Effects of Unpredictability and Uncontrollability in the Induction of Learned Helplessness

by

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A Thesis Submitted to the Faculty of Graduate Studies in Partial Fulfillment of the Requirements for the Degree of Master of Arts.

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Abstract

Research has demonstrated that exposure to uncontrollable events results in learned helplessness, i.e., a decrease in voluntary responding, interference in learning adaptive behaviors, and affective depression. Although uncontrollability has been considered both necessary and sufficient to produce helplessness, research suggests that predictability in an uncontrollable situation may be sufficient to prevent helplessness. The present study examined the effects of the presence or absence of perceived control and predictability of a loud noise with a 2 x 2 independent-groups design. Two control groups, comprised of noise-exposure and no-noise subjects were added to the design. Subjects who received either uncontrollable or unpredictable noise, or simple noise exposure, showed performance decrements relative to a no-noise group, whereas subjects who were able to control or predict the noise did not. Uncontrollability was found to be a more powerful determinant of helplessness than was unpredictability. Thus, either the perception of control or predictability of the aversive event was sufficient to prevent helplessness, while simple exposure to the noise produced deficits in performance. There were no differences among the groups in attributional style. These results suggest the need for further modifications to the theory of learned helplessness.

Effects of Unpredictability and Uncontrollability in the Induction of Learned Helplessness

The study of laboratory analogues of psychopathology has a long history, beginning with Pavlov's (1927) report of the demonstration of "experimental neurosis" in laboratory animals. Pavlov's dogs were required to make increasingly fine discriminations between a circle and an ellipse. As the ellipse became more circular and the discriminations became correspondingly more difficult, many of the animals demonstrated uncharacteristic behaviors. Some of the animals became passive and withdrawn, while others showed signs of excessive autonomic arousal, involving restless, agitated behavior. The affected animals lost the ability to perform previously learned behaviors, and the ability to learn new tasks was impaired.

About 40 years later, a series of experiments implicated the role of uncontrollable events in psychopathological processes. The initial studies exposed animals to inescapable shock (e.g., Overmier & Seligman, 1967). When the animals were later tested for acquisition of escape behavior in a two-way shuttle box, approximately two-thirds of them failed to learn the response. Later, other effects associated with inescapable shock were observed. These included less shock-elicited aggression, decreased interest in sex and food, weight loss and loss of position in the dominance hierarchy (Maier, Anderson & Lieberman, 1972; Miller & Weiss, 1969; Seligman, 1975). The development of these behaviors was believed to reflect common learning processes, namely learning to perceive that outcomes were independent of responding, and generalizing the expectation of non-contingency to a subsequent setting where a contingency between responding and outcome does exist. The result has come to be labeled learned helplessness. The identifying features of helplessness include a decrease in voluntary responding, interference in learning adaptive behaviors, and affective depression.

Similar effects to those observed in animals were demonstrated in human subjects by Hiroto (1974). Subjects were exposed to an uncontrollable aversive event (a loud noise) and again, approximately two-thirds of them failed to learn an escape or avoidance response in a later task.

Maier and Seligman (1976) summarized the human and animal data and proposed the learned helplessness theory to account for the debilitating effect of learning that outcomes are uncontrollable. In the original formulation of this theory, the organism must have information concerning the contingency between a response and an outcome, and must develop the expectation that responding and outcomes are independent. The organism will then exhibit helpless behavior characterized by a decrease in the probability of voluntary responding, difficulty in learning that subsequent responding produces a contingent outcome, and affective depression.

Responding to the criticism that this theory was not adequate to explain the complexity of human helplessness, Abramson, Seligman and Teasdale (1978) reformulated the theory based on a revision of attribution theory. In their version of attribution theory, a human subject attributes the perceived non-contingency between responses and outcomes to a cause which may be stable or unstable, global or specific, and internal or external. The expectation of future helplessness and the effect on self-esteem are influenced by the attributions made.

Stability refers to factors which are recurrent and long-lived, such as ability, or intermittent and short-lived, such as luck. Global factors occur over a broad range of situations such as achievement situations, while specific factors occur only in specific situations, such as mathematics class. Internal factors are those attributable to one's self, such as effort, while external factors are those attributed outside the self, such as an impossible task. Each of the three factors is believed to be orthogonal to the others; an attribution may be stable, global and internal all at once, such as the belief that one's lack of ability occurs in all aspects of one's life.

Another important step in the development of helpless behavior is the expectation of future non-contingency. An individual develops an expectation which will determine whether or not he or she will demonstrate helpless behavior. Only when there is an expectation of non-contingency between responses and outcomes in the future will helpless behavior be exhibited.

The authors hypothesized that people who are predisposed to make global and internal attributions about the causes of negative outcomes are also prone to become depressed. The reformulated model was later extended by Seligman, Abramson, Semmel and von Baeyer (1979), who argued that a predisposition to make unstable, specific and external attributions about the causes of positive outcomes may also cause depression.

