CAUSAL ATTRIBUTIONS AS MEDIATORS OF AFFECT AND PERFORMANCE IN A LEARNED HELPLESSNESS PARADIGM

BY

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Abstract

The mediational function of causal beliefs was examined in the context of an investigation linking two theoretically distinct areas of psychology, viz., the theory of learned helplessness expounded by Martin Seligman and the attribution theory associated with Bernard Weiner. Helplessness refers to the debilitation in instrumental responding observed in organisms previously exposed to uncontrollable aversive events. According to Seligman and his associates this debilitation has a motivational base and is concomitant with a cognitive deficit (expectancy that responding makes no difference) as well as an affective one (depression). Borrowing from attribution theory, it was suggested that how and under what circumstances these deficits occur may be mediated by causal attributions regarding the uncontrollable outcome. Weiner has theorized that following success or failure it is a causal belief's locus of control (internal vs. external) which mediates subsequent affect, and the belief's stability (stable vs. unstable) which mediates shifts in expectancy for success and, by inference, actual performance. The present research was designed to test this theory within the arena of a paradigmatic learned helplessness experiment.

In the context of what was purported to be a study of college aptitude, 80 experimentally naive University students were administered four series of pretreatment discrimination problems which were either solvable (controllable outcome) or unsolvable (uncontrollable outcome). They then received falsified information indicating their success or failure had been primarily determined by ability (internal, stable factor), effort (internal, unstable factor), task difficulty (external, stable factor) or luck

(external, unstable factor). They then provided self ratings of their anxiety, depression and hostility as well as their expectancy for success on the anagram problems which followed. These ratings served as the affect and expectancy dependent measures. Three performance dependent measures were derived from the recorded times to solution on the 20 anagram problems. Following the completion of some additional self report items, subjects were very thoroughly debriefed and paid for their participation.

The two pretreatment solvability conditions combined with the four causal belief manipulations produced eight distinct experimental groups. (An additional uncrossed cell was composed of 10 control subjects who did not attempt to solve the pretreatment problems.) The four causal belief factors were classified in terms of locus of control and causal stability to yield a 2 x 2 x 2 factorial design including two levels of pretreatment (solvable vs unsolvable), two levels of locus of control (internal vs. external) and two levels of causal stability (stable vs unstable).

Analyses were conducted upon the orthogonal design described above as well as upon a nonorthogonal design created by re-forming the experimental groups according to subjects' self attributions of causality. Results indicated that expectancy for future success was purely determined by a solvability main effect, i.e., those who received solvable problems expected to perform better than those who received unsolvable problems. There was, however, a powerful interaction of the solvability and locus of control factors upon all three measures of anagram performance as well as the dependent measure of depression. Those who attributed their failure on the unsolvable problems to internal causal factors reported more depression and performed more poorly on the anagram problems than those who attributed their failure to external factors. On the other hand, those who attributed their success on the solvable problems

to internal causal factors reported greater happiness and performed better on the anagrams than those who attributed their success to external factors. These findings have important implications for the mediational function of causal attributions and were discussed with reference to attribution theory, learned helplessness, and depression.

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CHAPTER I

Introduction

The term "learned helplessness" was first coined to describe an unexpected interference in escape behavior on the part of mongrel dogs previously exposed to uncontrollable shock (Overmeir & Seligman, 1967; Seligman & Maier, 1967). The actual experimental interest in the studies had to do with the effects of fear conditioning on instrumental learning. In the Seligman and Maier study, two groups of dogs were restrained in a Pavlovian hammock and subjected to a classical conditioning procedure in which the presentation of tones was followed by electric shock. One group of dogs, the escape group, could turn off the shocks in the hammock by pressing a panel with their noses. The other group, the inescapable group, were yoked to the escapable group and therefore received uncontrollable shocks of the same magnitude, number, duration and pattern. A third control group received no shocks in the hammock whatsoever. Twenty-four hours after the conditioning trials all three groups received ten trials of escape/avoidance training in a shuttlebox. The escape and control dogs easily learned to jump the barrier in order to escape and then to avoid the shock. In contrast, six out of the eight dogs in the inescapable group failed to master even the escape response. The typical behavior of a "helpless" dog was striking:

> This dog's first reactions to shock in the shuttlebox were much the same as those of a naive dog: it ran about frantically for about thirty seconds. But then it stopped moving; to our surprise, it lay down and quietly whined. After one minute of this we turned the shock off: the dog had failed to cross the barrier and had not escaped from shock. On the next trial, the dog did it again; at first it struggled a bit, and then, it seemed to give up and to

> accept the shock passively. On all succeding trials the dog failed to escape. This is the paradigmatic learned helplessness finding. (Seligman, 1975, p. 22).

Because the dogs in the inescapable group had received the identical shocks as the dogs in the escapable group, their response decrements were attributed to the uncontrollability of the trauma (Seligman & Maier, 1967).

A large body of research evidence has accumulated in the ten years since the helplessness effect was first noted. In the first part of this chapter, much of this research is reviewed and the theory of learned helplessness (including its relevance as a model for depression) is presented. Subsequently, a "sub-area" of attribution theory having to do with the influence of causal beliefs regarding previous success or failure is reviewed. Finally, the relevance of causal attributions in human learned helplessness is explored and the nature of the present study (an attempt to link the two areas) and its hypotheses are presented.

<u>The Effects of Uncontrollable Aversive Events</u>

Maier and Seligman (1976) define uncontrollability in terms of a two-dimensional instrumental training space. Learning theorists (e.g., Ferster and Skinner, 1957) have traditionally focussed on one of these dimensions, the conditional probability of an outcome or reinforcer following a particular response, i.e., p (RF/R). This probability can have values ranging from 0 (extinction) to 1.0 (continuous reinforcement), with intermediate values representing various degrees of partial reinforcement. Orthogonal to this probability is the conditional probability of an outcome or reinforcer occurring in the absence of a particular response, i.e., p $(RF/\overline{R})$. Maier and Seligman cite a body of literature (e.g., Catania, 1971; Church, 1969; Gibbon, Berryman & Thompson, 1974; Maier, Seligman & Solomon, 1969; Weiss, 1968) to suggest that an organism can learn the extent to which reinforcement occurs when it does not make a response as well as the extent to which reinforcement occurs when it does make a response. Within this framework an organism stands in a relationship of control to a reinforcer if, and only if, $p\ (RF/R) \neq p\ (RF/\overline{R})$. Here the organism can do or refrain from doing something that changes what happens to it. On the other hand a response does not stand in a relationship of control if, and only if, $p\ (RF/R) = p\ (RF/\overline{R})$. When this equation is true of all the responses in an organism's repertoire, the reinforcer is uncontrollable.

Seligman and his associates have utilized a "triadic design" to isolate the effects of controllability from the effects of the outcome being controlled. This design consists of three separate groups: a controllable outcome pretreatment group, an uncontrollable outcome pretreatment group and a no pretreatment control group. Using such a design, differences in the responses of the subjects in the uncontrollable pretreatment group on the test task can be attributed to the outcomes uncontrollability as distinct from the effects of the outcome per se. Maier and Seligman (1976) distinguish motivational, cognitive and emotional effects of uncontrollability.

Motivational effects. Maier and Seligman (1976) assume that the debilitation in voluntary instrumental responding following uncontrollable aversive stimulation reflects a more basic motivational deficit (see Levis, 1976). Accepting this assumption, we may note that the seminal studies on dogs (Overmeir & Seligman, 1967; Seligman & Maier, 1967) have been replicated (Overmeir, 1968; Seligman & Groves, 1970; Seligman, Maier & Geer, 1968). Seligman and Maier (1976) noted that between the years 1965 and 1969, the responses of more than 150 dogs pretreated with inescapable shock were studied. Of these approximately two thirds were unable to perform an escape response in the test phase of the experiment. Of the several hundred naive dogs, approximately 95% were able to efficiently escape electric shock during the test phase. The authors also noted that helplessness in dogs does not appear to be a function of parametric variations in the aversive stimuli, such as the frequency, intensity, duration or temporal pattern of the shock. Further, they reported, it does not matter if the shock is signalled or unsignalled or in what apparatus the pretreatment and test phase takes place, i.e., the Pavlovian hammock and the shuttlebox are interchangeable.

The debilitation of response initiation in dogs subjected to uncontrollable aversive events has also been reported in a variety of other animal species. Padilla, Padilla, Ketterer and Gialcone (1970) showed that goldfish administered inescapable shock were subsequently retarded in their ability to avoid shock in an acquatic shuttlebox (see Bintz, 1971; Padilla, 1973; for related data). Braud, Wepman and Russo (1969) demonstrated a helplessness effect in mice subjected to inescapable shock. Early attempts to produce helplessness in rats met with limited success (Maier et al., 1969; Seligman, Maier & Solomon, 1971). However, more recent experiments in which a more difficult behavioral response was used to test for helplessness produced substantial effects (Maier, Albin & Testa, 1973; Maier & Testa, 1975; Seligman & Beagley, 1975; Seligman, Rosellini & Kozak, 1975). Seligman (1975) has suggested that the response decrements found in studies of cockroaches (Horridge, 1962), pigeons (Engberg, Hansen, Welker & Thomas, 1973) and infrahuman primates (Harlow & Zimmerman, 1959; Redmond, Maas, De Kirmenjian & Schlemmer, 1973) could be efficaciously interpreted with the concept of learned helplessness.

The first published studies to deliberately produce learned helplessness in humans failed to include no-pretreatment controls and were hence not strictly comparable to the animal research (cf. Fosco & Geer, 1971; Thornton & Jacobs, 1971). Hiroto's (1974) findings with college students provided a direct replication of the results with mongrel dogs. His triadic design included (a) an escape group which could turn off aversive noise with a button pushing response, (b) an inescapable group, yoked to the escape group and hence receiving the same noise without personal control and (c) a control group receiving no noise. Following the pretreatment trials, all groups were then tested on a hand shuttle box in which noise could be turned off by moving the hand from one side to the other. In contrast to the two control groups, the inescapable noise group was significantly debilitated in its ability to escape the aversive noise. Indeed like the dogs described previously, most sat passively and endured the aversive stimuli. Generally the available literature reports similar deficits in response initiation among humans exposed to uncontrollable outcomes (Benson & Kennelly, 1976; Gatchel, Paulus & Maples, 1975; Gatchel & Proctor, 1976; Glass & Singer, 1972; Hiroto & Seligman, 1975; Klein & Seligman, 1976; Klein, Fencil-Morse & Seligman, 1976; Krantz, Glass &

Singer, 1974; Miller & Seligman, 1973; 1975; Racinskas, 1971; Roth & Bootzin, 1973; Roth & Kubal, 1975).

Cognitive effects. Maier and Seligman (1976) suggest that organisms exposed to uncontrollable events also suffer from a cognitive deficit, viz., a retardation in the perception of control. The authors cited evidence indicating that active learning occurs when stimuli are noncontingently presented. For example, Kemler and Shepp (1971) showed that children exposed to discrimination learning problems in which the left-right dimension was irrelevant to the solution were later slower to learn on problems in which this dimension was the relevant one. This finding is fortified by results indicating that conditioning is retarded when organisms have been previously exposed to the conditioned and unconditioned stimuli noncontingently presented (MacKintosh, 1973; Mellgren & Ost, 1971; Thomas, Freeman, Svinicki, Burr & Lyons, 1970). The cognitive deficit in helplessness is essentially a case of proactive interference. Seligman and Maier (1976) illustrate this anecdotally:

> Occasionally, a naive dog sits and takes shock on the first three or four trials in the shuttle box, and then on the next trial jumps the barrier and escapes shock successfully for the first time....On all further trials, the subject responds vigorously and goes on to learn to avoid shock altogether. But dogs that first received inescapable shock were different in this respect also. About one third of them go through a similar pattern--sitting through shock on the first three or four trials and then escaping successfully on the next. These dogs, however, then revert to taking the shock, and they fail to escape on further trials. It appears as if one success is just not enough to make a dog that has experienced inescapable shock learn that his responding now produces shock termination (p. 13).

Maier and Testa (1975) reported three experiments which provide strong evidence for a cognitive deficit in rats exposed to uncontrollable shock. It will be recalled that early attempts to produce helplessness in rats met with limited success when the response tested was simple, e.g., running across a shuttle box (Fixed Ratio 1 - FR1). However, when the response tested was made more difficult or less automatic, e.g., running across a shuttle box and back again (FR2), rats previously exposed to inescapable shock became helpless. In order to determine whether this deficit depended upon a difficulty in "perceiving" the contingency between responding and shock termination or on the increased difficulty of performing an FR2, Maier and Testa had rats learn an FR1 to escape but with a one second delay of shock termination. The contingency was therefore more difficult to perceive using an FR1. As predicted the rats exposed to uncontrollable shock failed to learn the FR 1 with the delay while the unshocked rats learned relatively well. In a second experiment the FR1 contingency was obscured by partial reinforcement (50 percent shock termination) with similar results. In a third experiment Maier and Testa used the more difficult FR2 schedule but made the contingency more apparent by turning the shock off and on again when the rat crossed the barrier, only terminating it when the second response of crossing back over again was made. As predicted the rats previously exposed to inescapable shock were not helpless under these conditions. The results of these experiments strongly suggest that it was the difficulty in detecting the contingency, not the required effort, which is debilitating for rats.

The previously described Hiroto study (1974) may shed some light on the nature of the cognitive deficit in human learned helplessness. In this study the basic triadic design was complicated by two additional experimental factors, (a) the personality dimension of internal versus external control of reinforcement and, (b) an instructional set describing outcomes on the shuttlebox test task as skill versus chance determined. Like subjects exposed to uncontrollable noise, externals were found to be significantly more helpless than internals and subjects receiving chance set instructions significantly more helpless than those receiving skill set instructions. The former results provide an empirical link between learned helplessness and generalized expectancies for locus of control (Joe, 1971; Lefcourt, 1966; Rotter, 1966); the latter between helplessness and situationally determined locus of control (Phares, 1957; 1976; James & Rotter, 1958; Rotter, Liverant & Crowne, 1961). On the basis of his findings Hiroto (1974) suggested that the expectation that response and outcome are independent may be the single process underlying learned helplessness, externality and the perceptual set of chance.

A similar cognitive deficit was shown in studies by Miller and Seligman (1975) and Klein and Seligman (1976). Individuals exposed to escapable noise, inescapable noise or no-noise completed two sets of tasks, one described as skill determined the other as chance determined. In fact, however, the tasks were controlled by the experimenters and each subject received a prearranged run of successes and failures. At the end of each trial subjects indicated their expectancy for success on the next trial. On the skilled task subjects exposed to inescapability made smaller expectancy shifts following successes and failures than did either of the control groups. Presumably this reflected these subject's difficulty in perceiving a contingent relationship between outcomes (success or failure) and their own responding. Notably there were no between group differences in expectancy shifts on the chance task.

Emotional effects. Maier and Seligman (1976) note that their first hint that exposure to uncontrollable aversive events had emotional consequences came with the observation that a single session of inescapable shock produced a transient helplessness effect in dogs of unknown history. Although the effect was observed if the dogs were tested 24 hours after pretreatment, it was not present if testing took place 48, 72 or 168 hours later (cf. Overmeir, 1968). In addition to the above finding, Maier and Seligman[1] referred to a series of studies by Weiss (1968, 1971a, 1971b, 1971c) in which rats were exposed to escapable, inescapable or no-pretreatment shock. In several respects these studies replicated Brady, Porter, Conrad and Mason's (1958) well known but methodologically flawed "executive monkey" study. In contrast to Brady et al.'s yoked monkeys, however, Weiss's yoked rats (the inescapable group) developed more ulcers than did the rats exposed to escapable shock ("the executive rats"). In addition their ulcerations were more severe, they defecated more, lost more weight and drank less than the executives (for related findings see Moot, Ceballa & Crabtree, 1970; Mowrer & Viek, 1948).

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[1]Maier and Seligman also cited the work on "experimental neurosis" (Liddell, Jones & Anderson, 1934; Masserman, 1943; Stenger-Krestnikova, in Pavlov, 1927; Stroebel, 1969) as being supportive of the postulated relationship between unconditionability and emotionality. Because the relationship between experimental neurosis and learned helplessness is far from clear, this literature is not reviewed here.

Further support for an emotional deficit in humans was provided by Gatchel, Paulus and Maples (1975), who showed that a helpless group pretreated with inescapable tones reported more affect (anxiety, depression and hostility) than did a group pretreated with escapable tones (see also Gatchel & Proctor, 1976). Seligman (1975) has theorized that learned helplessness provides a laboratory model for depression. This notion will be discussed at a later point in this chapter.

The Theory of Learned Helplessness

From the evidence it appears that organisms exposed to uncontrollable aversive events experience a debilitation in voluntary response initiation, a difficulty in perceiving that responding has contingent consequences and an increase in emotionality. The theory postulates that these deficits are a direct function of the organism's cognitive representation of a contingency in which responding makes no difference, i.e., $p\ (RF/R) = p\ (RF/\overline{R})$. Indeed the cornerstone of the theory is Maier's and Seligman's (1976) axiom: "When an organism is faced with an outcome that is independent of his responses, he sometimes learns that the outcome is independent of his responses" (p 17). Thus learned helplessness involves a three stage process in which; (a) information about a contingency in which outcome is uncontrollable engenders (b) an expectancy that outcomes are uncontrollable, a cognition which in turn produces (c) motivational, cognitive and emotional debilitation. Actual exposure to an uncontrollable contingency is neither necessary (chance set instructions work well with humans) nor sufficient (some individuals are relatively immune to helplessness) to produce the effect.

The cognitive representation of response/outcome independence is the crucial psychological determinant of the effect. This rests on the assumption that voluntary responses are in part a function of an expectancy that responding will control a given outcome. In the absence (or reverse) of this expectancy the incentive to respond and hence the actual probability of responding is reduced. (For discussions of expectancy and incentive mechanisms, see Bolles, 1972 and Klinger, 1975). The cognitive deficit is described as a simple transfer phenomena; the expectation that responding makes no difference inappropriately generalizes to new situations. In these situations, it interferes "proactively" with the perception that outcomes are in fact controllable. Unlike the motivational and cognitive deficits, the increase in emotionality is a direct function of the aversiveness of the uncontrollable outcome. The development of the expectancy that the outcome is uncontrollable alters, however, the nature of the emotionality. The dynamics of this alteration will be described when learned helplessness as a model for depression is discussed.

Generality of the helplessness effect. Maier and Seligman (1976) state that; "what is learned when the environment is uncontrollable can have consequences for a wide range of behavior" (p. 10). To shore up this belief the authors cite a small number of studies in which the pretreatment and test phases involved different aversive events. These included reports in which rats exposed to inescapable shock were subsequently debilitated at escaping from water (McCulloch & Bruner, 1939); at escaping from frustration (Rosellini & Seligman, 1975); at the performance of the shock-elicited aggression response (Maier, Anderson & Lieberman, 1972). A set of four experiments by

Hiroto and Seligman (1975) provide the most clear trans-situational extension of the learned helplessness effect in humans. Two of the experiments involved pretreatment with an escapable, inescapable or no aversive tones (instrumental pretreatment task); and two involved pretreatment with solvable, unsolvable or no discrimination problems (cognitive pretreatment task). Each type of pretreatment was followed with shuttlebox escape testing (instrumental test task) or by anagram solution testing (cognitive test task). All four experiments (all four combinations of pretreatment and test tasks) produced the helplessness effect. The authors concluded that inescapability and unsolvability are analagous in the sense that each produces helplessness on very different tasks by engendering the expectancy that responding and reinforcement are independent.

