TASK- AND SETTING-RELATED CUES

IN IMMUNIZATION AGAINST LEARNED HELPLESSNESS

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A thesis submitted to the Faculty of Graduate Studies
in partial fulfillment of the requirements
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TABLE OF CONTENTS

LIST OF TABLES

ABSTRACT

One prediction of learned helplessness theory is that experience with control prior to exposure to uncontrollable aversive events should prevent the performance deficits hich otherwise would occur. According to Seligman (1975), such "immunization" results from the generalazation of expectancies of control, and should occur regardless of the setting(s) in which control and uncontrollability are experienced. The present study tested this prediction by manipulating task- and setting-related cues so that the immunization and testing situations were similar or different on each dimension. Undergraduate students were randomly assigned to a group in the helplessness triad or to one of four immunization groups. Subjects experienced control on several cognitive tasks, and were exposed to uncontrollability on an instrumental noise task. Measures of performance on a final anagrams test were used to assess group differences. Interference effects were observed as a function of uncontrollability within the helplessness triad, and in three immunization groups. The group immunized in the same setting and on a similar task as testing showed no deficits. These results were interpreted within a stimulus control framework, and the implications of this conceptualization of immunization for learned helplessness theory were discussed.

Introduction

The term "learned helplessness" has been advanced to account for the interference with instrumental learning which occurs in animals and humans following exposure to uncontrollable aversive events (Overmier & Seligman, 1967; Seligman, 1975). According to the learned helplessness model, organisms learn that it is futile to respond when exposed to contingencies of response independent reinforcement. Such learning generalizes other situations where response contingent reinforcement is available, and results in interference with new learning (Seligman, Maier, & Solomon, 1971). Seligman (1975) has proposed that "helplessness" in humans may be mediated by a similar mechanism. According to this view, individuals exposed to uncontrollable aversive events come to expect their responding to be futile, and this expectation interferes with learning in a different situation. A number of studies with humans have supported this "generalized expectancy" hypothesis by demonstrating changes in mood (Gatchel, Paulus, & Maples, 1975; Miller & Seligman, 1976) and expectancy for success (Klein & Seligman, 1976) concurrently with performance deficits following exposure to uncontrollable outcomes

One prediction generated by the learned helplessness model is that initial experience with control over aversive events should interfere with forming an expectation of response-reinforcement independence, just as initial lack of control interferes with learning that responding may be effective (Seligman, 1975, p.57). This "immunization" hypothesis predicts that a prior history of control will cause an organism to be more persistent when confronted with uncontrollability, and to respond more readily when controllability is reestablished. In support of this hypothesis, Seligman and Maier (1967) found that dogs which received controllable shock in a shuttlebox, followed by uncontrollable shock in a Pavlovian hammock, showed no performance deficits when they again received controllable shock in the shuttlebox. A comparable group of dogs which received no prior escape training showed severe deficits in the shuttlebox following uncontrollable shock in the hammock. These findings were extended by Seligman, Marques, and Radford (Note 2), who found that shuttlebox deficits were prevented in dogs which received both immunization and helplessness training in the hammock.[1] Immunization effects have also been demonstrated with laboratory rats (Seligman, Rosellini, & Kozak, 1975), and with wild rats (Richter, 1957). However, Wepman (Note 4) found deficits in mice which had received immunization training, and Thornton and

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(1) While these immunization effects were significant, they were not as large as those reported by Seligman and Maier (Seligman, personal communication, noted in Thornton & Powell, 1974).

Powell (1974) reported "helplessness" in humans who received prior experience with control. Recently, Jones, Nation, and Massad (1977) used a design similar to Seligman, Marques, and Radford's to demonstrate imminization in humans. In their study, immunization effects were observed following experience with a 50% schedule of control, but not following 0% or 100% control.

The above studies generally support the immunization hypothesis, and provide some information about the necessary and sufficient conditions for immunization to occur (e.g., Jones et al., 1977). However, these studies do not address the basic issue of the generalization of immunization training. As formulated by Seligman (1975), the immunization hypothesis predicts that success training should generalize across tasks and settings just as the effects of uncontrollability generalize. No systematic examination of such generalization and the factors which may contribute to it has yet been conducted.

It is difficult to examine the role of generalization in the immunization studies reported here because several types of experimental tasks were employed in a variety of combinations of experimental settings. For example, Seligman, Rosellini, and Kozak (1975) administered immunization, helplessness training, and testing to rats in a single setting (their cages), but required a different response in testing (lever pressing) than was reinforced in immunization training (jumping). Wepman (Note 4) also reinforced different responses in immunization and testing, but in his study immunization, helplessness training, and testing occured in three different situations (a water maze, a cage, and a shuttlebox). Thornton and Powell (1974) used a design similar to Seligman, Marques, and Radford (Note 2), in which immunization and helplessness training were conducted in the same setting with the same task, while testing involved a different task.

The immunization paradigm has usually been discussed in terms of the transfer of an initially developed expectation of controllability to subsequent testing situations (e.g., Seligman, 1975). This explanation alone is unable to account for the varying success of the different immunization procedures described above. It is suggested that, whereas the inappropriate transfer of passive behavior is the hallmark of learned helplessness (cf. Roth & Bootzin, 1974), the procedures which have been used to prevent "helplessness" may constitute a form of discrimination training. This view of immunization proposes that alternating conditions of controllability and uncontrollability provide an organism with information concerning the stimulus dimension(s) relevant to reinforcement in each condition. The organism is thus able to learn to respond differently in these conditions, and its behavior is brought under stimulus control.

Taken as a group, the studies reported above suggest that the similarity of the immunization and testing situations may be important in establishing discriminative control over "learned helplessness." It appears that when the task- and setting-related cues associated with immunization training and testing were similar, as in the Seligman and Maier (1967) study, immunization was successful. As these situations were made increasingly dissimilar, immunization effects were attenuated (Seligman, Radford, & Marques, Note 2) or absent altogether (Wepman, Note 4). This observation is consistent with a stimulus control interpretation of immunization, since transfer of expectancies of control between immunization and testing would presumably be increased as the similarity between the two was increased.

The experiment reported here tests this stimulus control hypothesis of immunization against Seligman's (1975) generalized expectancy hypothesis by varying the similarity of the immunization and testing situations along several dimensions. The stimulus control hypothesis predicts that performance deficits will be progressively reduced (i.e., immunization will become more powerful) as the similarity of the immunization training and testing situations is increased. The generalized expectancy hypothesis predicts successful immunization in all groups which are provided with a prior experience of control. In order to demonstrate immunization, of course, it is first necessary to show the potential for interference effects. It is also predicted, therefore, that exposure to uncontrollability will produce performance deficits relative to exposure to controllability and no preexposure.

Method

Overview

The experimental design consisted of the triad of conditions frequently used in learned helplessness research, with the addition of a 2 X 2 factorial arrangement of "immunization" conditions. Thus, the design contained seven cells. The experiment was conducted in three consecutive but distinct phases: immunization, pretreatment, and testing. Subjects in the four immunization conditions of the factorial arrangement proceeded through all three of these phases, whereas subjects in the triad of helplessness conditions were involved only in the latter two.