Some evidence to support these models of depression can be found in a recent study by Seligman et al (1979). College students completed the Beck Depression Inventory (BDI; Beck, 1967) and an Attributional Style Scale which assessed their attributions about the causes for various positive and negative events. Scores on the BDI were found to be positively correlated with the subjects' stable, global and internal attributions for negative outcomes, and negatively correlated with their stable and internal, but not global attributions for positive outcomes.

Three experimental studies have compared causal attributions of depressed and non-depressed college students after induced success and failure experiences (Klein, Fencil-Morse, and Seligman, 1976; Kuiper, 1978; Rizley, 1978). None of these studies assessed the global-specific dimension, and none found significant differences on the stable-unstable dimension. All studies found that depressed students, relative to non-depressed students, rated internal factors as more important causes of failure; and only one study (Rizley, 1978) found that depressed students, relative to non-depressed students, rated external factors as more important causes of success.

Harvey (1981) criticized previous research on the basis of artificial and structured measures, such as the Attributional Style Scale. He advocated the use of personally important events in the assessment of attributional style. He surveyed 91 depressed and non-depressed female college students for descriptions of important negative and positive personal events, explanations of their causes, and ratings of the importance of the causes. Three blind judges independently coded the causes as internal or external, recurrent or transient, global or specific, and controllable or uncontrollable. Reliability for the global dimension was low, and thus this dimension was not analyzed. The results partially supported the reformulated model, in that predicted differences between depressed and non-depressed students' attributions were found only for the internal dimension of causal attributions, and not for the stable dimension.

Golin, Sweeney and Shaeffer (1981) suggested that previous correlational research did not provide evidence that attributions play a causal role in depression, or conversely, that depression causes a particular attributional style. The authors attempted to assess the causality of attributions in depression with a cross-lagged panel correlation analysis, which does not demonstrate causality in the same way as true experiments in which the effects of spuriousness are experimentally controlled; however, such an analysis can serve as an indicator of temporal precedence. This research involved giving a test battery which included the BDI and an attributional style questionnaire to 180 college students on two occasions separated by one month. Statistical analysis supported the hypothesis that stability and globality attributions for negative outcomes might be causes of depression. No support was found for the hypothesis that internal attributions for negative events cause depression. Evidence was uncovered that unstable attributions for positive outcomes may function as a cause of depression. However, the measures of attributional style, particularly for the internality dimension, were quite low in internal consistency. In addition, the statistical methods employed are of low power for detecting differences. It should be noted that the correlations between attributions and depression obtained in this study were small, possibly due to restricting the sample to a normal, non-clinical population. Once again, this statistical procedure is an exploratory approach for testing interesting hypotheses, and should be viewed as suggestive of temporal precedence and not as proof of causation.

Predictability

Predictability refers to the correlation between two stimuli, such that a conditioned stimulus (CS) which occurs immediately prior to an unconditioned stimulus (US) is perceived as correlated with the unconditioned stimulus. A situation is unpredictable when the CS is lacking or unsystematically correlated with the US. In an operant conditioning paradigm, the correlated stimuli for positive outcomes would be the discriminative stimulus and the reinforcer; for negative outcomes, these stimuli would be the conditioned aversive stimulus and the punisher. As an example, an aversive event, such as a loud noise, is said to be predictable if a prior stimulus, such as a light, consistently occurs before the onset of the aversive event.

Although it is commonly assumed that individuals prefer a warning signal when faced with impending harm, research findings with human subjects are equivocal. For example, Badia, Culbertson and Harsh (1974) found a majority of subjects chose longer or stronger signalled shock over shorter or weaker unsignalled shock, while Furedy (1975) found little or no preference for warning signals. Averill and Rosenn (1972) found that 75% of subjects who could avoid medium- or high-intensity shock preferred to listen for a warning signal, and showed less psychophysiological stress, as indicated by galvanic skin response and heart rate measures, than subjects who adopted a non-vigilant coping strategy. Averill, O'Brian and DeWitt (1976) explored the influence of response effectiveness on the preference for warning signals by giving subjects a choice between listening for a warning or listening to music during trials in which the effectiveness of the available avoidance response (pushing a button to avoid shock) varied between 100%, 66%, 33% or 0% effective in preventing shock. Results indicated that when the avoidance response was not at all effective, 65% of the subjects preferred not to listen for the warning. As response effectiveness increased, an increasing number of subjects chose to listen for the warning and showed less stress relative to subjects who chose to listen to music.

In many previous learned helplessness studies, the roles of predictability and controllability have been confounded. Controllability refers to the correlation between response and outcome, whereas predictability refers to the correlation between two stimuli, the CS and the US. It is not logically possible to manipulate these two factors completely independently, since controllable events involve a certain amount of predictability, at least over the offset of the event. However, according to Miller (1979), predictability and controllability can be kept methodologically distinct by providing an explicit signal or external cue. For example, a warning light which consistently occurs immediately before a loud noise, serves as an external cue, becoming a CS which correlates with the US, the loud noise. In this example, the noise is predictable;

it is not controllable unless the subject is able to make some response which will avoid or terminate the noise.

