.18	.24	.10	-.00	-.22
Test	-.29	-.18	-.13	.68	-.29
Digit temperature					
View	-.08	-.05	.29	.09	-.02
Test	-.05	-.25	.10	-.12	.09
Skin cond. level					
View	-.26	-.07	-.04	.07	.07
Test	-.26	-.17	-.24	.40*	.08
Skin cond. resp.					
View	-.23	.02	.03	.21	-.24
Test	-.20	-.25	.12	.14	.17

Note. All coefficient signs have been standardized so that positive values indicate greater improvement associated with increases in the coping factor score. FT = Fear Thermometer; AACL = Affective Adjective Checklist. N = 30 for all measures except for Digit temperature (n = 29).

*p < .05. **p < .01.

for this difference is apparent; it is tentatively attributed to chance, although a substantive cause such as differential performance expectations is possible. The other chance differences between groups on the outcome measures prior to experimental manipulation were evaluated independently of pretest effects by means of ANCOVAs. In addition, the pretest differences for the SCR measure were not consistent with the outcome findings, thereby decreasing the likelihood of pretest carry-over.

The primary parametric outcome results relating to self-report and behavioral measures indicated greater reduction in reports of fear and approach latency for the exposure groups relative to the no-exposure groups. The comparable nonparametric outcome results were similar in that the exposure subjects met more improvement criteria than the no-exposure subjects for self-report and behavioral measures. In addition, the nonparametric analyses indicated three interval effects that were not indicated by the parametric tests. The first finding was that the view self-report measures indicated less improvement for the 24-hr groups compared to the 50-min groups. The second finding was a trend which suggested that the 24-hr groups were less improved than the 7-day groups in terms of self-report, and the third finding was a similar suggestion that the 24-hr groups improved less than the 7-day groups on the behavioral measures.

The parametric and nonparametric outcome results from the psychophysiological measures can be summarized in the following way: (a) Both HR and DT indicated no significant effects from either the view or the test instruction period and (b) the SCR and SCL measures, alone and combined, revealed interval effects during the view period. These effects indicated more arousal associated with the 24-hr interval than

with the 50-min interval. There was also a tendency for more arousal to be associated with the 24-hr interval than with the 7-day interval.

The overall pattern of results supported the prediction of reliable fear reduction due to exposure. Treated subjects reported less fear and demonstrated less behavioral avoidance compared to untreated subjects. These results are consistent with previous studies that have found brief in vivo exposure to a snake to be an effective procedure for reducing fear of snakes (e.g., Kaloupek, 1983; Stone & Borkovec, 1975). Contrary to expectation, however, the exposure subjects did not demonstrate a uniform decrement in fear responding across the pretest-to-posttest intervals.

Also contrary to expectation, there were no exposure by interval interactions. That is, the response pattern between treated and untreated subjects did not differ across the pretest-to-posttest intervals on any of the dependent measures. Thus, the explanation which attributed response enhancement to temporary changes in control group responding does not appear to be viable.

In the present study, the nonparametric interval effects reflected similar patterns of responding for both treated and untreated subjects across all three types of dependent measures. The results generally indicated less improvement at posttest for subjects in the 24-hr group relative to the 50-min and/or 7-day groups. More specifically, the 24-hr groups showed less change in reported fear and greater electrodermal arousal than the 50-min groups. The 24-hr groups also showed less change in fear, (passive) avoidance behavior, and greater electrodermal arousal than the 7-day groups. These results suggest that fear changes in a time-dependent way following exposure to a fear cue of

relatively short duration (i.e., pretesting or 15-min exposure). There appears to be a temporary response decrement (TRD) at 50 min followed by a return to levels of responding comparable to pretest responding at 24 hr and, then, another response decrement at 7 days.

The response decrement found after a pretest-to-posttest interval of 50 min is consistent with results from human and infrahuman studies examining the effects of nonreinforced exposure. In four flooding studies (Hodgson & Rachman, 1970; McCutcheon & Adams, 1975; Miller & Levis, 1971; Stone & Borkovec, 1975) which used pretest-to-posttest intervals between 35 and 75 min, untreated human subjects demonstrated moderately decreased fear strength. In infrahuman studies which used acquisition-to-test intervals between 5 min and 24 hr (Rohrbaugh & Riccio, 1970; Rohrbaugh et al, 1972), untreated controls also demonstrated decreased avoidance responding.

The apparent response recovery found at the 24-hr interval in this study is consistent with findings from the infrahuman studies in which acquisition-to-test intervals were from 24 to 48 hours (Siegeltuch & Baum, 1971, Exp. II). Thus, in the present study and recent infrahuman studies, fear responding at a 24-hr interval was comparable to responding at pretest or during fear acquisition trials, respectively.

One major difference betwen infrahuman and human studies examining the effects of nonreinforced CS exposure concerns experimental control over acquisition of the conditioned response (CR). In the infrahuman studies, the acquisition of a CR is controlled by the experimenter. However, in the human studies, subjects come into the lab with pre-existing fear and the factors related to acquisition of the fear are unknown. For example, the length of the temporal interval between acquisition and the pretest could be years.

Despite these differences, it may be possible to functionally equate later responding with acquisition levels. That is, the infrahuman literature indicates that the strength of responding observed after acquisition of a fear response can be reinstated at later times in conjunction with the delivery of a stimulus associated with original training (i.e., a reactivator). For example, Klein and Spear (1970b) demonstrated that delivery of noncontingent footshock (NCFS) 1 hr after acquisition, when there is normally a retention deficit, reduced forgetting and improved performance to the extent that it was comparable to high response levels only achieved after shorter (10 min) or longer (24 hr) intervals. Other studies have also indicated that NCFS prior to testing reactivates fear and reduces performance (e.g., avoidance) deficits (Spear & Parsons, 1976; Rescorla & Heth, 1975; DiVietti & Bucy, 1975).

In addition, Silvestri, Rohrbaugh, and Riccio (1970) have shown that a moderate duration of reexposure to only the CS during a retention interval is sufficient to improve long-term retention of classically conditioned fear. Human infant studies using an appetitive reinforcement paradigm (Sullivan, 1980; Rovee-Collier, Sullivan, Enright, Lucas, & Fagen, 1980) have indicated that simple exposure to the reinforcer (i.e., a moving mobile) 14 or 27 days following training, when forgetting was complete, can restore performance to training levels. Finally, it has been shown that when training is followed by administration of an amnestic treatment, the presentation of a reactivating stimulus results in the drastic reduction or elimination of forgetting (e.g., Lewis, Misanin, & Miller, 1968).

The preceding infrahuman and human studies indicate that a variety

of cues associated with original training can activate responding to to levels similar to those following acquisition. Therefore, the general similarity among the results from the present study, other recent human studies, and the infrahuman studies may be explained in terms of a reactivation effect in the investigations with humans.

The Kamin Effect

The TRD at 50 min followed by response recovery at 24 hr found in the present study is similar to the pattern of responding referred to as the Kamin effect in the infrahuman literature. Kamin (1957) trained rats to a relatively incomplete level of avoidance response performance and retested them at intervals of varying lengths from 0 min to 19 days. Avoidance responding was highest immediately following acquistion, decreased to a minimum at 1 hr, and returned to levels comparable to acquisition at 24 hr. Thus, there was a response decrement at 1 hr followed by apparent response recovery at 24 hr in both the present study and the Kamin study.