The triad included three levels of helplessness pretreatment: escapable noise, inescapable noise, and no noise. The factorial combination of immunization conditions used one level of helplessness pretreatment (inescapable noise) for all four cells, and included two levels of a manipulated setting similarity/dissimilarity factor, and two levels of a task similarity/dissimilarity factor. In immunization, subjects were presented with a soluble cognitive problem either similar to or different from the final test task, in an experimental setting which was either the same as or different from the one in which pretreatment would occur. Following pretreatment, subjects in all seven conditions were tested in the same setting with a series of soluble cognitive problems.

Subjects

The subjects were 70 undergraduates, 35 males and 35 females, drawn from introductory psychology courses at the University of Manitoba. All subjects had learned English as their first language, and were naive to learned helplessness research. At the time of recruitment, subjects were given the opportunity to sign up for either one or two "learning experiments." Those who chose two experiments were informed that the experiments would occur consecutively for the sake of convenience, but were separate and unrelated studies. The experiments had different names, were to take place in different rooms, and were being conducted by different individuals. Prior to pretreatment, subjects were presented with samples of the aversive tones, and given the option of withdrawing from the experiment. One female chose to withdraw, and another female was subsequently excluded and replaced because she had ruptured an eardrum prior to the experiment. Four subjects (all females) assigned to the escapable noise pretreatment condition were excluded from the final sample and replaced because they failed to learn to escape the noise.

Apparatus

Immunization training. Subjects in the similar task immunization groups received a series of 25 easily soluble anagrams developed from Tresselt and Mayzner (1966). The anagram words all had high Thorndike-Lorge frequencies (A, AA, or 1), and were scrambled in one of four easy solution patterns drawn from Tresselt and Mayzner's "D" group. Anagrams using these four patterns were randomly ordered in the series so that, unlike the anagrams in the final test task, they could not be solved systematically. The anagrams were stenciled individually on 3 X 5 inch "wire-index" cards in 1 inch letters spaced 1/4 inch apart. The resulting series of anagrams is listed below in its constant order of administration: ifrut, gjude, artpy, rblae, wnago, oicve, outyh, mntho, vluea, spaue, haicr, odeml, cblim, wtera, imusc, huseo, pdoun, cothl, cbeah, tbirh, hmanu, ptain, gduar, dguie, scael.

Subjects in the dissimilar task immunization groups received as discrimination problems four sets of ten pairs of stimulus patterns adapted from Levine (9171). Each stimulus pattern contained four dimensions, and each of the two possible values of a dimension was represented on a card in a pair of patterns. The dimensions and their values were: (1) letter (A or T); (2) letter color (black or white); (3) letter size (large or small); and (4) letter border (circle or square). These dimensions and values duplicate those used by Hiroto and Seligman (1975). All of the discrimination problems were made soluble by veridical feedback provided by the experimenter.

<u>Pretreatment</u>. The pretreatment apparatus consisted of a spring-loaded button in the center of a 12 inch circular base. Two 24-V dc lights were arranged symmetrically on either side of the button. Aversive stimulation consisted of a 3,000 Hz tone created by a Heathkit audio generator (Model 1G-72) and administered at 90 db. through calibrated Sharpe HA-10 stereo earphones. Duration of the tones, lights, and intertrial intervals was controlled manually through a series of four interlocked Hunter timers. All timing circuitry and recording devices were contained in a a room separated from the experimental room by a one-way mirror. In the escapable condition, pressing the button four times terminated the tone; in the inescapable condition, button pressing had no effect upon the tone.

<u>Testing</u>. The test task for all subjects was the series of 20 soluble anagrams used by Hiroto and Seligman (1975). The anagrams were displayed individually in 1/4 inch letters on 4 X 6 inch files cards, and mounted on a

two-hole "Lock Arch File" clipboard. Each of the 20 anagrams, which were derived from Tresselt and Mayzner (1966), consisted of five letters arranged in the standard solution pattern 3-4-2-5-1 (e.g., "iardt" was the anagram of "triad"). The words used in the anagrams are listed below in order of presentation: triad, patio, joust, ghoul, habit, baton, flour, adopt, noble, poker, batch, jaunt, power, roach, giant, train, sugar, fault, drink, clerk. The test task differed from the anagrams task used in immunization both in the words used, and in the presence of a standard solution pattern.

Task administration in immunization and testing occured with the experimenter in the same room as the subject. In pretreatment, the experimenter remained in the experimental room to present the instructions, and then went to an adjacent room to administer the tones.

Procedure

Subjects who signed up for a single experiment were randomly assigned to the escapable (ES), inescapable (INES), control (CON), same-setting anagram immunization (AS), and same-setting Levine immunization (LS) groups. All received immunization (where applicable), pretreatment, and testing in a single experimental setting. Those subjects who signed up for two experiments were randomly assigned to either the different-setting anagram immuniza- tion (AD), or the different-setting Levine immunization

(LD) group. These subjects received immunization treatment in the first experiment, and were pretreated and tested immediately afterwards in the context of a second experiment.

Immunization. The immunization training procedures for the anagrams task and the discrimination task were the same regardless of the setting of administration. For the same-setting groups (AS & LS), training was administered by the experimenter who would later present pretreatment and testing in the same room. For the different-setting groups (AD & LD), however, the immunization tasks were presented by a different experimenter in a different room.

Upon their arrival at one of the experimental rooms, LS and LD subjects were read the following instructions:

> In this (part of the) experiment, you will be looking at cards like this one. Each card has two stimulus patterns on it. The patterns are composed of four different dimensions, and two values are associated with each dimension. The dimensions and their values are: border (circle or square); letter (T or A); size (large or small); and shading (light or dark). Each stimulus pattern has one value from each of the four dimensions. Thus, there are eight values in all. I have arbitrarily chosen one of these eight values as being correct, e.g., "large", or "square." For each card, I want

you to choose which pattern contains this value, and I will then tell you if your choice was correct or incorrect. In a few trials you can learn what the correct value is by this feedback. The object for you, then, is to figure out what the value I've chosen is, so that you can choose correctly as often as possible. Let's try a sample problem now, to make sure you understand the task. You begin by pointing to the pattern you think contains the value I have chosen.

At the end of the five card sample, and after each of the subsequent ten card problems, subjects were asked to name the relevant value. Veridical feedback was provided by the experimenter, and the response was scored either "pass" or "fail."

Subjects in the AS and AD groups were given the following instructions:

> In this (part of the) experiment, I'm going to present you with a series of anagrams to work on. Do you know what anagrams are? Anagrams are words with the letters mixed up in a different order. Your task will be to rearrange the letters so that they make a word. I am interested in seeing how many of these you can solve. When you think you have figured out the word, tell me what it is. If you can't find the word, don't go on to the next

one until I say to go ahead. I will tell you when to begin on the next card.

Each subject was then given the notebook containing the anagrams and told to begin. Solution latency and the number of attempts were recorded for each anagram. A maximum of 30 seconds was allowed for each card; after correct solution or expiration of the time limit, the experimenter said "O.K., try the next one." Each subject worked on all 25 anagrams.

Pretreatment. Three levels of pretreatment were administered in the triad of helplessness conditions. Subjects in the escapable noise group (ES) received 30 trials of unsignaled noise of 5 sec maximum duration. The intertrial interval ranged from 10 to 25 sec (mean ITI was 14.12 sec). For ES subjects, noise could be terminated by pressing the button four times. Inescapable noise (INES) subjects were yoked to ES subjects for noise duration and intertrial interval, but were unable to escape the noise by button pressing. Subjects in the no noise control (CON) group were given introductory instructions and then presented with the anagrams test task. In the four immunization groups, subjects were pretreated in the manner described above for the inescapable noise group.