What are the limitations to the generalizability of the effect? Seligman (1975) postulated three limiting factors. The first of these is the organism's past history of controllability. The more experiences with events over which an organism has exerted personal control, the less helplessness-prone it will be. In this regard, recall Overmeir and Seligman's (1967) report of a transient helplessness effect in dogs of variegated history exposed to a single session of uncontrollable shock. If small amounts of such shock are applied to laboratory reared dogs (animals having had minimal exposure to controllability) long term helplessness results. One of the factors investigated by Roth and Kubal (1975) was the amount of exposure to helplessness training. The results showed that the more training subjects received the higher the likelihood of helplessness, thus the converse of Seligman's first limiting factor also appears to hold.

The second limiting factor was immunization by discriminative control. The operation of this factor is exemplified by a group of Seligman's and Maier's (1967) dogs who had 10 initial escape/avoidance trials in the shuttle box before exposure to uncontrollable shock in the Pavlovian hammock. When later tested in the shuttle box they readily escaped. Dweck and Repucci (1973) produced discriminative control over helplessness in school children. When asked to solve problems by a teacher who had previously presented them with unsolvable problems, the children were unable to do so, even though they could do fine when the problems were presented by other teachers. From previously reviewed studies (e.g., Hiroto, 1974), we may also note that an instructional set that a task is skill vs. chance determined also established discriminative control over helplessness.

The third limiting factor postulated by Seligman (1975) was the "relative significance of the two situations: helplessness may generalize readily from more traumatic or important events to less traumatic or important ones, but not vice-versa" (p. 61). In support, Seligman cited unpublished data from his own laboratory indicating that the degree of helplessness is in part a function of the strength of pretreatment shock. Roth and Kubal (1975) also provided supportive evidence for this postulate. Subjects were exposed to the same uncontrollable tasks. Those to whom the task was described as important (predictive of success in college) exhibited more profound helplessness than those to whom the task was described as unimportant (as a puzzle).

Uncontrollability and aversiveness. It is clear from Seligman's statement of his theory, that it is exposure to uncontrollable outcomes, both positive and negative, which produces learned helplessness.[2] In reviewing the Hiroto and Seligman (1975) study, Maier and Seligman (1976) make a distinction between inescapability and unsolvability, viz., that the former involves an uncontrollable noxious event, whereas the latter involves an uncontrollable reward. Because unsolvability produced the helplessness effect they then concluded that "response initiation to control noxious events may be impaired by experience with uncontrollable reward" (p. 12). Their initial distinction seems questionable, however. The cognitive pretreatment task used by Hiroto and Seligman (1975) consisted of four discrimination problems, each consisting of 10 trials. In the unsolvable condition, half of these trials were failed (according to a prearranged schedule) as were each of the problems. Notably, in making their assertion, Maier and Seligman do not indicate how the repeated failure of a set of apparently simple cognitive tasks is any less traumatic to students at the University of Pennsylvania than the repeated failure to escape noxious noise.

A study by Benson and Kennelly (1975) speaks directly to this issue. The authors correctly pointed out that uncontrollability in helplessness research has typically involved either (a) escape from aversive stimuli or (b) situations where both positive and negative stimuli are delivered in a noncontingent manner. They further pointed out that the condition of uncontrollability, i.e., that p (RF/R) =

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[2]Maier and Seligman (1976) also cite reports that the presentation of appetitive events (food) noncontingently to pigeons retards the learning of responses to procure these events in the future (Engberg, Welker & Thomas, 1973; Welker, 1974) as supportive of their argument that an uncontrollable event does not have to be traumatic to be helplessness inducing. By their own admission, however, these results are controversial (see the critique by Gamzu, Williams & Schwartz, 1973) and therefore will not be reviewed here .

p $(RF/\bar{R})$, also holds when an organism is being continually reinforced noncontingently. In an attempt to determine if uncontrollable positive events, in the absence of aversive events could produce the helplessness effect, Benson and Kennelly added an additional group to what was essentially a replication of Hiroto and Seligman's (1975) cognitive pretreatment-cognitive test task experiment. This group received continuous noncontingent positive reinforcement, i.e., the response "correct," on each trial of the discrimination problems. On each problem, regardless of what they indicated to be the correct value, these subjects were told "that's the correct answer." The test task consisted of a set of 20 patterned anagrams. The results were consistent with the usual helplessness finding. The group receiving the unsolvable pretreatment problems took significantly longer to "catch on to the pattern" than did either the group receiving the solvable pretreatment or no pretreatment. However, the group receiving continuous noncontingent positive feedback was not signifigantly different from the controls in their test task performance. This result was obtained despite the fact that both the continuous reinforcement and unsolvable groups perceived the pretreatment tasks as equally uncontrollable. Therefore in contrast to Seligman's assertion, these findings suggest that helplessness generalizes not from exposure to uncontrollable events per se., but rather from uncontrollable aversive events.

Learned helplessness as a laboratory model of depression. Seligman (1975) speculated on the applicability of learned helplessness in understanding depression, the effects of maternal deprivation, psychophysiological disorder, instances of sudden death as well as a variety of social, educational and performance deficits. The most well developed of these speculations, however, was the proposition that learned helplessness provides a general laboratory model for reactive depression in man. This theoretical extension is succinctly stated by Seligman, Klein and Miller (1976):

> When a traumatic stimulus is introduced into a situation it produces fear and anxiety. Three kinds of learning can now occur and each modulates affect differently; (a) if an organism learns that it can control the stimulus, anxiety disappears; (b) if an organism is uncertain about control (neither a nor c has asymptoted), anxiety remains; (c) if an organism learns that it cannot control the stimulus, anxiety is displaced by the affective components of depression.

Seligman et al. (1976) specifically apply the helplessness model to "those depressions which begin as a reaction to loss of control over gratification and relief of suffering, and in which the individual is slow to initiate responses, believes himself to be powerless and hopeless, and has a negative outlook on the future" (p. 187). The argument is by analogy. It rests primarily on the apparent similarity of the etiological, behavioral and physiological manifestations of the two phenomena. In particular, six major manifestations of learned helplessness having direct parallels in depression are cited: (1) passivity and lowered response initiation, (2) negative cognitive set (difficulty learning that responding produces relief), (3) lack of aggression, (4) loss of interest in food as well as sexual and social stimuli, (5) norepinephrine depletion and cholinergic activity and (6) dissipation over time.

The evidence documenting the parallel "symptomatology is voluminous and cannot be reviewed here (see Seligman, 1975; Seligman et al., 1976). Worthy of note, however, are a number of recent studies by Seligman and his associates demonstrating a similarity between the lowered response initiation following exposure to uncontrollable aversive events and that found in naturally occurring depression (Klein & Seligman, 1975; Klein et al., 1976; Miller & Seligman, 1975). In several studies learned helplessness and naturally occurring depression produced similar effects on measures directly assessing cognitive rather than response initiation deficits. Klein and Seligman (1975) showed that nondepressed subjects exposed to uncontrollable aversive noise and naturally depressed subjects both perceived skill task reinforcement as more response independent than did non-depressed subjects exposed to controllable or no noise (see also Miller & Seligman, 1973; Miller, Seligman & Kurlander, 1975).

The Influence of Attributions of Causality for Success or Failure on Subsequent Expectancies and Emotional Responses

In his "naive analysis of action," Heider (1958) indicated that performance is generally perceived to be a function of both personal and environmental factors. Among the former he noted the dispositional characteristic of ability and effort. Among the latter he noted task difficulty and luck. Heider further suggested that the "common sense analyst" would tend to perceive outcomes on skill tasks to be both a function of "can" (ability) and "try" (effort). How well individuals expect to do on a task will be a function of the perceived relationship between the two relatively stable factors of ability and task difficulty. If the perceived difficulty level of a task is not beyond an individual's perceived ability, he should feel that he can do it. However, to be successful an individual must also try. Therefore, the more effort the person anticipates expending, the more he should anticipate being successful. If outcome on a task is perceived to be a function of chance factors, the degree of anticipated luck will also serve to determine the expectancy for success. In short, the notion that outcome expectancies are a function of how one attributes causality was implicit in Heider's theory.

Building from Heider's (1958) theory and Rotter's (1966) research on locus of control, Weiner et al. (1971) suggested that the four causal factors described by Heider could be formally conceptualized in terms of a two-dimensional taxonomy of causality. The dimensions considered to be both relevant and orthogonal were locus of control (internal vs. external) and stability (stable vs. unstable)[3]. Thus within this framework, ability is an internal, stable factor; effort is an internal, unstable factor; task difficulty an external, stable factor; and luck an external, unstable factor. Weiner and his associates have suggested that following success or failure, it is the stability of the particular causal attribution which primarily serves to mediate subsequent expectancy for success whereas it is a causal belief's locus of control which acts as the primary mediator of affective response (cf. Weiner, 1974; Weiner et al., 1971). The evidence for these assertions is examined in the following two sub-sections.

Expectancy for success and performance. After success or failure at a given task, expectancies regarding subsequent performance on that

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[3]Rosenbaum (1972) has proposed a three-dimensional taxonomy of causality including intentionality as a third classificatory dimension. His schema has the advantage of incorporating additional causal factors and differentiating between them with apparent face validity (e.g. both effort and fatigue are internal and unstable but differ in terms of intentionality). The relevance of this framework would seem to be attenuated somewhat by empirical findings that the most frequently utilized causal attributions are ability, effort, task difficulty and luck (Frieze, 1973).

task change (Feather, 1968; Feather & Saville, 1967; Ryckman, Gold & Rodda, 1971; Schwarz, 1969). Weiner et al. (1971) suggest that when individuals attain a certain level of performance on a task and attribute that attainment to causal factors which are inherently stable (ability and task difficulty) it makes sense for them to expect to perform at a similar level on future tasks of that nature. However if their performance is attributed to unstable factors such as effort (which can be voluntarily increased or decreased) or luck (which changes from moment to moment), there is no reason to expect a similar level of attainment in the future. Weiner and his colleagues supported this common sense argument with direct experimental evidence as well as through reinterpretations of some early locus of control literature (see Weiner, 1974; Weiner et al., 1971).

In the early work on locus of control, tasks perceived as being skill vs. chance determined were considered to provide a situational analogue of internal vs. external control. In his development of the generalized expectancy construct, Rotter (1966) relied heavily on previous research demonstrating expectancy and performance differences following success or failure on skill versus chance tasks (Phares, 1957; Holden & Rotter, 1962; James & Rotter, 1958; Rotter, Liverant and Crowne (1961). Rotter (1966) hypothesized that:

> .....if a person perceives a reinforcement as contingent upon his behavior, then the occurrence of either a positive or negative reinforcement will strengthen or weaken potential for that behavior to recur in the same or similar situation. If he sees the reinforcement as being outside his own control or not contingent, that is depending upon chance, fate, powerful others, or unpredictable, then the preceding behavior is less likely to be strengthened or weakened. In other words, learning

under skill conditions is different from learning under chance conditions (p. 5).

In the Phares (1957) study subjects were presented with ambiguous matching tasks described either as skill determined (internal control) or as chance determined (external control). Each subject received a fixed order of partial reinforcement (correct vs. incorrect) and was allowed to bet on the probability of being right on each successive task (the number of plastic chips bet provided the measure of expectancy). As predicted, increments and decrements in expectancy following respective successes or failures, i.e., typical shifts, were more frequent and of greater magnitude in the skill condition. Unusual or atypical shifts (i.e., higher expectancy following failure or vice versa) often charcterized the betting of subjects in the chance condition. The former results were interpreted to be a function of perceived internal control, the latter as a function of perceived external control.

Phares' (1957) results have been reinterpreted using Weiner's two-dimensional taxonomy of causality (Weiner, 1974; Weiner, Heckhausen, Meyer & Cook, 1972; Frieze & Weiner, 1971). In essence it was suggested that Phares' design confounded the locus of control and stability dimensions. Subjects given the skill set instructions would probably have perceived their performance as having been due to high or low ability, whereas the subjects receiving the chance set instructions would have perceived their outcomes as having been determined by luck. Ability is both internal and stable and luck is both external and unstable, hence the confound. From Phares' study it is impossible to determine if the differential expectancy shifts in the skill versus chance condition were determined by the locus of control or stability dimensions. According to Weiner et al. (1971) the latter possibility is more plausible.

Studies by Rotter and his associates (Holden & Rotter, 1962; James & Rotter, 1958; Rotter, Liverant & Crowne, 1961) studied the effects on extinction of both skill versus chance instructional sets and different reinforcement schedules. For example, in what was purported to be a study of extrasensory perception (ESP), James and Rotter (1958) told one group of subjects that success was determined by ESP skill and another group that it was completely determined by luck. On what essentially amounted to a guessing task, half of each group then received continuous reinforcement (100% correct responses) and half received partial reinforcement (50% correct responses). On subsequent extinction trials, subjects in the skill condition were more resistant to extinction following continuous reinforcement; under chance conditions, the reverse was true. (For similar results see Holden & Rotter, 1962; Rotter, Liverant & Crowne, 1961; Stabler & Johnson, 1970.)

In their critique, Weiner et al. (1971) indicated that it was unlikely that the experimental instructions in these studies could have maintained the perceptual set of chance for subjects receiving continuous reinforcement during acquisition. Research has shown that consistent outcomes lead subjects to make attributions to ability rather than luck (Frieze & Weiner, 1971; Jones, Rock, Shaver, Goethals & Ward, 1968). For this reason the chance instructional set would also be belied during the extinction phase by the complete lack of reinforcement. Weiner at al. (1971) cited the chance group's higher between-subject variability in the number of trials to extinction as being indicative of the greater attributional confusion. Because it was not clear that these subjects were operating from a subjective state of externality, Weiner et al. suggest that these studies cannot be claimed as unambiguous evidence for the influence of locus of control (or for that matter stability) on expectancy shifts and/or extinction behavior.

Weiner, Heckhausen, Meyer and Cook (1972) reported three experiments, one of which specifically tested the hypothesized relationship between attribution of causality and expectancy shifts. Meyer gave high school students series of five digit-symbol substitition tasks but induced repeated success or failure (by calling "time's up" when 75% were completed). Following each trial the students were required to attribute their success or failure to each of ability, effort, task difficulty and luck (the ratings had to total 100%), and estimate their probability of success on the next trial. The results indicated that in the failure condition, expectations were lower when performance was attributed to stable factors (ability and task difficulty) than unstable factors (effort and luck). Conversely in the success condition, expectancies were higher when performance was attributed to stable factors. In direct support of their theory Weiner et al. (1971) found no differences in expectancy between groups high in internal versus external attribution. In a similar correlational experiment, McMahon (1973) induced repeated success or failure on an anagram task and measured causal attributions using a paired comparisons method (all pairs of causal attribution being represented).

The results were consistent with those of Weiner et al. (1972) and were replicated across sixth grade, tenth grade and college level students.

Weiner (1974) cited studies by Fontaine (1972) and Rosenbaum (1972) as noncorrelational evidence in support of his framework. In the Rosenbaum study, subjects judged a hypothetical situation in which a supervisor and a subordinate were working on a project. Subjects were told that the project was successful or unsuccessful and that the cause was stable or unstable. Expectancies for future success on a different project were higher after success than failure. They were highest when the success was ascribed to stable causal factors. In the Fontaine study (1972, 1974) introductory psychology students received descriptions of eight tasks each of which had purportedly been completed by a comparison group. Each task represented a different combination of outcome (success or failure) and causal determinant (ability, effort, task difficulty and luck). Subjects' expectancies for how well they themselves would do was most consistent with comparison group outcome when that outcome was attributed to the stable factors of ability and task difficulty. This effect was more pronounced when the comparison group was similar ("psychology students from this university") than when dissimilar ("businessmen from Perth").

Two recently reported experiments by Valle and Frieze (1976) provided both correlational and experimental evidence for the influence of causal stability on expectancy for future success. In the first experiment, subjects were presented with falsified descriptions of prospective salespeople who were later hired and made an above average number of sales. Subjects then rated the importance of various causal determinants, estimated the number of sales that would be made in the next three months and whether they would promote the person. Relevant here is the fact that the more the outcome was attributed to stable causes (e.g., ability, personality, knowledge, appearance) the higher the positive correlation with predicted sales and the tendency to promote. A second experiment was identical to the first except that after being informed that the employee had performed better than average, subjects considered each of six attributional explanations for the performance from the employee's supervisor (with instructions to consider each separately as though applicable to a different person). As predicted the average predicted future sales and the likelihood of promotion were significantly higher when success was attributed to stable factors (ability, stable effort, task ease) than when attributed to unstable factors (unstable effort, luck, assistance from others).

In concluding this discussion of the relationship between causal stability and future expectancy, we may note that apart from two correlational studies (Weiner et al., 1972; McMahon, 1973) the relevant research has involved "hypothetical other, simulation" studies (Fontaine, 1974; Rosenbaum, 1972; Valle & Frieze, 1976). An exception was a study by Reimer (1975) who gave musically inexperienced subjects 15 minutes of instruction on the piano followed by success feedback. Each of four groups received a different causal belief manipulation, i.e., were told that their performance was due to ability, effort, task difficulty or luck. Subjects then completed an evaluation form on which they rated several affective response and expectancy for future success dimensions. No support was found for the hypothesized relationship between the stability dimension and expectancy for success. This single negative results is difficult to interpret. However, the fact that this is also the only study in which subjects' actual performance was evaluated and in which causal attributions were experimentally manipulated makes it appear somewhat conspicuous.

Affective response. Although Weiner and his associates have argued that the locus of control dimension is functionally irrelevant as far as shifts in expectancy are concerned (Weiner et al., 1971), they also suggest that it is a crucial determinant of affective response to success or failure (Weiner, 1974; Weiner & Kukla, 1970; Rest, Nierenberg, Weiner & Heckhausen, 1973; Weiner & Sierad, 1975). In general, it seems obvious that more positive emotional responses would tend to follow success experiences than failure experiences. According to Weiner's analysis such feelings, whether positive following success or negative following failure, will be maximized when these respective outcomes are attributed to internal causal factors. This notion also has a certain face validity; it makes sense that an individual would feel better about a successful outcome when it can be attributed to his/her high ability and/or effort than when it is merely attributable to the ease of the task or good luck. Conversely, it seems equally plausible that the negative emotions accompanying failure would be augmented when that failure is attributed to internal causal factors.

There are two lines of support for the above argument. The first is provided by studies involving the emotional consequences of the cognitive attribution/misattribution of arousal. The seminal study was performed by Schacter and Singer (1962) who induced physiological arousal in subjects by injections of epinephrine. Only half of the subjects were informed of the possible side effects of the injection (increased heart rate, flushing, etc.) before undergoing a waiting period with an experimental confederate who behaved either euphorically or angrily. It turned out that subjects "took on" the confederates' mood to a significantly greater extent when they were ignorant of the drug determined effects. Presumably when subjects were uninformed, attribution of arousal to the external and affectively neutral drug was less viable than attributing it internally, e.g., "If I am reacting in this angry situation, then I must be angry."

In general, the subsequent research is consistent with this interpretation of Schacter and Singer's (1962) results. In a similar study Schacter and Wheeler (1962) induced amusement by exposing uninformed subjects to appropriate situational stimuli during a state of undifferentiated arousal. Nisbett and Schacter (1966) reversed this misattribution procedure by administering a placebo pill in an experiment involving "mild" electric shock. Subjects provided with a description of fear relevant drug effects tremor, palpitations, etc.) reported less pain and tolerated higher shock intensities than subjects given a description of fear irrelevant drug effects (numbness, itching, headache, etc.). Ross, Rodin and Zimbardo

(1969) replicated these results using loud noise rather than a drug as an external source for attribution. Storms and Nisbett (1970) found that insomniacs went to sleep faster when induced to attribute their arousal to a placebo pill described as a stimulant. When the placebo was described as a sedative, the insomniacs took longer than usual to fall asleep. (For an unsuccessful attempt to replicate these findings see Kellogg & Baron, 1975.) Loftis and Ross (1974a, 1974b) facilitated the extinction of a conditioned galvanic skin response (GSR) by enabling subjects to attribute their arousal to a loud white noise present during acquisition or extinction. For a discussion of the therapeutic possibilities inherent in misattribution of arousal procedures the reader is referred to Davison and Valins (1969).