The Kamin effect has been replicated in a variety of aversive reinforcement paradigms using one-way (Klein & Spear, 1969; Seybert, Wilson, & Archer, 1982; Cooper, Schmidt, & Barrett, 1983) and two-way active avoidance training (Denny, 1958; Denny & Ditchman, 1962; Kamin, 1957; Segal & Brush, 1959), and passive avoidance training (Pinel & Cooper, 1966; Singh & Brush, 1969). In addition, the effect has been demonstrated with stress produced odorants serving as time-dependent cues for retrieval of the memory of previous avoidance training (Thomas, Riccio, & Myer, 1977) and with infrahuman studies using appetitive reinforcement (Seybert, McClanahan, & Gilliland, 1982; Seybert,

Vandenberg, Harvey, Budd, & McClanahan, 1979).

The present study and the studies demonstrating the Kamin effect all show a similar pattern of responding, although in the infrahuman studies, the experimenter controlled response acquisition while in this study there was only a pretest exposure to previously established fear cues. As discussion has indicated, however, there appears to be a functional similarity between acquisition and pretest exposure to fear cues based on the operation of a reactivation effect. Therefore, it may be useful to examine the TRD at 50 min followed by response recovery at 24 hr in light of explanations for the infrahuman Kamin effect.

Two major theories have been proposed to account for the performance deficit and recovery that characterizes the Kamin effect. One theory attributes the effect to time-dependent changes in activity state caused by exposure to an aversive stimulus (e.g., shock). It is believed that aversive stimulation initially elicits freezing behaviors that are incompatible with active avoidance responding (Denny & Ditchman, 1962; Anisman, 1975; Barrett, Leith, & Ray, 1971; Pinel & Mucha, 1973). Subsequently, the motor suppression dissipates, thereby allowing an avoidance response to be initiated.

Theorists who favor an activity decrement account of the Kamin effect generally explain the mechanism underlying the motor suppression at 1 hr and recovery at 24 hr in terms of an increase in fear which eventually dissipates (Denny & Ditchman, 1962; Kumar, 1970; McMichael, 1966; Tarpy, 1966), or to time-dependent neuronal or hormonal changes that accompany and follow a response to stress (Anisman, 1975; Barrett, Leith, & Ray, 1971; Brush & Levine, 1966; Cooper, Schmidt, & Barrett, 1983). The primary characteristic of these latter physiological changes

is the occurrence of a refractory period about 1 to 4 hr following a stressful experience, during which the organism is less able to respond to further stress either physiologically or behaviorally. By 24 hr, these physiological changes have dissipated and the organism is again able to respond to stress.

In terms of specific mechanisms, Brush and Levine (1966) proposed that the greater availability of corticosterone immediately following training and 24 hr later compared to 1 hr following training allows subjects at the former intervals to be better able to cope with the stress involved in the avoidance task. More recently, others have suggested that the motor suppression at 1 hr is attributable to the direct activation of inhibitory cholinergic pathways (Cooper, Schmidt, & Barrett, 1983) or to a homeostatic rebound in reaction to catecholaminergic increases elicited by aversive stimuli (Anisman, 1975).

An activity decrement hypothesis may be sufficient to explain demonstrations of the Kamin effect in which a decrease in general activity is observed (Kamin, 1957; Denny & Ditchman, 1962). However, this hypothesis is not sufficient to account for demonstrations of the Kamin effect with either passive avoidance paradigms (Pinel & Cooper, 1966; Singh & Brush, 1969) or with a discrimination escape paradigm (Bryan & Spear, 1976).

Passive avoidance is accomplished by refraining from a particular response, and poorer retention at a 1-hr interval is indicated by more activity. Thus, the inhibition of responding at 1 hr predicted by the activity decrement hypothesis is not observed. The discrimination task involves the use of brightness variations to signal subjects (rats) which arm of a T-maze would result in escape of shock, and the results reported by Bryan and Spear (1976) indicate fewer correct choices

following a 1-hr interval than a 24-hr interval. This study demonstrates a response decrement with choice behavior that is thought to be a measure of memory functions (i.e., not affected by motivational or activity changes), and it suggests that the activity decrement hypothesis is not sufficient to account for the Kamin effect. Furthermore, the replication of a pattern of responding similar to the Kamin effect in two infrahuman studies (Seybert, McClanahan, & Gilliland, 1982; Seybert, et al., 1979) and one human study (Fagen & Rovee-Collier, 1980) using appetitive reinforcement indicates a broader TRD phenomenon. This pattern of findings suggests that demonstrations of the Kamin effect with aversive stimuli are not simply attributable to a response to stress, but may also involve associative (e.g., memory) processes as well.

The results from the present study are not consistent with the previously cited theories which attribute the Kamin effect to activity deficits. The results indicate that the 50-min groups completed more steps in the approach test than the 24-hr groups and, thus, were more active than the 24-hr groups. The present results are also not consistent with the theories which explain the activity decrement at 50 min in terms of an increase in fear because the self-report measures clearly indicate less fear for subjects in the 50-min groups and the SCR measures indicate less arousal at this interval. A related explanation based on physiological mechanisms and an inability to cope with stress at 50 min similarly is not sufficient to account for the present results because as indicated, subjects in the 50-min groups completed more approach test steps than the 24-hr groups. This behavior does not seem at all compatible with the notion of deficient coping.

A second theoretical position, originally proposed by Klein and Spear (1970a), attributes the Kamin effect to memory retrieval processes mediated by a state-dependent mechanism. Initially, the theory assumes that at a 1-hr retention interval, there are fewer cues associated with original learning present compared to immediately following acquisition or 24 hr later. Consequently, according to Klein and Spear (1970a) the memories linked to an avoidance response are not retrieved as effectively 1 hr following acquisition compared to shorter or longer intervals. Furthermore, disruption or alteration in internal cues at 1 hr compared to immediately following acquisition or 24 hr later is assumed to be responsible for retrieval interference at 1 hr. This theory can account for demonstrations of the Kamin effect with both passive and active avoidance responding and discriminated escape.

In order to demonstrate that memory retrieval processes may mediate the Kamin effect, Klein and Spear (1970a) initially trained rats on an active or passive avoidance task and then tested them 5 min, 1 hr, 4 hr, or 24 hr later on the alternative task. The results indicated that rats tested at 1 or 4 hr learned the new task, either active or passive avoidance, more rapidly than rats tested at 5 min or 24 hr. Also, rats tested at 1 or 4 hr performed no differently than naive rats. These results suggest that at 1 or 4 hr, when internal stimulus conditions are presumably different than at acquisition, the original fear-elicited response is not well retrieved. Hormonal or neuronal changes that differentiate physiological states 1 to 4 hr following fear acquisition from those 24 hr later (e.g., Anisman, 1975) could mediate this presumed state-dependent retrieval process underlying the Kamin effect.