All subjects were given the following introductory instructions:

Now (S's name), this is an experiment in learning.

We are trying to develop verbal and nonverbal measures of learning ability to use in future research.

Subjects in the escapable and inescapable groups were then informed that the study would involve listening to noise through the earphones. Samples of the noise were presented, and subjects were given the option of withdrawing from the experiment. One female decided not to participate. Subjects were then given the following instructions:

From time to time, a loud noise like the ones you just heard will come on for awhile. When that noise comes on, there is something you can do to stop it. Your job is to learn a response which will consistently enable you to turn off the noise. Now, there are two lights located on this base, and these lights will serve as signals for you. One of the two lights will go on after each time the noise stops. If the blue light goes on after the noise stops, then you have just made the correct response, and have stopped the noise. If, on the other hand, the red light goes on, then you have not stopped the noise, but rather it has stopped automatically according to a preprogrammed schedule. Remember that your job is to learn a response which will enable you to stop the noise.

> The blue light will inform you that you have made the correct response, and the red light will inform you that you have not. Taking the earphones off and dismantling or disconnecting the apparatus in any way are not acceptable ways of stopping the noise. You should not need to get out of your seat.

Pretreatment was administered by the experimenter from an adjacent room containing the timing circuitry and recording devices. During pretreatment, the number of responses (button presses) on each trial was recorded for each subject.

Testing. Following pretreatment, all subjects were tested with the series of soluble patterned anagrams devised by Hiroto and Seligman (1975). Upon returning to the experimental room, the experimenter gave the following instructions:

> O.K., let's try something else. In this part of the experiment you will be asked to solve some anagrams. Anagrams are words with the letters scrambled, and the problem for you will be to unscramble the letters so they form a word. Now (S's name), there may be a pattern or principle by which you can solve the anagrams, but that is up to you to figure out. I can't answer any questions now, but after the experiment is over I'll answer

all your questions. Begin on the first one when I give you the clipboard, and tell me the word as soon as you find it. But don't go on to the next card until I tell you to go ahead.

Subjects were allowed 100 sec to work on each anagram; response latencies were measured with an electric timer. After successful solution or expiration of the time limit, the experimenter said "O.K., try the next one." If the subject's solution was incorrect, the experimenter said "That's not a word, try again."

Three dependent measures were obtained from the anagrams test task: (a) the mean response latency for the 20 anagrams, (b) the number of trials to criterion for learning the solution pattern (defined as three consecutive trials with solution latency less than 15 sec), (c) the number of failures to solve (defined as solution latency of 100 sec).

Following the test task, subjects responded to a ten item postexperimental questionnaire, and were debriefed. The questionnaire items assessed subjects' perceptions of task solubility and difficulty, and asked subjects to rate the extent to which their performance on a given task was influenced by their experience on previous tasks.

Results

Predictions following from a stimulus control interpretation of immunization were generally supported. Within the triad of pretreatment groups, interference effects were observed in the inescapable noise group relative to escapable and no noise groups. Comparable deficits were observed in the immunization groups which received prior training in situations differing on one or more dimensions from the final testing situation. No deficits were observed when immunization training was administered in a context maximally similar to that of testing.

Immunization

All subjects successfully solved at least 75% of the anagrams or discrimination problems presented in immunization. There were no significant differences between groups in percent correct, F (3,36) = .69, p < .57. The mean percent correct across the four immunization groups was 87.2%. Thus, immunization provided all subjects with comparable experiences of controllability.

Subjects' perceptions of the similarity between the task and setting of immunization and the task and setting of testing were assessed by the following items on the postexperimental questionnaire: "How similar did you find the first task (patterns or anagrams) to be to the final anagrams task?" and "To what extent did you think that the first task (patterns or anagrams) and the last two tasks (noise and anagrams) were related as part of the same experiment?" A planned orthogonal contrast revealed no significant differences in ratings of task similarity between subjects immunized with anagrams and those immunized with discrimination problems, t (36) = -.41, p < .68. However, there were highly significant differences in ratings of setting similarity between subjects immunized in the testing setting and subjects immunized in a different setting, t (36) = 9.77, p = .00.

Pretreatment

All but four of the subjects receiving escapable noise learned to turn off the noise. The four subjects (all females) who were unable to terminate noise in 30 trials were excluded from the final sample and replaced.[2] The mean number of trials to learn the escape response was 8.7, and mean total noise duration for escapable noise subjects was 76.89 sec. The number of times subjects attempted to terminate noise by button pressing was recorded and averaged within groups. The mean total number of presses was 99 (SD = 24.7) for escapable noise subjects (ES), and 26 (SD = 26.4) for inescapable noise subjects (INES). These results support the prediction that INES subjects

(2) Because they failed to learn to escape noise, these subjects experienced uncontrollability and thus could not be included in the escapable noise group. They could not be included with other inescapable noise subjects, however, because they were not yoked to escapable noise subjects. The possible effects of their exclusion from the experiment will be discussed later.

learn not to respond when reinforcement is independent of responding. The mean pressing totals for subjects in the immunization groups were: anagrams task in the test setting (AS) = 50.5 (SD = 43.1); anagrams task in a different setting (AD) = 51.1 (SD = 61.9); discrimination task in the test setting (LS) = 56.6 (SD = 58.1); and discrimination task in a different setting (LD) = 14.1 (SD = 20.6). The low number of presses by LD subjects relative to other subjects was an unexpected finding. It may be noted that subjects in the other immunization groups were more active in pretreatment button pressing than subjects in the inescapable noise group, although a comparison between the immunization groups and the inescapable noise group did not indicate significant differences, t (45) = 1.12, $p < .27$. The finding of increased pretreatment activity in the AS, AD, and LS groups is consistent with Seligman and Maier's (1967) report that preexposure to escapability produced increased activity in dogs subsequently exposed to inescapable shock.[3]

The effect of the inescapability manipulation on subjects' perceptions of the noise task was assessed by two

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(3) It was interesting to observe that not all subjects attempted to terminate noise exclusively by button pressing. The pretreatment instructions did not specifically instruct subjects to use the button, and many subjects exhibited a variety of other behaviors (e.g., hand signals, verbalizations, body movements) in attempting to discover the relevant response. These attempts were not recorded in the present study, but future research in this area might profit from observing such behaviors.

items on the postexperimental questionnaire. When asked, "While working on the noise problem, did you feel that you lacked the ability to solve it?", subjects in the escapable noise group reported significantly more confidence in their ability than subjects receiving inescapable noise (INES, AS, AD, LS, and LD groups), t (54) = 4.63, p = .00. When asked, "While working on the noise problem, did you feel that the problem was insoluble - that it couldn't be solved?", INES, AS, AD, LS, and LD subjects responded with significantly higher ratings of insolubility than ES subjects, t (54) = 3.95, p = .00. There were no significant differences between the ES, INES, AS, AD, LS, and LD groups in their ratings of the aversiveness of pretreatment noise, F (5,54) = .317, $p < .93$. The mean aversiveness rating across groups was 3.26 (SD = 1.65) on a seven point scale.

