76-21,166

GAMPEL, Ezra Sion, 1950-
LEARNED HELPLESSNESS AND ITS POSITIVE ANALOGUE.

City University of New York, Ph.D., 1976
Psychology, experimental

Xerox University Microfilms, Ann Arbor, Michigan 48106

LEARNED HELPLESSNESS AND ITS POSITIVE ANALOGUE

by

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A dissertation submitted to the Graduate Faculty in Psychology in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York

1976

This manuscript has been read and accepted for the Graduate Faculty in Psychology in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

May 17, 1976
date

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ABSTRACT

LEARNED HELPLESSNESS AND ITS POSITIVE ANALOGUE

by

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Learned helplessness is the term used to describe the interference that occurs in an instrumental learning task following inescapable aversive stimulation in a pretreatment task. The contingency theories of Seligman, Maier and Solomon (1971) and Hiroto and Seligman (1975) have been advanced as explanations of this phenomenon.

A contingency analysis of the learned helplessness phenomenon does not concern itself with the valence of the reinforcer as an important variable, even though all previous human learned helplessness studies have dealt only with aversive stimuli. Contingency theorists focus on the contingency between the response and the consequence. Whenever no response yields any specific outcome reliably, learned helplessness will result in a later learning task with correct feedback. Contingency theory thus implies that if positive reinforcement is used in the pretreatment task, the positive analogue to learned helplessness should result. Contingency theorists differ on the question of the necessity for the same reinforcer to be present in the later task as was present in the earlier noncontingent pretreatment. Seligman, Maier and Solomon (1971) believed that reinforcer specificity was necessary for the learned helplessness effect to

appear, while Hiroto and Seligman later (1975) claimed that reinforcer specificity was unnecessary and the presence of a different reinforcer would have no effect upon the magnitude of the learned helplessness effect.

The above theoretical interpretations were tested in the present research. Human subjects were randomly assigned to treatment groups where they received either positive (the onset of a light or the saying of the word "right" by the experimenter) or negative feedback (the onset of a light or the saying of the word "wrong" by the experimenter) in either a contingent or noncontingent manner. An auditory signal detection task functioned as the pretreatment. In the second task, all subjects received an attribute learning task with a conjunctive rule with correct feedback. To test whether the learned helplessness effect was reinforcer specific, one-half of all the subjects received a different feedback stimulus in the second task from the one they received in the pretreatment.

The results obtained indicated that in accord with contingency theory predictions there was a learned helplessness effect with positive noncontingent reinforcement. In addition, Scheffe tests indicated that there was no effect on learned helplessness from the presence of a different feedback stimulus in the contingent task. These results are entirely in accord with Hiroto and Seligman's predictions.

ACKNOWLEDGEMENTS

Even though a Ph.D. degree is awarded to one individual, it is in truth a product of many individuals who gave unstintingly of themselves.

Professor William F. Oakes has molded me into the scientist that I now am, and in addition he has always been encouraging and generous with his time and ideas. He has my eternal thanks.

I am grateful to Professors Ellen J. Langer and Robert Thompson for their invaluable advice and support. Their work is manifested in the quality of this manuscript.

I would like to thank Professors Ian Macmahan and Thom Verhave for their critical reading of this manuscript.

My parents, in-laws, relatives and friends have, by their emotional support, given me the impetus to complete the Ph.D. degree.

My wife, Manette, has been my constant inspiration and guide. She has supported me through this difficult period and has assisted me in the initial stages of this research by helping me define the topic of this dissertation. To her, I dedicate this dissertation with my love.

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INTRODUCTION

The role of the contingency between the stimulus, the response and the consequence has become a field of investigation in the last few years. There are two types of contingency: Stimulus-outcome, where the probability of reinforcement is different following a conditioned stimulus (CS) than when the CS is absent, and response-outcome contingency, where the probability of reinforcement is different following a specific response than when that response is not made.

The need in learning theory for a concept of contingency in addition to the traditional contiguity notion is exemplified in an article by Rescorla (1966). He first trained his rats on an unsignalled Sidman avoidance task. The rats were then divided into three groups and given Pavlovian training with a tone CS and a shock as an unconditioned stimulus (US), according to three different schedules. Group one received the CS and US presentations on a random schedule. This schedule resulted in some chance CS-US pairings. Group two received forward conditioning with the CS and US paired explicitly, and group three received backward conditioning. The rats were then replaced in the Sidman avoidance task. When the tone was sounded, group one did not change in its rate of responding, group two increased its rate of responding, and group three decreased its rate of responding. The finding that points up the inadequacy of the contiguity notion is the result of group one. Since there were some chance CS-US pairings, contiguity theory would predict a significant increase in the subject's response rate. This was not found. The results of groups two and three show that the subject learned what the CS predicted and therefore either increased or decreased in response rate. For group two, where the CS was predictive of shock, there was an increase in the number of avoidance responses during and just after the presentation of the signal. For group three, where the CS was predictive of shock termination, there was a decrease in the rat's response rate during and just after the presentation of the signal.