A less physiologically specific basis for state-dependent retrieval is suggested by the opponent-process theory of motivation (Solomon &

Corbit, 1974; Solomon, 1980). The theory proposes that exposure to an aversive stimulus elicits a negative affective reaction which, upon stimulus termination, quickly disappears and gives way to a positive affective state (reflecting the opponent process). This opponent state then slowly dissipates to affective baseline. With respect to possible changes in state associated with the Kamin effect, this theory suggests that exposure to an aversive stimulus in avoidance training initially produces an aversive state. When training stops, a more positive state reflecting the opponent process is experienced, thereby interfering with memory retrieval. By 24 hr, however, the positive state has dissipated so that retesting occurs in a state that does not produce interference.

In support of the assumption that a change in internal cues may mediate the retrieval failure underlying the Kamin effect, there is evidence from the state-dependency literature that, in general, poorer recall occurs when the internal states accompanying learning and recall are different than when they are the same. The state-dependent retention effect has been demonstrated with infrahumans using chlorpromazine (Otis, 1964) or pentobarbitol (Bliss, 1973) to induce state changes.

Other investigators using human subjects have induced changes in mood (Bower, 1980; Schare, Lisman, & Spear, 1984) or affective reaction (Macht, Spear, & Levis, 1977) and found a similar effect. More specifically, Bower (1980) requested subjects to maintain a diary of emotional events in which time, place, participants, and event was recorded for a week. Fourteen subjects were then hypnotized and half were placed in a pleasant mood and half placed in an unpleasant mood.

The results indicated that people in a pleasant mood recalled a greater percentage of their recorded pleasant experiences relative to their unpleasant experiences, whereas people in an unpleasant mood recalled a higher percentage of their unpleasant memories. These results suggest that it is difficult to recall unpleasant experiences while in a pleasant mood. In addition, Macht, Spear, and Levis (1977) found that when subjects received either threat of electrical shock or no threat of shock during learning a word list and were then tested in the alternate context, they recalled a significantly lower proportion of items than those subjects receiving the same treatments in both test phases.

Together these studies indicate that a recall state, whether emotionally positive or negative which is different from a learning state, results in poorer recall than when learning and recall occur in the same state. By inference, these studies suggest that a change in internal cues, possibly due to an opponent-process and/or physiological mechanism, may mediate the retrieval failure underlying the Kamin effect.

Likewise, the decrement in responding at 50 min followed by response recovery at 24 hr in the present study may be explained in terms of differences in memory retrieval mediated by a state-dependent opponent-process mechanism. That is, pretest exposure to the snake activates an aversive state and the termination of the pretest may initiate a relatively pleasant opponent state which is still present 50 min later. The internal cues associated with the opponent state are sufficiently different from the cues associated with the original fear state that retrieval of the fear memory network is incomplete when the snake is again presented at posttesting. Therefore, subjects in the 50-min groups demonstrate a decrease in reported fear, more behavioral

approach, and less arousal at the posttest compared to the pretest. By 24 hr, however, the opponent state has terminated and the posttest exposure to the snake produces relatively complete retrieval. Therefore, in comparsion to the 50-min groups, subjects in the 24-hr groups demonstrate more reported fear, less approach, and more arousal. They also show relatively little change in overall fear responding compared to the pretest.

It should be noted that using an opponent-process model to provide a mediator in a memory retrieval explanation does not preclude the consideration of changes in physiological state as a component in the state-dependent effect. Physiological changes in response to stress may underlie an opponent-process mechanism, but Solomon (e.g., 1980) has chosen to limit speculation about physiological processes.

State-dependent interference can account for the response decrement at 50 min followed by recovery at 24 hr, but it cannot readily account for the decrement in responding demonstrated by the 7-day group. According to the current state-dependent retrieval explanation, posttest responding at a 7-day retention interval should not differ from responding at a 24-hr retention interval.

The present findings are consistent, however, with recent infrahuman and human research which indicates that reactivated memories are less accessible and more difficult to retrieve at a 7-day retention interval following reactivation. For example, Spear, Hamberg, and Bryan (1980; Exp. I) initially confined rats to the white side of a chamber and administered 25 fear conditioning trials in which a light was paired with footshocks. Half of these animals were tested 3 min, 1 day, 3 days, or 7 days following acquisition. The other half received a

reactivation treatment 27 days later which consisted of a single footshock, and then they were tested at intervals following reactivation that matched the no-reactivation groups. Testing consisted of 25 nonshock trials in which the subject was expected to jump a hurdle in the presence of the CS from the white to the black chamber. A significant main effect for retention interval was found, with greater forgetting the longer the interval elapsed since reactivation or acquisition of the memory.

Further examination of the temporal course of the reactivated memories alone indicates little forgetting for the 3-min, 1-day, and 3-day groups. However, a substantial decrease in forgetting is observed at 7 days. In addition a composite of the results of human infant studies using similar reinforcement paradigms (Rovee-Collier, Enright, Lucas, Fagen, & Gekoski, 1981) indicates that retention markedly decreased somewhere between 3 and 15 days following reactivation. Together these studies suggest that reactivated memories are accessible and are easily retrieved up to 3 days following a reactivation treatment. However, after a 7-day delay, some forgetting has occurred and memories are more difficult to retrieve.

The decline in accessibility of reactivated memories over 7 days has implications for the results from the 50-min and 24-hr groups and can be easily incorporated with a state-dependent retrieval explanation. That is, 50 min following pretest exposure to fear cues, activated memories are still easily retrievable, but the opponent state interferes with retrieval of the fear memory network. The outcome of these competing effects favors interference, and, thus, there is a decrement in responding. At a 24-hr retention interval, reactivation continues to produce a facilitating retrieval effect and, in the absence of state-

dependent interference, response strength is similar to the pretest level. At 7 days, there is neither an interference effect from the opponent state nor a facilitating retrieval effect from reactivation. Thus, a response decrement is observed.

Avoidance Generalization Scale

Analyses on the 2 sets of avoidance generalization scores indicated that only the set of items with the highest overall average (i.e., the set that included descriptions of three steps along the approach test) differentiated the experimental groups. The results indicated that the 50-min and 7-day exposure groups reported more confidence in possible encounters with snakes than did the exposure 24-hr groups. The reverse pattern was shown by the no-exposure groups. The reliable difference between the 24-hr exposure group and the 7-day exposure group is consistent with the general pattern of outcome findings. In most other respects, the results for this scale are not especially informative.

Exposure Period Process Measures

The analyses on the exposure period measures demonstrated no differences between groups on either baseline value or peak response and habituation indices. These results indicate that the exposure treatment effect was similar across the three pretest-to-posttest intervals. The correlational analyses between the exposure process measures and outcome displayed in Tables 4 and 5 indicated several significant correlations. Greater increases in HR and SCR responsivity to the exposure treatment are associated with greater decreases in fear as measured by self-report and psychophysiological indices. Also increased responsivity as measured by the FT is associated with greater decreases in reported fear. Greater habituation of SCR is associated with greater

improvement in reported fear. Also, greater habituation of DT is associated with decreased physiological arousal. In contrast, greater HR habituation is associated with decreased behavioral approach, and greater FT habituation and responding is associated with less improvement in terms of skin conductance responding. Apart from the latter correlations, the exposure process correlations are generally consistent with previous findings (e.g., Foa, Steketee, Grayson, Turner, & Latimer, 1984; Schwartz, 1984) demonstrating that greater responding and greater habituation predict outcome improvement (Foa & Kozak, 1986).

