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# Depression and Learned Helplessness in Man

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Similarity of impairment in naturally occurring depression and laboratory-induced, learned helplessness was demonstrated in college students. Three groups each of depressed and nondepressed students were exposed to escapable, inescapable, or no noise. Then they were tested on a series of 20 patterned anagrams. Depressed – no noise subjects were much poorer at solving individual anagrams and seeing the pattern than nondepressed – no noise subjects. Inescapable noise produced parallel deficits in nondepressed subjects relative to escapable or no noise, but inescapable noise did not increase impairment in depressed subjects. These findings support the learned helplessness model of depression, which claims that a belief in independence between responding and reinforcement is central to the etiology, symptoms, and cure of reactive depression.

Overmier and Seligman (1967) and Seligman and Maier (1967) used the term *learned helplessness* to describe the interference with escape/avoidance learning produced in dogs by prior exposure to uncontrollable electric shock. A number of studies have demonstrated that learned helplessness can be produced in a variety of situations, with different types of uncontrollable, aversive events, and in a wide variety of species (see Seligman, 1975b for a comprehensive review of these studies). Seligman, Maier, and Solomon (1971) argued that the main behavioral symptoms of learned helplessness—deficits in response initiation and in associating reinforcement with responding—result from learning that reinforcement and responding are independent. Such learning is said to lower performance by reducing the incentive for instrumental responding, which results in lowered response initiation. In addition, learning that reinforcement and responding are independent interferes with learning that responses later control reinforcement.

Two research strategies have been used to study helplessness in humans. One strategy uses the learned helplessness paradigm to replicate the animal findings in man. Of the seven studies of this type, three have convincingly demonstrated learned helplessness in man (Hiroto, 1974; Hiroto & Seligman, 1975; Racinskas, Note 1), two yielded mixed results (Roth, 1973; Roth & Bootzin, 1974), and two seemed to produce learned helplessness, although they involve methodological departures from the paradigm, thus making interpretation difficult (Fosco & Geer, 1971; Thornton & Jacobs, 1971).

Seligman (1972, 1973, 1975a, 1975b) and Seligman, Klein, and Miller (in press) have claimed that learned helplessness is a laboratory model for naturally occurring depression in man, and the second research strategy concerns testing this claim. Studies of this type have looked for the behavioral symptoms of learned helplessness in depressed subjects (Miller & Seligman, 1973; Miller, Seligman, & Kurlander, Note 2).

The experiment reported here tests the learned helplessness model of depression by integrating these research strategies. Depressed and nondepressed college students first received escapable, inescapable, or no noise. Next, the subjects were faced with a test task that provided measures of response initiation and learning. The button-pressing pretreatment task and the anagrams test task of Hiroto

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and Seligman (1975) were used. In addition, the Multiple Affect Adjective Check List, Today Form (Zuckerman & Lubin, 1965), which indexes depression, anxiety, and hostility, was administered before and after the pretreatment. The learned helplessness model of depression predicts the following:

1. As found by Hiroto and Seligman with randomly selected college students, nondepressed subjects in the inescapable noise group should exhibit response initiation and learning deficits on anagrams relative to nondepressed subjects in the escapable noise group and no noise control group. So, nondepressed subjects in the inescapable noise group should (a) require more trials to learn the anagram pattern, (b) exhibit longer latencies in solving anagrams, (c) fail to solve more anagrams, and (d) require more consecutive anagram solutions before solving the pattern.

2. Untreated depressed subjects should exhibit response initiation and learning deficits relative to untreated nondepressed subjects, thereby mimicking the effects of uncontrollability. In addition, higher Beck Depression Inventory (Beck, 1967) scores, reflecting increasing depth of depression, should correlate with degree of impairment on the anagrams.

3. The learned helplessness model of depression does not make explicit predictions about the interaction of escapable and inescapable noise with depression. Intuitively, however, we might expect that depressed subjects would be highly susceptible to helplessness-inducing procedures. In addition, we might expect that experience controlling escapable noise would alleviate the effects of depression on anagram performance, although such "mastery" effects following exposure to escapable trauma have usually not been found in the learned helplessness literature.