Another piece of evidence pointing up the role of contingency came from an experiment by Rescorla and Skucy (1969). They found that delivering reinforcement not contingent upon a response was an effective extinction procedure. Rats were trained on a variable interval (VI) schedule and were then given reinforcement independent of their bar pressing behavior. This resulted in the extinction of the bar press response. Scheuer and Sutton (1973) showed that this procedure had profound effects upon reacquisition. Unlike most studies that have shown reacquisition to be faster than first learning (e.g., Pavlov, 1927), here many animals never reacquired the bar press response. Lattal (1974) found that as the percentage of free reinforcements vs. reinforcements worked-for increased, the rate of responding decreased. These studies showed that contingency needs to be considered in the learning process.

Stimulus-Outcome Contingency

Stimulus-outcome contingency has been a major focus of research, and several interesting phenomena have been found. If the stimulus does not predict a change in the consequence, "blocking" takes place (Kamin, 1969). In this paradigm, a rat is given Pavlovian training in which an arbitrary stimulus such as a white noise is paired with a shock. A second arbitrary stimulus such as a light is then paired with the white noise and is followed by the same level and duration of shock. Testing with the light alone shows that there is no conditioned emotional response (CER) to the light. This nonconditioning to the light, even though it has occurred contiguously with shock, is called blocking. Mackintosh (1973) further showed that not only does no CER occur but it is more difficult to condition this stimulus after the subject receives blocking training. For example, after pairing a noise with a shock, conditioning of the CER to the light alone was retarded.

If a stimulus is predictive of no consequence inhibition occurs. Because of this, Rescorla (1967) pointed out that the traditional control procedures used in learning research, where the CS is paired with no reinforcement, are invalid. He proposed that a truly random control procedure, where the CS and the US are independently programmed, should be used. There have been criticisms of this suggestion. Kremer (1971) taught rats to respond on a VI 2.5 minute schedule. He then placed them in a different operant chamber for Pavlovian training with a tone CS and a shock US. Group one (high density condition) received twenty presentations of the CS and twenty presentations of the US on two independently programmed random schedules. Group two (low density condition) received four presentations of the CS and four presentations of the US during each session on the truly random schedule. Kremer found that the rats in the high density condition showed a high level of suppression during CER testing, while those in the low density condition showed retardation in the development of the CER. In both cases there should have been no effect according to the Rescorla suggestion, since there was a zero correlation between the CS and the US. This problem has since been resolved. Kremer (1974) found that his earlier results were due to conditioning to what Kremer calls the static cues (background) in the Pavlovian training phase. When they were extinguished, there was no effect on the CER for either the high or low density rats, thus supporting Rescorla's suggestion.

If a CS and a US are presented non-contingently (i.e., correlated zero) prior to acquisition training, there is retardation of later learning involving that CS and that US. Mackintosh (1973) exposed pigeons to one of four pretreatments prior to giving autoshaping training. Group one received 40 presentations of the CS (illumination of the response key) and 40 presentations of the US (delivery of grain) on a random schedule. Group two received 40 presentations of the CS and none of the US. Group three received 40 presentations of the US and none of the CS. Group four was placed in the operant chamber but received no presentations of the CS or of the US. All _S_s were then given autoshaping training, where the CS was paired explicitly with the US. The random presentations pretreatment group, group one, pecked at a significantly slower rate than either of the other three groups. Mackintosh called this "learning to ignore stimuli." In a second experiment, Mackintosh showed that if the US was changed in the conditioning phase (from water to shock or vice versa) then there is no inhibition in learning. These are the most relevant findings concerning stimulus-coucome contingency.

Response-Consequence Contingency

The second area of research involving the role of contingency involves response-consequence contingency. One problem that has been studied is the effect of response-consequence noncontingency upon subsequent learning. The seminal work in this area was done by Seligman and Maier (1967) and Overmier and Seligman (1967). Seligman and Maier gave one group of dogs 64 unsignalled shocks in a Pavlovian hammock, which they could escape by pressing a panel in front of their head. Subjects in a second group, yoked to the first, were also given 64 unsignalled shocks, except that their shocks were inescapable. Twenty-four hours later the dogs were placed in a shuttle box and given ten trials of escape avoidance training, with a ten second CS-US interval. Of the dogs given inescapable shock, 75% failed to learn to escape shock-- as indicated by nine failures in ten trials. In contrast to that, all the subjects who had been able to escape by pressing the panel in the first phase learned the escape response in the shuttle box.

In a second experiment, Seligman and Maier found that giving dogs ten trials of escape-avoidance training prior to their receiving the inescapable shocks prevented the inescapable shocks from having the deleterious effect on later escape learning. Overmier and Seligman (1967) found that this effect was not dependent upon the number or duration of the shocks, nor was it due to any fortuitous pairing of a skeletal response with termination of the shock, since the effect also occurs under curare. This retardation of later escape avoidance learning resulting from the prior experience with inescapable shocks was termed "learned helplessness" by Overmier and Seligman. Interestingly, if there is only one session of inescapable shock, the effect wears off in 48 hours, whereas if two or more sessions of inescapable shock occur over a two week period, the effect lasts for a full week (Seligman and Groves, 1970; Seligman, Maier and Solomon, 1971).