Coping factors and Outcome Measures

The analyses on the exposure process measures indicated that the exposure treatment had a similar effect across the pretest-to-posttest intervals, therefore, the relationships between exposure process measures and outcome are attributable to individual differences in reaction to the exposure treatment. One type of individual difference examined in this study was coping strategy. In this regard, the correlational analysis between coping factors and outcome for exposure subjects presented in Table 6 indicated that a style of coping labeled as flexible behavior is associated with less improvement in reported fear during the view period. Also, the simple support factor is associated with less improvement in reported fear during the test period. In contrast, a coping approach that appears to be characterized by fatalistic rationalism is associated with more improvement in behavioral approach and SCL arousal. The actual behavior reflected by the coping ratings is not clear, but the results suggest in a limited way that coping style can affect treatment effectiveness. These preliminary findings indicate the need for further research to clarify

both the nature and the effect of coping in this context.

In summary, the results are consistent with previous findings in showing more improvement for treated subjects compared to untreated subjects on self-report and behavioral measures. Responding and habituation of responding during exposure is directly associated with outcome improvement consistent with previous findings as well. In addition, less improvement at the 24-hr interval compared to the 50-min and/or 7-day intervals on self-report, behavioral, and psychophysiological measures for both treated and untreated subjects is indicated. The decrement in responding at 50 min relative to stable responding at 24 hr reflects a response pattern similar to the Kamin effect. This outcome is partially accounted for in terms of differences in state-dependent memory retrieval due to interference generated by an opponent-process mechanism. The decrement in responding at 7 days is explained in terms of difficulty retrieving memories 7 days following reactivation.

The finding of time-dependent changes in fear responding has clinical and research implications. With respect to research, these results suggest the need to be aware of possible time-dependent fluctuations in the response of subjects receiving an exposure treatment when between-group comparisons are made in outcome studies. Clinically, these results suggest the need to consider treatment interval as a factor in the evaluation of the stability of a client's change in behavior or report of improvement. In addition, there may be an optimal time for treatment 24 hr following reactivation, when the fear-memory network is easily retrieved and emotional processing can occur more easily. Unfortunately, this study was limited in that the

subjects were only females in the mild-to-moderate range of fear strength. In addition it concerned only an in vivo type of exposure treatment of brief duration. Therefore, before the implications of these findings for research and clinical work can be fully clarified, replication with other exposure treatments of varying durations and with both male and female clinical populations is necessary.

Footnotes

[1]The Exposure groups experienced a 10-min baseline period, a 25-min treatment period, and a 25-min reading period which, in terms of total time, equals the 50-min reading period of the no-exposure groups. Thus, the pretest-to-posttest intervals of the exposure and no-exposure groups were equivalent.

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List of Appendices

Appendix A: General Screening Consent Form

General Screening Research Participation Form

Fear Survey Schedule II

Snake Questionnaire

Autonomic Perception Questionnaire

Repression-Sensitization Scale

ASSESSMENT PROJECT CONSENT FORM

Dr. Kaloupek and his research associates from the Psychology Department of Concordia University are conducting a project involving a series of questionnaires. The information is to be put to several uses, including selecting individuals who might be eligible to participate in future studies.

In exchange for completing the packet of questionnaires, you will become eligible for a drawing which will award a $100 prize and two $50 prizes. Only 500 people will be eligible for the drawing. The main requirement is that you complete all the questionnaires in the packet.

Please note that this project involves the following:

(1) Eligibility for the drawing is established when the fully completed packet is returned to the project personnel.

(2) All questionnaires must be completed in this room. For most people this will require about 30 minutes.

(3) All information from this project is confidential. Your identity is protected by a numerical coding system.

(4) You are free to examine the packet of questionnaires before signing this form. You are also free to withdraw from the study at any time. However, eligibility for prizes is based on full completion of all questionnaires.

(5) Project staff members will be able to answer questions you may have about completing the questionnaires. However, no specific explanation for the purpose of a particular questionnaire will be provided.

(6) It is important that you respond honestly to all questionnaire items.

If you understand the terms outlined above and agree to participate, please sign below.

_____

Participant Signature

_____

Witness

_____

Date

READ THIS PAGE CAREFULLY, PLEASE:

Your responses to the questionnaires in this packet are confidential, for this reason you are identified only by a number. However, if you might be interested in participating in future research related to the questionnaires - which may or may not involve payment - you can indicate this by completing the section below. Please note that this does not commit you to future participation. It only indicates that you are willing to be contacted.

You are not required to complete the information below in order to be eligible for the prize drawing. Also, this sheet will be removed from all packets so that confidentiality is more readily maintained.

Participant #_____

Age: _____ Sex: M / F

Name (Print): _____

Telephone: _____

Signature: _____

FEAR SURVEY SCHEDULE - II

The items in this questionnaire refer to objects and situations that may cause fear or other unpleasant feelings. Circle the number following each item that describes how much you are disturbed by it.

	None	Very Little	A Little	Some	Much	Very Much	Terror
1. Sharp objects	1	2	3	4	5	6	7
2. Being a passenger in a car	1	2	3	4	5	6	7
3. Dead bodies	1	2	3	4	5	6	7
4. Suffocating	1	2	3	4	5	6	7
5. Failing a test	1	2	3	4	5	6	7
6. Looking foolish	1	2	3	4	5	6	7
7. Being a passenger in an airplane	1	2	3	4	5	6	7
8. Worms	1	2	3	4	5	6	7
9. Arguing with parents	1	2	3	4	5	6	7
10. Rats and mice	1	2	3	4	5	6	7
11. Life after death	1	2	3	4	5	6	7
12. Hypodermic needles	1	2	3	4	5	6	7
13. Being criticized	1	2	3	4	5	6	7
14. Meeting someone for the first time	1	2	3	4	5	6	7
15. Roller coasters	1	2	3	4	5	6	7
16. Being alone	1	2	3	4	5	6	7
17. Making mistakes	1	2	3	4	5	6	7
18. Being misunderstood	1	2	3	4	5	6	7
19. Death	1	2	3	4	5	6	7
20. Being in a fight	1	2	3	4	5	6	7
21. Crowded places	1	2	3	4	5	6	7
22. Blood	1	2	3	4	5	6	7
23. Heights	1	2	3	4	5	6	7
24. Being a leader	1	2	3	4	5	6	7
25. Swimming alone	1	2	3	4	5	6	7
26. Illness	1	2	3	4	5	6	7
27. Being with drunks	1	2	3	4	5	6	7
28. Illness or injury to loved ones	1	2	3	4	5	6	7
29. Being self-conscious	1	2	3	4	5	6	7
30. Driving a car	1	2	3	4	5	6	7
31. Meeting authority	1	2	3	4	5	6	7
32. Mental illness	1	2	3	4	5	6	7
33. Closed places	1	2	3	4	5	6	7
34. Boating	1	2	3	4	5	6	7
35. Spiders	1	2	3	4	5	6	7
36. Thunderstorms	1	2	3	4	5	6	7
37. Not being a success	1	2	3	4	5	6	7
38. God	1	2	3	4	5	6	7
39. Snakes	1	2	3	4	5	6	7
40. Cemetaries	1	2	3	4	5	6	7
41. Speaking before a group	1	2	3	4	5	6	7
42. Seeing a fight	1	2	3	4	5	6	7
43. Death of a loved one	1	2	3	4	5	6	7
44. Dark places	1	2	3	4	5	6	7
45. Strange dogs	1	2	3	4	5	6	7
46. Deep water	1	2	3	4	5	6	7
47. Being with a member of the opposite sex	1	2	3	4	5	6	7
48. Stinging insects	1	2	3	4	5	6	7
49. Untimely or early death	1	2	3	4	5	6	7
50. Losing a job	1	2	3	4	5	6	7
51. Auto accidents	1	2	3	4	5	6	7

Have you ever donated blood to the Red Cross or other similar organization?