The separation of predictability and controllability occurs outside the laboratory as well. For example, an individual with a head cold can exert some control through medication, diet and rest, but cannot predict when he or she will recover. This person may perceive some degree of control, but little predictability over the course of the illness. There are many situations in which an individual would perceive predictability, but little controllability. Prison inmates, religious converts, and military personnel relinquish much control over their lives, but the orderly predictability involved may serve to mitigate the development of helpless behavior in these individuals.

Predictability and Learned Helplessness

Seligman (1975) speculated that predictability could play a theoretically important role in learned helplessness, but only in situations resulting in fear or anxiety. Although he has proposed that predictability of aversive events provides the organism with information about when the aversive event will not occur, thus reducing stress during "safe" periods of time, he argues that uncontrollability is both a necessary and a sufficient condition to cause learned helplessness. Glass and Singer (1972) and Lefcourt (1973) propose that either uncontrollability or unpredictability results in the perception of a lack of control, so that either factor would cause learned helplessness.

A theory which supports Seligman's conclusion, expounded by

Miller (1979), states that "A person who has control over an aversive event insures having a lower maximum danger than a person without control. This is because a person with control attributes the cause of relief to a stable internal source--his own response--whereas a person without control attributes relief to a less stable more external source." (p. 294). This theory predicts no difference in the effects of controllability due to the presence or absence of predictability because the subject's own response is a more stable guarantee of future minimized danger than are external signals.

Lubow, Rosenblatt and Weiner (1981) argued that the perception of uncontrollability through response-outcome independence may not be a necessary condition to produce learned helplessness. They propose that the necessary condition is the lack of contingency between a repeatedly presented target event and any other event in the environment, and that the occurrence of any event which is reliably correlated with the target event will prevent this lack of contingency. Thus, when a subject is given the opportunity to respond to the aversive event, either by terminating it or by making any other response, even an ineffective one, no subsequent deficit should be found. This conclusion was confirmed by subjecting groups of subjects to a learned helplessness induction procedure which included three groups given escapable noise, inescapable noise, and no treatment, and two further groups given inescapable noise with the opportunity to make an ineffective response, or signal lights which were illuminated immediately following tone offset. They found that these latter two conditions were sufficient to prevent learned helplessness deficits in the performance of a task similar to the induction task.

However, the authors failed to demonstrate the generalization of these results to a different type of task, possibly due to the use of Hebrew anagrams. They suggest that this task was too easy for their Israeli subjects, with a mean solution time 33% faster than Hiroto and Seligman's (1975) American subjects who solved English anagrams. They feel that their anagram test was not sufficiently sensitive to detect otherwise reliable group differences.

The authors concluded that a lack of controllability is a sufficient but not a necessary condition for learned helplessness. These findings suggest that perception of predictability of uncontrollable contingencies, by means of providing an explicit stimulus which reliably correlates with the target event, may serve to prevent the occurrence of learned helplessness. This provides subjects with a contingency among events, which the authors suggest may be a more general variable of which controllability is simply one aspect. Predictability may also involve a contingency between the target event and a prior stimulus, rather than a subsequent stimulus as used in their research.

Recent research has attempted to investigate the roles of predictability and controllability in the induction of learned helplessness. Prindaville and Stein (1978) attempted to compare predictability with unpredictability without the use of an explicit signal, by using a fixed versus variable ratio schedule of feedback to subjects. However, since they exposed subjects to either predictable and controllable success, or unpredictable and controllable success prior to conditions of helplessness, they have provided some information regarding the proactive effects of predictability, but they have not extricated the functions of predictability and controllability. In order to do this, it is necessary to utilize a 2 x 2 factorial design in which subjects are exposed to events involving the presence or absence of controllability and/or predictability during the induction of learned helplessness.

Predictability and Attributions

The effects of uncontrollability on attributions for helplessness, as hypothesized by the reformulated model, have been demonstrated by research which has provided some support for the model (Harvey, 1981; Rizley, 1978; Seligman et al., 1979). However, these studies confounded controllability with predictability. No research has yet effectively separated controllability and predictability, nor investigated the separate effects of these factors on attributions for learned helplessness.

Research Design

The major focus of the present study was an attempt to separate the effects of controllability and predictability in the induction of learned helplessness. In addition, we explored the effects of these variables in creating causal attributions for helplessness.

Control was achieved by an extension of Maier and Seligman's (1976) original triadic design. This design involved: (a) a group given contingent, controllable outcomes to their responses, (b) a group yoked to the previous group, experiencing the same amount of favorable and unfavorable outcomes, except that outcomes were not contingent on the subject's response, and (c) an untreated control group. For the present study, groups (a) and (b) were split in half. One half was given the additional condition of predictability, via a stimulus which signalled the onset of an aversive event; the second half was not given this stimulus, so that onset of the aversive event was unpredictable.

All subjects were then given a task to measure the transfer effects of the treatment. An untreated control group was not given the induction procedure, but instead was asked to passively listen to the noise. A second control group was given neither noise nor exposure to the induction procedure, but simply measured on their performance of the transfer task. In the original triadic design, the comparison between the contingent and non-contingent groups (groups a and b) allowed measurement of the effects of uncontrollability separately from the effects of the experience of an aversive event, which was constant for both groups. For the present study, the effects of uncontrollability were measured by combining both groups having controllable outcomes and comparing them with both groups having uncontrollable outcomes. Similary, the effects of predictability were measured by combining both groups having predictable outcomes and comparing them with both groups having unpredictable outcomes. This design also allowed the measurement of the effect of each factor under conditions where the other is either available or lacking, to determine if learned helplessness is the result of the interaction of these factors or if either one alone is sufficient.