## METHOD

### *Subjects*

Fifty-seven undergraduate students at the University of Pennsylvania were obtained through campus advertisements for a "noise pollution experiment." These 57 subjects were assigned to depressed and nondepressed groups on the basis of their scores on the Beck Depression Inventory. The mean Beck Depression Inventory score for college students, found by Miller and Seligman (1973), was used as the cutting score. Subjects with Beck Depression Inventory scores of 9 or above were assigned to the depressed group, whereas those with scores of 8 or lower were assigned to the nondepressed group. The subjects were then randomly assigned to the inescapable, escapable, or no noise pretreatments. Nine subjects (four nondepressed and five depressed) assigned to the escapable noise pretreatment were excluded from the final sample because they failed to learn how to escape the noise.[1] There were 23 males and 25 females in the final sample of 48. The means and standard deviations of the Beck Depression Inventory scores for the six groups are shown in Table 1.

TABLE 1

MEAN BECK DEPRESSION INVENTORY SCORES AND STANDARD DEVIATIONS

| Group | Depressed | | Nondepressed | |
|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* |
| Inescapable noise | 14.88 | 6.18 | 3.38 | 2.39 |
| Escapable noise | 13.88 | 3.52 | 2.88 | 2.48 |
| No noise | 15.00 | 4.81 | 3.38 | 1.92 |

*Note.* Each cell contains eight subjects.

### *Apparatus*

The pretreatment task consisted of a spring-loaded button in the center of a 12-inch (30.48-cm) circular base. Two 24-V dc lights were located symmetrically on each side of the button. The aversive stimulus was a 3,000-Hz, 90-db. tone produced by an Eico audio generator (Model 377). All decibels use as a reference 20 $\mu$ N/m$^2$. The tone was presented to the subjects through calibrated Grason-Stadler earphones (Model TDH-39). The circuitry and recording devices were contained in a room separated from the experimental room by a one-way mirror.

The anagram task devised by Hiroto and Seligman (1975) was used as the test task. This task consisted of 20 anagrams that were individually placed on file cards contained in a small, spiral notebook. Each of the 20 anagrams, which were selected from a list of five-letter anagrams (Tresselt & Mayzner, 1966), consisted of five letters arranged in a standard sequence of 3-4-2-5-1 (i.e., the first letter of the solution word was the fifth letter of the anagram; the second letter of the solution word was the third letter of the anagram; etc.).

### *Procedure*

The subjects were administered the Beck Depression Inventory and the Multiple Affect Adjective Check

[1] These nine subjects could not be included in the escapable noise group because they had, in effect, received inescapable noise. They could not be included in the inescapable noise group because they were not yoked to escapable noise subjects. The net result of this exclusion is that subjects in the escapable noise group only were selected for escape learning ability. The difficulty that this selection provides for interpretation of the results for this group is discussed later.

List, Today Form, and were then assigned to the appropriate subject group. Subjects in the two noise groups were first given a brief sample of the tone before being asked to continue. No subjects dropped out.

Subjects in the escapable noise group could escape the noise by pressing the button four times. Each subject in the inescapable noise group was yoked to an escapable noise subject for the duration of noise exposure. There were 50 trials with the unsignaled 90-db. tone, each trial 5 sec in duration, with an intertrial interval ranging from 10 to 25 sec (mean intertrial inverval was 14 sec). Subjects in the no noise group were asked to sit and wait while the experimenter adjusted the apparatus in the next room. The length of the waiting period was approximately the same as the time required for the 50 noise trials (mean of 20 min).

Subjects in the escapable and inescapable noise groups were given the following instructions:

> From time to time, a loud tone will come on for awhile. When the tone comes on, there is something you can do to stop it. There are two lights located on the base in front of you, 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 the noise has stopped automatically according to a preprogrammed schedule. Taking the earphones off and dismantling the apparatus in any way are not acceptable ways of stopping the noise.

Following the pretreatment or the waiting period for the no noise control group, the subjects were retested with the Multiple Affect Adjective Check List, Today Form. Before retesting with the check list, the subjects were told:

> This is the same as one of the questionnaires you filled out earlier. Your answers may or may not be the same as they were before—that is not important. The important thing is to check off all those adjectives that describe how you are feeling right now.

After retesting with the Multiple Affect Adjective Check List, all subjects were presented the anagrams. Although each of the 20 anagrams could be solved individually, the easiest method was to learn to use the standard letter sequence described above, and subjects were alerted to this by the instructions. The subjects were allowed 100 sec to solve each anagram; response latencies were measured with an electric timer. The subjects were given the following instructions:

> The next task is an anagrams task. As you know, anagrams are words with their letters scrambled, and your task is to unscramble the letters so that they form a word. When you think you know the word, tell me what it is, and I'll tell you if you're right or wrong. The anagrams are contained in this booklet. Now, there may be a pattern or principle by which you can solve the anagrams, but that is up to you to figure out. Do not open the booklet and do not turn any pages until you are told to do so.