Testing

Since the three dependent variables (mean latency, trials to criterion, and number of failures) measured on the anagrams test were expected to be highly intercorrelated, group differences in test performance were examined using multivariate analyses of variance (MANOVAs) and multivariate contrasts. Standardized weights reflecting the relative importance of each variable in each analysis were obtained through discriminant analysis, and will be summarized with the results.[4] Univariate *F*-ratios and probability statements will be reported, but not interpreted.[5] In these analyses, type-1 error rate was controlled "family-wise" (Kirk, 1968), with the alpha level for rejection of the null hypothesis set at .05 for each family of analyses. The three families of analyses consisted of: (1) a pair of planned orthogonal contrasts within the triad of pretreatment groups (ES, INES, CON) to test for interference effects; (2) a 2X2 MANOVA on the four immunization groups to assess the importance of task- and setting-related cues in immunization; and (3) a set of four nonorthogonal contrasts between the five inescapable noise groups (INES, AS, AD, LS, LD) to test for immunization effects.

INSERT TABLES 1 AND 2 ABOUT HERE

The group means and standard deviations for perfor-

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(4) These weights are analogous to the partial regression weights in a multiple regression equation, so that each weight represents the relative importance of a given variable when the effects of the other variables have been "partialed out" (Tatsuoka, 1970).

(5) An inspection of univariate *F*'s will sometimes, but not always, reflect the unique contribution of each variable to the multivariate *F*. As the intercorrelations among dependent variables increase, the univariate *F* statistic becomes a less meaningful descriptor.

mance on the anagrams test task are presented in Table 1. The contrasts performed on the data from the pretreatment triad are summarized in Table 2. Within the pretreatment triad, significant performance deficits were observed in the inescapable noise group relative to the escapable noise and no noise groups, multivariate $\underline{F}$ (3,35) = 6.32, $\underline{p}$ < .003. Discriminant analysis revealed that the "latency" variable contributed the most (i.e., was assigned the greatest absolute weight) in this analysis. The "trials" and "failures" variables, although relatively less important, each contributed substantially in their own right. A second contrast revealed, as expected, that the performance of the escapable noise group was not significantly different from that of the no noise control group, multivariate $\underline{F}$ (3,25) = 2.09, $\underline{p}$ < .126.

INSERT TABLE 3 ABOUT HERE

A 2 (similar vs different task) X 2 (same vs different setting) MANOVA was performed on the factorial combination of immunization groups to isolate the relative contribution of task- and setting-related cues. As summarized in Table 3, this analysis revealed a marginally significant interaction, multivariate $\underline{F}$ (3,34) = 2.65, $\underline{p}$ < .06, a marginally significant task main effect, multivariate F (3,34) = 2.30, p < .09, and a nonsignificant effect due to setting. Examination of the interaction with the "trials" variable (which in this analysis was by far the most effective discriminator) suggests that task similarity contributed to immunization only in the setting in which testing occured. Thus, the interpretation of a task main effect may be somewhat misleading. Interestingly, the "trials" variable was the most significant in the univariate analyses of the task main effect, but (according to discriminant analysis) contributed the least unique variance to the multivariate test of the effect. This finding reflects the hazards in interpreting the relative importance of several variables on the basis of univariate analyses.

INSERT TABLE 4 ABOUT HERE

Contrasts performed between the inescapable noise group and each of the immunization groups (SA, AD, LS, LD) revealed significantly better performance only in the AS group, multivariate F (3,43) = 4.81, p < .006. That is, significant immunization effects were observed only in subjects who had solved anagrams in the test setting prior to pretreatment and testing. Discriminant analysis revealed that the "trials" variable contributed most to the test of this difference, and the "latency" variable somewhat less. Information provided by the "failures" variable was redundant.

Postexperimental Questionnaire

Two items on the postexperimental questionnaire asked subjects to rate the extent to which their experience with the noise task had influenced both their attitude and their performance during the anagrams test task. There were no significant differences between the ratings of escapable noise subjects and inescapable noise subjects (INES, AS, AD, LS, and LD) on either the "attitude" question, t (54) = .387, p < .70, or the "performance" question, t (54) = .035, p < .97. Thus, although test performance varied consistently with pretreatment condition, subjects did not recognize this relationship.

Two additional questions asked "immunized" subjects to assess the effects of immunization upon their attitude and performance during the test task. Subjects' ratings on each question were subjected to a 2 (similar vs different task) X 2 (same vs different setting) analysis of variance, which revealed a highly significant task main effect with respect to both "attitude", F (1,36) = 8.08, p < .007, and "performance", F (1,36) = 8.12, p < .007. Both setting main effects and interactions were nonsignificant. Thus, subjects reported a relationship between their feelings in the testing situation and the nature of the immunization task. Subjects who received anagrams in immunization reported a stronger influence upon their attitude and performance in testing than subjects who received discrimination problems. This finding is consistent with the marginally significant main effect for task on the anagrams performance measures.

Discussion

These results provide a further demonstration of interference effects in humans resulting from exposure to inescapable noise. In addition, the results demonstrate successful "immunization" against interference effects in humans, and provide clear support for a stimulus control intepretation of immunization.

In order to demonstrate immunization against learned helplessness, it is first necessary to produce interference effects in a comparison group which did not receive immunization training. Such effects were observed within the triad of pretreatment groups, where the group which received inescapable noise performed more poorly than the escapable noise and no noise groups. The only possible qualification of this finding lies in the unavoidable methodclogical confound of excluding from the final sample those escapable noise subjects who failed to learn to escape. It could be argued from this exclusion that escapable noise subjects were selected on the basis of their escape learning ability, and thus were not sampled from the same population as all other subjects. The effect of such selection on anagrams solution is not known; it is possible that the performance measure means of the escapable noise group were artificially lowered by this procedure. Any speculation about selection effects, however, must be tempered by the fact that only 30% of potential escapable noise subjects were excluded. Further, escapable noise subjects were pooled with no noise subjects in comparisons on anagram performance, and any effects due to selection should be attenuated by this procedure.

The demonstration of interference effects makes it possible to assess the effectiveness of immunization training. Since the immunization groups and the inescapable noise group all performed under identical pretreatment contingencies (i.e., inescapable noise), any differences in their anagram performance may be related to the effects of immunization training. Such differences were found only for the group immunized with anagrams in the test setting. No "immunization" was found in the group which received discrimination problems in the test setting, or in the groups which received either anagrams or discrimination problems in a different setting.

Analyses conducted within the factorial arrangement of immunization groups attempted to determine the differential importance of cues related to the task and setting of immunization training. The finding of a marginally significant task main effect suggests that performance deficits will be prevented only when the responses in "immunization" closely approximate those measured in testing. The similarity or dissimilarity of the immunization and testing settings does not appear to be an important factor in and of itself. However, the finding of an interaction between task and setting suggests that setting-related cues may potentiate immunization effects when the immunization and testing tasks are similar. Interpretation of this interaction hinges upon the reversal which occured between the immunization groups receiving discrimination problems in different settings (see Table 1). Whereas setting similarity was associated with improved performance in the groups immunized with anagrams, the reverse was true for the groups which received discrimination problems in immunization. If this reversal is reliable, then it would appear that task similarity contributes significantly to the prevention of deficits only when the tasks are administered in the same setting.