A further line of evidence relevant to the relationship between locus of causality and affective responses is provided by an additional body of simulation-type studies. Weiner and Kukla (1970) reported a study in which subjects administered hypothetical rewards and punishments to hypothetical pupils differing in ability, effort expended and task performance. Results indicated that attributions to effort were the most salient determinants of their evaluations. Pupils low in ability but high in effort were rewarded more and punished less than those of high ability. (For a cross-cultural replication, see Eswara, 1972.) Rest, Nierenberg, Weiner and Heckhausen (1973) showed that the perceived difficulty of a task does not influence the rewards and punishments dispensed as a function of effort and ability. On the basis of these and other findings (Zander, Fuller

& Armstrong, 1972), Weiner (1974) concluded that emotional responsiveness (pride vs. shame) on achievement related tasks would be most directly affected by internal as opposed to external causal attribution with greater shifts being consequent upon attribution to the internal factor which is under volitional control, i.e., effort.

A qualification to the latter conclusion seems appropriate. Specifically, to this author's knowledge, the augmentation of affective response following attributions to effort (rather than ability) has only been demonstrated in hypothetical-other, simulation type designs. Because the role of effort has strong moral connotations in this society (cf. Weiner, 1973), it seems reasonable to assume that its role as a determinant of performance should be particularly salient when determining rewards and/or punishments for others. However, individuals' perceptions as observers often differ greatly from their perceptions as actors (cf. Jones & Nisbett, 1972). In the latter situation it appears that ego-enhancing/defensive motives are much more likely to come into play (see Fontaine, 1975). Feather (1967) showed that the more success or failure was attributed to internal causes (manipulated by a skill instructional set) the more the outcome was viewed as respectively "attractive" or "repulsive." Reimer (1975) assessed emotional response following attributions for success to ability, effort, task difficulty and luck. More positive effect followed attributions to the two internal causal factors than to the two external factors. From the mean affect indices it appears that ability and effort were equally important in their influence.

The Present Study

The initial impetus for the present study came from a realization that the cognitive theory of learned helplessness seemed not very "cognitive" when applied to human beings. Levis (1976), more eloquently pointed out that:

> The cognitive model of Maier and Seligman has been applied with equal voracity to explaining learned helplessness effects noted in fish, cats, dogs, and people,....If Maier and Seligman are viewing their cognitive model as as involving hypothetical constructs in the definitional sense suggested by MacCorquadale and Meehl (1948), one can only be amazed that the brain capacity of a given species is not viewed as an important variable....Without such a stated parameter we are left with the conclusion that both qualitatively and quantitatively the "expectancy" mechanism of a fish or cockroach is equivalent to that of a man. (p. 56).

Such a view seems untenable when regarded in the shadow of recent discussions of human behavior which have highlighted the importance of cognitive mediational concepts (cf. Bandura, 1969; Davison, 1969; Kanfer & Phillips, 1970; Lazarus, 1971; Mischel, 1973).

An additional starting point for the present study involved the perceived similarity of uncontrollable/controllable events and failure/success on achievement oriented tasks. The present literature review indicates that the naive analyst will often attribute failure/success to specific causal factors which can be differentiated in terms of both a stability and locus of control dimension. Much of this evidence also supports the notion that it is the former dimension which mediates expectancy for success (and, by implication, performance), whereas it is the latter dimension which mediates affective response. An understanding of the mediational function of causal beliefs in the learned helplessness phenomenon could do much to increase our ability to predict, and perhaps alter, individual responses to uncontrollability.

There is some precedent for a theoretical link between attribution theory and human learned helplessness. Dweck and Repucci (1973) gave fifth grade children solvable block design problems (administered by a "success experimenter") randomly interspersed with unsolvable designs (administered by a "failure experimenter"). At two different points in the session, each experimenter administered an equivalent set of solvable test designs. The children were then differentiated into "helpless" and "persistent" groups on the basis of their performance on the problems administered by the failure experimenter. From a previously administered scale, it was shown that the helpless group tended to take little responsibility for the outcomes of their actions, and when they did, tended to attribute them to the presence or absence of ability. The subjects who persisted despite failure tended, on the contrary, to emphasize the role of effort as the determinant of outcome. Dweck (1975) identified children who had maladaptive responses to failure, i.e., who expected to fail beforehand and demonstrated performance deterioration in the face of failure. She then showed that those children who were taught to attribute failure to a lack of effort subsequently exhibited unimpaired performance following failure relative to children only given success training. (For related research see Miller, Brickman & Bolen, 1975.)

In a recent study Klein, Fencil-Morse and Seligman (1976) gave both depressed and nondepressed subjects four series of solvable, unsolvable or no pretreatment discrimination problems. Subjects in the unsolvable condition received two different instructional sets designed to manipulate the attribution of failure. One group received an internal attribution of failure set in the form of instructions ("most people are able to get three or four of the problems correct") and a graph indicating the task to be an easy one. Another group received an external attribution of failure set in the form of instructions ("the problems are very difficult and almost no one has been able to solve them") along with an exemplifying graph. A third group exposed to unsolvable problems received no attribution of failure instructions. The results indicated that the nondepressed subjects who received unsolvable discrimination problems performed the same on a set of anagram test problems regardless of the attribution instructions. However, among the depressed subjects exposed to unsolvable problems, those who received external attribution instructions performed better than those who received internal or no attribution instructions. Apparently the deficits typically showed by depressed subjects were eliminated if they were led to believe that their prior failure was due to the difficulty of the task rather than their own incompetence. Unfortunately Klein et al. (1976) did not report the effect of their attribution manipulation upon the self-reported affect measures taken after pretreatment.

Klein et al. (1976) interpreted their results to reflect a difference in locus of causality (internal vs. external) manipulated by their attribution instructions. They further speculated that the external attributional set may have helped the depressed subjects because it had the effect of lowering the perceived importance of the unsolvable problems. Their already low expectancy for success was reinforced in a manner which absolved them of blame. Nondepressed subjects, on the other hand, may have seen the high difficulty as a challenge against which they could measure their competency. Therefore, the problems assumed more importance, and failure was more devastating. Why there were no differences between nondepressed subjects receiving the external and internal attributional set was not explained by Klein et al..

The present study attempted a more comprehensive application of Weiner's attributional analysis to Seligman's theory of learned helplessness and depression. The study's purpose was to show how the four most frequently used causal beliefs (and more specifically their differentiating stability and locus of control dimensions) could differentially mediate between exposure to solvable/unsolvable problems and subsequent emotional response, expectancy for success on a different task as well as actual performance on that task. The hypotheses follow directly from Weiner's theory:

(1) Subjects pretreated with unsolvable problems and informed that their failure was determined by stable causal factors (ability and task difficulty) will subsequently have lower expectancies for success on, and actually perform more poorly on, a different set of test problems than will subjects informed that their failure was determined by unstable causal factors (effort and luck).

(2) Subjects pretreated with solvable problems and informed that their success was determined by stable causal factors will subsequently have higher expectancies for success on, and will perform

better on, a different set of problems than will subjects informed that their success was determined by unstable causal factors.

(3) Subjects pretreated with unsolvable problems and informed that their failure was determined by internal causal factors (ability and effort) will have a more negative emotional response than subjects informed that their failure was determined by external causal factors (task difficulty and luck).

(4) Subjects pretreated with solvable problems and informed that their success was determined by internal causal factors will have a more positive emotional response than subjects informed that their success was determined by external causal factors.

CHAPTER II

Method

Overview

The present research differs from the paradigmatic learned helplessness experiment in that a causal belief manipulation separates the pretreatment and testing phases. Following the administration of an initial control measure of vocabulary, subjects were introduced to the pretreatment discrimination problems and instructed to rate their current level of anxiety, depression, hostility and expectancy for success on the problems they were about to receive. Each subject then completed four series of solvable (S) or unsolvable (U) discrimination problems.

Following pretreatment, subjects received falsified information indicating that their success or failure on the discrimination problems was a function of one of four causal factors. One-fourth of the experimental subjects were informed that their performance was determined by their ability (AB), one-fourth were informed that their performance was determined by their effort (EF), one-fourth were informed that their performance was determined by the difficulty of the task (TD) and one-fourth were told that their performance was really a function of chance or luck (LU).

The testing phase began with a brief description of the anagram test problems. Subjects then re-rated themselves on anxiety, depression and hostility as well as expectancy for success on the anagrams (the three affect and the single expectancy dependent measures). They were then administered 20 anagram problems. Three performance dependent measures were derived from the recorded times to solution. The testing phase concluded with a series of self-report items designed to serve control and exploratory purposes as well as a brief personal reaction survey designed to tap insight or suspiciousness regarding the true nature of the experiment. All subjects were thoroughly debriefed.

The two pretreatment solvability conditions combined with the four causal factors implicated in the belief manipulation produced eight distinct experimental groups labelled as follows: S-AB, U-AB, S-EF, U-EF, S-TD, U-TD, S-LU and U-LU. A final ninth cell was composed of control (C) subjects who did not attempt to solve the pretreatment problems and who received no belief manipulation. The four causal factors were classified in terms of locus of control and stability to yield a 2x2x2 factorial design including two levels of solvability (solvable and unsolvable), two levels of locus of control (internal and external) and two levels of stability (stable and unstable).

Subjects

Ninety undergraduate male students at the University of Manitoba participated in the study. Subjects were recruited directly in science, engineering, agriculture and administrative studies classrooms as well as through advertisement on bulletin boards and in the campus newspaper. The study was described as "having to do with the measurement of college aptitude" and involving "a number of aptitude type tests." Appointments for experimental sessions were made individually following a brief telephone interview. This interview also served to provide information as to age, and academic major as well as to screen out applicants whose first language was not English and those who had recently participated in psychological research and/or course work (and perhaps sensitized to look for deception). When reporting individually for their appointments, subjects were assigned to one of the experimental conditions according to a predetermined schedule (generated by a table of random numbers). Following the completion of the session each subject was paid $5.00 for his participation.

Ten subjects were excluded from the study. Two subjects were excluded early in the project because one of the experimenters failed to administer the first three words of the WAIS vocabulary test following zero credit responses on one of words four to eight (see administration procedure in Wechsler, 1955, p. 42). Two others were excluded because they failed to achieve a raw score of 40 or higher on the vocabulary test. Two subjects who indicated they were bilingual (and favored French over English) were excluded. One subject who failed to provide three correct solutions on the four pretreatment discrimination problems was excluded. Finally, one subject who had taken part in a similar experiment at a different university and three subjects who indicated suspicion or insight regarding the falsified nature of the experimental manipulations were excluded. Each of these ten subjects was replaced with the next participants to appear at the experimental laboratory.

The decision to use males rather than females was an arbitrary one designed to reduce the error variance which could have arisen as a function of sex differences (Dweck & Gilliard, 1975; Feather, 1969;

Rotter, 1966). The ages of the 90 young men comprising the sample ranged from 18 to 27 (mean = 19.7 years). Most were in their first year of university (mean = 1.6 years). The following faculties were indicated as major areas by subjects: science (36 subjects or 40% of the sample), agriculture (23 subjects or 25.6%), administrative studies (13 subjects or 14.4%), engineering (11 subjects or 12.2%), environmental studies (5 subjects or 5.6%) fine arts and education (1 subject each or 2.2%). The fact that the sample included no arts majors (the primary consumers of psychology courses at the University of Manitoba) reflects the fact that the subjects were more experimentally naive than those who would have emerged from the departmental subject pool.

Experimenters

The experiment was conducted by the author and a paid research assistant, both male graduate students in their late twenties. Each experimenter directed half the subjects from each condition through the experimental procedure. In order to minimize experimenter differences, several taped practice sessions were conducted prior to the experiments. In addition, each experimenter ran 11 pilot subjects through the procedure. On several occasions during these sessions (and during early experimental sessions) the experimenters unobtrusively observed one another's performance after the subjects had been administered the vocabularly test and escorted to the adjoining room.

Experimental Materials

Vocabulary test. All subjects were administered the WAIS vocabulary test (Wechsler, 1955) prior to the start of the actual experiment in order to provide a control measure of intelligence. Subjects were not presented the word list as recommended by Wechsler, however. Rather, the words were presented individually on 10.2 x 15.3 cm. index cards in conjunction with the experimenter's enunciation of the word. This procedural variation was designed to decrease the predictability of the task as well as to minimize cues which subjects could utilize to gauge their own performance. It was hoped that this would in turn minimize the development of a sense of control (or lack of control) which could generalize to the actual experimental situation.

Pretreatment discrimination problems. The solvable and unsolvable pretreatment problems consisted of four series of four-dimensional stimulus patterns adapted for this purpose by Hiroto and Seligman (1975) from previous discrimination learning research materials (viz., Levine, 1966, 1971). Each of the four dimensions has two values associated with it: (a) letter (A or T); (b) letter size (large or small); (c) letter color (black or white); and (d) shape of border surrounding letter (circle or square). Each pattern was on a 10.2 x 15.3 cm. index card. Each card had two stimulus patterns on it, each pattern being composed of different values of the four dimensions (for examples of the cards see Appendix A). A problem consisted of 10 cards, each series separated by a card with the word STOP printed on it in block letters. The problems were solvable when one value of one of the dimensions, for example, the letter A, was designated to be consistently correct throughout each series. The problems were unsolvable when no value was designated as correct for any series.

Because it was considered desirable to replicate those aspects of the methodology related most closely to the production of helplessness in previous research, the first three pretreatment problems were identical in terms of patterns and card order to those used by Hiroto and Seligman (1975). The fourth problems consisted of cards identical to those of the first problem arranged in reverse order. The pretreatment problems were preceded by the identical demonstration problem utilized by Hiroto and Seligman (1975). It consisted of five cards on which two five-dimensional patterns were printed. Each of the five dimensions has two associated values: (a) letter (X or Y): (b) letter size (large or small); (c) letter color (red or blue); (d) shape of border surrounding letter (circle or square); and (e) border texture (solid or dashed). Examples of the demonstration cards are also presented in Appendix A.

The demonstration and pretreatment cards were bound in a two-ring note size whirl board file. The deck of cards was preceded by a title card upon which "Discrimination Learning Test (DLT)" was printed in .5 cm. block letters. This was designed to maximize the perceived importance of the task, a factor related to the production of learned helplessness (Roth & Kubal, 1974).

Anagram test problems. The test task consisted of the identical series of 20 five letter anagrams adapted from Tresselt and Mayzner (1966) by Hiroto and Seligman (1975). As in the latter study, all anagrams had the same letter order, i.e., 3-4-2-5-1. The anagrams were placed individually on 10.2 x 15.3 cm. index cards and composed of .8 cm. block letters spaced .4 cm. apart. The 20 cards were preceded by a title card upon which "Anagram Test" was printed in .5 cm. block letters. The entire deck of anagram cards were bound in a 10 ring cardboard binder. The twenty anagrams and solution words are presented in Appendix B.

Falsified research reports. Four different falsified research reports were used to manipulate subjects' beliefs as to the cause of their success or failure on the pretreatment DLT problems. Each report consisted of three pages written in the style and format of a formal research report. Following the administration of the pretreatment problems, subjects in the S-AB and U-AB groups received a report entitled; The Discrimination Learning Test: A Pure Measure of Ability. This report, documenting the importance of an individual's ability as the primary determinant of how well he does on the DLT, is presented in Appendix C. Subjects in the S-EF and U-EF groups received a report entitled; The Discrimination Learning Test: A Pure Measure of Effort. Here the importance of effort or "how hard a person tries" was invoked as the primary determinant of success on the DLT (see Appendix D). Subjects in the S-TD and U-TD groups were given a report entitled; The Discrimination Learning Test: Confounding Difficulty Levels. This report indicated that there were several different forms of the DLT and that performance was a function of the difficulty of the form on which the person was tested (see Appendix E). Finally, subjects in the S-LU and U-LU groups were given a report entitled; The Discrimination Learning Test: The Influence of Chance. This report indicated that an individual's score on the DLT was in fact determined by chance or luck (see Appendix F).

Examination of Appendices B, C, D and E reveals the similar appearance of the four reports. Each was reduced and cut to 16.2 x 21.3 cm. pages to give them a more "official" appearance. The falsified list of references and much of the filler material in the body of the reports was identical. Only particular passages were changed in order to emphasize the importance of the causal belief being manipulated. Examination of the reports also reveals that three structurally similar passages were highlighted with a yellow felt tip marker on each of the four reports. The passages, of course, differed in terms of the causal factor invoked as the determinant of DLT performance.

Respondent Information Form. The self-report dependent, control and exploratory measures were contained in a booklet with the above label on the title page. Subjects were asked to respond to various items at three different times during the experimental sessions. The booklet for experimental subjects is presented in Appendix G. Because subjects in the C condition did not attempt to solve the pretreatment DLT problems, certain items referring to those problems were deleted. The booklet for subjects in the C condition is presented in Appendix H.

Experimental Space. Subjects reported individually to the experimental room at prearranged times. A sign on the door--"College Aptitude Measurement Project"--was designed to reinforce the importance of the tests they would be taking. Subjects were first seated across a desk from the experimenter and administered the vocabulary test. They were then escorted to the adjoining room. This room was connected to the first by a one-way mirror and two metal apertures allowing normal vocal communication between the rooms. Subjects were seated at a desk directly opposite the mirror. On the upper left-hand side of the desk the Anagram Test was placed. Immediately below it was the Respondent Information Form. On the upper right-hand side was the falsified research report (face down) appropriate for the group to which the subject was assigned. Immediately below it was the DLT package. The experimenter directed the experiment from the first room. A stop-watch was used to time the responses to each of the 20 Anagram problems.

Independent Variables

The basic experimental design involved three between subject independent variables corresponding to three completely crossed two level factors. The random assignment of subjects to groups automatically placed them at one level of each of the following factors or independent variables:

Solvability. All experimental subjects were administered four series of pretreatment DLT problems. For half of the subjects these problems were solvable, for the other half they were unsolvable. In the solvable condition subjects received contingent reinforcements, i.e., veridical feedback as to the correctness of their responses. The criterion for acquisition was that the subject could identify the correct value on three out of four 10 block series of patterns. As indicated previously, only one subject failed to reach criterion. Twelve identified the correct value on three series, the other 28 subjects identified the correct value on all four series. Subjects in the unsolvable condition received a predetermined schedule of "correct" and "incorrect" feedback regardless of what value they guessed on each trial. Reinforcement was thus noncontingent or independent of responding. There was no correct value for any of the four series in the unsolvable condition, i.e., subjects gave the "wrong answer" on each of the four problems.

Stability. Following the administration of the pretreatment problems, subjects were falsely informed that their success or failure was primarily determined by their ability, their effort, the difficulty of the task or their luck. Subsequently, subjects were differentiated as to whether they received an informational set invoking a stable determinant (ability or task difficulty) or an unstable determinant (effort or luck).

Locus of control. Similarly, subjects were differentiated as to whether they received an informational set invoking an internal determinant (ability or effort) or an external determinant (task difficulty or luck.

Dependent Variables

There were seven dependent variables including: (1) anxiety, (2) depression, (3) hostility, (4) expectancy for success, (5) mean trials to criterion for anagram solution, (6) number of failures to solve and (7) mean response latency. They may be categorized as follows:

Affective response. At three separate times in the experiment subjects rated their emotional state on the same three 11 point scales. These scales assessed feelings of anxiety as polarized by "calm" versus "nervous," feelings of depression as polarized by "depressed" versus "happy," and hostility as polarized by "hostile" versus "friendly." All scales were contained in the Respondent Information Form (refer to Appendices G and H). Only the scales administered after the causal belief manipulation served as the affect dependent measures.