The same three dependent measures used by Hiroto and Seligman (1975) were obtained from the anagrams task: (a) the mean response latency for the 20 anagrams, (b) the number of trials to criterion for solving the anagram pattern, defined as three successive trials with a response latency less than 15 sec, and (c) the number of failures to solve, defined as the number of trials with latencies of 100 sec. A fourth dependent measure, not used by Hiroto and Seligman, was also obtained— (d) the number of consecutive, successful anagram solutions that occurred prior to reaching criterion for learning the pattern. This additional measure was included because the number of trials needed to learn the anagram pattern is not independent of failures to solve anagrams; failure trials provide no information on the pattern.

Following the test phase, the subjects completed a postexperimental questionnaire, were debriefed, and were paid $2.

## RESULTS[2]

In general, the effects of inescapability and depression were as predicted: Both produced impairment of anagram solution. We will consider separately the results obtained for the pretreatment trials, the test trials, and the Multiple Affect Adjective Check List.

### *Pretreatment*

The following question was included in the postexperimental questionnaire to assess the effectiveness of the inescapability manipulation: "Did you feel at any time that no matter what you did, you could not solve the button-pressing task?" Subjects responded to this question on a 7-point scale with higher scores indicating a belief in insolvability. Both inescapable groups believed that no matter what they did, they could not solve the button-pressing task relative to the escapable noise groups. The mean ratings for depressed – inescapable and nondepressed – inescapable groups were 6.00 ($SD = 1.66$) and 6.13 ($SD = 1.05$), respectively, whereas the mean ratings for depressed – and nondepressed – escapable noise groups were 4.25 ($SD = 1.85$) and 1.88 ($SD = 1.97$), respectively.

A 2 (depressed versus nondepressed) $\times$ 2 (escapable versus inescapable noise) analysis of

[2] All tests are two-tailed.

variance conducted for this questionnaire item yielded a highly significant main effect due to noise pretreatment, $F(1, 28) = 22.59, p < .001$. The depression main effect was not significant.

Although the Depression × Noise Pretreatment interaction did not reach statistical significance, $F(1, 28) = 3.92, p < .1$, it should be noted that for these ratings, depressed subjects in the escapable noise group tended toward a greater belief in insolvability than nondepressed – escapable noise subjects. This questionnaire result matches the interesting finding that depressed subjects required significantly more trials than nondepressed subjects to learn how to escape the noise. Depressed subjects required a mean of 20.00 ($SD = 8.69$) trials to learn to escape the noise, whereas nondepressed subjects needed a mean of only 6.75 ($SD = 2.91$) trials. The difference between depressed – escapable and nondepressed – escapable noise groups was highly significant, $t(14) = 3.83, p < .002$. In addition, higher Beck Depression Inventory scores, which reflect more intense depression, were significantly correlated with greater number of trials to learn to escape the noise ($r = .67, p < .01$).

Subjects in the noise groups rated the aversiveness of the tone on a 7-point scale with higher ratings indicating greater aversiveness. The mean ratings for the depressed – and nondepressed – inescapable groups were 3.00 ($SD = 1.41$) and 4.00 ($SD = 1.26$), respectively, and the mean ratings for the depressed– and nondepressed – escapable noise groups were 3.50 ($SD = 1.12$) and 3.38 ($SD = 1.41$), respectively. A 2 (depressed versus nondepressed) × 2 (escapable versus inescapable noise) analysis of variance conducted for this aversiveness rating yielded no significant main effects or interaction. This finding should be noted in light of the speculation (e.g., Miller & Weiss, 1969) that uncontrollable events are more aversive than controllable events and that such a difference is responsible for learned helplessness effects.

### *Test Task*

Overall, the results confirmed the experimental predictions. The scores for the six groups on the four dependent measures obtained from the anagrams test task are presented in Figure 1.[3] We now consider the predictions in order.

*Prediction 1.* Nondepressed subjects in the inescapable noise group should (a) require more trials to learn the anagram pattern, (b) take longer to solve anagrams, (c) fail to solve more anagrams, and (d) require more consecutive anagram solutions before solving the pattern than nondepressed subjects in the escapable and no noise groups. As Figure 1 shows, the nondepressed subjects in the inescapable noise group performed more poorly on the anagrams task than the nondepressed subjects in the escapable and no noise groups.