The postexperimental questionnaire results provide evidence for the importance of task-related cues in immunization, but do not indicate any contribution by the setting factor. When asked to assess the influence of immunization upon their test performance and their attitudes toward testing, subjects receiving anagrams reported a significantly greater effect than subjects receiving discrimination problems. No such differences were found as a function of setting, and no interaction between task and setting was observed. Thus, subjects' perceptions revealed a main effect due to task consistent with the marginally significant task main effect observed on the performance measures.

It could be argued that the absence of performance deficits in the group immunized with anagrams in the test setting was the result of practice effects. That is, what is being referred to here as "immunization" might be construed simply as the end product of training in anagram solution. This argument is weakened in the present context by the fact that the anagrams used in testing differed from those used in immunization training along several dimensions: different solution words were used, a more difficult letter order was employed, and there was a constant letter order pattern in testing. Because of these differences, task specific solution skills would not be expected to transfer readily from immunization training to testing. Any effects from previous training which might transfer would be more general (e.g., ability to manipulate or rearrange letters), and these should have been observed in the group receiving anagrams in a setting different from the test. However, test performance was significantly improved only in the group receiving anagrams in the test setting, and the explanation of practice effects is not adequate to account for this finding.

The results of this study provide an experimental demonstration of immunization against "learned helplessness" with humans. Certain parallels are evident between these findings and those previously reported in the literature. First, in the present study, prior experience with control prevented performance deficits only when the task and setting of immunization were maximally similar to those of testing. This is consistent with the findings of Seligman and Maier (1967), who prevented shuttlebox deficits in dogs by providing escape training in the shuttlebox prior to inescapable shock in the hammock and shuttlebox testing. The Seligman and Maier study thus also maximized the similarity between the immunization and testing situations, while maintaining a contrast between these and the situation in which uncontrollability occured. The present finding that performance deficits were not prevented when immunization training and testing employed different tasks is also consistent with results reported in the literature. Wepman (Note 4) administered immunization training and testing to mice in different settings with different tasks, and Thornton and Powell (1974) used different tasks in the same setting with humans; neither study reported success in preventing performance deficits.

It thus appears that the immunization phenomenon is partly mediated by external cues associated with the situation(s) in which training takes place. In addition, immunization effects have been shown to depend on the schedule of reinforcement used in immunization training (Jones, Nation, & Massad, 1977). Partial reinforcement (PRF) in the form of a 50% control schedule reliably prevented performance deficits, whereas continuous reinforcement (CRF), a 100% control schedule, did not. These findings together are consistent with an interpretation of immunization which relates test performance to internal and external stimulus factors in a stimulus control framework. Following Amsel (1972), PRF may be viewed as a process in which approach responses become associated with internal cues accompanying frustrative nonreward. This conditioning results in greater persistence during extinction than follows acquisition training on CRF. The essential point to the present analysis is that such persistence following PRF, manifested in the testing phase of a learned helplessness experiment as "immunization", may be understood as an instance of internal stimulus control. That is, the generalization of persistence from immunization training to testing may be partly mediated by learned coping responses to internal frustration cues developed during PRF. One implication of this discussion is that internal and external stimulus factors may combine to determine the pervasiveness of immunization effects. It is an empirical question whether the use of PRF in the present study would have resulted in more generalized immunization (i.e., in improved performance in the AD, LS, or LD groups).

The results of the present study are consistent with the findings of Jones et al. (1977), and provide support for a stimulus control interpretation of immunization. This formulation hypothesizes that organisms learn to respond differently to conditions of controllability and uncontrollability, providing the cues associated with each type of experience are distinctive. According to this view, experiences of control should be more effective in preventing "helplessness" when the cues associated with such experiences are reinstated. This, of course, is what was found. These results are inconsistent with the generalized expectancy hypothesis of immunization advanced by Seligman (1975). This interpretation, which suggests that performance deficits are prevented by the generalization of expectancies of control from immunization training to testing, cannot adequately explain the present results because it does not take into account the factors which may mediate such generalization. In its simple form, the generalized expectancy hypothesis predicted immunization effects in all groups pretreated with success training, which was not observed. A more adequate formulation of

Seligman's hypothesis would have to specify the conditions under which expectancies of control would be assumed to generalize. The point here is not that cognitive expectancies (i.e., attributions) play no role in immunization, but rather that the degree to which expectancies generalize depends in part on (1) the similarity of the training and testing situations, (2) the schedule of reinforcement that is in effect (Jones et al., 1977), and (3) perhaps the number of settings in which immunization is provided (Thomas, 1970). It is argued that consideration of internal and external factors within a stimulus control framework provides a more complete, and parsimonious, explanation of immunization.

The study of immunization raises important questions about the nature of interference effects. If immunization can be adequately conceptualized in terms of stimulus control, what are the implications of this formulation for "helplessness?" The distinction between differential and nondifferential training made in the stimulus control literature is relevant to this discussion. In nondifferential training, an organism is presented with a particular stimulus and is reinforced for responding appropriately in the presence of that stimulus. In differential training, a procedure of contrasts is used, where several stimuli are presented alternately, and responding is reinforced in the presence of a particular stimulus but not in the presence of others. In basic learning research it is well established that nondifferential training produces weak stimulus control (i.e., broad stimulus generalization), whereas differential training increases the control of the training stimulus (Terrace, 1966).

In attempting to explain the different results of these types of training, Thomas (1970) has suggested that "differential training might have the general effect of establishing the validity of external stimuli as signifying events of importance to the welfare of the organism." Nondifferential training, on the other hand, might serve to teach the organism the insignificance of external stimuli, and/or the futility of behaving differentially in their presence. Thus organisms should respond more selectively to stimuli after differential training than after nondifferential training. If experience with uncontrollability is regarded as a form of nondifferential training in which no responses to stimuli in the experimental setting are reinforced, one would expect "helpless" behavior to generalize broadly to stimuli not associated with initial training. In fact, this is what appears to occur. The administration of prior "immunization" training may, however, function to make the dimension of controllability-uncontrollability more distinctive, and additionally provide an opportunity for differential responding to develop. Thus, in this view, "learned helplessness" results from nondifferential training, and "immunization" is produced by differential training.

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Appendix A: Tables 1-4

Table 1: Group Means and Standard Deviations on Anagrams Test

Group	Mean Latency		Trials to Criterion		Number of Failures	
	M	SD	M	SD	M	SD
Escapable	26.58	15.80	9.30	4.08	3.20	2.62
Inescapable	47.58	22.71	16.60	4.50	7.50	4.81
No Noise	35.11	19.22	13.10	5.84	4.70	3.40
Imm. AS	24.23	21.64	8.20	4.44	3.60	4.30
Imm. AD	33.01	19.42	12.50	5.87	4.20	3.52
Imm. LS	47.07	27.99	15.80	6.21	7.50	5.70
Imm. LD	41.85	24.75	13.30	4.72	6.60	4.38

Table 2: Triad Contrasts

Source	d.f.	m.s.	F	p	weights
INES-ES/CON					
Multivar	3,25	-----	6.32	.003	----
Latency	1,27	1865.95	4.93	.035	-4.83
Trials	1,27	194.40	8.21	.008	2.34
Failures	1,27	84.02	6.06	.021	3.48
ES-CON					
Multivar	3,25	-----	2.09	.126	----
Latency	1,27	364.66	0.96	.335	4.56
Trials	1,27	72.20	3.05	.092	-2.59
Failures	1,27	11.25	0.81	.376	-2.84
ERROR WITHIN					
Latency	27	378.38			
Trials	27	23.68			
Failures	27	13.86			

Note. Alpha level per comparison = .05/2 = .025.