Expectancy for success and anagram performance. At the same times as the above measures were taken subjects rated how successful they expected to be on problems they were about to receive. Again these ratings were made on 11 point scales each polarized by "unsuccessful" versus "successful". The first rating referred to the discrimination problems they were about to receive, the second referred to the anagram problems they were about to receive and the third referred to a hypothetical "additional set of anagram problems." Because control subjects did not actually receive the discrimination problems they did not complete the first rating of expectancy for success. The second rating of expectancy for success (on the anagram problems) provided the dependent measure for all subjects.

Actual performance on the anagram test problems was assessed using the same three measures described by Hiroto and Seligman (1975). These included the mean number of trials to criterion for anagram solution, criterion being the solution of three consecutive anagrams in less than 15 seconds after which no failures to solve occurred,[4] (6) the number of failures to solve, i.e., the number of trials with latencies of 100

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[4]The previous research does not specify the maximum (poorest) score which can be obtained on this measure although it appears to be 20. In other words, individuals received this score whether the latencies on the last three anagrams are all under 15 seconds or whether they are all equal to 100 secs. In this study the maximum score on trials to criterion was 23, i.e., it was assumed that if more than 20 anagrams were administered they would have been solved in less than 15 secs.

seconds (the time limit for an individual anagram), and mean response latency for the 20 anagrams.

Control and Exploratory Measures

In addition to the seven dependent variables, a number of collateral measures were taken for control and/or exploratory purposes (see Appendices G and H). These were as follows:

Covariates. Five potential covariates were measured prior to pretreatment: (1) vocabulary and ratings on (2) anxiety, (3) depression, (4) hostility as well as (5) expectancy for success. The WAIS vocabulary subtest was used as a measure of verbal ability or I.Q., a factor which was hypothesized to be related to individual differences in the ability to solve anagrams. Similarly, it was considered unlikely that the independent variables would account for all the variance on the three affect dependent measures and the single expectancy for success dependent measures, i.e., these measures were expected to be correlated with the same measures taken prior to experimental manipulation.

Affect and expectancy post measures. Following completion of the actual experiment subjects re-rated themselves on the three affect dimensions and the single expectancy for success ("on an additional set of problems") dimension. These measures were designed to serve purely exploratory purposes.

Attribution of causality rankings. Experimental subjects rank ordered each of the four causal factors (ability, effort, task difficulty and luck) in terms of how much they influenced how well they did on the discrimination problems (experimental subjects only) as well as on the anagram problems (see Appendices F and G, p. 4). The rankings referring to the discrimination problems served both control and exploratory purposes. In the former capacity they acted as a partial check on the effectiveness of the causal belief manipulation (although these rankings were also expected to reflect ego-enhancing/ defensive processes initiated by the manipulations).

Perceptions of performance: Importance, success and control. For both the discrimination and anagram problems, subjects made three self-ratings on the same 11 point scales. These included ratings of the degree to which their results on the problems were important to them as polarized by "unimportant" versus "important," the degree to which they felt that they were successful on the problems as polarized by "unsuccessful" versus "successful" and the degree to which they felt in control of how well they did on the problems as polarized by "not at all in control" versus "very much in control" (see Appendices G and H, p. 5). These measures were designed primarily to serve exploratory purposes.

Perceptions of the causal factors: The locus of control and stability dimensions. For both exploratory and control purposes it was decided to attempt to determine if subjects perceptions of ability, effort, task difficulty, and luck corresponded to the perceptions of the researchers and theoreticians in the social psychology community.[5] In particular it was considered desirable to determine if subjects

[5]The author is grateful to Michel P. Janisse for suggesting this attempt. The scales used for this purpose were adapted from those previously used by Dr. Janisse.

would align the four causal factors on the locus of control and stability dimensions in an appropriate manner. Subjects rated each of the four causal factors on three 11 point scales corresponding to a single locus of control and two stability dimensions. The locus of control (I-E) scale was polarized by "a function of the self" versus "a function of external circumstances," the stability across the same type of problems (STAB 1) scale was polarized by "stable on the same type of problems" versus "changeable on the same type of problems," and the stability across different types of problems (STAB 2) scale was polarized by "stable on different types of problems" versus "changeable on different types of problems." (See Appendices G and H, pp. 6-7).

Additional exploratory items. Four additional items were included for purely exploratory purposes. Each item consisted of an 11 point bi-polar scale. Subjects were asked to: (1) indicate to what degree they felt the discrimination and anagram problems were similar on a scale polarized by "the problems are very different" versus "the problems are very similar;" (2) indicate how skillful they felt they were at playing verbal games such as Scrabble, crossword puzzles, etc., on a scale polarized by "not skillful at all" to "very skillful;" (3) indicate to what degree they generally felt that most of life's problems were solvable on a scale polarized by "most of life's problems are not solvable" versus "most of life's problems are solvable;" and (4) indicate to what degree they generally felt a sense of personal control over most of life's problems on a scale polarized by "no control over life's problems" versus "very much control over life's problems."

Procedure

Upon his arrival at the experimenter's room the subject was seated across the table from the experimenter. The WAIS vocabulary subtest was then administered in the manner previously indicated. The subject was then escorted to the adjoining room and seated at the table at which point the experimenter said:

> The actual experiment will take place in here. I'll be observing you from the other room. We'll be able to communicate because sound carries through these openings (the experimenter pointed to the apertures). Don't touch anything on the desk until I tell you.

Upon his return to the first room the experimenter checked to make sure that the subject could hear all right and then slowly read the following introductory statement:

> This experiment has to do with the measurement of college aptitude. You will be given a number of aptitude tests. The major purpose of the experiment is to examine the validity of the tests and to see how they are related ...to see to what degree they are measuring similar things and to what degree they are measuring different things. We are also interested in the feelings and perceptions that people have while taking the tests. At several times during the experiment I will ask you to rate how you are feeling in the questionnaire to your left...don't look at it yet. As we go along I'll be giving you more information about the tests that you'll be doing. Your results will be strictly confidential.

Pretreatment. The experimenter introduced the pretreatment demonstration problems to all subjects in the following manner:

> Take the set of cards on the table to your right. Turn the title card by the blue tab. This test is called the Discrimination Learning Test (or the DLT for short). It consists of cards very much like this sample card. Each card has two stimulus patterns on it...one on the right and one on the left. These sample patterns are composed of five different dimensions, each dimension having two values associated with it. The 'letter' dimension has the two values 'X' or 'Y', the 'letter size' dimension has the values 'large' or 'small', the 'color' dimension has the values 'circle' or 'square' and the 'border texture' dimension has the values 'solid' or 'dashed'. Each stimulus pattern has one value from each of the five dimensions.

Experimental subjects were given the following instructions:

> I have arbitrarily chosen one of the ten values as being correct. For each card I want you to choose which side contains this value and I will tell you if your choice was 'correct' or 'incorrect'. Just say "left" if you think the pattern on the left contains the correct value or "right" if you think the pattern on the right contains the correct value. In a few trials you can learn what the correct value is by this feedback. The object is for you to figure out what the answer is so that you can choose correctly as often as possible. Go ahead and choose which side you think contains the correct value.

All experimental subjects were administered the five trials of the five-dimensional problem. This was designed to clarify the task of finding the "correct" value. If it appeared that the task was not clear, the subject was asked to turn back to the beginning of the five trial series and presented with a new problem, i.e., for which a new correct value was chosen. This was repeated a maximum of two times. C subjects were asked merely to study each stimulus pattern carefully and then to turn to the next card.

When the demonstration was completed all subjects received the following instructions, "Move the discrimination problem cards away. Before we go through the cards I'd like you to answer some questions in the questionnaire on your left. Put the questionnaire in front of you and read the instructions." When the subject had completed reading the instructions (see the Respondent Information Form in Appendices G and H), the experimenter said, "Okay...turn the page and answer the questions on page one. Let me know if you don't understand any of the questions." When the subject had completed these ratings the experimenter directed him to "turn the questionnaire over and move it aside."

Experimental subjects then received the following instructions:

> Place the discrimination problem cards in front of you. The actual test cards will again have two stimulus patterns... one on the left and one on the right. Turn the stop card and tell me which side contains the correct value. On each card I will tell you if you are correct or incorrect. After I give you feedback turn to the next card. Go ahead.

Instructions to the C group were, "I want you to again study each card carefully and turn to the next one when I tell you. Go ahead and look at the first card." On the first few cards, C subjects were told to "turn the card" after 3 or 4 seconds. These instructions discontinued when it was clear that the subject could pace his card turning at the appropriate rate. Each of the the four series of 10 experimental cards were examined in this manner. Between each series (when the subject reached the 'STOP' card), the experimenter waited approximately 5 secs. and then repeated the instructions.

Experimental subjects received four different problems in blocks of 10 trials each. At the end of each 10-trial problem they were asked, "What is the correct value?" The criterion for acquisition was whether or not the subject could identify the correct value after each 10-trial block. Subjects who received unsolvable (U) problems heard a predetermined schedule of "correct" or "incorrect" regardless of what value was guessed on an individual trial, i.e., reinforcement was not contingent on responding. The schedules for the four problems were as follows: (a) C-I-I-C-C-I-I-C-C-I, (b) I-C-I-C-C-I-C-I-C-I, (c) I-C-C-I-I-C-C-I-I-C, and (d) I-C-I-C-I-C-C-I-C-I. When subjects in the U groups attempted to guess the correct value after each problem they were told "that's incorrect." Subjects receiving solvable problems, of course, received contingent reinforcement on all trials of all four problems. Prior to the start of each new problems, all experimental subjects were told:

> We are now starting a new problem. You do not know at this point if I have chosen a different correct value for this problem. I will continue telling you if you are correct or incorrect. Go ahead and turn to the first card.

Following Hiroto and Seligman's (1975), experimental procedure subjects were allowed 10 secs. to make a decision on each trial before the experimenter warned that they had five more secs. As in that study, however, almost all subjects took less than 10 secs. on every trial.

Causal belief manipulation. Following the completion of pretreatment, experimental subjects were told, "Okay (subject's first name), you've got a minute or so to relax before the next test. On the right hand side of your table there is a research report describing some recent research on the test you've just taken...take a minute and glance through it." After a few moments the experimenter said, "You won't have time to read it all...the major points are underlined in yellow marking pencil." The subject was observed carefully to be sure that he followed instructions. After a maximum of 60 secs. the experimenter made the following comments depending upon the condition to which the subject had been randomly assigned. To S-AB subjects the experimenter said:

> Basically the research has shown that how well a person does on the test is determined by how much ability he has. You did very well...according to the test you have a pretty high ability level.

To S-EF subjects, the experimenter said:

> Basically the research has shown that how well a person

> does on the test is actually determined by how hard he tries. You did very well...according to the test you were trying very hard.

To S-TD subjects, the experimenter said:

> Basically the research has shown that how well a person does on the test is actually determined by how difficult the specific form of the test is. You did very well, but that is probably because you took form D...the easiest form.

To S-LU subjects, the experimenter said:

> Basically the research has shown that how well a person does is actually determined by chance. You did very well...according to the test you were very lucky.

To U-AB subjects, the experimenter said:

> Basically the research has shown that how well a person does on the test is determined by how much ability he has. You did very poorly...according to the test you have a pretty low ability level.

To U-EF subjects, the experimenter said:

> Basically the research has shown that how well a person does on the test is actually determined by how hard he tries. You did very poorly...according to the test you weren't trying very hard.

To U-TD subjects, the experimenter said:

> Basically the research has shown that how well a person does on the test is actually determined by how difficult the specific form of the test is. You did very poorly but that is probably because you took form A...the most difficult form.

To U-LU subjects, the experimenter said:

> Basically the research has shown that how well a person does on the test is actually determined by chance. You did very poorly...according to the test you were very unlucky.

For the C subjects, it was considered desirable to control for the passage of time. Therefore, following pretreatment the experimenter said, "Okay (subject's first name). You've got a minute or so to relax before the next test." C subjects were then simply observed for

for approximately 60 secs.

Testing phase. Immediately following the causal belief manipulation, all subjects received the following instructions:

> In the next test you will be trying to solve anagrams. Anagrams are words with the letters scrambled. The problem for you will be to unscramble the words so that they form a word. Right now put the questionnaire in front of you. Turn to page two. Remember to make your ratings in terms of how you are feeling now.

When subjects had completed their ratings the experimenter said:

> Take the brown booklet on your left and put it in front of you. Turn the cover. Again the problem for you is to unscramble the letters so that they form a word. When you have found the word tell me what it is. Now there could be a pattern or a principle by which to solve the anagrams but that's for you to figure out. Don't turn the cards until I tell you. Go ahead and turn to the first anagram. Tell me when you've found the word.

The number of seconds to solution were measured with a stopwatch (up to a maximum of 100 secs., when the trial was ended). When the time was recorded the experimenter said, "Turn to the next anagram and tell me what the word is." When the 20 anagrams had been completed in this manner, the experimenter directed subjects to complete the final control and exploratory items by saying, "Put the questionnaire in front of you and turn to page three. Remember to make your ratings in terms of how you are feeling now." When the subject completed all ratings on page three the experimenter said, "Go ahead and answer the questions in the rest of the questionnaire." When this was completed the subject was directed to bring his questionnaire and come back into the experimenter's room.

Post-experimental probe and debriefing. The primary purpose of the post-experimental probe was to determine if the deceptive aspects of the procedure were "bought" without question or suspicion. The format of this inquiry was not strictly programmed. The experimenter examined experimental subjects' rankings of the causal factors influencing performance on the DLT (see Appendix F, p. 4). If they did not rank the manipulated causal factor first, i.e., as being the most influential, the experimenter probed as follows: "Do you remember the research report that you read? Do you remember what it said? Do you think the report was accurate...do you think how well you did on the DLT was most influenced by (ability, effort, task difficulty, or luck)? And if necessary, "You didn't rate your performance on the DLT as being most influenced by (the manipulated causal belief) ...can you tell me why not?" Invariably one or several of the subject's responses to these questions would indicate whether or not the subject's attribution was a function of suspicion (or insight) regarding the nature of the procedure or whether it was a personal, idiosyncratic judgment unrelated to the procedures lack of face validity for him. In a similar manner the experimenter examined the responses to the personal reaction survey on the last page of the Respondent Information Forms (see Appendices G and H). When suspicion or insight was indicated, these indications were probed. As noted previously, three subjects were replaced for these reasons.

Debriefing was patterned after a procedure outlined by Mills (1976). It was extensive and thorough, taking anywhere from 10 to 15 minutes. It was designed to alter the previously formal experimenter/subject relationship to a more open and empathetic one. The purpose was three-fold: (a) to inform the subject as to the exact nature of the deceptions, (b) to make him feel good about himself, his performance and his contribution to an important and meaningful area of research; and (c) to induce him to not reveal the true nature of the experiment to others for a period of three weeks.

The format of the debriefing was not rigidly structured. Generally, however, five basic points were touched on: (a) the actual research interest using real life examples of helplessness and attribution processes; (b) the nature of the solvability and causal belief manipulations (including examples of the other conditions); (c) reasons why deception was necessary; (d) an explanation of the fact that we wanted to see how "the average person" responded and could not generalize from how he or any other individual had responded; and, finally (e) the need for silence to avoid "subject pool pollution." All subjects agreed not to discuss the study for a period of three weeks and were paid $5.00 for their participation. It was both experimenters' impression that this debriefing procedure elicited a good deal of interest in the study and often a degree of self-disclosure regarding personal experiences of helplessness, etc.

Experimental Design and Data Analysis

The experimental design consisted of a 2x2x2 factorial arrangement supplemented by a single uncrossed control group (the latter to provide a baseline against which helplessness or facilitation could be operationally defined. The factorial design included two levels of pretreatment (solvable vs. unsolvable problems), a manipulated stability causal dimension (stable vs. unstable) and a manipulated locus of control dimension (internal versus external). Thus, the design consisted of three independent variables, seven dependent variables and a variety of control and exploratory variables.

A primary set of analyses involved the direct tests of the four previously stated research hypotheses. Each of these hypotheses corresponded to a planned orthogonal comparison. Because the comparisons were orthogonal and a priori, the hypothesis provided the conceptual unit for error rate (cf. Kirk, 1968) for these as well as the factorial analyses. It must be noted, however, that hypotheses one and two each involved a package of four dependent variables (the expectancy for success and the three anagram performance measures) and hypotheses three and four each involved a package of three dependent variables (the three affect measures). Thus the number of actual statistical comparisons relevant to each hypothesis was equivalent to the number of dependent variables being considered. Therefore separate tests of each statistical comparison would inflate the error rate per hypothesis beyond the selected significance (alpha) level.

Partly in order to reduce the ambiguity regarding Type I error rate generated by the consideration of several dependent variables, multivariate as well as univariate techniques were utilized. The multivariate test of the equality of mean vectors (i.e., evaluating all dependent measures simultaneously) for each experimental hypothesis was utilized as a control for Type I error rate (cf. Cramer & Bock, 1966). By effectively taking into account the intercorrelations of the dependent variables to reference the appropriate sampling distribution, the multivariate test establishes an omnibus error rate for that "package" of dependent variables (Gabriel & Hopkins, 1974). With this procedure rejection of the null hypothesis using the multivariate test was considered a prerequisite for the interpretation of the separate univariate results relevant to that same research hypothesis. In other words a significant multivariate F-statistic was required prior to interpreting the significance of univariate F-statistics.

Because of the heuristic possibilities inherent in the present research endeavor, the error of not detecting a real experimental phenomenon (Type II error) was considered to be at least as serious as mistakenly concluding that the predictions were supported (Type I error). In view of the relatively benign consequences of an error of the latter type, maximizing statistical power was of some concern. For this reason the selected error rate per hypothesis (significance level) was relaxed from the conventional .05 to the .10 level. The possible "liberalness" of this decision rule is attenuated, however, by the fact that the univariate results were considered against an alpha level equally split between the dependent variables in the package (see Dunn, 1961). For example, following significant multivariate tests each of the four univariate results considering the expectancy for success and the three anagram performance measures were judged at alpha = .025, whereas each of the three affect dependent variables were judged at alpha = .033. Further, it should be noted that one-tailed rejection regions were not utilized despite the inherent directionality of the hypotheses (it being considered mandatory to have an interpretive capability to deal with surprise results in unpredicted directions).

The measurement of covariates potentiating the use of multivariate analysis of covariance (MANCOVA) rather than multivariate analysis of variance (MANOVA) represented another attempt to increase statistical power. The increase in precision consequent upon the use of such techniques is dependent primarily upon the absolute magnitude of the product moment correlation between the dependent variables and the relevant covariates. According to Cochran (1957) anything less than $r = .30$ provides an inconsequential reduction in variance. Therefore, it was decided that the first criterion for the use of ANCOVA techniques was that the multiple correlations between the dependent variables be positive and average to a correlation equal to or greater than .30. Given that the covariates passed this test, a second consideration involved the assumption of parallel regression planes. Glass, Peckham and Sanders (1972) cited an unpublished Monte Carlo study by Peckham (1968) indicating that the F-statistic was robust to violations of this assumption unless the departure from homogeneous slopes was extreme. The authors pointed out, however, that these findings were specific to a situation in which the error variance was held constant and in which the covariate was fixed (i.e., was not a random variable). For these reasons, Glass et al. (1972) state that: "One should guard against overgeneralizing from this empirical investigation" (p. 277). In order to avoid unnecessary interpretive complication, a second criterion for the use of ANCOVA techniques was that the regression planes be parallel.