Two orthogonal comparisons tested for the learned helplessness phenomenon in nondepressed subjects. The first of these comparisons contrasted nondepressed subjects in the inescapable noise group with those in the escapable and no noise groups. As predicted, the nondepressed – inescapable noise group needed significantly more trials to learn the anagram pattern, $F(1, 42) = 14.71, p < .001$, took significantly longer to solve anagrams, $F(1, 42) = 6.74, p < .05$, and required significantly more consecutive anagram solutions before learning the anagram pattern, $F(1, 38) = 8.66, p < .01$, than the nondepressed – escapable and no noise groups. For number of failures to solve anagrams, the difference between the nondepressed – inescapable noise group and the nondepressed – escapable and no noise groups was marginally significant, $F(1, 42) = 3.33, p < .1$.

The second orthogonal comparison contrasted the nondepressed – escapable and no noise groups. As expected, these two groups did not differ significantly on any of the anagram measures. Those findings parallel those of Hiroto and Seligman (1975).

*Prediction 2.* In the no noise control group, depressed subjects should (a) require more trials to learn the anagram pattern, (b) take

[3] The number of consecutive anagram solutions before seeing the pattern could be computed only for those subjects who actually learned the anagram pattern. Four subjects (two subjects in the depressed – no noise group and one subject in both the depressed– and nondepressed – inescapable noise groups) failed to reach the criterion for learning the pattern and were, therefore, excluded from analyses involving this measure.

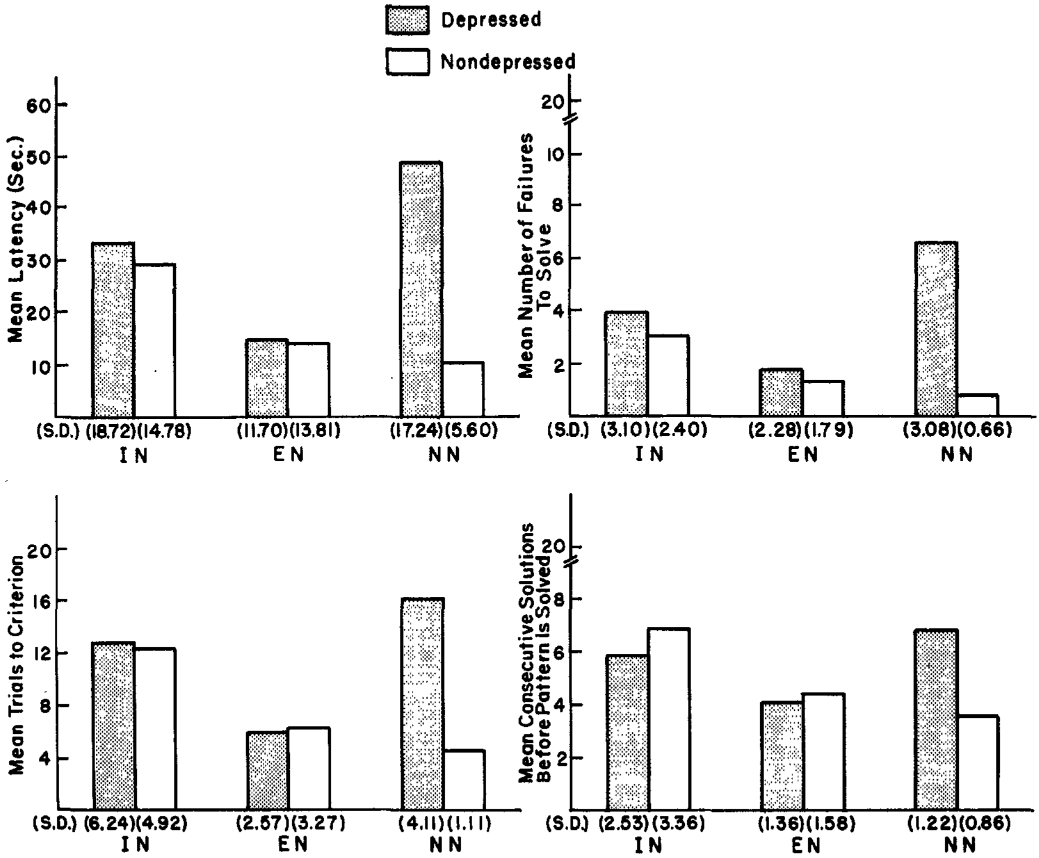


Figure 1. Means and standard deviations for the six groups on the four anagram measures. (Abbreviations: IN = inescapable noise, EN = escapable noise, NN = no noise.)