With rats, learned helplessness was demonstrated both when the pretreatment and testing phases take place in the same stimulus situation and when they occur in different stimulus situations. Mowrer and Viek (1948) showed that there was a greater inhibition of eating if rats were given uncontrollable shock than if they were able to control it. All the rats were shocked ten seconds after eating a nibble of food. Group one was able to escape the shock by performing a jump-up response. Group two was unable to control shock termination. After the shock was terminated, both groups were able to eat freely for ten seconds before being shocked again. It was termed an inhibition if the rat did not eat during the ten second period. The group that could control shock showed only 1.6 inhibitions in ten trials while the uncontrollable shock group showed 8.5 inhibitions in ten trials.

In a different stimulus situation, Seligman and Beagley (1975) and Seligman, Rosellini and Kozak (1975) found that after a series of prior inescapable shocks rats did not learn an escape avoidance task where pressing a bar three times or a jump-up response was required.[1] All the results that have been previously mentioned with dogs were also replicated.

Learned Helplessness in Human Subjects

The learned helplessness effect has also been found with humans, although the first such study by Thornton and Jacobs (1971) did not yield clear cut results. In the pretreatment

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[1]With the bar pressing one need not appeal to learned helplessness as an explanation, since bar pressing is not a species specific defense reaction (Bolles, 1972).

phase, the subjects were divided into 8 groups. There were four shock contingency groups which were further subdivided according to whether they received a fixed or variable level of shock. The reason for the variable level of shock was to preclude any opportunity for the subject to attenuate the subjective intensity of the shock by flinching or tensing. Three of the four shock contingency groups were seated in front of a training apparatus and were told to press a button that corresponded to a stimulus light. Group one was able to avoid shock by responding within 0.5 seconds after the stimulus light onset. Group two was yoked to group one and was told that they would receive shocks independent of their performance. Group three received no shocks. Group four was not placed in front of a training apparatus but received inescapable shocks in a separate room. The subjects were then placed in the test phase. Here the subjects were presented with the same CS (light) which was followed 2.0 seconds later by a shock. All the subjects could escape or avoid the shock by pressing the button. Thornton and Jacobs (1971) found that for a variable level of shock, the subjects who received noncontingent shock responded slower than the group which received contingent shock. However, a fixed level of shock yielded no significant differences in responding. The reason for these inconsistent results may have been due to the yoked subjects being told in the pretreatment phase that the shock was noncontingent upon performance. No statement concerning the presence or absence of contingency was made in the test phase.

In the second experiment with human subjects, Hiroto (1974) presented one group of subjects with 30 unsignalled inescapable five second presentations of an aversive noise. A second group was able to escape the noise by pressing a button. Both groups were then taken to a different room where they were given 18 trials of escape avoidance training. On each trial they were able to escape an aversive tone by moving a lever from one end of a panel to the other (called a finger shuttle box). Of the inescapable pretreated subjects, 50% failed to learn the task, while 13% of those with prior escape training failed to learn it in 18 trials. Hiroto and Seligman (1975) showed that the retardation produced by an uncontrollable pretreatment generalized across test tasks of different modalities. Subjects had prior experiences with either the button pressing first task as in the Hiroto study cited above, or a discrimination learning task in which they were required to pick out the correct one from among 10 values. Experimental subjects were either unable to stop the noise or were given insoluble discriminations. In the testing phase each pretreated group was further subdivided. They received either the finger shuttle box or an anagram solution task. In this way four separate experiments were conducted. Learned helplessness effects were found on all four combinations of tasks. These experiments indicated that the presence of the same feedback stimulus in the test phase as in the pretreatment phase was not necessary for the occurrence of learned helplessness effects.

Dweck and Repucci (1973) had two experimenters give Wechsler Intelligence Scale for Children block design problems to children. One of them, the "success" experimenter, gave the children problems they could solve. The other experimenter, the "failure" experimenter, gave the children insoluble problems. The test phase consisted of the failure experimenter giving the children two problems similar to ones they had previously received from the success experimenter. The results showed that it took the children significantly longer to solve the problems given to them by the failure experimenter than it took them to solve the same problems when given to them by the success experimenter.

Roth and Bootzin (1974) found results contrary to those above. A group that received random feedback on a concept learning task showed more control behavior over an aversive event (the blurring of a screen on which the cards in a problem solving task were projected) than a group which had control. Subjects were told that they could leave the task as soon as they got 25 answers correct in a row. The blurring of a screen would prevent the subjects from solving the task. Control was exhibited if the subject stood up and went for the experimenter. This may not be the best possible dependent measure since it is conceivable that those who went for the experimenter were more frustrated or more interested in leaving the experimental situation. However, the subjects who received random reinforcement were slower at solving the problem, though not significantly so, but they went for the experimenter sooner.