A further word on interpretation seems in order. Because the tests of multivariate hypotheses generated by MANOVA or MANCOVA permitted the simultaneous consideration of several related dependent measures, the multivariate F-statistics were of considerable interest above and beyond their utility as a control for Type I error. However, each of the dependent variables, while conceptually related, also had varying degrees of distinctive theoretical interest above and beyond whatever they contributed to the multivariate effect. Therfore, given a significant multivariate effect, the second stage of interpretation involved an examination of the individual univariate F-statistics to determine which, if any, of the dependents were statistically significant. Unfortunately, however, the F-values for these individual variables do not necessarily reflect the magnitude of their contribution to the multivariate F-statistic (because the latter takes the intercorrelations among the dependent variables into account in determining the ratio of treatment to error variance). As an aid to the interpretation of significant multivariate effects, therefore, discriminant function analyses were performed as an adjunctive second-stage interpretive vehicle (along with individual ANOVA's or ANCOVA's, one for each dependent variable).

Because the standardized discriminant function coefficients take into account the interdependencies among dependent variables, they indicate these variables relative contribution to a given MANOVA or MANCOVA effect. Unfortunately this very dependency makes for an interpretive ambiguity of a different nature than that entailed in the use of univariate F-statistics. Spector (1977) points out that:

> ...the interpretation of each individual variable cannot be made independently of the others, and the more complex the interdependencies among the dependent variables, the more complex the interdependencies in the discriminant function. The elimination of individual variables from the function can greatly affect the remaining coefficients. Further, variables that do not directly differentiate the j groups but rather moderate the relationships between treatments and other dependent variables can have relatively large coefficients. Finally, if two dependent variables are highly correlated and one differentiates better than the other, the better discriminator may have a high coefficient and the other a low coefficient, simply because the second variable adds little discrimination over the first (i.e., there is a redundancy of measurement). Yet the second may in fact discriminate by itself, an ability obscured by the discriminant function.

For the above reasons as well as the fact that errors of measurement are compounded when many dependent variables are involved, Spector suggests caution in using discriminant coefficients to indicate the contribution of individual variables to multivariate effects. In the presentation of results which follows this chapter, standardized discrimination function coefficients are routinely reported following all significant multivariate effects. When the interpretation of such effects are unclear, e.g., when there are no significant univariate effects, the coefficients will be utilized in conjunction with the univariate F-statistics for whatever insight they may lend. (For a more complete discussion of the relationship between discriminant analysis and ANOVA in MANOVA, see Spector, 1977.)

CHAPTER III

Results

Data analysis can be conceptualized as serving primarily a control or validation function, an hypothesis testing function, and a heuristic or exploratory function. These somewhat arbitrary distinctions indicate the basic sequence in which the results will be presented in this chapter. Control analyses will include (a) an analysis to determine the appropriateness of MANCOVA versus MANOVA; (b) an analysis for experimenter bias; (c) an examination of self-reported causal attribution; and (d) a comparison of all experimental groups to the control group. Hypothesis testing analyses will include (e) direct tests of the four predictions and (f) general analyses to determine the effects of the three independent variables upon the two packages of dependent variables. Among the heuristic or exploratory analyses are (g) an analysis of affect and expectancy following the anagram test; (h) an analysis of subjects' perceptions of the DLT and anagram test in terms of the importance of their results, their degree of success and their degree of personal control; (i) an examination of subjects' perceptions of ability, effort, task difficulty and luck in terms of the stability and locus of control dimensions; (j) an analysis of additional exploratory items and (k) a correlational analysis of all dependent measures. For reasons to be discussed later in this chapter, an additional set of analyses was conducted on groups formed according to subjects' measured self-attributions of causality rather than according to the causal beliefs manipulated by the deceptive procedure. The new groups created by this alteration will be subjected to the d, f, g and h analyses described above.

Control Analyses

Criteria for the use of covariates. In order to determine the appropriateness of MANCOVA procedures the covariates and their related dependent variables were subjected to (a) a multiple correlation analysis and (b) a test of the assumption of parallel regression hyperplanes. In Table 1, the regression of the first package of dependent variables (expectancy for success, trials to criterion, number of failures to solve and mean response latency) on the two covariates of scaled vocabulary score and the expectancy for success premeasure is presented. The average of these correlations ($\bar{X}$. = .3326) exceeds the criterion of .30. The test of the null hypothesis of parallel regression hyperplanes was nonsignificant ($F = .7608$, $df = 56/208.3320$. $p > .88$). Therefore, the researcher decided to utilize the MANCOVA procedures when considering these four dependent variables.

In Table 2, the regression of the second package of dependent variables (anxiety, depression and hostility) on the three premeasures of these variables is presented. It is clear from Table 2 that each of the relevant multiple correlations easily exceeds the criterion and that the use of covariates would result in a substantial increase in precision. Unfortunately, however, the parallelism test was statistically significant ($F = 1.6476$, $df = 63/138.1514$, $p < .0081$). Therefore, the researcher decided to discard these covariates and utilize MANOVA procedures when considering the three affect dependent variables.

Experimenter bias. In order to assess the presence of experimenter bias, each of the two basic packages of dependent variables was consid-

Table 1

Multiple Correlation Statistics for Regression Analysis with Scaled Vocabulary Score and Expectancy for Success as the Predictor Variables

Dependent Variable	R	R^2
Expectancy for success	.2946	.0868
Trials to criterion	.2931	.0859
Number of failures	.3747	.1404
Response latency	.3680	.1355

Table 2

Multiple Correlation Statistics for Regression Analysis with the Three Affect Premeasures as the Predictor Variables

Dependent Variable	R	R^2
Anxiety	.5815	.3382
Depression	.7232	.5230
Hostility	.8242	.6794

ered in a four-way factorial design in which the experimenter factor was completely crossed with each of the three independent variable factors. In the first analysis, expectancy for success, trials to criterion, number of failures to solve and mean response latency were considered using MANCOVA. The assumption of parallel regression hyperplanes across the 16 cells of the design was justified by the nonsignificant parallelism test ($F = .7506$, $df = 120/227.8975$, $p > .94$). All mulivariate tests of experimenter main effects and interactions were judged to be nonsignificant (all $p > .10$). It was concluded that expectancy and anagram performance dependent measures were not significantly affected by differences between the experimenters. A summary table of this analysis is presented in Appendix I. In the second analysis, the three dependent variables of anxiety, depression and hostility were considered using a four-way MANOVA. All multivarite tests of experimenter main effects and interactions were judged to be nonsignificant (all $p > .18$). No differences on the affect dependent measures were considered to have occurred as a function of differences between the experimenters. A summary table of this analysis is presented in Appendix J.

In order to determine if the attribution manipulation was differentially affected by the experimenters, the rankings of the causal belief manipulated in each of the experimental conditions were compared between experimenters. All tests were nonsignificant as follows: U-AB group ($t = .58$, $p > .58$); U-EF group ($t = .49$, $p > .641$); U-TD group ($t = 1.63$, $p => .141$); U-LU group ($t = -.59$, $p > .572$); S-AB group ($t = -1.26$, $p > .242$); S-EF group ($t = -1.41$, $p > .195$); S-TD group ($t = 0.0$, $p > .1.0$); S-LU group ($t = -.52$, $p > .62$). On the basis of this analysis the researcher concluded that there were no significant differences in the attribution manipulation as a function of the experimenters. All three of the above analyses are unanimous as to the lack of experimenter differences.

Self-reported causal beliefs. It will be recalled that immediately following the completion of the anagram test subjects rank ordered the causal factors of ability, effort, task difficulty and luck in terms of how much they influenced performance on the pretreatment discrimination problems. The percentage of individuals ranking the manipulated factor first was 40% in the U-AB group, 50% in the U-EF group, 60% in the U-TD group, 50% in the U-LU group, 60% in the S-AB group, 60% in the S-EF group, 30% in the S-TD group and 20% in the S-LU group. With the exception of the S-TD and S-LU groups, the modal ranking of the manipulated causal factor in all experimental groups was equal to 'one'. The S-TD group's rankings were tri-modal (modes = 1, 2 and 3) and the S-LU group's rankings were bi-modal (modes = 2 and 4). The mean rankings of the four causal factors by experimental group are presented in Table 3.

The ranking of the causal factors will later be discussed in terms of the degree to which they reflected the success of the causal belief manipulations as well as the degree to which they reflected the ego enhancing/defensive motives of the subjects. At this point, however, it may be noted that the rankings do not in and of themselves provide overwhelming evidence for the effectiveness of the attribution manipulations (although they are comparable to results of previous research involving similar deceptions, c.f., Reimer, 1975). Regardless of previous findings, the fact that the highest ranked causal factor of from 40% to 80%

Table 3

Cell Means and Standard Deviations of the Rankings of Causal Factor Influence on the Pretreatment DLT Problems

	Causal Factors			
Groups	Ability	Effort	Task Difficulty	Luck
U-AB	2 (1.054)	2 (1.247)	2.8 (0.919)	3.2 (0.919)
U-EF	2.2 (0.919	2 (1.247)	2.6 (1.075)	3.2 (1.033)
U-TD	3 (0.667)	2.8 (1.135)	1.6 (0.843)	2.6 (1.349)
U-LU	3 (1.247)	2.7 (1.595)	2.5 (0.849)	1.8 (1.033)
S-AB	1.4 (0.516)	2 (1.054)	2.8 (0.632)	3.8 (0.422)
S-EF	2 (0.667)	1.5 (0.707)	2.6 (0.966)	3.9 (0.316)
S-TD	1.8 (0.788)	2.3 (1.059)	2.2 (1.032)	3.7 (0.675)
S-LU	2.1 (0.875)	2.4 (1.349)	2.9 (1.100)	2.6 (1.174)

Note: Standard deviations are in brackets.

of the subjects within individual experimental groups did not correspond to the causal factor they were told was most influential cannot be ignored. Whether the lack of correspondence indicates that the manipulations "didn't take" in the sense of exerting a predictable impact on subsequent affect, expectancy and performance is a question which will be addressed in the chapter which follows. However, it was in large part because of this issue that several analyses (to be reported on the following pages) were redone on groups "re-formed" according to subjects' measured attributions of causality.

Control group comparisons. The presence or absence of helplessness and/or facilitation effects in individual experimental groups was operationally defined with reference to the C group. Strictly speaking, helplessness could only be said to have occurred when a group's anagram performance was significantly below that of control subjects; facilitation could only be said to have occurred when it was significantly above that of the control subjects. The multivariate analogue to Dunnett's t procedure was used to compare the eight experimental groups to the C group. This involved the use of MANCOVA with the scaled vocabulary scores serving as the covariate. (For the summary table see Appendix K, for the means see Appendix L.)

For the comparison involving the U-AB group versus the C group, the multivariate test was judged to be statistically significant ($p < .0024$). Although the mean differences on all dependent variables reflected the relatively debilitated anagram performance of the U-AB subjects, only the univariate test considering trials to criterion was judged to be significant ($p < .0141$). Noteably the standardized discriminant function coefficients for trials to criterion (1.7841), number of failures to solve (-0.5667) and response latency (-0.8448) reflected the order of magnitude of the univariate effects. No other multivariate tests were considered significant (all $p > .22$). Helplessness appears to have occurred only in the U-AB group.

Hypothesis Testing or Explanatory Analyses

Direct tests of the major hypotheses. In Chapter I four hypotheses were presented. The first two hypotheses described simple effects involving the influence of the stability dimension on expectancy and performance. Both comparisons were tested with MANCOVA procedures using the scaled vocabulary scores and the premeasure of expectancy for success as covariates. (For a summary of these comparisons see Table 4, for the adjusted means see the solvability by stability interaction in Appendix O.) Hypothesis one predicted that subjects who received unsolvable DLT problems and information indicating that their failure was determined by stable causal factors (ability and task difficulty would have lower expectancies for success on the anagram problems and would actually perform more poorly on those problems than subjects who received unsolvable problems and information indicating that their failure was determined by unstable causal factors (effort and luck). The multivariate test of this comparison was nonsignificant ($p > .16$) and hypothesis one was considered to be unsupported. Hypothesis two predicted that subjects who received solvable DLT problems and information indicationg that their success was a function of stable factors would have higher expectancies for success on the anagram problems and would actually perform better on those problems than subjects who received solvable

Table 4

Multivariate and Univariate Analyses of Covariance* for the Two Planned Orthogonal Comparisons Considering Expectancy and Anagram Performance Measures

Source	df	MS	F	p**
Unsolvable Pretreatment: Stable vs. Unstable Beliefs (Hyp. #1)				
Multivariate			1.6828	.1643
Expectancy for success	1	3.8113	0.8951	.3474
Trials to criterion	1	14.1893	0.3705	.5448
Number of failures	1	7.4022	0.5790	.4493
Response latency	1	5.3328	0.0131	.9094
Solvable Pretreatment: Stable vs. Unstable Beliefs (Hyp. #2)				
Multivariate			1.0013	.4132
Expectancy for success	1	0.0585	0.0137	.9071
Trials to criterion	1	122.3744	3.1951	.0782
Number of failures	1	8.9971	0.7037	.4045
Response latency	1	613.5716	1.5016	.2246
Subject Within Groups				
Expectancy for success	70	4.2582		
Trials to criterion	70	38.3003		
Number of failures	70	12.7851		
Response latency	70	408.6228		

* Premeasures of expectancy for success on the DLT and the scaled vocabulary test scores served as the covariates.

** p - value for multivariate test of equality of mean vectors generated with reference to F (4,67).

problems and information that their success was determined by unstable causal factors. The multivariate test of this comparison was nonsignificant ($p > .41$) and hypothesis two was considered to be unconfirmed.

The third and fourth hypotheses described simple effects involving the influence of the locus of control dimension upon affective response. Both comparisons were tested with MANOVA procedures. (For a summary of these comparisons see Table 5; for the means see the solvability by locus of control interaction in Appendix R.) Hypothesis three predicted that subjects who received unsolvable DLT problems and information indicating that their failure was a function of internal causal factors (ability and effort) would indicate more anxiety, depression and hostility than would subjects who received unsolvable problems and information indicating that their failure was determined by external causal factors (task difficulty and luck). The multivariate test was judged to be statistically significant ($p < .0631$). Although the mean differences on all dependent measures were in the predicted direction only the univariate test considering depression was considered to be significant ($p < .0114$). The standardized discriminant function coefficients for anxiety (0.0826), depression (-1.1162) and hostility (0.4361) clearly indicates the importance of depression in the significant multivariate effect. Hypothesis three was considered to be confirmed. Hypothesis four predicted that subjects who received solvable DLT problems and information indicating that their success was determined by internal causal factors would indicate less anxiety, depression and hostility than subjects who received solvable DLT problems and information indicating that their success was determined by external causal factors. The multivariate test of this

Table 5

Multivariate and Univariate Analyses of Variance for the Two Planned Orthogonal Comparisons Considering the Three Affect Dependent Measures

Source	df	MS	F	p*
Unsolvable Pretreatment: Internal vs. External Beliefs (Hyp. #3)				
Multivariate			2.5448	.0631
Anxiety	1	4.9000	1.0268	.3143
Depression	1	22.5000	6.7556	.0114
Hostility	1	0.6250	0.1757	.6764
Solvable Pretreatment: Internal vs. External Beliefs (Hyp. #4)				
Multivariate			0.9981	.3990
Anxiety	1	3.6000	0.7544	.3881
Depression	1	10.0000	3.0025	.0875
Hostility	1	3.6000	1.0121	.3178
Subject Within Groups				
Anxiety	72	4.7722		
Depression	72	3.3305		
Hostility	72	3.5569		

* *p* - value for multivariate test of equality of mean vectors generated with reference to F (3,70).

comparison was statistically nonsignificant (p .39) and hypothesis four was regarded as unsupported.

Expectancy and anagram performance measures. The expectancy and anagram performance measures were subjected to a three way MANCOVA with the premeasure of expectancy for success and the scaled voacabulary score serving as the covariates. (For the summary table see Appendix M; for the adjusted cell means see Appendix N.) Of particular interest from a hypothesis testing standpoint in this omnibus analysis was the interaction between solvability and stability. It is this interaction which is most relevant to the postulated relationship between causal stability and subsequent expectancy and performance. Because this interaction term is calculated across both solvable and unsolvable conditions it constitutes a more powerful, albeit more general, test of the basic relationship than that provided by the simple effects decribed by hypotheses one and two.

The multivariate test of the solvability main effect barely exceeded alpha ($p < .1053$) and was judged to be marginally significant. While the mean differences were all in the appropriate direction only the univariate test considering expectancy for success approached statistical significance ($p < .0282$). These results suggest that exposure to unsolvable problems caused lower expectancies for success but that this lowered expectancy was not accompanied by significant debilitation in actual performance on the anagram problems as measured by the performance dependent variables. Notably, however, the standardized discriminant function coefficients for expectancy for success (-0.7832), trials to criterion (1.2730), number of failures to solve (1.8725) and mean response latency (-3.0542) reflected the reverse order of magnitude as did the univariate ANCOVA effects. Thus from the standpoint of the dependent variables as an interrelated package it appears that the performance measures, particularly mean response latency, contributed most heavily to the multivariate effect. It could be that the response latency measure is acting as a moderator variable and therefore is heavily weighted in the discriminant function. No other mulivariate test of main effects were considered statistically significant (both $p > .13$).

The multivariate test of the crucial interaction between solvability and stability was judged to be statistically significant ($p < .0799$). None of the univariate tests were considered to be significant, however (all $p > .09$). Notably, the standardized discriminant function coefficients for expectancy (0.3388), trials to criterion (0.7492), number of failures (-2.5659) and response latency (2.1775) reflect a rather different order of magnitude than that reflected by the univariate F-statistics (see Appendix M). Clearly number of failures and response latency, whether acting as moderators or high discriminators, are primarily responsible for the significant multivariate effect. Unfortunately this effect's theoretical relevance is difficult to determine in the absence of signifcant univariate results. In view of this interaction's theoretical importance, therefore, a discriminant composite was derived from the dependent variable means (weighted by the raw discriminant function coefficients and summed across conditions). The raw coefficients are as follows: expectancy (.254991), trials to criterion (.322411), number of failures (.559220) and response latency (-.172517). The composite scores for each condition are: unsolvable/stable (3.72), unsolvable/unstable

(2.93), solvable/stable (3.17), solvable/unstable (3.74). Although these scores are relatively meaningless in terms of scale value, as graphed in Figure 1 they clearly portray the form of the multivariate interaction of solvability and stability. Notably this form corresponds to that predicted for the anagram performance measures.

In Figures 2, 3, 4 and 5 the nonsignificant univariate effects are graphed. From Figure 2 it is clear that the postulated relationship between causal stability and expectancy is completely unsupported, indeed, contraindicated by the adjusted mean differences. This is particularly evident in the unsolvable condition where subjects informed that their failure was due to stable causal factors actually had higher expectancies for success than subjects informed that their failure was due to unstable causal factors. From Figures 3, 4 and 5 it can be seen that the adjusted mean differences on all the performance dependent measures are in the predicted direction within the solvable condition. However, only on the trials to criterion measure are the differences in the predicted directions in both the solvable and unsolvable conditions. Noteably, it was this dependent variable which had the highest F-statistic among all the dependent variables considered by the univariate ANCOVAS.