Table 3: 2 X 2 Factorial

Source	d.f.	m.s.	F	p	weights
TASK FACTOR					
Multivar	3,34	-----	2.30	.094	----
Latency	1,36	2509.85	4.48	.041	1.92
Trials	1,36	176.40	6.13	.018	-1.43
Failures	1,36	99.23	4.81	.035	-1.46
SETTING FACTOR					
Multivar	3,34	-----	0.51	.679	----
Latency	1,36	31.59	0.06	.813	-2.41
Trials	1,36	8.10	0.22	.599	-0.72
Failures	1,36	0.23	0.11	.917	2.99
INTERACTION					
Multivar	3,34	-----	2.65	.064	----
Latency	1,36	489.65	0.87	.356	0.87
Trials	1,36	115.60	4.02	.053	-2.03
Failures	1,36	5.63	0.27	.605	0.67
ERROR WITHIN					
Latency	36	560.27			
Trials	36	28.77			
Failures	36	20.64			

Table 4: Immunization Contrasts

Source	d.f.	m.s.	F	p	weights
INES-AS					
Multivar	3,43	-----	4.81	.006	----
Latency	1,45	2633.93	4.78	.034	1.00
Trials	1,45	322.58	11.92	.001	-1.74
Failures	1,45	64.98	3.07	.086	-0.04
INES-AD					
Multivar	3,43	-----	1.66	.190	----
Latency	1,45	1170.63	2.12	.152	-3.26
Trials	1,45	56.33	2.07	.157	1.04
Failures	1,45	67.50	3.19	.081	3.10
INES-LS					
Multivar	3,43	-----	0.08	.967	----
Latency	1,45	37.05	0.07	.797	2.78
Trials	1,45	4.82	0.18	.675	-2.00
Failures	1,45	1.35	0.63	.802	-1.57
INES-LD					
Multivar	3,43	-----	1.43	.248	----
Latency	1,45	163.88	0.30	.588	2.70
Trials	1,45	54.45	2.01	.163	-2.20
Failures	1,45	4.05	0.19	.664	-1.06
WITHIN ERROR					
Latency	45	551.38			
Trials	45	27.07			
Failures	45	21.14			

Significance levels are defined by .05/4 = .0125 per comparison.

Appendix B: Literature Review

Literature Review

The learned helplessness literature has grown out of research on the behavior of organisms exposed to uncontrollable outcomes. A brief examination of the learning relationship represented by conditions of uncontrollability will provide a context for later discussion of the learned helplessness model. Seligman, Maier, and Solomon (1971) have distinguished three basic learning situations. In the first, reinforcement is made contingent upon the emission of a response, and an organism learns to emit the response in the presence of an appropriate stimulus. In the second, an organism learns that a previously reinforced response will no longer produce reinforcement, and extinction occurs. Both of these situations involve consistent reinforcement contingencies, and allow an organism to modify its behavior in accordance with the demands of its environment. Appropriate behavior is impossible in the third learning situation. Here, reinforcement occurs independently of an organism's responding. Seligman (1974) has defined this situation as one in which, "The conditional probability of reinforcement, given a specific response, does not differ from the conditional probability of reinforcement in the absence of that response (p. 94)." When this relationship holds true for all of an organism's responses to a stimulus, the organism is in the situation of uncontrollability. The learned helplessness model suggests that an organism in this situation will learn that its responses are not instrumental in producing reinforcement, and that it will eventually make no responses.

Initial research investigated the effects of uncontrollable aversive stimulation. Overmier and Seligman (1967) and Seligman and Maier (1967) first applied the term learned helplessness to the interference with shuttlebox escape-avoidance learning found in dogs previously exposed to inescapable electric shock in a Pavlovian hammock. Overmier and Seligman found that mongrel dogs pretreated with inescapable shock in the hammock were significantly slower to learn to escape shock in the shuttlebox than dogs which had received no pretreatment. In subsequent research, Seligman and Maier demonstrated that the situation of uncontrollability, rather than exposure to shock alone, was responsible for this interference effect. A group of dogs which received inescapable shock in the hammock later showed profound performance deficits in the shuttlebox relative to groups which received yoked escapable shock in the hammock. Typically, dogs in the inescapable group passively accepted shock in the shuttlebox and failed to initiate escape responses. Moreover, if a dog did manage to escape or avoid shock on a given trial, the instrumental response did not recur with increasing frequency as it does in normal dogs.

It should be noted at this point that helplessness was a statistical effect in the above studies. That is, approximately two-thirds of the dogs given inescapable shock became helpless, while one-third responded normally. About five percent of "naive" dogs were helpless in the shuttlebox without any prior experience with inescapable shock. The significance of this finding will be discussed in the next section.

Most subsequent helplessness studies have employed the characteristic triadic design described above (i.e., a controllable outcome pretreatment group, an uncontrollable outcome pretreatment group, and a no-pretreatment control group). Overmier and Seligman's findings have been replicated with dogs (Overmier, 1968; Seligman & Groves, 1970; Seligman, Maier, & Geer, 1969), and the trans-species generality of the interference effect has been extended to cats (Thomas & Balter, Note 3), rats (Maier, Albin, & Testa, 1973; Seligman & Beagley, 1974; Seligman, Rosellini, & Kozak, 1975), mice (Braud, Wepman, & Russo, 1969; Wepman, 1972), and goldfish (Padilla, 1973; Padilla, Padilla, Ketterer, & Gialcone, 1970).

Several early attempts to produce learned helplessness in humans are difficult to interpret because of methodological shortcomings. Fosco and Geer (1971) and Hiroto (1974) confounded the factor of uncontrollability with the amount of aversive stimulation received by not yoking subjects in the escapable and inescapable trauma groups. Thornton and Jacobs (1971) overcame this difficulty with additional control groups, but did not demonstrate performance deficits in their inescapable shock group Subsequent studies, however, have replicated with humans the previous studies with animals, and the applicability of the learned helplessness model to humans seems well established (e.g., Hiroto & Seligman, 1975; Miller & Seligman, 1973, 1975; Sherrod & Downs, 1974).

The findings of the studies reported above provide support for the hypothesis that organisms can learn the relationship of response-reinforcement independence when exposed to uncontrollable outcomes. This hypothesis is the heart of the learned helplessness model, and leads to the prediction that response deficits will occur in different situations as a function of generalization. More formally stated, the learned helplessness model proposes that exposure to uncontrollable outcomes produces a perception or expectation of uncontrollability which interferes with response intiation and instrumental learning in new situations where contingent reinforcement is available (Seligman, 1975).

The helplessness model generates a number of interesting predictions which have received some empirical support.

Before proceeding to a discussion of these, however, it should be noted that the typical helplessness experiment essentially conforms to a transfer paradigm. Thus, the interference effect represents a behavior deficit (passivity) developed in a situation of noncontingent reinforcement, which transfers to and is maintained inappropriately in a situation where contingent reinforcement is available. Although such transfer effects have been shown to be very persistent (Seligman & Maier, 1967), they are eventually replaced by different patterns of responding which are more appropriate. Much of the research in learned helplessness has explored the variables controlling this transfer in order to learn how such behavior deficits may be broken up or avoided altogether.