longer to solve anagrams, (c) fail to solve more anagrams, and (d) require more consecutive anagram solutions before solving the pattern than nondepressed subjects. As Figure 1 shows, depressed subjects performed more poorly on the anagrams task than nondepressed subjects within the no noise group. A planned, nonorthogonal comparison contrasted the depressed – and nondepressed – no noise groups. As predicted, the depressed – no noise group required significantly more trials to learn the anagram pattern $F(1, 42) = 28.17$, $p < .001$, showed significantly longer mean latency in solving anagrams, $F(1, 42) = 24.88$, $p < .001$, failed to solve significantly more anagrams, $F(1, 42) = 20.62$, $p < .001$, and required significantly more consecutive anagram solutions before solving the pattern, $F(1, 38) = 8.19$, $p < .01$.

Also, for the no noise group, higher Beck Depression Inventory scores, reflecting greater depth of depression, should be significantly correlated with more trials to learn the anagram pattern, longer latencies, more failures, and higher number of consecutive anagram solutions before solving the pattern. The prediction was confirmed: Increasing depth of depression was significantly correlated with increasingly poorer performance on the four anagram measures for subjects in the no noise group—for number of trials to learn the pattern, $r = .86$ ($p < .001$); for latency, $r = .69$ ($p < .01$); for number of failures, $r = .71$ ($p < .01$); and for number of consecutive anagram solutions before seeing the pattern, $r = .77$ ($p < .01$).

Overall, as expected by the model, naturally occurring depression mimicked the effects of inescapability on nondepressed subjects. On all measures, depressed – no noise subjects performed at least as poorly as nondepressed – inescapable noise subjects.

*Prediction 3.* As noted above, the learned helplessness model of depression does not make specific predictions concerning the interaction of escapable and inescapable noise with depression. Figure 1 shows that depressed – escapable noise subjects performed considerably better, and depressed – inescapable noise subjects performed slightly better, on the anagrams than depressed – no noise subjects. Two orthogonal comparisons assessed the effects of the pretreatments on depressed subjects' anagram performance. In contrast to the results for nondepressed subjects, the depressed – inescapable noise subjects did not differ significantly from the depressed – escapable and no noise subjects on any of the anagram measures. Comparison of the depressed – escapable and no noise groups indicated that the depressed – escapable noise group performed significantly better on the anagrams in terms of trials to learn the anagram pattern, $F(1, 42) = 22.38$, $p < .001$; mean latency, $F(1, 42) = 19.54$, $p < .001$; number of failures to solve, $F(1, 42) = 14.07$, $p < .001$; and number of consecutive anagram solutions before solving the pattern, $F(1, 38) = 5.84$, $p < .025$.

It was suggested that depressed subjects might be more sensitive than nondepressed subjects to helplessness-inducing procedures. This effect would be reflected in a significant Depression × Treatments interaction. Although the Depression × Treatments effect was significant for each dependent measure, the locus of this interaction effect is clearly due to the difference between depressed and nondepressed groups within the no noise condition. Depressed and nondepressed groups were highly similar on all four anagram measures in both the inescapable and escapable noise groups.

So, depression and inescapability were not additive. These results suggest that pretreatment with inescapable noise may have even resulted in somewhat *better* anagram performance for depressed subjects than no pretreatment at all. Closer examination reveals that the inescapable noise pretreatment did not affect all depressed subjects in the same way. There were two distinct effects that are obscured by the averaged data. The anagrams performance of six of the eight depressed – inescapable noise subjects was considerably poorer than the performance of nondepressed – inescapable noise subjects ($p < .05$), and was similar to the performance of the depressed – no noise subjects. The other two depressed – inescapable noise subjects were similar in solving anagrams to the nondepressed – no noise subjects. As will be seen, these two subjects were made *less* depressed by the pretreatment. Note, however, that even with the exclusion of these two depressed – inescapable noise subjects, the remaining six depressed – inescapable noise subjects did not perform more poorly on the anagrams than the depressed – no noise subjects.