Controllability was manipulated by providing subjects with feedback regarding the accuracy of their problem-solving which was correlated or uncorrelated with the occurrence of an aversive noise which occurred on 50% of the problem-solving trials, in random order.

As suggested by Miller (1979), predictability can be manipulated by providing an external cue or conditioned aversive stimulus which signals the occurrence of an aversive event. As an example, Dweck and Repucci (1973) provided subjects with predictability by having solvable problems administered by a "success" experimenter, while unsolvable problems were administered by a "failure" experimenter. In the present study, the predictability stimulus was the display of a card printed "NOISE TRIAL".

Since this research was experimental, rather than correlational, it was possible to determine if helplessness caused a particular attributional style. As suggested by Harvey (1981), subjects were asked to make attributions for their performance, rather than just to give their reactions to hypothetical situations; thus, measurement of attributions was conceivably more personal, sensitive, and accurate.

Hypotheses

1. Uncontrollability is hypothesized to result in learned helplessness (Seligman, 1975; Miller, 1979).

2. Unpredictability is expected to result in learned helplessness (Glass & Singer, 1972; Lefcourt, 1973). Alternately, unpredictability may not produce helplessness (Seligman, 1975; Miller, 1979).

3. If unpredictability does produce deficits, then both factors together should produce a greater degree of helplessness than either factor alone. Thus an interaction between unpredictability and uncontrollability is expected, with greater effects of uncontrollability occurring under unpredictable than predictable conditions.

4. According to the reformulated model of learned helplessness (Abramson et al., 1978), subjects who perceive a lack of control of an aversive event are expected to make attributions for their performance which are more internal, stable and global than their counterparts who are unable to perceive control over outcome.

5. Those subjects who are unable to predict uncontrollable outcomes through an external cue will make attributions for failure which are more internal, stable and global than their counterparts who are able to predict failure. A rationale for this hypothesis may be provided by Lefcourt's (1973) proposal than unpredictability results in a perception of a lack of control, so that either uncontrollability or unpredictability may result in learned helplessnesss. In either case, the attributions should be similar.

From a logical perspective, the occurrence of a specific warning signal should cause the subject to perceive the subsequent event as external, rather than due to internal causation. The predictable nature of the noise presentation should lead the subject to anticipate "safe" and "unsafe" time periods, and thus to perceive the events as unstable, rather than stable. The explicit nature of the warning signal should cause the subject to perceive the events as specific to this particular task, rather than as global.

Method

Subjects

Fifty-four male and 66 female introductory psychology students served as subjects in order to fulfill a course requirement. All subjects were screened in advance to restrict participation to subjects who scored less than 9 on the Beck Depression Inventory (Beck, 1967). Previous research (e.g., Klein & Seligman, 1976; Miller & Seligman, 1973) has used this cut-off score to define non-depressed college students. It was believed that employing only non-depressed subjects was consistent with the purposes of the research, which was not directed at examining differences between depressed and non-depressed subjects.

One subject refused to participate because of exposure to the noise. A second subject was dropped after the induction procedure, after expressing suspicions about the manipulation. Both subjects were randomly replaced.

Apparatus

A Heathkit audio generator (Model 1G-72) was used to generate an aversive tone of 4000 Hz, presented at 90 dB through a set of stereo earphones. The aversive stimulus, intended to be irritating but not painful, was comparable to that used in previous learned helplessness research (e.g., Hiroto & Seligman, 1975).

The helplessness induction task consisted of items 7 to 36 from Set II of the Standard Progressive Matrices (Raven, 1962), a complex multiple choice pattern-completion task, presented individually on 8 x 11 in. cards. Item D1 was shown to subjects as a sample. The correct solution and the final alternative were removed from the eight available choices for each of the 30 items, leaving each item with a choice of six incorrect solutions, so that feedback to the subjects could be manipulated to influence subjects' perceptions of success, failure, and controllability of the task and thus of the noise. The problems were sufficiently complex so that only one subject expressed suspicion of the deception.

Procedure

All subjects were informed that they would be exposed to a "slightly unpleasant tone", were given a sample tone, and were offered a chance to refuse further participation. All subjects, with the exception of those in the no-noise control condition, were exposed to a total of 15 trials of a 90 dB tone of random duration, varying from 3 to 10 sec. A random noise duration was used in order to prevent the subjects' perceiving predictability over the offset of the noise.

Subjects were assigned at random to one of six groups of 20 subjects each, so that each group consisted of 11 females and 9 males. A no-treatment control group was asked to listen passively to the noise without working on the induction problems, and then proceeded to the anagram task. A no-noise control group was asked to do the anagram task without exposure to noise or to the induction task. This was done to assess the effects of exposure to the factors of controllability and predictability of the noise separately from the effects of exposure to noise alone.