In a pilot study, Gampel (Note 1) compared the effect of random feedback and being always wrong on an auditory siganl detection task upon a subsequent attribute learning problem. In the pretreatment, three groups of subjects were given an auditory signal detection task where feedback was delivered under three different conditions. Group one received true feedback concerning their performance. This phase continued until 40 errors were made. Group two received 40 trials of random feedback. On ten prearranged trials they were correct; on the other thirty they were wrong. Group three was given 40 trials in which the subject was told he was wrong on all trials. A fourth group did not receive the first phase. In the test phase, subjects were given an attribute learning problem with a conjunctive rule (see Haygood and Bourne, 1965). Groups one and four did significantly better than the all wrong and the random reinforcement groups, which did not differ from each other.

Theories of Learned Helplessness

Response Competition Hypothesis

Among the theories that have been offered as explanations of the learned helplessness phenomenon, there are two that will be considered here. The first is a response competition hypothesis, which holds that during inescapable shock training, unsuccessful escape from noise, or failure in discrimination learning, the subject learned an incompatible response that prevented him from learning in the escape avoidance situation. When the animal is placed in restraint in the Pavlovian hammock, it may have learned a "holding still" response, which would interfere with its later learning to escape. There is evidence to support this interpretation. Bracewell and Black (1974) gave rats inescapable shock either in a harness or in an operant chamber. They found that only the restrained animals were retarded in learning the subsequent shuttle box response. There was no effect of the inescapable shock in the "operant chamber". Anisman (1973) showed that prior shock exposure without restraint facilitated one-way and two-way shuttle box responding in the rat. However, shock in restraints resulted in the learning of the shuttle box response requiring more trials. It is important to note here that even though the rats showed retardation in learning due to restraint, they still learned to escape, unlike Seligman and Maier's dogs, who never learned to escape or avoid, under the experimental condition.

There is also, however, evidence that disputes the response competition hypothesis. Seligman et al. (1971) mentioned that even if their dogs did escape on some trials, they did not do so on the following ones. Seligman et al. concluded that a response competition hypothesis cannot explain this. Further, Maier (1970) gave one group of rats unavoidable and inescapable shocks. A yoked group was able to escape shock by inhibiting the head movements that are the normal concommitants of shock-- i.e., they learned to escape by performing a "holding still" response. In the escape avoidance phase the yoked group learned a shuttle box response slower than a non-pretreated control group, but they did learn to escape. In contrast to this, most of the inescapable shock rats did not learn the escape avoidance response.

A third problem with the response competition hypothesis is that all of the data supporting it have been obtained with rats responding in a shuttle box. Maier, Albin, and Testa (1973) suggest that the reason for a facilitation or no effect that is found in the shuttle box is due to the fact that rats do not show a learning curve in a shuttle box task, since the rats' behavior in this case is a species specific defense reaction (Bolles, 1972). Running is part of the animal's natural defense repertory and this behavior is promptly acquired. Therefore, while expectancy effects would be negated, there would be effects upon learning due to the restraints. Thus Maier et al. would suggest that tasks that show a learning curve be used as tests for learned helplessness (such as a bar press or a wheel turning response). When these responses are used, learned helplessness effects appear (see Seligman, 1975; Seligman and Beagley, 1975).

Another problem with the response competition hypothesis comes from the Hiroto and Seligman (1975) study already described, where cross modal effects occur. A response competition hypothesis cannot explain the effect of a motor task upon a subsequent cognitive one since there is presumably little or no overlap in the response topography of the two tasks.

Contingency Theory

The second theory that is used to explain learned helplessness considers the essential factor one of response consequence independence. Seligman, Maier, and Solomon (1971) suggested that the subject is able to detect the response-reinforcer independence, and is sensitive to the fact that the conditional probability of reinforcement may be supposed to remain the same whether or not a response is made. They suggested that in learned helplessness situations the animal may learn this independence in the following way:

> "(1) S makes active responses during exposure to inescapable shocks. (2) Because shock cannot be controlled, S learns that shock termination is independent of its behavior. (3) S's incentive for initiating active instrumental responses is assumed to be partially produced by its having learned that the probability of shock termination will be increased by these responses. When this expectation is absent, the incentive for instrumental responding should be reduced. (4) The presence of shock in the escape-avoidance training situation should then arouse the same expectation that was previously acquired during exposure to inescapable shocks; shock is uncontrollable. Therefore, the incentive for initiating and maintaining active insturmental responses in the training situation should be low" (p. 369).

The above quote suggests that the presence of the same feedback stimulus in the training situation would be necessary in order for learned helplessness to occur. As pointed out below, Seligman suggested in some of his later work that the effect need not be limited to the presence of the same feedback stimulus. This later conception will be treated as the generalized contingency theory.

An explanation similar to the one offered by Seligman et al. (1971) is suggested by the work of Mackintosh (1973). In his work on "learning to ignore stimuli" mentioned earlier, Mackintosh showed that a stimulus that is experienced as nonpredictive of a particular outcome will be ignored in later acquisition training involving that outcome. In the pretreatment phase of the learned helplessness experiments, the subject makes many responses that are not predictive of any outcome. Each response produces stimulus feedback to the subject. In this phase, it would be assumed that the response that will need to be made in the escape-avoidance task is tried and is found to be nonpredictive of the desired outcome. In the test phase, when the animal is able to escape-avoid, it will tend to ignore this response even when it coincides with the desired outcome. This is not inconsistent with the finding of Seligman and Maier (1967) that even if the subject escapes on one trial, it does not do so on subsequent trials. Also, Gampel (1974) showed that random feedback and response consequence independence had similar effects.