Analysis of the effects of subjects' sex on anagram task performance indicated that females performed better than males. (Female undergraduates generally have higher verbal Scholastic Aptitude Test (SAT) scores than males at the University of Pennsylvania.) Depression × Treatments × Sex analyses of variance (unweighted means analyses) yielded significant main effects due to sex for the number of trials to learn the anagram pattern $F(1, 36) = 9.75$, $p < .004$; for mean latency $F(1, 36) = 7.29$, $p < .011$; and for number of failures to solve anagrams, $F(1, 36) = 6.69$, $p < .014$. Since analyses of variance did not yield significant interaction effects involving the sex factor, the analyses above were conducted for males and females combined. The results of separate tests of the experimental predictions for males and females revealed no points of disagreement with the results presented above.

### *Pretreatment and Mood*

The effect of the pretreatments on subjects' depression, anxiety, and hostility levels was assessed by administering the Multiple Affect Adjective Check List, Today Form, before and after the pretreatment. The before and after pretreatment scores are presented in Table 2; the change scores for each group are presented in Figure 2. The depressed groups

TABLE 2
MEAN MULTIPLE AFFECT ADJECTIVE CHECK LIST SCORES AND STANDARD DEVIATIONS

| Score | Inescapable noise | | Escapable noise | | No noise | |
|---|---|---|---|---|---|---|
| | Depressed | Nondepressed | Depressed | Nondepressed | Depressed | Nondepressed |
| Prior to pretreatment | | | | | | |
| Depression | 19.63 | 10.75 | 14.38 | 12.75 | 21.63 | 10.88 |
| | (8.75) | (4.20) | (7.80) | (4.89) | (7.93) | (5.25) |
| Anxiety | 10.88 | 5.88 | 6.88 | 7.13 | 9.63 | 7.38 |
| | (3.98) | (2.75) | (4.12) | (3.36) | (2.77) | (4.14) |
| Hostility | 10.63 | 5.88 | 6.00 | 8.38 | 9.63 | 6.25 |
| | (3.16) | (3.40) | (4.54) | (4.60) | (3.29) | (3.01) |
| After pretreatment | | | | | | |
| Depression | 19.38 | 14.13 | 16.38 | 13.88 | 21.63 | 10.88 |
| | (2.26) | (4.29) | (7.46) | (6.20) | (7.13) | (5.79) |
| Anxiety | 11.63 | 8.25 | 8.38 | 7.00 | 9.25 | 5.88 |
| | (3.11) | (2.87) | (3.50) | (3.85) | (3.24) | (2.42) |
| Hostility | 15.00 | 8.00 | 8.13 | 8.63 | 8.50 | 5.75 |
| | (4.04) | (3.59) | (3.31) | (4.78) | (3.59) | (3.50) |

*Note.* Standard deviations are in parentheses.

had, as expected, higher depression scores than the nondepressed groups.

The higher anxiety scores of the depressed groups are consistent with the finding of Miller et al. (Note 2) that virtually all depressed college students score above the mean on the IPAT Anxiety Scale Questionnaire (Scheier & Cattell, 1967). Depression × Treatments analyses of variance for initial mood level scores yielded significant depression main effects for the depression score, $F(1, 42) = 13.41, p < .001$, and the anxiety score $F(1, 42) = 5.13, p < .029$, whereas the depression main effect for the hostility score was marginally significant, $F(1, 42) = 3.18, p < .082$. No significant treatments main effects were found.

There was an unexpected, significant Depression × Treatments interaction for the initial hostility score, $F(2, 42) = 4.12, p < .024$. Depressed subjects had higher initial hostility scores than nondepressed subjects in the inescapable and no noise groups, whereas the reverse was found in the escapable noise group. This finding may be related to the fact that subjects in the escapable noise groups, unlike those in the other two groups, were not randomly selected. A relatively large number of depressed – and nondepressed – escapable noise subjects were excluded for failure to learn to escape. The Depression × Treatments interactions for initial depression and anxiety scores were not statistically significant.

The effects of pretreatment on mood level were examined by Depression × Treatments analyses of covariance conducted for the depression, anxiety, and hostility change scores, with the initial Multiple Affect Adjective Check List scores as covariates. Significant treatments main effects emerged for anxiety and hostility change scores, $F(2, 42) = 3.86$, $p < .05$, and $F(2, 42) = 12.20, p < .001$, respectively, but not for depression change score. Figure 2 indicates that pretreatment with inescapable noise resulted in relatively large increases in anxiety and hostility scores, but no pretreatment was followed by decreases in both hostility and anxiety scores.