All treatment groups were shown a sample problem and three 3 x 5 in. cards, on which were printed "CORRECT", and "NOISE TRIAL", respectively, and were given the following instructions:

> I am going to give you some problems like this one. Each problem is a pattern with one piece missing. You are to choose which of the six pieces you think most people would choose to complete the pattern, and tell me its number. I will give you feedback each time by pointing to these cards. From time to time the noise may come on; for some subjects, there may be a way to control the noise, and there may be a warning signal. Other subjects may not have these options.

All subjects were given the same 50% failure feedback in a fixed random pattern. The experimenter pointed to the appropriate feedback card after the subject's verbal response was given.

Four treatment groups were formed as follows:

a) A predictable-controllable group was given the perception of controllability by having all those responses given failure feedback followed by noise exposure, while no noise occurred after success feedback. Predictability was manipulated by the experimenter pointing to the "NOISE TRIAL" card just before the noise occurred.

b) An unpredictable-controllable group was given the perception of controllability as above, and unpredictability by the experimenter pointing to the "NOISE TRIAL" card after the noise began.

c) A predictable-uncontrollable group was given the perception of uncontrollability by having noise occur on 50% of success trials and 50% of failure trials, in random order, so that there was no correlation between noise occurrence and failure feedback. Predictability was manipulated as in group a.

d) An unpredictable-uncontrollable group was given the perception of uncontrollability as in grup c, and unpredictability as in group b.

After completion of this task, experimental subjects were asked to complete a post-test questionnaire including ratings of the aversiveness of the noise, perceived predictability and controllability of noise occurrence, and their attributions for their performance. They were asked to complete the Multiple Affect Adjective Check List (Zuckerman & Lubin, 1965), in order to measure the affective component of learned helplessness deficits.

At this point, all subjects, both treatment and control, were shown a sample anagram, and were asked to rate, on a scale from 1 to 20, their expectation of success on the transfer task. This task consisted of 20 solvable five-letter anagrams as used by Hiroto and Seligman (1975), printed on 3 x 5 in. cards. The anagrams were arranged in a constant pattern so that subjects could learn the fixed pattern. A stopwatch was used to record time to solution of each anagram; failure to solve was defined as a time greater than 100 sec; trials to criterion was defined as the subject's solving three consecutive items in less than 15 sec each. Subjects were given the Multiple Affect Adjective Check List a second time to assess changes in mood, and a final questionnaire to assess their knowledge of the anagram rule and to assess changes in attributions. Subjects were then debriefed and thanked for their participation in the study.

Results

Manipulation Checks

Subjects in the simple noise exposure control group and the experimental conditions were asked how aversive they experienced the noise to be (1 = not at all; 5 = a great deal). No significant group differences emerged for this variable, $F(4,95) = .28$, $p < .88$. Overall, subjects appeared to find the noise slightly aversive ($\bar{X} = 2.04$, S.D. = .88).

Subjects in the experimental conditions were asked to rate, on the same scale as above, the degree to which they had experienced control over the occurrence of the noise. A significant effect of controllability emerged, $t(78) = 7.91$, $p < .0001$. Subjects in the controllable conditions reported perceiving greater control ($\bar{X} = 3.30$, S.D. = 1.02) than did subjects in the uncontrollable conditions ($\bar{X} = 1.58$, S.D. = .93). Thus, controllability appeared to have been successfully manipulated.

Subjects were also asked to rate, on the same scale, the degree to which they felt the noise to be predictable. The perception of predictability did not differ between predictable and unpredictable groups, $t(78) = .71$, $p < .70$. For the groups having predictability, the mean perception of predictability was 2.65, S.D. was 1.61; while the groups having no predictability showed a mean rating of 2.50, S.D. was 1.32. This suggested that subjects did not accurately perceive the predictable or unpredictable nature of the noise presentation, despite the presence or absence of an explicit warning signal and instructions indicating that such a signal might be presented. Mean differences in the perception of predictability between the controllable ($\bar{X}$ = 3.75) and uncontrollable ($\bar{X}$ = 1.75) groups were noted, suggesting that subjects tended to perceive controllability as predictability. Although controllability and predictability were independent factors, subjects' perceptions of both factors were significantly correlated, $r(38) = .45$, $p<.01$.

All subjects were asked to predict how many of the 20 anagrams they thought they could successfully solve before attempting the anagram task. A significant effect was found for success expectancy, $F(5,114) = 2.53$, $p<.04$. Post-hoc group comparisons indicated that no-noise control subjects expected significantly better performance than subjects in each of the other groups ($p<.05$). Although mean values suggested a slight tendency for subjects with controllability and/or predictability to expect better performance than subjects lacking these factors, neither predictability nor controllability of the noise significantly affected subjects' expectation of success on the anagram task.

Comparison of All Six Groups (Experimental and Control)

Four experimental groups consisting of all combinations of controllable/uncontrollable and predictable/unpredictable noise exposure, and two control groups comprised of simple noise exposure and no-noise subjects were compared on anagram performance in a one-way multivariate analysis of variance. This analysis revealed significant differences among the groups on all three measures of anagram performance, $F(15,310) = 4.16$, $p<.0001$[1], with all three univariate F values reaching significance ($p<.001$).