All the studies that have been reviewed so far which have demonstrated learned helplessness have used aversive stimuli. If the basic effect is due to the independence between the response and the outcome then it would be predicted that the same effect should occur if positive or nonaversive stimulation is given independent of a response. This point was first made by Maier, Seligman, and Solomon (1969).

To date there have been only two studies conducted using non-aversive stimuli that qualify as a learned helplessness analogue. Seligman, Meyer, and Testa (Note 2) delivered food from an opening in the roof on a VI schedule to rats in an operant chamber independent of any response. The test phase consisted of learning to press a bar for food. Subjects who received the pretreatment were significantly slower at learning to bar press than a group that received food as a consequence of a specific response.

Engberg, Welker, Hansen, and Thomas (1972) demonstrated that autoshaping is retarded after a pigeon is given free food on a VI schedule from the grain cup in an operant chamber. Group one had to jump on a treadle in order to receive food. Group two received the food on a random schedule independent of any response. Group two autoshaped slower than group one. Gamzu, Williams and Schwartz (1973) point out that the magnitude of this effect is very small. This may be due to the fact that the same grain cup was used for both phases of the experiment. The pigeon may have learned some control; the food was always in the same spot. A much stronger effect occurred in the Seligman et al. (1971) study.

The behavioral contingency theory of Seligman et al. (1971) states that the learned helplessness effect is due to the presence of the same feedback stimulus in the controllable situation as was encountered in the uncontrollable situation. If this is correct, it would be expected that the presence of a different feedback stimulus in the controllable task should significantly decrease the magnitude of the learned helplessness effect vis a vis the same feedback stimulus upon a subsequent escape avoidance task. In some later work, Hiroto and Seligman (1975) suggested that the learned helplessness effect generalized to other feedback stimuli and is not dependent upon the specific feedback stimulus. Thus they suggest the possibility that when a different feedback stimulus is used in the controllable task, there would be no difference in escape avoidance learning.

At this point we can state the hypotheses that the present research was designed to test:

a) Concerning the effects of contingency:

If either generalized contingency theory or behavioral contingency theory is correct, an effect analogous to learned helplessness should occur with success. Thus the group receiving a response independent positive feedback pretreatment should perform worse on a test task than the group receiving response dependent positive feedback.

b) Concerning the effects of feedback stimuli:

If behavioral contingency theory is correct, then there should be a significant difference between the effect obtained when a feedback stimulus different from that used in the pretreatment is used in the test phase than when the same feedback stimulus is used.

If generalized contingency theory is correct, then there should be no differential effect associated with the presence of the same or a different feedback in the test phase.

METHOD

The experiment consisted of two phases. In the first phase subjects were assigned to either one of six pretreatment groups or to a no pretreatment control group which were further subdivided into two groups for the test phase. In the test phase all subjects received response dependent feedback. The research plan consisted of two 4x2 factorial designs.

Subjects

All subjects were members of the Brooklyn College subject pool which consists of all enrollees in the introductory psychology course. The subjects, who are usually freshmen, are required to participate in two hours of experiments. Subjects volunteering were randomly assigned to each of the conditions with the constraint that each cell had an equal number of males and females. 160 subjects were used, 10 for each cell of the factorial design.

Apparatus

The subjects were tested in two distinctly different environments. In phase 1 the subjects were presented with an auditory discrimination task in which they were required to pick out the correct from among four potential words which were presented under a mask of white noise. All trials were prerecorded on a tape recorder (Sony Model TC270). The words to be discriminated were pronounced by the experimenter. A General Radio 1565 soundmeter placed at approximately the area of the subject's ear, gave a reading of 63 decibels. The noise used for masking was produced by the experimenter blowing air through a straw into a microphone. The subject had a panel with four response buttons placed before him by which he signalled his response. The onset of a light on the panel for half of the subjects and the saying by the experimenter of "right" or "wrong" to the other half of the subjects indicated to the subject whether or not he was correct on the previous trial. There was a five second intertrial interval in this phase.

In phase 2 the subjects were given an attribute learning task (see Kintsch, 1971) for forty trials. If the subject responded by chance, he would be expected to be correct on twenty trials. Kintsch suggested that with four dimensions that may vary in three ways, the subject learns an attribute learning task in approximately ten trials. In this study, we used four dimensions that varied only in two ways. Therefore, forty trials were considered sufficient to show any effect that may have occurred. If the subject was in the different stimulus condition, he received the word "right" or "wrong" or the light depending upon which feedback stimulus the subject had received in the pretreatment.

<u>Procedure</u>

Subjects were escorted into room 1 and told the following:

> This experiment consists of two tasks. In the first task we are interested in how well people are able to recognize a word when it is masked by a lot of noise. Before we begin this task it is necessary to determine the noise level that is appropriate for you. I will

> present to you either the word "bum" or the word "bun" underneath a very high level of noise such that it will be impossible to tell which word was presented. I will then lower the noise level until you will be able to tell me the word that was presented underneath the noise. Before each presentation you will hear the word "ready". Any questions?