Circle one: Yes / No

If you answered "yes" above, approximately how many times have you donated? _____

SNAQ Participant Number _____

Please indicate whether each of the following items are mostly TRUE or mostly FALSE as applied to you.

1.	I avoid going to parks or on camping trips because there may be snakes about.....	T	F
2.	I would feel some anxiety holding a toy snake in my hand	T	F
3.	If a picture of a snake appears on the screen during a motion picture, I turn my head away.....	T	F
4.	I dislike looking at pictures of snakes in a magazine.....	T	F
5.	Although it may not be so, I think snakes are slimy.....	T	F
6.	I enjoy watching snakes at the zoo.....	T	F
7.	I am terrified by the thought of touching a harmless snake.....	T	F
8.	If someone says that there are snakes anywhere about, I become alert and on edge.....	T	F
9.	I would not go swimming at the beach if snakes had ever been reported in the area.....	T	F
10.	I would feel uncomfortable wearing a snakeskin belt.....	T	F
11.	When I see a snake, I feel tense and restless.....	T	F
12.	I enjoy reading articles about snakes and other reptiles.....	T	F
13.	I feel sick when I see a snake.....	T	F
14.	Snakes are sometimes useful.....	T	F
15.	I shudder when I think of snakes.....	T	F
16.	I don't mind being near a non-poisonous snake if there is someone there in whom I have confidence.....	T	F
17.	Some snakes are very attractive to look at.....	T	F
18.	I don't believe anyone could hold a snake without some fear....	T	F
19.	The way snakes move is repulsive.....	T	F
20.	It wouldn't bother me to touch a dead snake with a long stick..	T	F
21.	If I came upon a snake in the woods I would probably run.....	T	F
22.	I'm more afraid of snakes than any other animal.....	T	F
23.	I would not want to travel "down south" or in tropical countries, because of the greater prevalence of snakes.....	T	F
24.	I wouldn't take a course like biology if I thought you might have to dissect a snake.....	T	F
25.	I have no fear of non-poisonous snakes.....	T	F
26.	Not only am I afraid of snakes but worms and most reptiles make me feel anxious.....	T	F
27.	Snakes are very graceful animals.....	T	F
28.	I think that I'm no more afraid of snakes than the average person.....	T	F
29.	I would prefer not to finish a story if something about snakes was introduced into the plot.....	T	F
30.	Even if I was late for a very important appointment, the thought of snakes would stop me from taking a shortcut through an open field.....	T	F

PERCEPTION OF FEELING QUESTIONNAIRE

The following 20 questions ask about your bodily reactions when you are anxious. Choose the number on the scale from 0 to 9 which best represents your personal experience. Each scale is labeled at both ends. Circle one number along the scale which indicates how you generally feel when you experience anxiety. Please answer carefully.

1. When you feel anxious, are you aware of many bodily reactions?

0 1 2 3 4 5 6 7 8 9
Aware of very few — Aware of very many

2. When you feel anxious, how often are you aware of your bodily reactions?

0 1 2 3 4 5 6 7 8 9
Never — Always

3. When you feel anxious, does your face become hot?

0 1 2 3 4 5 6 7 8 9
Does not change — Becomes very hot

4. When you feel anxious, do your hands become cold?

0 1 2 3 4 5 6 7 8 9
No change — Very cold

5. When you feel anxious, do you perspire?

0 1 2 3 4 5 6 7 8 9
Not at all — A great deal

6. When you feel anxious, does your mouth become dry?

0 1 2 3 4 5 6 7 8 9
Never — Always

7. When you feel anxious, are you aware of increased muscle tension?

0 1 2 3 4 5 6 7 8 9
No increased tension — A great deal of tension

8. When you feel anxious, how often are you aware of any change in your heart action?

0 1 2 3 4 5 6 7 8 9
Never Always

9. When you feel anxious, do you experience accelerated heart beat?

0 1 2 3 4 5 6 7 8 9
No change Great acceleration

10. When you feel anxious, does the intensity of your heart beat increase?

0 1 2 3 4 5 6 7 8 9
Does not Change Increase to extreme pounding

11. When you feel anxious, how often are you aware of changes in your breathing?

0 1 2 3 4 5 6 7 8 9
Never Always

12. When you feel anxious, does your breathing become more rapid?

0 1 2 3 4 5 6 7 8 9
Never Always

13. When you feel anxious, do you breathe more deeply?

0 1 2 3 4 5 6 7 8 9
No change Much more deeply

14. When you feel anxious, do you breathe more shallowly?

0 1 2 3 4 5 6 7 8 9
No change Much more shallowly

15. When you feel anxious, do you feel as if blood rushes to your head?

0 1 2 3 4 5 6 7 8 9
Never Always

16. When you feel anxious, do you get a lump in your throat or a choked-up feeling?

0 1 2 3 4 5 6 7 8 9
Never Always

17. When you feel anxious, does your stomach get upset?

0	1	2	3	4	5	6	7	8	9
Not at all									Very upset

18. When you feel anxious, do you get a sinking or heavy feeling in your stomach?

0	1	2	3	4	5	6	7	8	9
Never									Always

19. When you feel anxious, do you have any difficulty talking?

0	1	2	3	4	5	6	7	8	9
Never									Always

20. When you feel anxious, are you bothered by your bodily reactions?

0	1	2	3	4	5	6	7	8	9
Not bothered at all									Bothered very much

PROJECT NUMBER: _____ DATE: _____

INSTRUCTIONS: The following are some statements on feelings, attitudes, and behavior. Read each statement and decide if it is true or false in reference to yourself. Circle "T" if the statement is true and "F" if it is false.

Be honest, but do not spend too much time with any one statement. As a rule, first impressions are as accurate as any.