Post-hoc contrasts using .95 Scheffe confidence bounds showed that: a) the two control groups were significantly different on all three measures, with the no-noise control group demonstrating better performance than the noise exposure control group; b) there was no significant difference in performance between the no-noise control group and either the controllable-predictable or the controllable-unpredictable group; and c) there was no significant difference in performance between the noise exposure control group and either the uncontrollable-predictable or the uncontrollable-unpredictable group.

Comparison of Experimental Groups

The four experimental groups were compared with a multivariate analysis of variance within a 2 (controllable-uncontrollable noise) x 2 (predictable-unpredictable noise) factorial design with both independent variables being between-subjects manipulations. This analysis, using three measures of anagram performance, three mood variables and six attribution measures revealed significant main effects for controllability and predictability, and a non-significant interaction effect. Table 1 presents the univariate $\underline{F}$ statistics and corresponding probability values of each of the twelve dependent variables, for each main effect and for the interaction. The measure which provided the best discrimination for both main effects was trials to criterion, while all three performance measures discriminated well between groups having controllability vs uncontrollability.

Insert Table 1 about here

Table 2 presents the means and standard deviations for each of the four experimental groups. The largest mean differences appear to be differences in trials to criterion scores between groups having controllability vs. uncontrollability. Table 3 presents the means and standard deviations for the mood variables. Mean differences were greatest for measures of depression and anxiety for both main effects, while hostility scores differ the least among the groups.

Insert Tables 2 and 3 about here

The analysis of the controllability effect revealed a significant multivariate F value, $F(12,65) = 3.16$, $p<.0014$[1]. Significant univariate F values were found for the number of trials to criterion, $F(3,76) = 20.88$, $p<.0001$, the number of failures, $F(3,76) = 9.58$, and depressive mood, $F(3,76) = 5.38$, $p<.02$. Uncontrollable-noise subjects, relative to controllable-noise subjects, showed poorer performance on all three measures for the anagram task and reported greater feelings of depression (see Tables 1 and 2). These results support Hypothesis 1, in that uncontrollability was found to produce deficits in performance and to create depressed affect.

In order to assess the magnitude of the controllability effect, an estimate of omega squared was calculated for the trials to criterion variable. This variable was selected because it had the highest univariate F value, suggesting that it provided the best discrimination for this effect. This value was found to be .20, indicating that this variable had low to moderate power to discriminate between groups with and without controllability.

A significant multivariate *F* effect was also found for predictability, $F(12,65) = 2.75$, $p<.005$[1]. The best discriminator variable for this effect was trials to criterion, $F(3,76) = 6.92$, $p<.01$. There was a tendency toward differences in self-reported anxiety, $F(3,76) = 3.11$, $p<.08$. Other variables, including most of the attribution measures, were less effective in discriminating between predictable and unpredictable conditions. Unpredictable-noise subjects, relative to predictable-noise subjects, showed poorer anagram performance and reported feeling more anxiety (see Tables 2 and 3). These results tend to support Glass and Singer's (1972) and Lefcourt's (1973) prediction, as outlined in Hypothesis 2, i.e., that a lack of predictability would result in learned helplessness, since unpredictability was found to produce deficits in performance.

In order to assess the magnitude of the predictability effect, an estimate of omega squared was calculated for the trials to criterion variable. This value was found to be .07, indicating that this dependent variable was less powerful in discriminating between subjects with and without predictability than it was for discriminating between controllable and uncontrollable conditions.

Hypothesis 3 predicted greater effects of uncontrollability occurring under unpredictable rather than predictable conditions. This interactive effect failed to reach significance, $F(12,65) = 1.71$, $p<.08$[1]; thus this hypothesis was not supported.

<u>Attributions</u>

Table 4 presents the means and standard deviations for the attribution measures. None of the attribution measures was found to discriminate between groups differing in either controllability or predictability; therefore no support was found for either Hypothesis 4 or 5 predicting differences in attributional style due to differences in these factors.

An interesting finding was a univariate F value of $F(3,76) = 9.77$, $p<.01$ for the specific dimension within the overall non-significant multivariate interaction effect. Considering the lack of a significant overall interaction effect, and the failure of this variable to contribute to the discriminations made by other variables in the significant main effects, this particular finding must be considered to be an artifact.

Insert Table 4 about here

Pre-test vs Post-test Measures

Table 5 presents the intercorrelations between pre-test and post-test measures of the three mood variables and the six attributions. The purpose of this analysis was to assess the changes in these measures from post-induction to completion of the anagram task in order to examine the duration of the helplessness effect and its susceptibility to the experience of a controllable, predictable task. Of the three moods, only anxiety showed a moderate intercorrelation, while measures of depression and hostility were essentially uncorrelated. Subjects who were initially anxious tended to remain anxious, $r(78) = .286$, $p<.01$, while initial feelings of depression and/or hostility tended to dissipate after subjects completed the anagram task. All six attribution measures were moderately correlated, with correlations ranging from $r(78) = .278$, $p<.05$ for the internal dimension to $r(78) = .492$, $p<.01$ for the unstable dimension, indicating that attributions tended to change little from post-induction to completion of the anagram task.