Although the Depression × Treatments interaction for depression change score was not significant, inspection of Figure 2 suggests that the depression scores of depressed and nondepressed subjects were differentially affected by inescapable noise. Separate comparisons of depressed and nondepressed subjects indicate that for nondepressed subjects the depression change score was significantly higher in the inescapable noise condition that in the no noise condition, $t(14) = 3.16, p < .007$. For depressed subjects, the depression change scores in the inescapable and no noise conditions were not significantly different. Recall that two of the eight depressed – inescapable noise subjects were similar to the nondepressed — no noise subjects in solving anagrams. Both of these subjects told the experimenter at the end of the experiment that they had decided early in the experiment that it had been rigged so that they could not escape the noise and that this had made them angry. Both of these subjects showed, as a result of the pretreatment, large decreases in Multiple Affect Adjective Check List depression scores. (These subjects also exhibited small decreases in anxiety scores and moderate increases in hostility scores.) The remaining six depressed – inescapable noise subjects showed increases in depression similar to those of the nondepressed – inescapable noise subjects.

Finally, the only significant depression main effect was for hostility change scores, $F(1, 42) = 4.62, p < .05$. Nondepressed subjects showed smaller increases in hostility scores as a result of the pretreatment than did depressed subjects.

## DISCUSSION

These results support the learned helplessness model of depression by showing parallel effects of depression and helplessness. In addition, they provide a further demonstration of learned helplessness in man. For nondepressed subjects, pretreatment with inescapable noise resulted in impairment of anagram solving, whereas pretreatment with escapable noise had no significant effect on anagram performance. These results replicate the finding of cross-modal helplessness reported by Hiroto and Seligman (1975) for college students randomly selected as to depression.

If learned helplessness is a valid model of depression, then nonpretreated depressed and nondepressed subjects should differ from each other in the same way and on the same tasks that differentiate nondepressed subjects pretreated with inescapable noise vs no noise. This is, of course, precisely what was found. In the no noise group, depressed subjects were much poorer at solving anagrams than nondepressed subjects. In fact, on three of the four anagram measures, depressed – no noise subjects tended to do worse than nondepressed – inescapable noise subjects. In addition, the more depressed subjects in the noise condition were, the poorer was their performance on the anagrams.

Because inescapability and depression similarly impair learning the anagram *pattern*, it

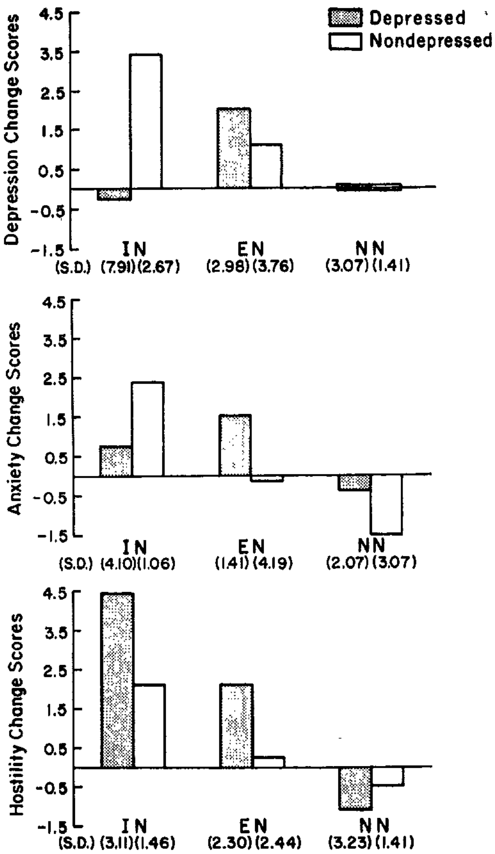


FIGURE 2. Mean depression, anxiety, and hostility change scores and standard deviations for the six groups. (Abbreviations: In = inescapable noise, EN = escapable noise, NN = no noise.)

seems that depressed and inescapable noise subjects need more information before they see the pattern than nondepressed – escapable and no noise subjects. Hiroto and Seligman (1975) designed the anagrams task as a measure of both response initiation deficits and "negative cognitive set," that is, deficits in associating reinforcement with responding. Response initiation deficits (e.g., of mental juxtaposition of letters or memory scan of similar words) were believed to be reflected in longer latencies and more failures to solve, whereas negative cognitive set presumably resulted in more trials to see the anagram pattern. Note, however, that deficits on all three anagram measures can be viewed as a result of either motivational interference or cognitive interference, or both.