1. I tend to keep on a thing until others lose their patience with me..... T F
2. I frequently find myself worrying about something ..... T F
3. I sweat very easily even on cool days..... T F
4. I think of ways to get even with certain people..... T F
5. Most people who know me would say I am a cheerful person..... T F
6. I find discussions about sex slightly annoying..... T F
7. I usually have to stop and think before I act, even in trifling matters..... T F
8. Sometimes when I am feeling well I am cross..... T F
9. I am more of a "happy-go-lucky" person than a deep thinker..... T F
10. I try to plan in advance what to do if certain threatening situations were to arise..... T F
11. I work under a great deal of tension..... T F
12. When things go wrong, I cannot rest until I've corrected the situation..... T F
13. I like to let people know where I stand on things... T F
14. When I leave home I tend to worry about such things as whether the door is locked and the windows closed..... T F
15. I am not easily awakened by noise..... T F
16. I have very few quarrels with members of my family.. T F
17. I rarely wonder what hidden reason another person may have for doing something nice for me..... T F

18.	I am not often troubled with disturbing thoughts....	T	F
19.	I have daydreams that I make a fool of someone who knows more than I do.....	T	F
20.	I never get angry.....	T	F
21.	Everything is turning out just as the prophets of the Bible said it would.....	T	F
22.	People have too much sex on their minds.....	T	F
23.	I sometimes tease animals.....	T	F
24.	Most nights I go to sleep without thoughts or ideas bothering me.....	T	F
25.	I tend to get along well with people and am liked by almost everybody.....	T	F
26.	Bad words, often terrible words, come into my mind and I cannot get rid of them.....	T	F
27.	I have a habit of counting things that are not important, such as bulbs on electric signs, and so forth.....	T	F
28.	Sex education should not be part of the high school curriculum.....	T	F
29.	I never get so mad as to feel like beating or smashing things.....	T	F
30.	I almost never think of things too bad to talk about.....	T	F

Appendix B: Experimental Consent Form

Medical Questionnaire

Consent Form

In this experiment we are interested in testing your behavioral and physiological fear of a nonpoisonous, harmless laboratory snake. You will be seated in a room in front of a curtain. Behind the curtain is an 8-foot long runway. At the far end of this runway enclosed in a plexiglas box is a harmless laboratory snake. The experimenter will attach equipment to you necessary for measuring your heart rate, galvanic skin response, and finger temperature. You will also be asked to wear headphones. The headphones are provided in order to present you with taped instructions of your task in this experiment. The entire procedure may take slightly more than 1½ hours which will be completed today or will begin today and be completed either 24 hours or 7 days from today.

As we stated over the telephone, the experiment is completely voluntary, so you are free to stop or leave at any point in the procedure. We understand how you may feel at certain times and that the sight of the snake may be emotionally disturbing. We certainly would understand your wish to discontinue the experiment. However, due to problems with experimental variables, you will not be asked whether you wish to leave. You may simply tell the experimenter that you do not wish to continue at any point, and you will receive $2.00 for participating in the experiment. If you complete the experiment, you will receive $10.00. The experimenter will be in contact with you throughout the experiment via a TV camera and an intercom.

Subject _____

Witness _____

Date _____

We also request that you answer the following questions to insure that you have an adequate understanding of the procedures described on this sheet.

1. What animal is being used as part of this experiment? _____
2. Will attachments be necessary to monitor your heart rate, galvanic skin response, and finger temperature? _____
3. When may you terminate the experiment if you deem it necessary? _____
4. Under what conditions will you receive payment for participating? _____

RESEARCH PARTICIPANT FORM

The information requested below is strictly for the purpose of insuring that the participants in our research are equivalent with respect to certain important characteristics. The information will be maintained in confidence and will be destroyed when the study to which it relates is completed. Please note that we do not wish to have your name on the sheet -- you will be identified only by a number in order to insure confidential treatment of the information.

If you have any questions please feel free to ask the experimenter.

(1) Age _____

(2) Education level (circle one):

CEGEP University 1 University 2 University 3

Other: explain _____

(3) Sex (circle): M/F

(4) Are you currently being treated by a physician or taking any medication?

Yes/No If yes please explain briefly:

(5) Do you have any long-standing medical problems of which you are aware (e.g., high blood pressure, asthma, epilepsy, etc.)? Yes/No If yes, please explain briefly:

(6) Have you ever had a fainting spell? Yes/No If yes please explain briefly:

(7) Have you ever taken (had a prescription for) tranquilizers of other psycho-active drugs? Yes/No

If yes, what drug_____, when_____,

and for how long_____?

(8) Are you presently, or have you ever been trated for psychological or psychiatric reasons? Yes/No If yes, please explain briefly:

(9) Do you smoke cigarettes? Yes/No
If yes, approximately how many do you smoke per day _____, and when did you last smoke prior to entering the lab _____?

(10) When did you last consume an alcoholic beverage or other "recreational drug" (e.g., marijuana) _____, and in what quantity _____ (drinks, joints, etc)?

(11) Please indicate the lavel which most closely describes your emotional state prior to coming into the lab (more than one may be marked): Alert Tired Anxious Depressed Relaxed Other (specify):_____

(12) During the hour prior to entering the lab what were you doing (e.g., in class, playing basketball, etc.)?
_____

(13) Did you have to hurry or rush in coming to the lab? Yes/No

Female Only

(14) When did you last have menstrual flow (i.e., when did you last have a period)? _____days ago

(15) Are you taking birth control pills (i.e., oral contraceptives)? Yes/No If yes, for how long: _____months?

This section is to be completed by the experimenter.

Study_____

Participant #_____ Date:_____

Time of Day_____ Lab Temperature _____F/C

Outside Temperature_____F/C Assistant(s) _____

Experimenter _____

Appendix C: Transcript of Taped Instructions.

Prologue

The instructions for this experimental phase are taped. If my voice is not clear, or if the volume is either too high or too low, tell the experimenter over the intercom... Please try to follow the instructions you will be given as closely as possible. Don't do anything other than what the instructions explicitly ask you to do.

For the next 10 min. you are to remain seated and still so that your resting-state physiological responses can be recorded. At the end of 10 min, you will receive further instructions.

---baseline period---

Pretest/Posttest

Behind the curtain is a laboratory snake in a plexiglas box, located at the far end of an 8-foot runway. The snake is harmless and non-poisonous. When the curtain is opened, you are to observe the snake for a 1-min period. At the end of the 1-min period, the curtain will be closed. The curtain will be opened now... Observe the snake.

---1 min view---

On the wall to your right, you will find 3 manilla envelopes. In 2 or 3 of these envelopes, there are clipboards (1 per envelope) with pens attached. With your free hand, take the clipboard labeled with the number 1 from the envelope marked with a 1 and place it on your lap. On the clipboard are 3 sheets of paper. Turn the first blank sheet of paper to the next sheet of paper marked with an "A" (I-Posttest). On this sheet is the Fear and Anxiety Thermometer. It consists of a scale divided into 10 equal parts from 0 to 10. 0 indicates no fear or anxiety at all and 10 indicates terrified or extremely anxious. Circle the number on the scale which describes the maximum amount of fear or anxiety you felt during the preceding 1 min. Do not turn to the next page, until instructed to do so.

---1 min for questionnaire---

Turn to the next page marked with a "B" (J-Posttest). On this sheet of paper is the Affect Adjective Checklist which consists of adjectives describing various emotional states. Check off those adjectives which describe how you felt while observing the snake.