After the level was determined, the subjects were told the following:

> I will now present to you either the word "bum" or the word "bun" underneath a very low level of noise. It will be very easy for you to tell which of the two words were presented. I will then increase the noise level until it will be impossible for you to tell which of the two words was presented. As soon as this occurs, let me know. Any questions?

The above instructions for high and low levels of noise were presented a second time so that a rough threshold was determined by taking the mean of the four settings. It was not necessary to be very precise since the important variable was the type of feedback received.

After the threshold was determined the subjects were told:

> We are now ready to begin the experiment proper. In front of you is a panel with four buttons. Underneath each button a word appears. Under button one the word "but" appears; under button two the word "bug"; under button three the word "bud", and under button four the word "buck". A second after you hear the word "ready" one of these four words will be presented over a noise background. It may be difficult for you to tell which one of the four words was presented. However, as soon as the word is presented you are to press the appropriate button as quickly as possible, indicating the word you think was presented. If you are not sure which word was presented, guess.

> The subjects receiving positive feedback by light onset then heard: Whenever you are correct, the light in front of you will turn on. When you are wrong, nothing will happen.

> The subjects receiving positive verbal feedback then heard: Whenever you are correct, you will hear the word

"right". When you are wrong, nothing will happen.

> The subjects receiving negative feedback by light onset then heard: Whenever you are wrong, the light in front of you will turn on. When you are right, nothing will happen.

> The subjects receiving negative verbal feedback then heard: Whenever you are incorrect, you will hear the word "wrong". When you are right, nothing will happen.

> The instructions then continued: Your task here is to hear the word and respond as quickly as possible by pressing the appropriate button. One reminder; no word will ever be repeated more than twice in a row. Any questions?

The subjects were divided into their several groups prior to entering the experimental room. Each group consisted of 20 subjects. The assignments to groups was only for the purpose of the experimental treatment and analysis. Each subject went through the experimental procedure alone. The groups received the following type of pretreatment. A summary of the pretreatments is presented in Table 1.

Group 1 received response independent positive feedback. No matter which button they pressed, it was followed by either light onset or the word "right" indicating correctness. This group received positive stimulus feedback on all 50 trials. Occasionally, of course, the feedback would be given for a correct response. In other words, on individual trials there was a relationship between the response and the consequence, but the more of these trials that there were for subjects in this group, the less likely was the learned helplessness effect to be found.

Group 2 received positive feedback dependent upon a cor-

Table 1

A Summary of Treatments in Phase 1.

	Group	Type of Feedback Stimulus: Light	Type of Feedback Stimulus: Verbal	Feedback Dependent on Response	Feedback Independent of Response	Trials: 0	Trials: 50	Trials: 50 Feedbacks
Received positive feedback	1a	x			x		x	
	1b		x		x		x	
	2a	x		x				x
	2b		x	x				x
	3a	x		x			x	
	3b		x	x			x	
	4a					x		
	4b					x		
Received negative feedback	5a	x			x		x	
	5b		x		x		x	
	6a	x		x				x
	6b		x	x				x
	7a	x		x			x	
	7b		x	x			x	
	8a					x		
	8b					x		

rect response. Every response that they made correctly was followed by either light onset or the word "right". This phase continued until the subjects received positive feedback 50 times. Group 2 was a control for the number of feedback stimuli.

Group 3 also received positive feedback dependent upon a correct response, but only for 50 trials. This group was a control for the effect of the number of trials.

Group 4 did not receive phase 1 but received positive feedback in phase 2.

Group 5 received negative feedback independent of their responses. Every response that the subject made was followed by light onset or the word "wrong" indicating failure. This phase continued until the subject received negative feedback 50 times. With this procedure, of course, on some trials negative feedback would be (correctly) given for a response that was in fact incorrect. However, as mentioned with reference to group 1 above, this fact works against the present hypothesis, since it would be expected that with more adventitious (correct) negative feedback for incorrect responses, it would be less likely for learned helplessness to be demonstrated by this group.

Group 6 received negative feedback dependent upon their responses. Every incorrect response that was made by the subject was followed by light onset or the word "wrong" indicating failure. This phase continued until the subject made 50 errors.

Group 7 received negative feedback dependent upon their responses for 50 trials.

Group 8 did not receive phase 1 but received negative feedback in phase 2.

After the completion of this phase, all subjects were escorted to a second environment located behind an opaque curtain and were asked to sit facing a projection screen. In this phase, feedback was delivered to all groups dependent upon a correct response. One half of all groups who received the pretreatment received a different feedback stimulus from the one they received in phase 1. One half of group 4 and group 8 (the no pretreatment control groups) were assigned to receive each of the feedback stimuli appropriate to either positive or negative feedback.