Also interesting is the fact that the adjusted mean differences on number of failures to solve take the general form of a main effect rather than an interaction. The fact that this variable's univariate F-statistic is the lowest ($p < .9582$) among the dependent variables while its standardized discriminant function coefficient is the highest suggests that it was most likely acting as a moderator. Probably the variables "most moderated" were those with the lowest discriminant coefficients,

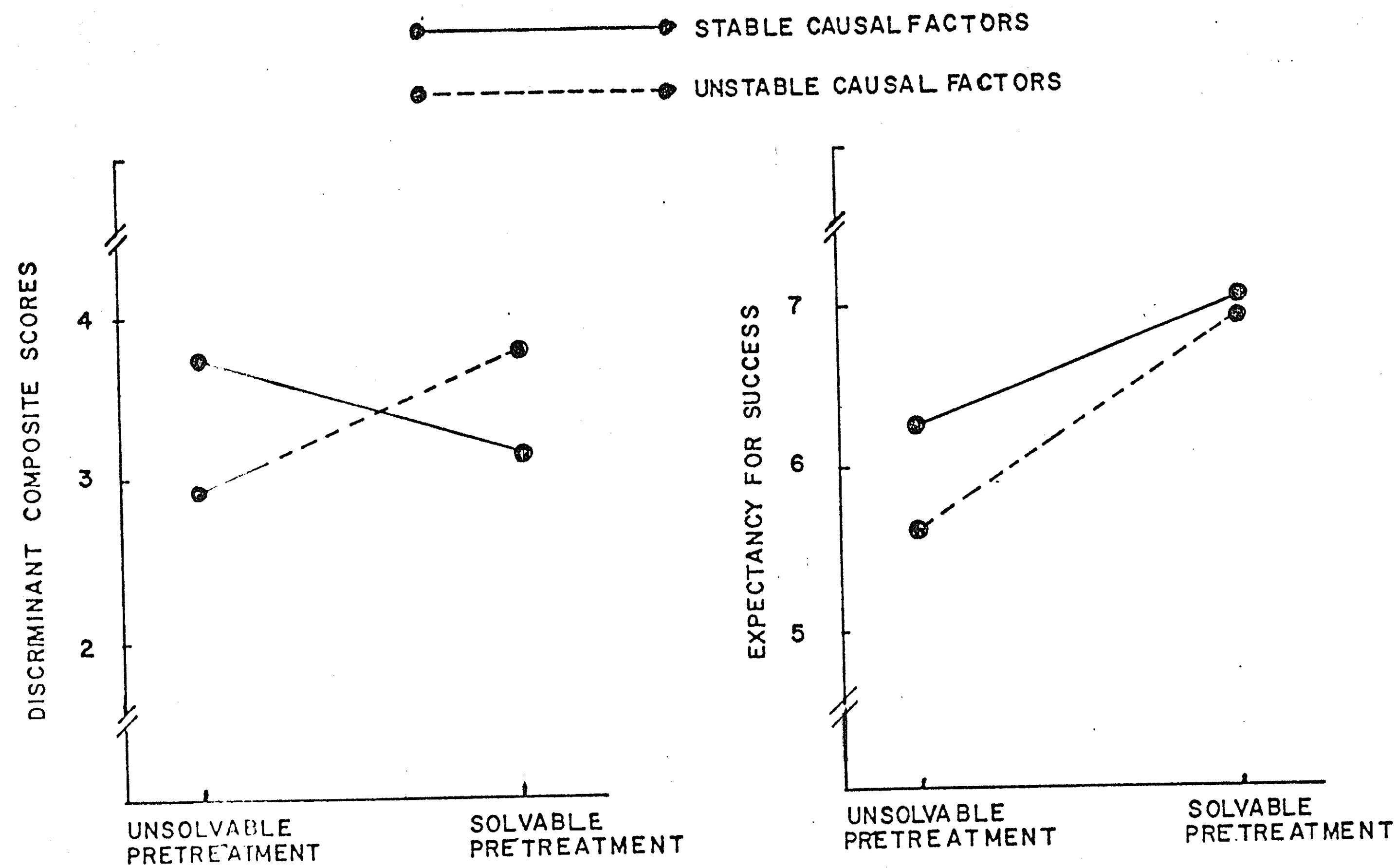
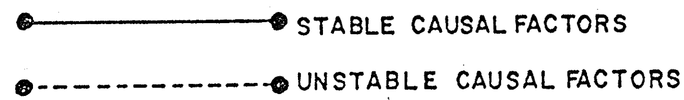


Figure 1. Discriminant composite score differences: The multivariate solvability by stability interaction.

Figure 2. Adjusted mean differences: The solvability by stability interaction.



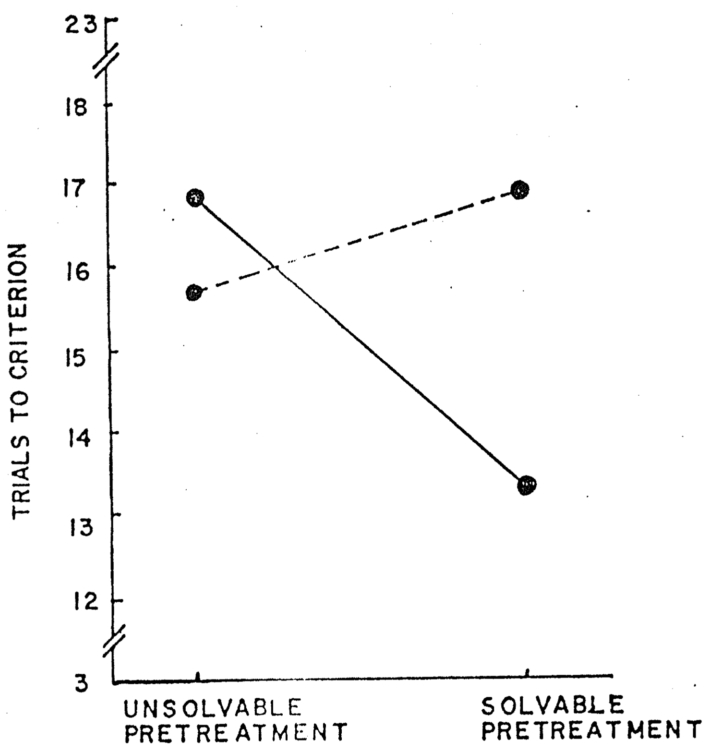


Figure 3. Adjusted mean differences on trials to criterion: The solvability by stability interaction.

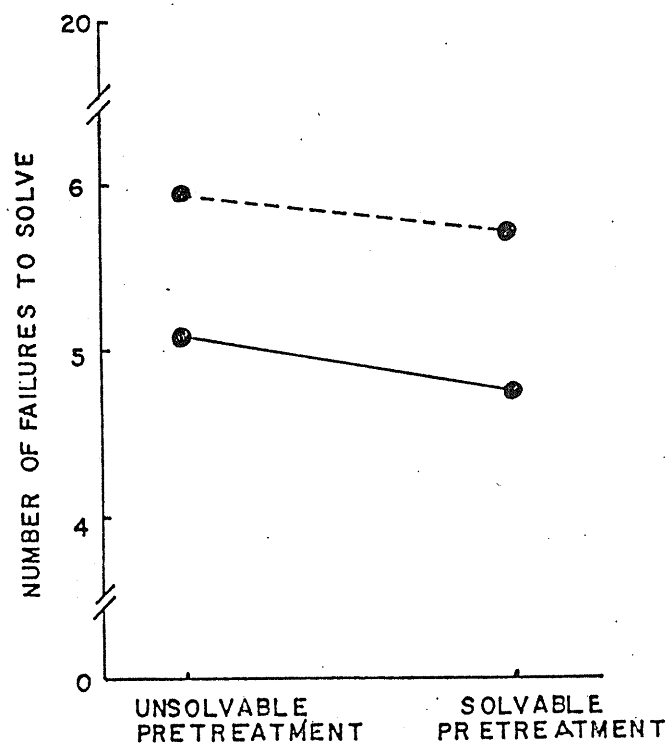


Figure 4. Adjusted mean differences on number of failures to solve: The solvability by stability interaction.

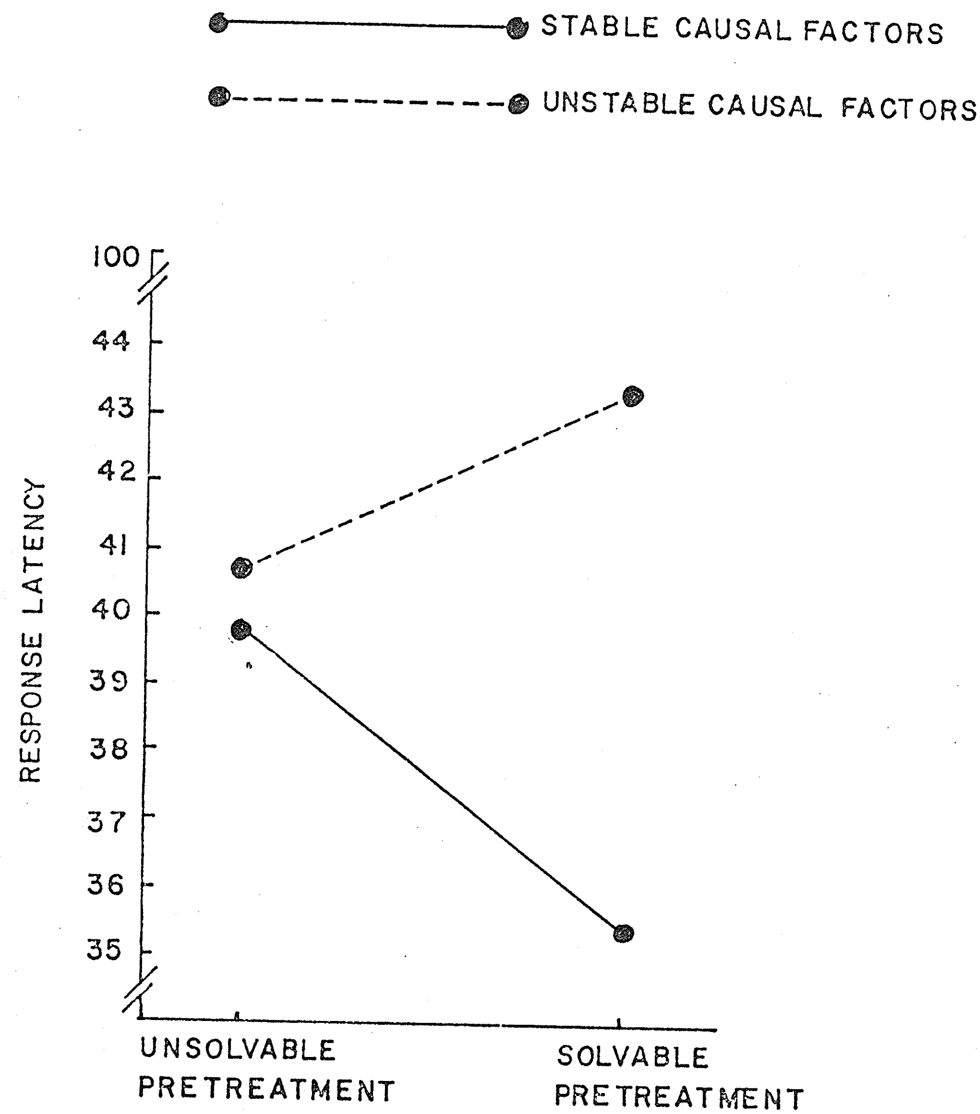


Figure 5. Adjusted mean differences on response latency: The solvability by stability interaction.

i.e., expectancy for success and trials to criterion. Further it was probably the adjusted mean differences in the unsolvable condition which were most enhanced. Note, however, that in the unsolvable condition the mean differences on both these variables are in the same direction yet only the differences on trials to criterion are in a precidted direction. Thus, to the degree that the contradictory differences on expectancy for success were moderated by the number of failures variable is the degree to which expectancy made a 'theoretically spurious' contribution to the significant multivariate effect, in particular to the composite score differences in the unsolvable condition (see Figure 1). If it could be shown that only trials to criterion was moderated by number of failures to solve interpretation of the multivariate effect would be simpler. Trials to criterion is, however, notable both because it most closely approached statistical significance ($p < .0967$) but also because its adjusted mean difference (see Table 3) appear to correspond most closely to the compostie score differences on the multivariate results (see Table 1). This nonsignificant univariate result tends to be supportive of the postulated relationship between causal stability and anagram performance in both solvable and unsolvable conditions. The mean differences (on this and the other two performance dependent measures) suggests, however, that this support primarily resides in the solvable condition, i.e., subjects told to attribute their success to stable causal factors tending to do better on the anagrams than those told to attribute their success to unstable causal factors. These nonsignificant univariate trends following the ambiguous multivariate result lend the postulated relationship between causal stability and anagram performance only a weak and tentative degree of support.

Affect dependent measures. The three affect measures were subjected to a three way MANOVA. (For the summary table see Appendix O; for the means see Appendix P.) Of particular interest from a hypothesis testing standpoint was the interaction of solvability and locus of control. It is this interaction which is most relevant to the postulated relationship between a causal belief's locus of control and subsequent emotional response. Because the interaction term is calculated across both solvable and unsolvable conditions, it constitutes a more powerful test of the basic relationship than that provided by the simple effects delineated by hypotheses three and four.

The multivariate test of the main effect of solvability was strongly significant ($p < .0005$). Of the three univariates only the tests considering depression ($p < .0001$) and hostility ($p. < 0237$) were judged to be statistically significant. From Appendix P it can be seen that the mean differences were in the expected direction on all dependent variables. The standardized discriminant function coefficients for anxiety (-0.1409), depression(-1.0272) and hostility (-0.0320) clearly show depression to be the major contributor to the multivariate effect. It was concluded that subjects exposed to unsolvable pretreatment problems evidenced significantly higher feelings of depression and hostility than subjects exposed to solvable problems. No other significant main effects were detected by the multivariate tests (both $p > .46$).

The multivariate test of the crucial interaction between solvability and locus of control was statistically significant ($p < .0287$). Of the dependents, only the measure of depression was judged to be significant ($p < .0031$). The standardized discriminant function coefficients for anxiety (0.1082), depression (-1.0580) and hostility (0.2431) clearly indicate the greater importance of depression in the multivariate effect. As Figure 6 illustrates, the degree to which subjects rated themselves as depressed was a function of both solvability and locus of control: In the unsolvable condition subjects told that their failure was due to internal causal factors were more depressed than subjects told that it was due to external causal factors; in the solvable condition subjects told that their success was due to external causal factors were more depressed than those who were told that it was due to internal causal factors. The primacy of this effect is reinforced by the absence of any other significant interaction effects (all multivariate $p > .22$).

Exploratory Analyses

Post-experimental affect and expectancy. Following their completion of the anagram problems subjects rated their anxiety, depression, hostility and expectancy for success "on an additional set of anagram problems". (For the scales see Appendices G or H, p.3). In order to determine the presence of any lingering effects of the independent variables, these measures were subjected to a three way MANOVA. (For the summary table see Appendix Q.) There were no statistically significant multivariate effects (all $p > .12$).

Perceptions of the pretreatment DLT problems: Importance, success and control. Experimental subjects rated the degree to which their results were important to them, the degree to which they felt they were successful and the degree to which they felt in control. (For the scales see Appendix G, p.5.) These three measures were examined with a three

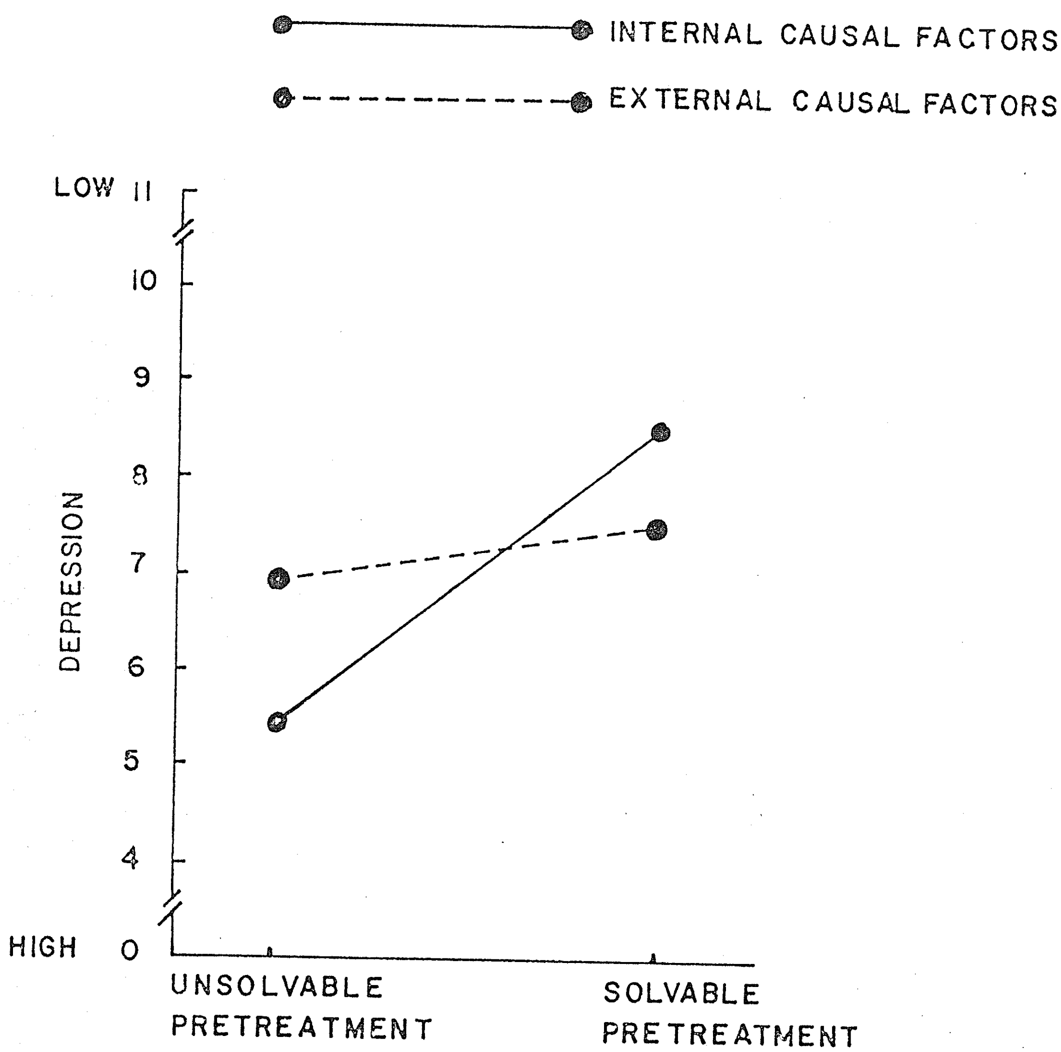


Figure 6. Mean differences on the self-rating of depression: The solvability by locus of control interaction.

way MANOVA in order to assess the effects of solvability, stability and locus of control. (For the summary table see Appendix R.)

The multivariate test of the main effect of solvability was statistically signifigant ($p < .0001$). The univariate tests of success (p .0001) and control ($p < .0001$) were both judged to be significant while the test of importance was considered to be marginal ($p < .0453$). The standardized discriminant function coefficients for importance (-0.0147), success (-0.7801) and control (-0.3647) are consistent with the magnitudes of the univariate F-statistics. It was concluded that subjects receiving unsolvable problems perceived their results on the DLT to be less important, themselves to have been less successful and less in control of how well they did. The multivariate tests of other main effects were judged to be nonsignificant (both $p > .21$).

The multivariate test of the stability by locus of control interaction was statistically significant ($p < .0809$). None of the univariates were considered to be significnat however (all $p > .19$). The standardized discriminant function coefficients for importance (0.6033), success (-0.8489) and control (.8253) indicate that all the dependents were potent weights in the multivariate effect. They further reflect a contrast between the interactions on importance and control versus the interaction on success. In general it appears that subjects told that their performance on the DLT was determined by effort saw their results as more important and themselves as more in control than those told that their performance was due to luck. On the other hand those told that their performance was determined by ability tended to see themselves as having been more successful than those told it was due to task difficulty. This effect was felt to be weak and only of minor interest. There were no other significant multivariate interaction effects (all $p > .31$).

Perceptions of the anagram problems: Importance, success and control. Subjects also rated the degree to which their results on the anagram problems were important to them, the degree to which they felt they were successful and the degree to which they felt in control of how well they did (for the scales see Appendices G or H, p.5). As in the previous analysis these three measure were examined using a three way MANOVA. (For the summary table see Appendix S.) There were no significant multivariate effects (all $p > .11$).