The additional measure used here, number of consecutive solutions before perceiving the pattern, seems to more clearly reflect the operation of some sort of fundamental cognitive interference rather than motivational deficit. It could be argued, of course, that depressed and inescapable noise subjects' deficit in seeing the pattern was due to slowness of responding, not to a need for more information, because, by definition, reaching "criterion" for seeing the pattern required short latency anagram solutions. However, observation of subjects' performance suggests that slowness of responding was not the critical factor. No subject gradually decreased his response latency to the point of reaching criterion for pattern solving during a consecutive series of anagram solutions. "Insight" into the solution uniformly consisted of relatively long latency responses (15 to 90 seconds) followed by an immediate decrease to very short latency responses (about 1 to 4 seconds).

Although there is nothing in the present findings that would allow us to decide between cognitive and motivational explanations for deficits in anagram performance, observations of the subjects as they worked on the anagrams task suggest that negative cognitive set may be the primary factor. Depressed – no noise subjects and subjects in the inescapable noise groups clearly seemed to be attempting to solve the anagrams on the first few trials. These subjects looked like people trying very hard to solve a difficult problem, and they looked concerned when they failed. After the first few anagram failures, however, depressed – no noise subjects and inescapable noise subjects showed decreased concern over their poor performance. Some of these subjects appeared to have given up entirely after the initial trials.

These observations suggest that initially the depressed – no noise subjects and inescapable noise subjects are adequately motivated. It may be that the initial poor performance is due to some sort of cognitive interference and that the resulting poor performance then leads to a motivational deficit, loosely termed "giving up." The issue of the relative importance of cognitive and motivational factors in the production of performance deficits in learned helplessness and depression is of great theoretical and practical importance (cf. Miller, 1975). Resolution of this issue awaits future research.

The findings for the escapable noise group require special attention. These results suggest that escapable noise has no effect on nondepressed subjects' performance but significantly improves depressed subjects' performance. However, the methodological confound of excluding subjects who failed to learn to escape makes any interpretation of the escapable noise group results difficult.

In an experiment similar to the present one, Miller (1974) changed the escapable noise pretreatment instructions in an attempt to reduce the number of escapable noise subjects who failed to escape. The instructional change had the intended effect. However, in contrast to the present results, Miller (1974) found that escapable noise did *not* break up the effects of depression on expectancy changes in a skill task. Whether escapable noise will similarly have no effect on the anagram performance of depressed subjects who are not selected for escape learning ability must await future research. However, there is clear evidence that both escapable noise and solvable problem pretreatments have no effect on the anagram performance of nondepressed subjects who are not selected for escape learning ability (Hiroto & Seligman 1975; Klein et al., Note 1).

The results for depressed subjects in the inescapable noise condition were unexpected. It is interesting that the two depressed – inescapable noise subjects who performed well on the anagrams showed large decreases in depression scores, exhibited moderate increases in hostility, and reported being angry at the experimenter. These results are consistent with the finding that instigation to anger is an effective means of breaking up depression (Taulbee & Wright, 1971). The fact that the other depressed – inescapable noise subjects did not perform more poorly on the anagrams than the depressed – no noise subjects may have been due to a floor effect.

Although the model under consideration specifically links learned helplessness with depression, it is not unreasonable to suspect that pretreatment with inescapable noise would result in increased anxiety and/or hostility in college students. The results for the Multiple

Affect Adjective Check List indicate that depression, anxiety, and hostility all increased as a result of the inescapable noise pretreatment. The finding that inescapable noise did not result in a significant increase in depression for depressed subjects was due to the large decreases in depression scores for the two subjects discussed previously.

One possible alternative explanation for the findings reported here is that subjects were responding to the demand characteristics of the experimental situation (Orne, 1962). However, this alternative seems unlikely because, in extensive debriefing, the subjects gave no evidence of having discovered the purpose of the study or what was predicted of them.

It might also be suggested that depressed subjects were of lower intelligence level than nondepressed subjects and that this difference accounts for the depressives' inferior anagram performance. However, this explanation cannot account for the difference in anagram performance of nondepressed – inescapable and no noise subjects. Finally, Miller et al. (Note 2) found no significant difference in Wechsler Adult Intelligence Scale (WAIS) Vocabulary scores of depressed and nondepressed college students.

In conclusion, we have found that nondepressed subjects given helplessness training exhibit an impairment in anagram performance parallel to that shown by depressed subjects given no pretreatment. In addition, we have replicated the finding of cross-modal helplessness in man. These findings provide additional support for the learned helplessness model of depression.

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