---1 min for questionnaire---

OK, turn the pages back to the first blank sheet of paper and put the clipboard back into the envelope labeled with the number 1. Then, you will receive further instructions.

The curtain will be opened again shortly. This time, when I say, "Begin", press the button on the arm of the chair with your free hand. Each time you press the button, the box with the snake will advance toward you a distance of 1 foot. 8 button presses will bring the snake directly in front you. It will take about 4 sec for the box with the snake to move to a new position after the button is pressed. If you bring the snake up the full distance, that is, so that it is directly in front of you, you should try to open the lid and try to pick up the snake. The snake is gentle and won't hurt you. You are, of course, free to stop the procedure at any time, but it is important for the experiment that you carry out the instructions for this phase of the experiment. When I say "Begin", you are to press the button in front of you and bring the snake as close to you as you can. If you bring it all the way up, you are to open the lid and try to pick up the snake. You are free to stop the procedure at any time. All you need do is say, "I want to stop this test". It is important for the experiment that you carry out as much of the procedures as you can. You may start pressing the button anytime after I say "Begin". If you have any questions, ask them now and the experimenter will answer over the intercom... Following completion of this experimental phase, you will be given further instructions.

---curtain open---

BEGIN

---(record latencies)---

OK, that's fine. The curtain will be closed now... With your free hand, take out the clipboard labeled with the number 2 from the envelope marked with a 2 on the wall to your right and place it on your lap. On this clipboard are 4 sheets of paper. Turn the first blank sheet of paper to the next sheet of paper labeled with a "C" (K-Posttest). Circle the number on the scale which describes the <u>maximum</u> amount of fear or anxiety you felt during the Approach Test. Do not turn to the next page until instructed to do so.

---1 min for questionnaire---

Turn to the next sheet of paper labeled with a "D" (L-Posttest). Check off those adjectives which describe your feelings during the Approach Test. Do not turn to

the next page until instructed to do so.

---1 min for questionnaire---

The experimenter will now reposition the snake in the plexiglas box to its position along the runway farthest from you.

---reposition snake---

Turn to the next page labeled with an "E". On this page is a Coping Checklist. It consists of statements describing possible way of coping with anxiety or fear. Circle "T" if the statement is true and "F" if it is false as it pertains to the way you responded following your decision to participate in this experiment, as you were observing the snake, and as you went through the approach test. Now complete page "E".

Exposure Subjects

Turn the pages back to the first blank sheet of paper and put the clipboard into the envelope marked with the number 2. Then you will be given further instructions.

No Exposure Subjects

Turn the pages back to the first blank sheet of paper and put the clipboard into the envelope marked with the number 2. This experimental phase is over. I will now enter the room where you are sitting and give you further instructions.

Exposure Treatment

For the next 10 min, you are to remain seated and still so that your resting state physiological responses can be recorded. At the end of 10 min, you will receive further instructions.

---baseline period---

During this phase of the experiment, your physiological responding will be continuously monitored during a situation much like the one you have already experienced. Of particular interest will be times when you are focusing your attention on a specific aspect of the situation. When the curtain is opened, the experimenter will advance the snake in the plexiglas box, along the runway from the position farthest from you, to directly in front of you. It will take about 1 min for the snake to move the full distance. Then, the snake will remain directly in front you for 15 min. You are to carefully observe the snake. While you are observing the snake, you will be asked to complete the Fear Thermometer

3 times. It is extremely important that other than when you are filling out the questionnaires, you observe the snake closely at all times when the curtain is open. Your eye contact with the snake will be monitored by way of a closed circuit video system. During the times when the curtain is closed, you are to sit quietly.

In preparation for completing the questionnaires, with your free hand, take out the clipboard labeled with the number 3 from the envelope marked with a 3 on the wall to your right and place it on your lap. Following the first blank sheet of paper are 3 sheets of paper labeled with an "F", "G", or "H". You will be instructed when to fill out each sheet. Listen carefully to the instructions given at that time. Following completion of each questionnaire, it is important that you immediately resume observing the snake. Also, do not turn to the next page until you are instructed to do so.

Once again, it is critical for the purposes of the study that other when you are completing the questionnaires that you pay careful attention to the completely harmless snake. Be sure to listen carefully to instructions presented during the observation period. Remember to sit quietly at times when the curtain is closed. Also, when the curtain opens, the experimenter will advance the snake from its position most distant from you to directly in front of you. Then, the snake will remain directly in front of you for the remainder of the observation period.

If you have any questions, ask them now and the experimenter will answer over the intercom... Otherwise, sit quietly until the curtain is opened, and, then, begin observing the snake.

---exposure procedure---

---end of min 1---

Turn the first blank sheet of paper to the next sheet of paper labeled with an "F". Circle the number which describes the <u>maximum</u> amount of fear or anxiety which you felt during the preceding min. When you have completed the questionnaire, immediately resume observing the snake and do not turn the page.

---fill out questionnaire---

---end of min 15---

Turn to the next page labeled with an "H". Circle the number which describes the <u>maximum</u> amount of fear or anxiety you felt during the last minute. Do not turn the page until instructed to do so.

---fill out questionnaire---

Turn to the next page labeled with an "H". Circle the number which describes the maximum amount of fear you felt during the preceding 14 min, that is, the time between completion of the first and second questionnaires.

---fill out questionnaire---

The curtain will be closed now... The experimenter will now reposition the snake to its position farthest from you.

---reposition snake---

This experimental phase is over. I will now enter the room where you are sitting and give you further instructions.

Begin No Exposure Treatment here. (Continue with Exposure Treatment)

Now, I will remove your psychophysiological attachments and escort you to another room outside the experimental area for a period of 50 min (25 min for exposure subjects) where you will be given further instructions.

---escort subject to room---

Here (give subject book) are 2 books which contain Wicks and Doonesbury cartoons. Remain seated and read the books until you are told to stop. You will then be given further instructions. Also, I will now go to the experimental lab for approximately 5 min. Then, I will pass through this room and sit next door with the door closed for the remainder of the reading period.

---50-min (25-min no-exposure subjects) reading period---

50-min group

Now I will escort you back to the laboratory for the final experimental phase.

24-hr and 7-day groups

This experimental phase is over. Now I will make an appointment with you for the final experimental phase.

Posttest

Repeat pretest instructions up to repositioning of

snake.

---reposition snake---

Turn to the next sheet of paper labeled with an "M". On this sheet of paper and the next sheet of paper labeled with an "N" is the Avoidance Generalization Scale of Self-Efficacy. It consists of 10 statements which describe diverse encounters with snakes inside the laboratory and in natural settings. Rate these statements on the scale following each description in terms of whether you would stay in the situation and watch what was happening or whether you would leave or look away, if you were to encounter snakes in the lab or in your everyday life. The scale is from 10 to 100 with 10 indicating comletely certain to leave or look away and 100 indicating completely certain to stay and watch. Now complete pages "M" and "N".

---1 min for questionnaire---

Turn the pages back to the first blank sheet and then, place the clipboard into the envelope labeled with the number 2. The experiment is over.