In the second task all subjects were presented with four cards which varied along four dimensions: size, color, shape and number. The size was either large or small; the color red or blue; the shape a square or a circle; and there were either one or two figures on each card. They then received the following instructions:

> In this part of the experiment you will be looking at slides just like the four cards that are in front of you. The objects on these cards vary in four ways: size, color, shape and number. The size of the object may be large or small; the color may be red or blue; the shape may be a square or a circle; and there may be one or two figures on each card. In card 1 you can see that the size of the figures is small, the color is red, the shape is a square, and there are two figures.
>
> I have arbitrarily chosen two of the ways that the cards vary as being correct. Whenever these two ways appear together on a card, the answer is yes. If only one of the ways appears, or if none of the ways appear

on the card, the answer is no. If I had chosen the size small and the color red, then only when a card is both red and small would you say yes; if it is only red or only small or neither, you would say no.

A different set of ways that the cards can vary will be chosen in the problem you will be given. You will be shown a slide. After the slide is shown, you will say either "yes" or "no".

The above instructions were given to all subjects. An additional statement was given to each specific group as follows:

Subjects receiving positive stimulus feedback by light onset were told: Each time you are correct the light in front of you will turn on. When you are incorrect, nothing will happen.

Subjects receiving positive verbal stimulus feedback were told: Each time you are correct you will hear the word "right". When you are incorrect, nothing will happen.

Subjects receiving negative feedback by light onset were told: Each time you make an error the light in front of you will turn on. When you are correct, nothing will happen.

Subjects receiving negative verbal feedback were told: Each time you make an error you will hear the word "wrong". When you are correct, nothing will happen.

The instructions then continued to all subjects: From this information you will be able to figure out what are the two important ways that the cards vary. Any questions?

The subject was only allowed 10 seconds to answer "yes" or "no". This procedure was used by Hiroto and Seligman (1975). The intertrial interval was no more than a second or two as the attempt was made to start the next trial immediately.

The experimenter withdrew behind a curtain prior to the beginning of each phase of the experiment in order to record the subject's responses and to deliver the feedback stimuli.

RESULTS

The completion of phase 1 for the groups receiving feedback dependent upon their responses required 98 to 130 trials.

The statistical analysis used involved two 4x2 analyses of variance of the dependent variable, the number of correct responses in forty trials in the second task. The first analysis involved the groups positive feedback dependent on the response, positive feedback independent of the response, positive feedback control for trials and the no pretreatment control; and the second analysis involved the groups negative feedback dependent on the response, negative feedback independent of the response, negative control for trials and the no pretreatment control. A summary of the experimental conditions and the mean values obtained for each condition may be seen in Tables 2 and 4.

The analyses of variance show that for both the positive and negative feedback designs the only significant effect obtained was due to whether the feedback was dependent on a response or not. A summary of each of the analyses of variance is presented in Tables 3 and 5. A Neumann-Keuls analysis (Winer, 1962) of the treatment cells indicated that the response independent group differed significantly from the other three, which did not differ among themselves. This was true in both the positive and negative cases.

The Scheffé technique (Winer, 1962) was also used for the following cell comparisons for both the positive and negative feedback conditions:

a) the response independent same cell vs. the response independent different cell.

b) the response independent same and response dependent different cells vs. the response independent different and the response dependent same cells.

c) the response independent same and different cells vs. the no pretreatment same and different cells.

The above comparisons were all made in order to determine whether or not there was a feedback stimulus specificity effect. All of the comparisons were nonsignificant, indicating that no matter which feedback stimulus was presented in the pretreatment, the transfer to a different feedback stimulus in the test task did not differ from that of the same feedback stimulus.

Table 2

The Mean Number of Correct Responses for the Positive Feedback Groups.

	Type of Pretreatment			
	Positive Feedback Independent of Response	Positive Feedback Dependent on Response; Control for Amount of Feedback	Positive Feedback Dependent on Response; Control for Number of Trials	No Pretreatment*
Type of Feedback Stimuli:				
Same	25.2	32.3	34.7	32.2
Different	25.4	33.0	31.7	32.4
Σ	25.3	32.65	33.2	32.3

*The classification of same vs. different for the no pretreatment control group is inappropriate. The appropriate distinction is between the use of the light or the word "right" as a feedback stimulus.

Table 3

The Analysis of Variance for the Positive Feedback Groups.

Source	df	Mean Square	F	P
Response Dependence	3	277.7	11.44	.001
Feedback Stimulus	1	4.5	<1	n.s.
Response Dependence x Feedback Stimulus	3	14.4	<1	n.s.
Error	72	24.2		

Table 4

The Mean Number of Correct Responses for the Negative Feedback Groups.

	Type of Pretreatment			
	Negative Feedback Independent of Response	Negative Feedback Dependent on Response; Control for Amount of Feedback	Negative Feedback Dependent on Response; Control for Number of Trials	No Pretreatment*
Type of Feedback Stimuli:				
Same	28.3	32.6	30.4	33.1
Different	27.6	33.4	33.8	33.8
$\sum$	27.95	33.0	32.1	33.45

*The classification of same vs. different for the no pretreatment control group is inappropriate. The appropriate distinction is between the use of the light or the word "right" as a feedback stimulus.