Insert Table 5 about here

Discussion

The present results suggest that the perception of control over aversive events and predictability of these events are both involved in the determination of learned helplessness. Subjects who experienced aversive events that were either controllable or predictable failed to display performance deficits characteristic of helpless subjects. The fact that no significant interactive effect was found suggests that both factors act independently of each other, and that either predictability in an uncontrollable situation, or controllability in an unpredictable situation may be sufficient to mitigate the development of learned helplessness.

Differences in the relative magnitude of the main effects indicate that, in some circumstances at least, lack of control is a more powerful determinant of helpless behavior than is lack of predictability. Past research has not typically presented measures of magnitude of learned helplessness effects; however, the present effects were of small to moderate size. The small size of the predictability effect might be due to the fact that predictability was not accurately perceived by the subjects, but was perceived as controllability. These results suggest, as does Lefcourt (1974), that predictability is effective because it leads to the perception of controllability. Future research is necessary, involving a more salient predictability signal and more precise instructions which lead subjects to attend to this signal, in order to determine the mechanism by which predictability is effective in preventing helplessness.

The demonstration of predictability and controllability effects in the present research, coupled with findings in previous research, suggest that a lack of control may be a sufficient, but not a necessary cause of learned helplessness effects. A more general model, suggested by Lubow et al. (1981), proposes that learned helplessness effects are caused by a lack of correlation of an aversive event with any other event in the environment. This provides adequate explanation for the demonstration of learned helplessness deficits under different conditions of non-contingency of the aversive event: a) with the response, which constitutes uncontrollability; b) with a warning signal, which constitutes unpredictability, and c) with any other event, when no such event is available. The effect of the unavailability of any contingent event was demonstrated by Lubow et al. (1981) and again here, by the demonstration of learned helplessness deficits in the control group given exposure to the noise without working on the induction task, relative to the no-noise control group and the groups given the perception of controllability and/or predictability of the noise during the induction procedure.

The role of attributional style, as either cause and/or effect in learned helplessness remains to be clarified. The failure of the present research to demonstrate attribution effects may be due to methodological complexity or to errors in the model. In the research, experimental subjects were given two tasks to perform simultaneously: a) to solve each pattern-completion item; and b) to find a means of controlling and/or predicting the noise. Subjects were expected to make attributions about their performance on the latter task, but it is possible that attributions were made about their performance on the former task or some combination of both tasks. Since the experimental conditions were designed so that all subjects experienced the same 50% degree of failure on the former task, this could have caused a levelling effect on the attributions made by all subjects, despite the differences in finding a means to control and/or predict the noise.

Regardless of the confusion created by experimental complexity, there is other evidence in the present research to cast some doubt on the validity of attribution theory in accounting for helplessness. A greater degree of variability was found in subjects lacking either controllability or predictability, relative to subjects having either or both factors, which confirms previous findings that some subjects appear to be less vulnerable than others to learned helplessness manipulations. These differences do not appear to be explained by differences in attributional style. Since the noise-exposure control group demonstrated a degree of helplessness and an increase in variability similar to groups lacking controllability, and these subjects had no performance about which to make attributions, some other variable or variables must be responsible for the differences in individual susceptility. Recent research has attempted to explore the role of other variables in accounting for these differences. For example, Lavelle, Metalsky and Coyne (1979) found learned helplessness deficits in subjects who were high, but not low, in test anxiety.

Another variable which may play a role in determining susceptibility to learned helplessness is performance expectancy; subjects who expect a high degree of success due to differential past histories, may be more susceptible than those who expect less. In the present research, measurement of success expectation was for performance on the transfer task, rather than for performance on the induction task. Since all subjects did equally well on the induction task, this may have caused a levelling effect in which all experimental subjects, relative to the no-noise control subjects, expected poorer performance on the subsequent task. Further research examining initial performance expectancies is necessary to determine if subjects who expect better performance are more susceptible to learned helplessness than those who expect less.

Just as the lack of control appears to be a specific instance of a more general, inclusive model, attribution theory might prove to be a specific instance of a simpler model, involving differences in self-evaluative tendencies, which would continue to operate in the absence of performance. One such possible concept is the "self-efficacy mechanism" (Bandura, 1982). Self-percepts of efficacy have been found to influence performance and emotional arousal. It is believed that depressive reactions often arise from stringent standards of self-evaluation, and that people experience anxiety when they perceive themselves ill-equipped to manage potentially injurious events.

Attribution theory is further complicated since it equates learned helplessness with depression, and it is bidirectional in that attributional style is believed to be both a cause and an effect of depression. The difference between learned helplessness and depression may be a "state-trait" difference, since subjects who developed helplessness and reported depressed affect after the induction procedure, no longer reported feeling depressed after completing the anagram task; victims of chronic depression are much less labile in mood. Depression may be a result of repeated helplessness experiences. Further research is necessary to determine if attribution theory plays a role in depression and/or learned helplessness, and to determine if attributional style is a cause and/or effect of depression. If certain attributional styles prove to be a result, but not a cause of helplessness or depression, then depression must be due to environmental changes.