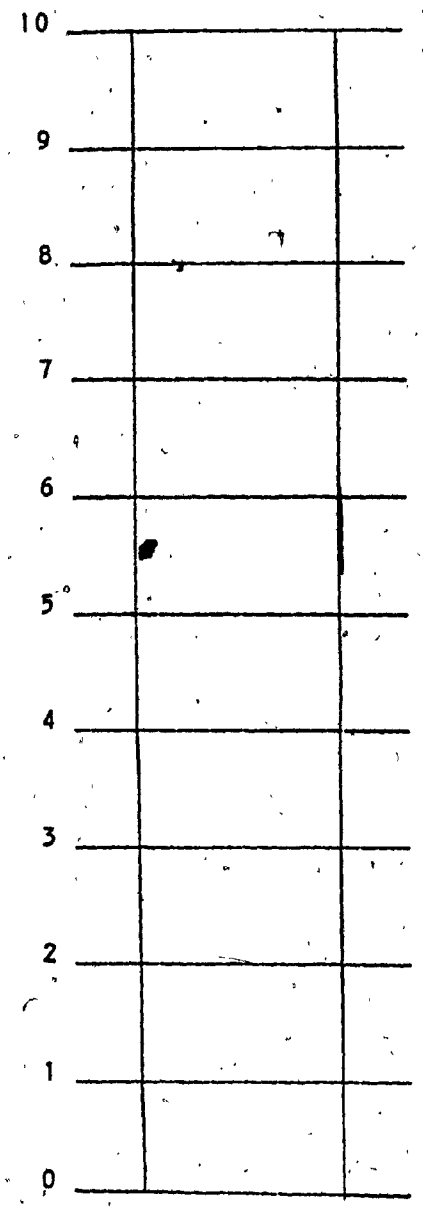
Appendix D: Fear Thermometer

Affective Adjective Checklist

Project ID #_____ Period_____

FEAR AND ANXIETY THERMOMETER

Circle the number on this scale which describes your feelings.



Project ID _____ Period _____

AFFECTIVE ADJECTIVE CHECKLIST

Below you will find 21 words describing emotional states. Check all those words which describe your feelings.

happy_____	secure_____
upset_____	pleasant_____
thoughtful_____	joyful_____
frightened_____	nervous_____
steady_____	loving_____
contented_____	panicky_____
terrified_____	afraid_____
cheerful_____	shaky_____
fearful_____	calm_____
desperate_____	worrying_____
tense_____	

Appendix E: Coping Checklist

Avoidance Generalization Scale
(Self-efficacy measure)

S#_____

APPROACH TEST COPING SCALE

The following are some statements concerning possible reactions following your decision to participate in this experiment, as you were observing the snake or as you were going through the approach test. Read each item and decide whether the statement is true or false as it pertains to your reactions to the previous experiences. Circle "T" if the statement is true or "F" if it is false.

1.	I tried to see the positive side.	T	F
2.	I tried to step back from the situation and be more objective.	T	F
3.	I prayed or hoped for guidance and strength.	T	F
4.	I took things one step at a time.	T	F
5.	I considered several alternatives for handling the situation.	T	F
6.	I drew on my past experiences; thought about how I have handled other situations where I was afraid.	T	F
7.	I talked with the experimenter to find out more about the situation.	T	F
8.	I concentrated on the instructions for the task and the task itself.	T	F
9.	I talked with a friend about the situation.	T	F
10.	I tried to relax myself.	T	F
11.	I prepared for the worst.	T	F
12.	I felt angry about the way I was treated, although I probably felt this way because I was afraid.	T	F
13.	I tried to reduce tension by not thinking about the situation.	T	F
14.	I tried to reduce the tension by imagining that I was elsewhere.	T	F

15. I kept my feelings to myself. T F

16. I didn't worry about it; figured everything would probably work out fine. T F

17. I thought about leaving; reminded myself I could leave at any time. T F

18. I thought about the money and how much I wanted or needed the full amount. T F

19. I got busy with other things in order to keep my mind off the situation. T F

Self-Efficacy Measure

Below are 10 statements describing diverse encounters with snakes. Circle the number on the scale following each statement which indicates your judgment as to whether you would be able to stay in the situation and watch what was happening, if you were to encounter them in the laboratory or in your everyday life.

1. You are seated in a laboratory and on the end of the test apparatus eight feet from you is a 3 ft. boa constrictor enclosed in a glass cage.

10 20 30 40 50 60 70 80 90 100
completely certain to leave or look away — completely certain to stay and watch

2. You are seated in a laboratory and on the end of the test apparatus one foot from you is a 3 ft. boa constrictor enclosed in a glass cage.

10 20 30 40 50 60 70 80 90 100
completely certain to leave or look away — completely certain to stay and watch

3. You are seated in a laboratory and on the end of the test apparatus one foot from you is a 3 ft. boa constrictor resting free on a metal platform.

10 20 30 40 50 60 70 80 90 100
completely certain to leave or look away — completely certain to stay and watch

4. You are watching the news on television and there is a report which shows snakes being used as part of a religious service.

10 20 30 40 50 60 70 80 90 100
completely certain to leave or look away — completely certain to stay and watch

5. You read an article in a magazine which concerns the habits of snakes.

10 20 30 40 50 60 70 80 90 100
completely certain to leave or look away — completely certain to stay and watch

6. You are watching a movie and the hero is thrown into a pit containing hundreds of slimy snakes.

10 20 30 40 50 60 70 80 90 100
completely certain to leave or look away — completely certain to stay and watch

7. You visit a friend and he shows you his 4 ft. python outside of its cage.

10 20 30 40 50 60 70 80 90 100
completely certain to leave or look away — completely certain to stay and watch

8. You visit the snake house at the zoo and see various snakes in glass cages.

10 20 30 40 50 60 70 80 90 100
completely certain to leave or look away — completely certain to stay and watch

9. You are sitting with friends at a picnic table in a park and you see a snake approaching the table.

10 20 30 40 50 60 70 80 90 100
completely certain to leave or look away — completely certain to stay and watch

10. You are sitting alone in your backyard and a snake falls out of a tree onto the ground 5 ft. from you.

10 20 30 40 50 60 70 80 90 100
completely certain to leave or look away — completely certain to stay and watch

Appendix F: List of Criterion Scores indicating improvement for Outcome Measures in Nonparametric Analyses

Outcome Measure	Criterion Score
FT	
View	less than or equal to a score of 2
Test	less than or equal to a score of 5
AACL	
View	less than or equal to a score of 8
Test	less than or equal to a score of 12
Latency	
Mean	less than or equal to 10 sec
Final	less than or equal to 5 sec
Number of steps	greater than or equal to 10 steps
Heart rate	
View	less than or equal to a decrease of 3 bpm
Test	less than or equal to an increase of 2 bpm
Digit temperature	
View	less than or equal to a decrease of 1 mm of pen deflection during recording
Test	less than or equal to an increase of 10 mm of pen deflection during recording
Skin cond. level	
View	less than or equal to an increase of 1.0 micromhos
Test	less than or equal to an increase of 1.5 micromhos
Skin cond. response	
View	less than or equal to a score of 0 which reflects no change in frequency relative to baseline
Test	less than or equal to a score of 0 which reflects no change in frequency relative to baseline