Predictions of the Helplessness Model

Since helplessness is conceived as the inappropriate transfer of the expectation of uncontrollability, one implication of the learned helplessness model is that forcible exposure to the new escape-avoidance contingency should weaken this expectation. Such exposure would amount to discrimination training, and should enable an organism to learn to distinguish between, and respond differentially to, conditions of controllability and uncontrollability. Thus, the process of inappropriate generalization could be broken up, and helpless behavior in controllable situations would more rapidly be replaced by normal escape-avoidance behavior.

This reasoning was supported by Seligman, Maier, and Geer (1968), who forcibly dragged dogs from side to side in a shuttlebox after helplessness training in the hammock. The animals were in this manner clearly exposed to the new escape contingency. After 20, 35, and 50 such forcible exposures, the helpless dogs began to escape and avoid normally, even after the barrier was replaced. The "cure" was complete and lasting. This behavior contrasted markedly with that of helpless dogs which received no such exposure. Untreated animals typically accepted shock for several hundred trials before learning to escape and avoid. In another study, Thornton and Powell (1974) found that actual exposure to the new contingency was not necessary for the discrimination to be learned. Thornton and Powell instructed human subjects after helplessness training that they would be able to control shock in the next task, and found that these subjects had the shortest response latencies of all groups. Thus, it appears that, while laboratory induced helplessness can be very persistent, under the proper conditions it can easily be brought under discriminative control.

A second hypothesis that can be derived from the learned helplessness model is that, "initial experience with control over trauma should interfere with forming the expectation that responding and shock termination are independent, just as not being able to control shock interferes with learning that responding produces relief (Seligman, 1975, p.57)." This is known as the "immunization" hypothesis. Phrased differently, this hypothesis suggests that a prior history of control will cause an organism to be more persistent when confronted with uncontrollability, and to respond appropriately more readily when controllability is reestablished.

In support of this hypothesis, Seligman and Maier (1967) found that dogs which received controllable shock in a shuttlebox, followed by uncontrollable shock in a Pavlovian hammock, were not helpless when they again received controllable shock in the shuttlebox. Moreover, the dogs with a history of control in the shuttlebox were nearly four times more active in ineffective panel pressing in the hammock than dogs which had received no immunization treatment. Seligman (1975) has suggested that this increased activity probably represented the attempts of the dogs to control shock.

Extending these findings, Seligman, Marques, and Radford (Note 2) found that deficits were prevented in dogs which received both immunization and helplessness training in the hammock when they were subsequently tested with controllable shock in the shuttlebox. The immunization effect has also been demonstrated with laboratory rats (Seligman, Rosellini, & Kozak, 1975) and with wild rats (Richter, 1957). Other investigators,hhowever, have failed to demonstrate this effect. Wepman (Note 4) found deficits in rats which had received immunization training, and Thornton and Powell (1974) reported helplessness in immunized human subjects. No studies have yet reported successful immunization procedures using humans.

The immunization studies reported above are difficult to interpret because they have employed several different types of experimental tasks, administered in a variety of combinations of experimental settings. For example, Seligman, Rosellini, and Kozak (1975) administered immunization, helplessness training, and testing to rats in a single setting (their cages), but required a different response in testing (lever pressing) than was reinforced in immunization training (jumping). Wepman (Note 4) also reinforced different responses in immunization and testing (swimming and jumping), but in his study immunization, helplessness training, and testing occured in three different situations (a water maze, a cage, and a shuttlebox). The studies by Seligman and Maier (1967) and Seligman, Marques, and Radford (Note 2) have already been outlined. Each of these immunization procedures varied one or more factors while holding others constant. Due to the unsystematic nature of this research, it is nearly impossible to determine which factors, or combination of factors, are related to the observation of the immunization effect. In addition, no parametric studies of immunization have been conducted, and no evidence concerning the importance of the intensity and/or duration of immunization training is available. Thus, it is difficult to determine why immunization was produced in some studies but not in others. Further research in this area must manipulate and control these factors in order to clarify their significance.

The immunization paradigm described above has usually been discussed in terms of the transfer of an initially developed expectation of controllability to subsequent training sessions (e.g., Seligman, 1975). Whereas the inappropriate generalization of passive behavior is the hallmark of learned helplessness (cf. Roth & Bootzin, 1974), the procedures described above used to alleviate and prevent helplessness would seem to constitute a form of differential discrimination training. This view of immunization proposes that the alternating conditions of controllability and uncontrollability would provide an organism with information concerning the stimulus dimension(s) relevant to reinforcement in each condition. The organism could thus learn to respond differently in each condition, and its behavior would be brought under stimulus control.

The distinction between nondifferential and differential discrimination training made in the stimulus control literature is relevant to this discussion. In nondifferential training, an organism is presented with a particular stimulus and is reinforced for responding appropriately in the presence of that stimulus. In differential training a procedure of contrasts is used, where several stimuli are presented alternately, and responding is reinforced in the presence of a particular stimulus but not in the presence of other stimuli. It is a well established finding that nondifferential training produces weak stimulus control and relatively broad stimulus generalization, whereas differential training increases the control of the training stimulus and reduces generalization to other stimuli (see review by Terrace, 1966).

In attempting to explain the different results of these types of training, Thomas (1970) has suggested that differential training might have the general effect of establishing the validity of external stimuli as signifying events of importance to the welfare of the organism. Nondifferential training, on the other hand, might serve to teach the organism the insignificance of external stimuli, and/or the futility of behaving differentially in their presence. Thus organisms would be expected to respond more selectively to stimuli after the former type of training than after the latter. If learned helplessness training is considered as a type of nondifferential training in which no responses to the stimulus of the experimental setting are reinforced, one would expect "helpless" behavior to generalize to stimuli not involved in initial training. In fact, this is what appears to occur. The combination of immunization and learned helplessness training, however, presents the organism with differentially reinforced stimulus situations, and provides an opportunity for differential responses to develop. This training brings "helpless" behavior under stimulus control, and reduces its generalization to subsequent testing situations where reinforcement is available. Thus, in this view, the immunization effect described by Seligman and Maier (1967) is interpreted as the product of discrimination training rather than as the transfer of an expectation of controllability.

Some evidence in support of this view comes from the studies on immunization reported above, and from a study by Maier (1972). Maier alleviated learned helplessness in rats previously exposed to uncontrollable shock by giving them experience in controlling shock. He then reestablished the condition of uncontrollable shock, and found that helpless behavior quickly reappeared. Maier suggested that this recurrence represented the profound effects of initial helplessness training (i.e., was a transfer effect), but an equally plausible explanation is that the rats had begun to discriminate between conditions of controllable and uncontrollable shock, and had learned to respond to each differently. Further research alternating these conditions several times is required to determine if this view is tenable.

The foregoing discussion has been primarily concerned with providing a description of the learned helplessness model, and the associated data. It has been suggested that the basic learning processes of generalization and discrimination underlie and establish the limits of helpless behavior. In the following section, the studies which have examined these processes in more detail will be discussed. Both generalization and discrimination are necessarily mediated by various types of cues. Although specific cues are often difficult, and sometimes impossible, to determine, an examination of the literature should provide some general information about the types of cues which are relevant to learned helplessness.