Perceptions of ability, effort, task difficulty and luck: The locus of control and stability dimensions. Subjects rated the concepts of ability, effort, task difficulty and luck on the locus of control dimension (IE) and two different stability dimensions, i.e., stability across "the same type of problems" (STAB 1) and across "different types of problems" (STAB 2). (For the scales see Appendices G or H, pp. 6-7.) In order to determine the presence of significant between group differences the data from the twelve ratings were subjected to a one-way MANOVA (see Appendix T). The multivariate test was judged to be nonsignificant ($p > .29$). It was concluded that there were no significant between group differences.

A general picture of how subjects conceptualized the concepts of ability, effort, task difficulty and luck in terms of the IE, STAB 1 and STAB 2 dimensions can be gained from an examination of the histograms in Figures 7, 8 and 9. From Figure 7 it is apparent that the subjects as

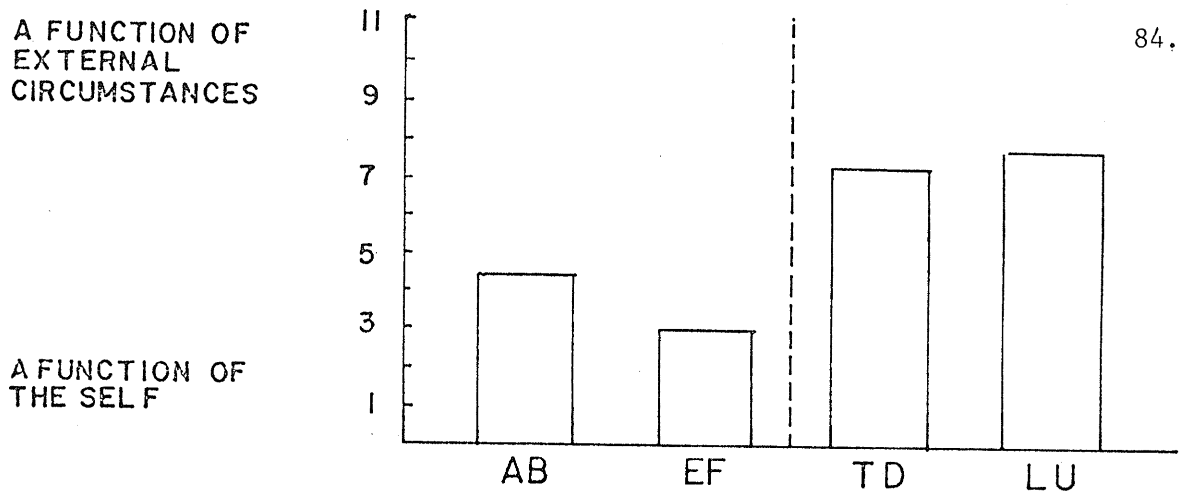


Figure 7. Mean ratings of the causal factors on the IE dimension.

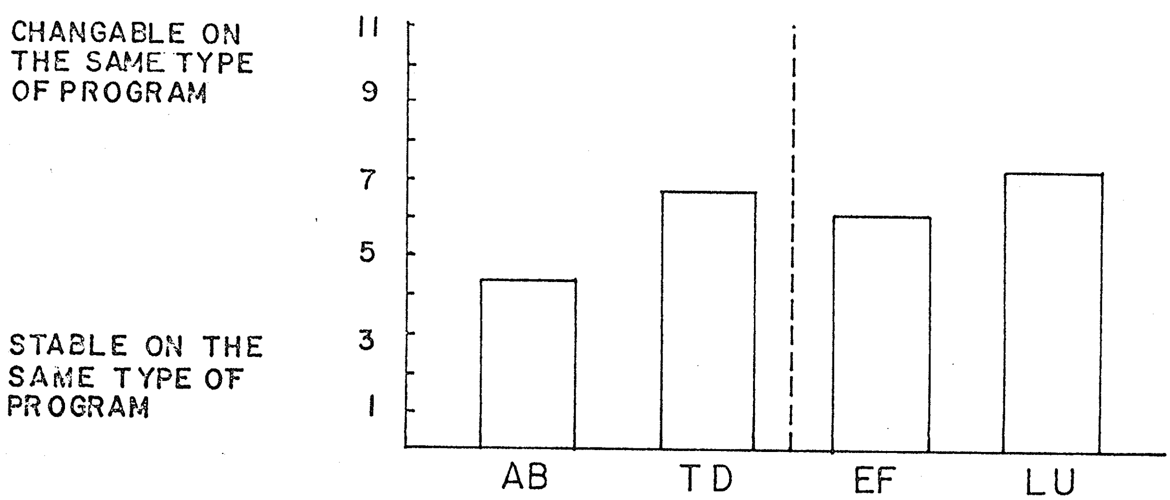


Figure 8. Mean ratings of the causal factors on the STAB 1 dimension

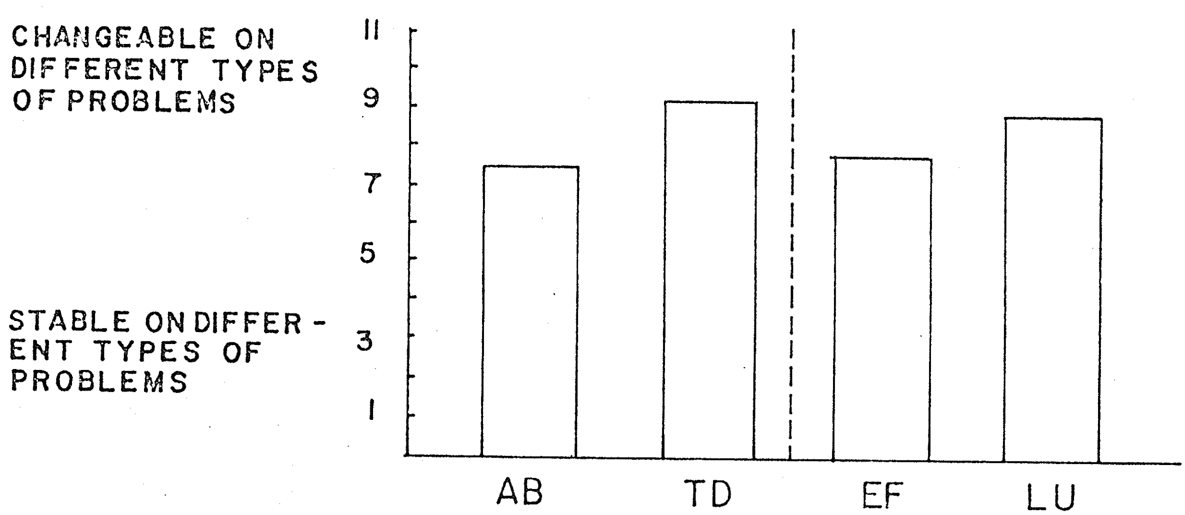


Figure 9. Mean ratings of the causal factors on the STAB 2 dimension.

a whole perceived ability and effort to be more internal than task difficulty and luck. It is also clear from Figures 8 and 9, however, that they made little if any differentiation between the causal factors in terms of STAB 1 and STAB 2. Informal questioning during the debriefing suggested that this may have reflected not so much their actual perception of the causal factors as their misunderstanding of these two differentiating dimensions. Confusion was often apparent even when subjects were utilizing the IE dimension to describe the factors. Several subjects, for example, indicated ability to be more "a function of external circumstances" than "a function of the self". Invariably such subjects turned out to be considering ability not in terms of its externality but rather in terms of its etiology (e.g., as a function of genetic heritage or developmental environment). This writer's impression was that such conceptual contamination simply occurred more frequently when subjects were required to use the less familiar and more complex STAB 1 and STAB 2 dimensions. This of course implies that stability may not be as salient a dimension as locus of control in their own causal analyses of response-reinforcement contingencies.

Additional exploratory items. Subjects were asked to indicate on 11-point scales: (1) "to what degree you feel the discrimination and anagram problems are similar", (2) "how skillful you feel you are at playing verbal games such as Scrabble, Charades, crossword puzzles or anagrams", (3) "to what degree you generally feel that most of life's problems are solvable", and (4) "to what degree you generally feel that you have personal control over life's problems" (see Appendices G and H, p.8). On the off-chance that any of the three independent variables may have affected subjects' responses to these items, they were subjected to a three way MANOVA. All multivariate tests were clearly nonsignificant (all $p > .1476$).

In the interest of completeness, coefficients of correlation were calculated between each of the above four variables and the scaled vocabulary scores, the three sequential ratings of anxiety, depression, hostility and expectancy for success as well as the anagram performance dependent measures (see Appendix U). Notably subjects self-reported skill at playing verbal games was negatively associated with the number of anagram failures and mean response latency. This measure was, however, positively associated with subjects' initial expectancy for success on the anagrams (before actual exposure to the anagram test) and their expectancy for success on a different set of anagrams (after taking the anagram test). More interesting is the fact that the degree to which subjects felt they had "personal control over most of life's problems" was positively associated with expectancy for success on the DLT and their expectancy for success after taking the anagram test. Noteably, the degree to which they generally felt "that most of life's problems were solvable" was negatively associated with post-experimental anxiety and depression.

Correlational analysis of dependent measures. Again in the interest of completeness, correlations were calculated between each of the seven dependent variables (see Appendix V). Notable is the high degree of association between the anagram performance measures and between the measures of affect. Noteable also are the negative relationships between expectancy for success and the measures of depression and hostility.

Striking however is the weak degree of association between expectancy for success and the three anagram performance measures. This lack of a strong relationship will be discussed at some length in the chapter which follows.

Reanalysis on Groups Formed According to Self-Attributions of Causality

As previously indicated in this chapter, several analyses were redone on groups formed on the basis of subjects' self-attributions of causality (as opposed to groups formed by random assignment to experimental conditions). It was also indicated that this reanalysis was stimulated in part by the fact that the highest ranked causal factor of from 40 to 80% of the subjects within individual experimental groups did not correspond to the causal factor they were told was most influential in determining their success or failure on the DLT. This as well as the rather unspectacular support found for the predicted relationship between causal stability and anagram performance suggests that the causal belief manipulations may have had limited effectiveness. Thus an actual relationship between causal beliefs and expectancy for success and/or subsequent performance could have been masked by the fact that experimental groups were heterogeneous with respect to their stated causal belief. By conceptualizing the design in more "naturalistic" correlational terms rather than in true experimental design terms this problem was obviated; i.e., designated groups consisted only of subjects who attributed their success or failure to the same causal factor. The reconstituted groups consisted of the following sample sizes: U-AB (N = 8), U-TD (N = 10), U-EF (N = 13), U-LU (N = 9), S-AB (N = 14), S-TD (N = 7), S-EF (N = 17), and S-LU (N = 2). The same statistical hypotheses tested in previous analyses were then tested in this non-orthogonal design in the manner recommended by Carlson and Timm (1974). Specifically this involved the weighting of each hypothesis in accordance with the cell frequencies represented.

Expectancy and anagram performance measures. The expectancy and anagram performance dependent measures were subjected to a three-way MANCOVA with the premeasure of expectancy for success and the scaled vocabulary score serving as the covariates. (For the summary table see Appendix W; for the adjusted cell means see Appendix X.) The multivariate test of the solvability main effect was considered significant ($p < .0898$). Of the univariates, only the test considering expectancy for success approached significance ($p < .0279$). Predictably this result is almost identical to that found previously (refer to Appendix M for the counterpart analysis on the orthogonal experimental design). As in the previous analysis, the standardized discriminant function coefficients for expectancy (-0.7351), trials to criterion (1.4100), number of failures to solve (1.9481) and response latency (-3.1524) indicate the performance dependent measures to be most heavily weighted in the multivariate effect. However from the standpoint of individual dependent variable effects it is clear that only the expectancy measure was significantly influenced by solvability, albeit marginally. This result reinforces the previous conclusion that exposure to unsolvable problems caused lower expectancies for success but that this lowered expectancy was not accompanied by significant debilitation in actual performance. No other multivariate tests of main effects were considered statistically significant (both $p > .21$).

The multivariate test of the interaction between solvability and locus of control was clearly significant ($p < .0135$). The univariate tests of trials to criterion ($p < .0037$), number of failures ($p < .0148$) and response latency (p .0199) were all judged to be statistically significant. Only the test considering expectancy for success was considered nonsignificant ($p > .10$). The standardized discriminant function coefficients for expectancy (0.2448), trials to criterion (-1.5651), number of failures (-2.1975) and response latency (2.8668) show all the performance variables to be potent weights in the multivariate effect. The interactions of solvability and locus of control on these variables are represented diagrammatically in Figures 10, 11 and 12. Clearly subjects who received unsolvable DLT problems and attributed their failure to internal causal factors were more debilitated in solving subsequent anagrams than the subjects who received unsolvable problems and attributed their failure to external causal factors. On the other hand, subjects who received solvable problems and attributed their success to internal causal factors performed better on subsequent anagram problems than subjects who received solvable problems and attributed their success to external causal factors. This strong, unpredicted effect is not qualified by the presence of any other significant multivariate interaction effects (all $p > .44$). It thus stands in sharp contradiction to the postulated relationship between causal stability and subsequent task performance.

Affect dependent measures. The three affect dependent measures were subjected to a three way MANOVA. (For the summary table see Appendix Y; for the means see Appendix Z.) As in the counterpart analysis on the

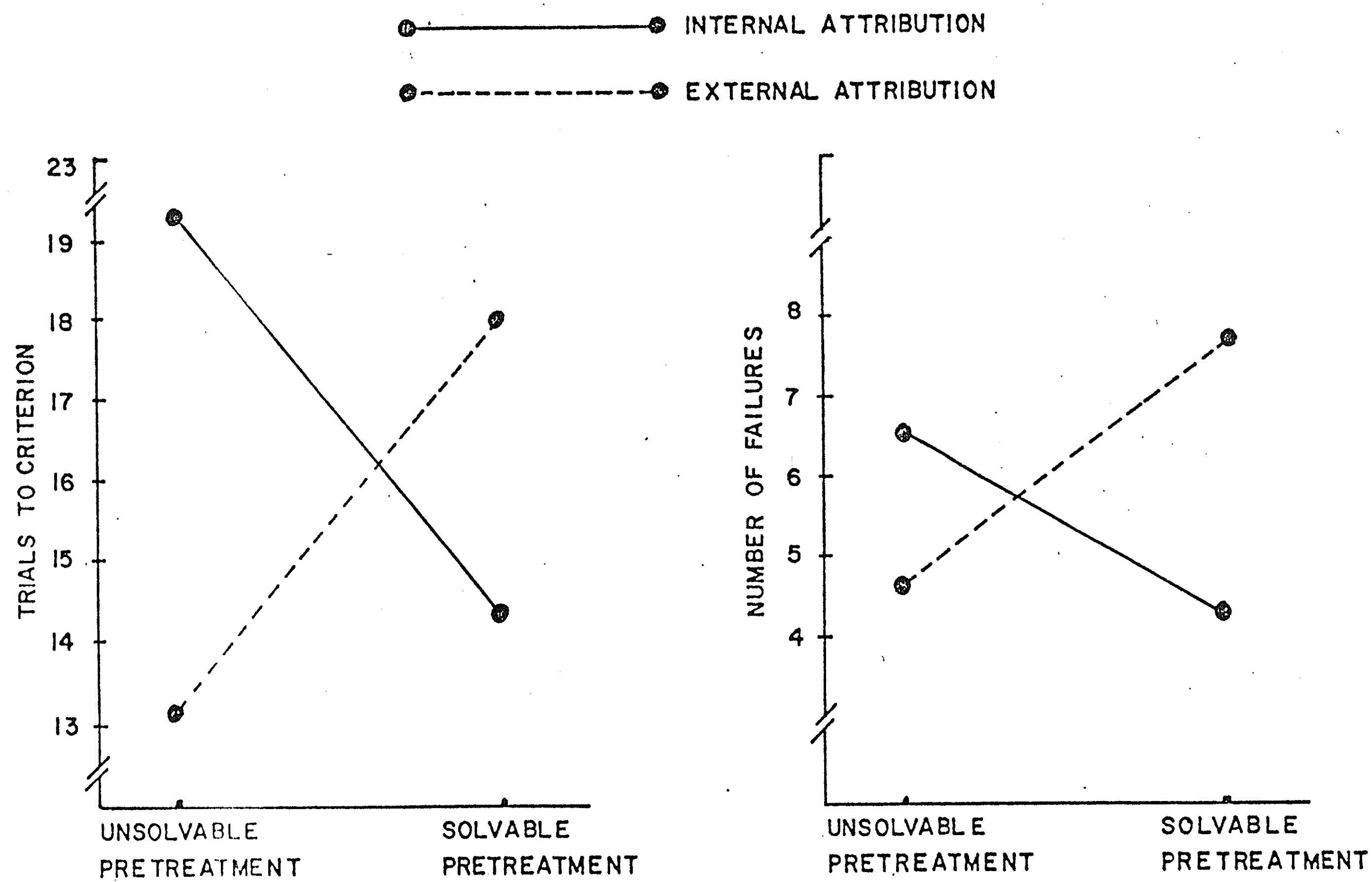


Figure 10. Adjusted mean differences on trials to criterion: The solvability by locus of control interaction from the nonorthogonal design.

Figure 11. Adjusted mean differences on number of failures to solve: The solvability by locus of control interaction from the non-orthogonal design.

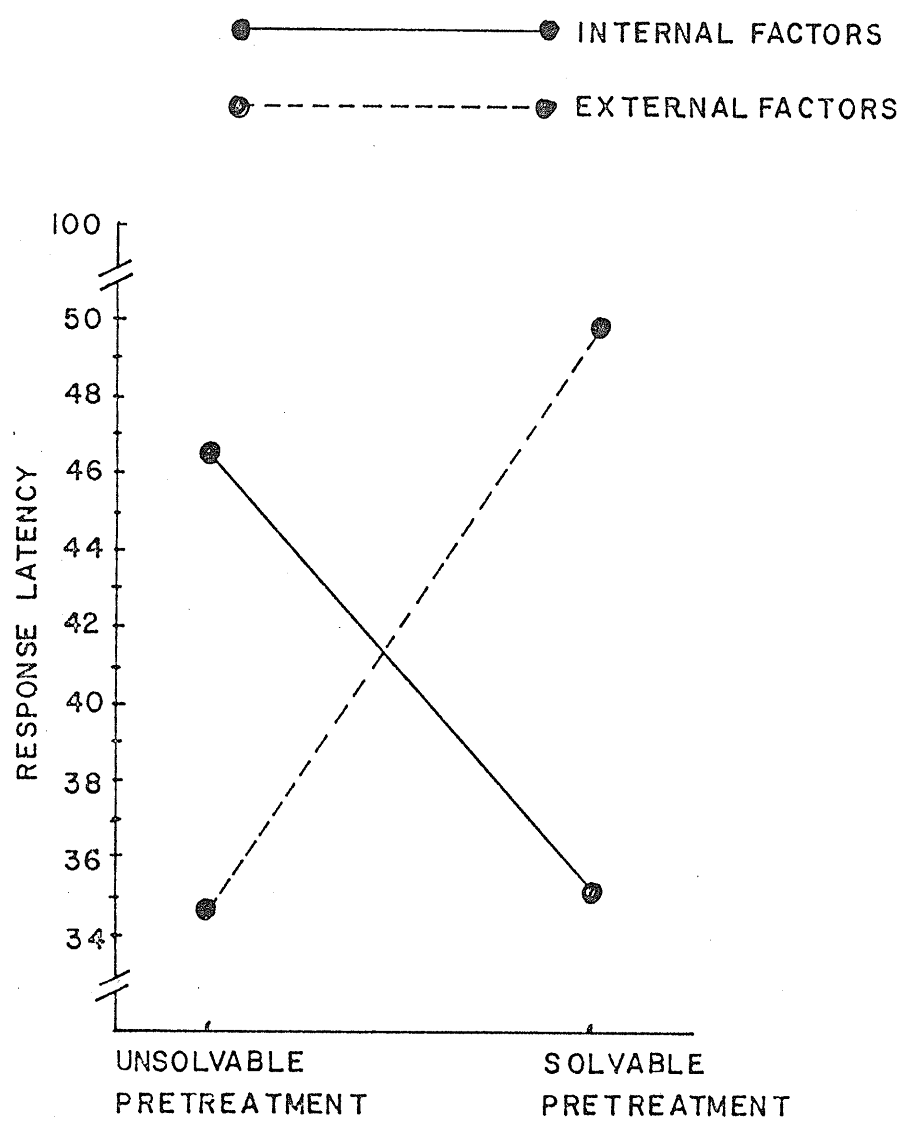


Figure 12. Adjusted mean differences on response latency: The solvability by locus of control interaction from the nonorthogonal design.

orthogonal experimental design the multivariate test of the main effect of solvability was clearly significant ($p < .0004$) as were the univariates considering depression ($p < .0001$) and hostility ($p < .0208$). The standardized discriminant function coefficients for anxiety (-0.0841), depression (-1.0350) and hostility (0.0208) clearly show depression to be the most important weight in the multivariate effect. As concluded previously, subjects exposed to unsolvable pretreatment problems evidenced significantly higher depression and hostility than subjects exposed to solvable pretreatment problems.