In order to clarify attribution theory, future research should involve the isolation of mediating or intervening variables. As suggested previously, performance expectancies, individual standards of self-evaluation, and self-percepts of efficacy may be considered as likely candidates.

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Appendix A

Attribution Questionnaire and Manipulation Checks

Please answer the following questions according to this code:

not at all--1

a little--2

somewhat--3

considerable--4

a great deal--5

How much was your performance on the task you have just completed affected by:

the difficulty of the task. 1 2 3 4 5

your effort. 1 2 3 4 5

your problem-solving ability. 1 2 3 4 5

luck. 1 2 3 4 5

doing any kind of puzzle or problem 1 2 3 4 5

this particular task. 1 2 3 4 5

How unpleasant was the noise? 1 2 3 4 5

How much control did you feel you had over the occurrence of the noise? 1 2 3 4 5

How well could you predict when the noise was about to come on? 1 2 3 4 5

If you could predict the noise, how? . . . .
. . . . 1 2 3 4 5

Appendix B

Final Questionnaire

Please answer the following questions according to this code:

not at all--1

a little--2

somewhat--3

considerable--4

a great deal--5

How much was your performance on the task you have just completed affected by:

the difficulty of the task..................................1 2 3 4 5

your effort...1 2 3 4 5

your problem-solving ability................................1 2 3 4 5

luck..1 2 3 4 5

doing any kind of puzzle or problem.........................1 2 3 4 5

this particular task...1 2 3 4 5

Were you able to find a principle which helped you to solve the anagrams?...Yes or No

If yes, what was this principle?.....................................

....

Note

1. F is based on Rao's approximation to Wilk's Lambda.

Table 1

Univariate Statistics

	Controllability		Predictability		Interaction	
	F	p	F	p	F	p
Performance						
Mean Latency	8.84	.004	.17	.68	.01	.95
Failures	9.58	.003	1.51	.22	.31	.58
Trials	20.88	.0001	6.92	.01	1.02	.32
Mood						
Depression	5.38	.02	2.29	.13	2.94	.09
Anxiety	.10	.76	3.11	.08	.01	.92
Hostility	2.64	.11	1.60	.21	.29	.59
Attributions						
External	.81	.37	1.27	.26	.11	.75
Internal	.09	.77	.09	.77	.01	.92
Unstable	.52	.47	3.09	.08	.01	.92
Stable	.28	.60	1.33	.25	.28	.60
Specific	.12	.73	.34	.56	9.77	.01
Global	.01	.91	.01	.91	.11	.75

Table 2

Means and Standard Deviations of Performance Variables

Group	No-noise Control	Control-Predict	Control-Unpredict	Uncontrol-Predict	Uncontrol-Unpredict	Noise Control
Mean Latency (sec)						
Mean	13.00	12.22	13.09	17.82	18.47	21.09
S.D.	5.75	6.19	6.62	10.27	9.24	7.63
Failures						
Mean	2.20	2.00	2.45	3.70	4.90	3.95
S.D.	2.07	2.43	2.58	3.45	3.39	2.39
Trials						
Mean	4.65	5.15	7.20	9.65	14.25	11.50
S.D.	2.41	3.42	4.92	6.44	7.10	6.79

Table 3

Means and Standard Deviations of Mood Variables

Group	Contollable-Predictable	Controllable-Unpredictable	Uncontrollable-Predictable	Uncontrollable-Unpredictable
Depression				
Mean	.10	.05	.25	1.05
S.D.	.31	.22	.55	2.11
Anxiety				
Mean	.30	.70	.35	.80
S.D.	.57	1.38	.67	1.40
Hostility				
Mean	0	.10	.15	.40
S.D.	0	.31	.37	1.14

Table 4

Means and Standard Deviations of Attributions

Group	Controllable-Predictable	Controllable-Unpredictable	Uncontrollable-Predictable	Uncontrollable-Unpredictable
External				
Mean	3.35	3.05	3.10	2.90
S.D.	.81	1.10	1.02	1.02
Internal				
Mean	3.30	3.35	3.20	3.30
S.D.	.86	1.23	1.20	1.26
Unstable				
Mean	2.10	2.50	2.25	2.70
S.D.	.85	1.05	1.12	1.26
Stable				
Mean	3.35	3.50	3.10	3.50
S.D.	.93	1.10	1.02	1.19
Specific				
Mean	3.40	2.85	2.65	3.45
S.D.	1.10	.88	.81	1.05
Global				
Mean	2.75	2.70	2.65	2.75
S.D.	.91	1.08	1.09	1.02

Table 5

Pre-test and Post-test Intercorrelations

	r
Moods	
Depression	.05
Anxiety	.286**
Hostility	.002
Attributions	
External	.357**
Internal	.278*
Unstable	.492**
Stable	.314**
Specific	.305**
Global	.427**

*$p < .05$.

**$p < .01$.