Factors in the Generalization of Learned Helplessness

Since uncontrollability is a fairly universal experience, albeit an infrequent one, why is helplessness not similarly universal? Seligman (1975, p.60) suggests that at least three factors may limit an expectation of uncontrollability: (1) immunization by a contrary expectancy, (2) immunization by discriminative control, and (3) the relative significance of the task outcomes. Each of these factors will be discussed in turn.

Contrary Expectancies.

It was suggested above that immunization through prior exposure to controllability may be a form of discrimination training. That is, while expectations will undoubtedly transfer from an initial experience and affect performance in a subsequent one, repeated exposure to different contingencies will probably produce different response patterns. Immunization studies thus far have only examined the early stages of this process, namely, the transfer effects.

The expectations and response patterns an organism brings to a novel situation will be determined by its developmental history. If an organism has a history of control, it will attempt to exercise control initially in a new setting regardless of the contingencies in force. Similarly, a history of inability to control will produce initial helplessness in a novel situation. Such historical variables may account for the fact that only two-thirds of the mongrel dogs in the Overmier and Seligman (1967) study became helpless after exposure to uncontrollable shock, while the remaining one-third responded normally. The "normal" dogs may have experienced more pre-experimental control than "helpless" dogs, and therefore were less susceptible to the effects of uncontrollability.

Seligman and Groves (1970) tested this hypothesis by raising dogs singly in laboratory cages under conditions designed to minimize controllable experiences. Upon testing, the cage-reared dogs proved to be more susceptible to helplessness than dogs of unknown history. Thus, it appears that developmental factors do affect an organism's response to uncontrollability.

An important implication of this finding is that research subjects, particularly humans with complex histories, probably cannot justifiably be regarded as "naive." Subjects' responses to controllability and uncontrollability in the experimental setting will probably already be under discriminative control, mediated by cues which have been relevant in previous experience.

Discriminative Control

Discriminative control provides a second limitation on the generality of learned helplessness. This occurs when an organism is provided with cues which signal the probability of response contingent reinforcement. Generally discriminative control is dependent on procedures involving differential reinforcement. The cues which mediate the generalization of learned helplessness, and establish its limits, have not yet been systematically examined by research. The studies which are relevant to this issue have explored the importance of three general types of cues: (1) those relating to the similarity/dissimilarity of the tasks employed (i.e., the types of responses required), (2) those relating to the nature of the controllable and uncontrollable outcomes (i.e., the type of aversive stimulation used), and (3) those relating to the the experimental setting(s) in which the tasks are administered.

The effect of task and outcome similarity upon the generality of learned helplessness was examined by Hiroto and Seligman (1975). Hiroto and Seligman pretreated human subjects either with escapable, inescapable, or control aversive tones in an instrumental escape-avoidance task, or with soluble, insoluble, or control discrimination problems in a cognitive task. In testing, subjects were presented with either an escapable noise instrumental problem (shuttlebox), or a set of soluble cognitive problems (anagrams). Subjects in the inescapable and insoluble conditions of each of the four combinations of pretreatment and test tasks showed deficits in test performance relative to escapable, soluble, and control subjects. It appears from this study that "helplessness" will generalize across different task and outcome modalities, at least within the same experimental setting. Other investigators have replicated Hiroto and Seligman's findings using one of more of their pretreatment-test combinations (e.g., Gatchel, Paulus, & Maples, 1975; Klein, Morse, & Seligman, 1975; Miller & Seligman, 1975).

Several limitations of the Hiroto and Seligman (1975) study should be mentioned. First, the cognitive and instrumental tasks used to demonstrate "cross-modal" helplessness were both essentially problem solving tasks. As Wortman and Brehm (1975) noted, this fact must qualify the breadth of the generalization claimed by the investigators. Second, both the pretreatment and test tasks were administered in the same setting, and were clearly perceived by subjects as a part of the same experiment (Hiroto & Seligman, 1975). This procedure is not analogous to the animal helplessness research, where such task situations as the hammock and the shuttlebox are relatively free of contextual association. Roth and Bootzin (1974) have argued that it is essential in human helplessness research for the training and testing situations to be clearly different and perceived as unrelated if the parallel with the animal paradigm is to be maintained.

The importance of the cues relating to the experimental setting in mediating the generality of learned helplessness was demonstrated by Eckelman and Hartsough (Note 1). In this study, some subjects signed up for a single experiment, while others signed up for what were perceived as two separate and unrelated experiments. Both groups were given the cognitive pretreatment and test tasks used by Hiroto and Seligman (1975). For both groups, pretreatment and testing were separated by 24 hours, but for the second group testing took place in what was perceived as a different experiment. Insoluble pretreatment subjects tested in the same setting as pretreatment showed the performance deficits associated by Hiroto and Seligman (1975) with learned helplessness, whereas the soluble, insoluble, and control subjects tested in a setting different from pretreatment showed no differences in performance. These results are consistent with those of Roth and Bootzin (1974), who employed a similar manipulation and found no "helplessness" in the second setting. Unfortunately, the Roth and Bootzin study did not include a same-setting comparison group, and it is impossible to determine whether the helplessness induction procedures used were effective.

Further evidence of the importance of situational cues in establishing discriminative control over learned helplessness comes from a study with school children by Dweck and Reppucci (1973). These investigators found that when a teacher who had presented pupils with unsolvable problems presented solvable problems, the children failed to solve them, even though they were able to solve the same problems if they were presented by different teachers. It is apparent that future research must systematically examine the conditions under which helplessness will generalize across settings and those under which it will not.

<u>The Relative Significance of Task Outcomes</u>

A third limitation upon the generality of learned helplessness is provided by the relative significance of the pretreatment and test situations. Two dimensions along which task significance can be examined are: (1) the amount or intensity of uncontrollable aversive stimulation received, and (2) the importance assigned to the pretreatment task. These two factors have been related empirically in a study by Roth and Kubal (1975). These investigators administered varying amounts of noncontingent reinforcement to human subjects in task situations differing in perceived "importance." Importance was manipulated by presenting the training task either as a good predictor of academic success in college, or as a puzzle. Testing was conducted with different problems in a separate situation, presented as a different experiment (as in Roth & Bootzin, 1974). The results showed that performance was facilitated in insoluble subjects in the condition of low task importance and low amount of noncontingent reinforcement, while helplessness was present in the high task importance/high amount of noncontingent reinforcement condition.

In addition to demonstrating the joint role of task importance and amount of training in mediating learned helplessness, the Roth and Kubal (1975) study also reflected the interaction of these factors with setting-related cues. Subjects in the high task importance/high amount of training condition showed deficits when tested in a different setting. A study by Sherrod and Downs (1974), in which effects similar to "helplessness" were observed in a second setting following an experience designed to produce frustration, is consistent with Roth and Kubal's findings. These results contrast with those of Roth and Bootzin (1974) and Eckelman and Hartsough (Note 1), who did not manipulate the variables of task importance and amount of training, and did not observe performance deficits upon testing in a second setting. It seems likely that these variables interact with situational cues in determining how far helplessness will generalize. Because of the obvious complexity invclved, no study has yet attempted to vary all of these factors systematically.