Table 5

The Analysis of Variance for the Negative Feedback Groups.

Source	df	Mean Square	F	P
Response Dependence	3	126.3	5.22	.005
Feedback Stimulus	1	22.0	<1	n.s.
Response Dependence x Feedback Stimulus	3	14.6	<1	n.s.
Error	72	24.16		

DISCUSSION

The present experiment yielded results that allowed tests of the predictions from the behavioral and the general versions of contingency theory. In order to make a judgement concerning the adequacy of the theories, it was first necessary to show that the experimental manipulation was effective in producing learned helplessness in a situation where it had previously been demonstrated. This is shown by the results of the negative feedback groups, where a clear learned helplessness effect occurred in that the group that received negative feedback independent of their response did significantly poorer than did the groups that received response dependent feedback. Once this was shown, the same manipulation was extended to the positive feedback case where the predictions from the two theories were tested.

The results show that with positive feedback there is the positive analogue of a learned helplessness effect. This is in agreement with the predictions of the contingency theories.

The results of the Scheffé analyses provide the basis for the comparison between generalized contingency theory and behavioral contingency theory. The presence of nonsignificant results for all of the six comparisons permits the inference that the learned helplessness generalizes across different stimulus and feedback situations. This is obviously weak support for the generalized contingency theory. However, Greenwald (1975) argues that the acceptance of the null hypothesis (which here supports the generalized contingency theory) may be considered a meaningful result if certain conditions are met. First, it is necessary to show that the manipulation performed is effective. This is pointed up by the highly significant response dependency effects demonstrated for both the positive and negative feedback groups. Second, it is necessary to determine the largest effect that could have been missed. If the magnitude of that largest possible real effect is very small, then we can assume that the effect is at most a trivial one. This can be determined by performing a power analysis (Winer, 1962; p. 104) and solving for the mean difference. Since it is impossible to determine the actual power of the test, the most conservative option was taken; the assumption of a power of .9. With a power of .9 (power is defined as 1- the probability of making a Type 2 error) the largest difference that could have been missed was 2.4 units, where the range of variation was 24 units. Such a small possible effect would seem to justify the conclusion that the feedback stimulus specificity effect, if it really does exist is very small- small enough to be considered trivial in comparison with the other differences obtained.

Further support for the generalized contingency position has been provided by Rosellini and Seligman (1975) who showed that a rat which received inescapable shock showed interference in performing a hurdle jump response to escape from a frustrating situation (no food present in the goal box of a runway). Thus they found that learned helplessness effects transferred to different aversive stimuli.

The obtained results are in contrast to much of the animal literature in which there is a reinforcer specificity effect. For example, Mackintosh (1973) has shown that when a specific stimulus is nonpredictive of a reinforcement, then retardation in learning a contingency occurs between that stimulus and that specific reinforcer. If the stimulus were paired with a different reinforcer, no retardation would occur. One possible way of accounting for the anomalous results obtained, in which there is no reinforcer specificity effect, is that there was a functional equivalence of the different reinforcers. For example, shock and frustration, the reinforcers used in the Rosellini and Seligman (1975) study have been found by Fallon (1968) to induce the same emotional response; thus indicating a type of functional equivalence of these two reinforcers. In the same way one can interpret the results of the present study. The instructions delivered to the subject may have caused the two different feedback stimuli to be functionally equivalent. They were told that when they were correct (wrong) that light onset (or the word "right" or "wrong") would occur. This may have established the feedback stimuli as functionally equivalent for the different subjects. The same analysis may be applied to the Hiroto and Seligman (1975) study where the subjects received an aversive tone if they were unable to solve the escape problem or were told they were wrong if they were unable to solve the cognitive problem. If this is correct, it would not be inconsistent with the above mentioned data. Further research should be conducted on this problem, by administering in the two phases of the learned helplessness procedure two feedback stimuli that could not be made functionally equivalent.

Subsequent to the beginning of this research, Anisman (1975) proposed that the learned helplessness effect is due to a lowered catecholamine level that follows aversive stimulation. For example, Weiss, Pohorecky and Glazer (1975) showed that placing a rat in a cold bath reproduced the learned helplessness effects cited earlier. These investigators suggested that "the disruptive effects of inescapable shock are due to either associative or nonassociative competing responses elicited by the initial experience.... When animals have some control over the stressor, then norepinephrine levels are not greatly modified, and consequently disruption in performance is not observed" (Anisman, 1975; p. 376). From this analysis it would be predicted that with positive response independent feedback there should be no analogue to the learned helplessness effect, since their assumption is that it is the stressor from the aversive stimulation that causes the learned helplessness effect. Positive stimulation should not cause a decrease in the catecholamine levels. Thus the data from the present study contradict the Anisman hypothesis.

It would also be interesting to look into the number of response independent experiences that are required for learned helplessness effects to occur. It may be possible to determine whether the learned helplessness effect increases over trials or whether it emerges full blown once a certain minimal number of trials have occurred. In any case, we may conclude from the present experiment that there is a positive analogue to the learned helplessness effect and that it is not specific to any particular feedback stimulus.

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