The multivariate test of the main effect of stability was also judged to be statistically significant ($p < .0176$). None of the univariate tests, however, were clearly significant (all $p > .06$). The standardized discriminant function coefficients for anxiety (0.2060), depression (-1.0192) and hostility (0.9831) indicate the latter two measures to be the most potent weights. The signs of the weights, however, suggest that stability has a contrasting effect on depression and hostility. From the mean differences in Appendix Z it appears that subjects who attributed their performance on the DLT problems to stable causal factors were somewhat more depressed and less hostile than subjects who attributed their performance to unstable causal factors. The multivariate test of locus of control main effect was judged to be nonsignificant ($p > .34$).

As in the counterpart analysis, the multivariate test of the solvability by locus of control interaction was judged to be strongly significant ($p < .0065$) and only the univariate test on depression was clearly significant ($p < .0005$). The standardized discriminant function coefficients for anxiety (0.0600), depression (-0.8039) and hostility (-0.2733) clearly indicate the dominant role played by depression in the multivariate effect. From Figure 13 it can be seen that subjects who received unsolvable problems and attributed their failure to internal factors were more depressed than those who received unsolvable problems and attributed their failure to external factors. On the other hand subjects who received solvable problems and attributed their success to internal factors were less depressed than subjects who received solvable problems and attributed their success to external causal factors. There were no other statistically significant interaction effects (all multivariate $p > .35$). The fact that the interaction of solvability and locus of control on depression found in this analysis parallels the same relationship found in the counterpart analysis on the orthogonal experimental design lends the postulated relationship between locus of control and affective response an extra measure of support.

Post-experimental affect and expectancy. In order to determine the presence of any lingering effects of the independent variables, the post-experimental measures of affect and expectancy were subjected to a three way MANCOVA. (For the summary table see Appendix AA.) As in the counterpart analysis there were no significant multivariate effects (all $p > .20$).

Perceptions of the pretreatment DLT problems: Importance, success and control. Subjects' ratings of the degree to which their results on the DLT were important, and the degree to which they themselves were successful and in control on how well they did were subjected to a three way MANOVA. (For the summary table see Appendix BB; for the means see Appendix CC.) As in the counterpart analysis there was a significant

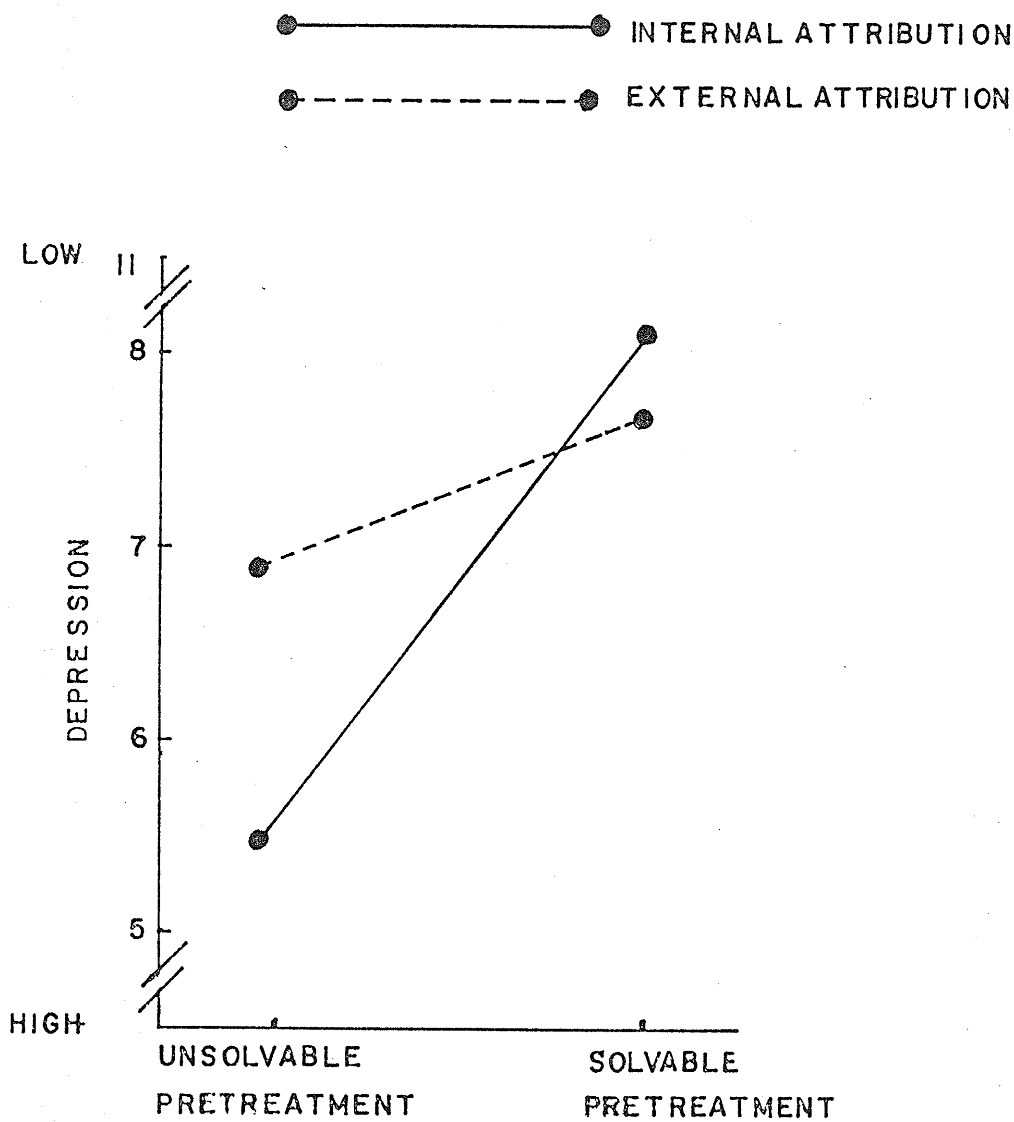


Figure 13. Mean differences on the self-rating of depression: The solvability by locus of control interaction from the nonorthogonal design.

multivariate test ($p < .0001$) of the solvability main effect while the univariates considering success ($p < .0001$) and control ($p < .0001$) were both significant. The univariate test considering importance was considered to be marginal ($p < .0451$). The standardized discriminant function coefficients for importance (-0.0147), success (-0.7831) and control (-0.3681) reflect the same order of magnitude as the univariate F-statistics. These results indicate that subjects exposed to unsolvable problems tended to see their results on those problems as less important and themselves as less successful and less in control.

The multivariate test of the main effect of locus of control was strongly significant ($p < .0001$) as were the univariates considering success ($p < .0001$) and control ($p < .0018$). The standardized discriminant function coefficients for importance (-0.1113), success (-0.8224) and control (0.2851) reflect the same order of magnitude as the univariate effects. These results indicate that subjects who attributed their success or failure to internal causal factors tended to see themselves as having been more successful and more in control than those who attributed causality to external causal factors. The multivariate test of the main effect of stability was nonsignificant ($p > .81$).

The multivariate test of the interaction of solvability and locus of control was statistically significant ($p < .0001$) as were the univariate tests considering success ($p < .0001$) and control ($p < .0009$). The standardized discriminant function coefficients for importance (0.0504), success (-0.8766) and control (-0.2436) reflect the same order of magnitude as the univariate effects. These results indicate that the significant main effects on solvability and locus of control interact primarily in the solvable condition. In the unsolvable condition, the degree to which subjects perceived themselves as successful or in control was not markedly influenced by the locus of control inherent in their attributions of causality. In the solvable condition, however, subjects who attributed their success to internal causal factors perceived themselves to have been more successful and more in control of how well they did than subjects who attributed their success to external causal factors.

The multivariate test of the interaction of stability and locus of control was considered marginal ($p < .1010$). Of the univariates only the test considering control could be considered statistically significant ($p < .0251$). The standardized discriminant function coefficients for importance (0.2657), success (-0.4549) and control (1.0671) clearly indicate the control measure to be the most potently weighted in the multivariate effect. This effect suggests that feelings of having been in control were also a unique function of the stability and locus of control factors. In the internal condition attribution to the unstable factor of effort was associated with higher feelings of having been in control than attributions to the stable factor of ability. In the external condition, attributions to the stable factor of task difficulty was associated with higher feelings of having been in control than attribution to the unstable factor of luck. This effect, therefore, qualifies the previous locus of control main effect and solvability by locus of control interaction effect on the control measure.

In fact all of the previous effects are qualified by the fact that the multivariate test of the triple interaction was significant ($p < .0097$) as were the univariates considering success ($p < .0014$) and control

($p < .0186$). The standardized discriminant function coefficients for importance (0.1653), success (-0.8166) and control (-0.3366) suggest the same order of magnitude as in previous significant multivariate effects. From this analysis then it must be concluded that feelings of success and control on the DLT were not only a function of the factors and the interactions of factors already reported, but also were a unique function of the individual experimental groups. Readers who wish to more closely interpret the triple interaction are referred to the means in Appendix CC.

Perceptions of the anagram test problems: Importance, success and control. Subjects' ratings of the degree to which their results on the anagram problems were important, and the degree to which they themselves were successful and in control of how well they did were subjected to a three way MANOVA. (For the summary table see Appendix DD.) While the multivariate test of the solvability main effect barely exceeded alpha in the counterpart analysis, in this analysis it was barely below it ($p < .0946$). None of the univariate tests were considered significant, however (all $p > .07$). The standardized discriminant function coefficients for importance (0.7220), success (-0.9378) and control (0.2054) reflected the same order of magnitude as did the univariate F-statistics. Essentially the multivariate effect appears to be detecting that subjects exposed to unsolvable problems saw their results on the anagram test as somewhat less important, saw themselves as somewhat more successful and more in control. The multivariate tests of the remaining main effects were both considered nonsignificant (both $p > .16$).

The multivariate test of the interaction between solvability and locus of control was significant ($p < .0220$). Only the univariate test considering success ($p < .0300$) was judged to be significant, however. The standardized discriminant function coefficients were as follows: importance (-0.0225), success (-1.5280) and control (1.1213). The results suggested that in the unsolvable condition subjects who attributed their failure on the DLT to external causal factors rated themselves as more successful on the anagrams than subjects who attributed their failure to internal causal factor. In the solvable condition, however, subjects who attributed their success to internal causal factors rated themselves as more successful on the anagrams than subjects who attributed their success to external causal factors.

The multivariate test of the interaction of stability and locus of control was also judged to be significant ($p < .0828$). None of the univariate tests were considered significant however (all $p > .15$). The standardized discriminant fucntion coefficients for importance (0.0215), success (-1.5196) and control (1.2861) reflected the same order of magnitude as the univariate effects. This result may qualify somewhat the previous interaction on success. Essentially it appears that subjects who attributed their performance on the DLT to the stable internal factor of ability saw themselves as more successful on the anagram test than those who attributed their DLT performance to the unstable internal factor of effort. On the other hand, those who attributed their DLT performance to the unstable external factor of luck saw themselves as having been more successful on the anagram test than those who attributed their DLT performance to task difficulty. Because this univariate effect was not significant the qualification to the previous interaction of solvability and locus of control should probably be regarded as minimal. There were no other significant interaction effects (all multivariate $p > .30$).

Control group comparisons. In the interest of completeness, the individual groups formed on the basis of self- attributions were compared to the C group to determine the presence of helplessness and/or facilitation effects. As before the multivariate analogue to Dunnett's *t* procedure was used. This involved the use of MANCOVA with the scaled vocabulary score serving as the covariate. (For the summary table see Appendix EE; for the means see Appendix FF.)

The multivariate test comparing the U-EF group versus the C group was judged to be statistically significant ($p < .0252$). Although the U-EF group was debilitated on all dependents only the univariate test considering trials to criterion ($p < .0202$) was judged to be significant. The standardized discriminant function coefficients for trials to criterion (1.9155), number of failures (1.9381) and response latency (-3.0736) indicate that all dependents were potently weighted in the multivariate effect. No other multivariate tests were considered to be significant (all $p > .13$). In the groups formed on the basis of self-attributions helplessness apppears to have occurred only among those who attributed their failure to lack of effort.

CHAPTER IV

Discussion

The present study investigated the mediational effects of causal attributions in a typical learned helplessness experiment. The four hypotheses involved simple effects derived from Bernard Weiner's theory regarding the effect of attributions of causality for success or failure upon subsequent affective responses, expectancy for success on subsequent tasks and actual performance on those tasks. The first two hypotheses described the postulated relationship between causal stability and subsequent expectancy for success and actual performance within each level of the solvability factor. Neither of these hypotheses were supported. The third and fourth hypotheses described the postulated relationship between locus of control (or locus of causality) and subsequent emotional response within each level of the solvability factor. Only the third hypothesis was confirmed. Specifically this result indicated that subjects receiving unsolvable pretreatment problems and information that their failure was determined by internal causal factors rated themselves as more depressed than subjects who received unsolvable pretreatment problems and information indicating that their failure was determined by external factors. Generally speaking, the direct tests of the predictions provided support for the applicability of Weiner's model as it applies to the influence of locus of control on affect but no support as far as the influence of causal stability upon subsequent expectancy for success or subsequent task performance is concerned. Results of the three way omnibus analysis on both the orthogonal experimental design (groups formed by random assignment) and the nonorthogonal design (groups formed on the basis of self attributions of causality) more clearly indicates the influence of the three independent variables upon the two basic packages of dependent variables.

Expectancy for Success and Anagram Performance

The results of analyses upon both the orthogonal and nonorthogonal designs suggested that expectancy for success was determined solely by the solvability of the pretreatment problems. Those receiving unsolvable problems had lower expectancies for success than those who received solvable problems. There were no other statistically significant effects on this variable at the univariate level. This is somewhat surprising given the significant interaction effect upon anagram performance (to be discussed below). The fact that expectancy for success was not also significant runs counter to the pervasive assumption that it acts as the primary psychological mediator of task performance (see Aronson & Carlsmith, 1962; Bolles, 1972; Maier & Seligman, 1976; Seligman, 1975; Weiner et. al., 1971; Zajonc & Brickman, 1973). Notably from Appendix V, the product-moment correlations between expectancy for success and the three anagram performance measures ranged from -.1972 to -.2354 (i.e., accounted for only .04 to .06% of the variance). In view of its theoretical importance, the lack of a substantial relationship between expectancy and performance in the present study will be further discussed at a later point in this chapter.

The results on anagram performance differed markedly between the orthogonal versus the nonorthogonal design. Although the three measures (particularly number of failures and response latency) were weighted heavily in the discriminant function for the solvability main effects from both designs, none approached significance at the univariate level. On the orthogonal design there was also a significant multivariate interaction of solvability and stability with number of failures and response latency weighted heavily in the discriminant function. None of the univariate tests, however, were considered to be statistically significant. Direct interpretation of the multivariate effect was considered hazardous due to the likelihood that it was enhanced by some unpredicted adjusted mean differences on expectancy for success (which was in turn probably moderated by the number of failures to solve variable). Only the nonsignificant differences on trials to criterion were in the predicted directions across both solvability conditions. In the unsolvable condition subjects informed that their failure was due to stable causal factors tended to require somewhat more trials to reach criterion than subjects informed that their failure was due to unstable causal factors. In the solvable condition, on the other hand, subjects told that their success was determined by stable causal factors required fewer trials to reach criterion (and also had fewer failures to solve and shorter response latencies) than did subjects told their success was due to unstable causal factors. It should be emphasized that these mean differences were clearly nonsignificant at the univariate level. The significant multivariate interaction, while suggestive, provides insubstantial support for the postulated relationship between causal stability and anagram performance.

When the three way MANCOVA was repeated on the nonorthogonal design a clearly significant multivariate interaction of solvability and locus of control emerged. Each of the univariate tests considering trials to criterion, number of failures to solve and response latency were also statistically significant. (While the adjusted mean differences on expectancy for success were in the appropriate direction they were not considered to be significant at the univariate level.) This effect indicated that subjects who received unsolvable problems and attributed their failure to internal causal factors performed more poorly on the anagram problems than subjects who received unsolvable problems and attributed their failure to external causal factors. On the other hand, subjects who received solvable problems and attributed their success to internal causal factors performed better on the anagrams than subjects who received solvable problems and attributed their success to external causal factors. The strength of this effect clearly overshadows the interaction of solvability and stability found with the orthogonal experimental design. It also stands in sharp contrast to the postulated relationship between causal stability and task performance (cf. Weiner et. al., 1971).

In seeking an explanation for the marked difference in results emergent from the orthogonal versus the nonorthogonal design we must first look to the methodological differences. Aside from the unequal *Ns* inherent in the latter design (a factor taken into account by the weighting procedure), the major difference is the degree to which subjects were consistent in their attributions of causality. In the orthogonal design where subjects were assigned randomly to experimental groups, 40 to 80% of the subjects within those groups attributed their success or failure to a different causal factor than that suggested by the causal belief manipulation. It is not unreasonable to assume that this within group heterogeneity could have masked (or distorted) the relationship between causal belief and anagram performance. The fact that such a strong interaction of solvability and locus of control emerged when the analysis was performed on homogeneous groups formed according to the subjects' measured self attribution lends credence to such a view.

The primacy of the solvability by locus of control interaction over the weak multivariate effect from the orthogonal design would be further reinforced if it could be shown that the latter was really a function of the former. This may in fact have been the case. Recall that in the solvability by stability interaction from the orthogonal design the largest and most consistent mean differences (across all the anagram performance measures) were in the solvable condition. It is reasonable to assume that these differences were largely responsible for the significant multivariate effect. Noteably, however, of the 20 subjects randomly assigned to the S-AB and S-TD groups (solvable/stable conditions), 17 actually attributed their success to internal causal factors while only 3 attributed it to external factors. Of the 20 subjects assigned to the S-EF and S-LU groups (solvable/unstable conditions) only 14 attributed their success to internal causal factors while 6 attributed it to external factors. Given the fact that subjects who actually attributed their success on the solvable problems to internal factors performed considerably better on the anagram problems than those attributing their success to external factors, this disparity in actual attributions between solvalbe/stable and solvable/unstable conditions could easily have accounted for the solvability by stability interaction on the orthogonal design.

Accepting this analysis, then, the latter effect simply becomes an artifact of the slippage between the experimental causal belief manipulations and subjects' actual attributions of causality.

In Chapter I a body of evidence was cited in support of Weiner et. al.'s (1971) postulated relationship between causal stability and subsequent expectancy for success as well as actual task performance. Before elaborating on the present evidence for a relationship between locus of control (or locus of causality) and performance it is first necessary to account for the body of contradictory evidence. First of all it should be noted that all of this aforementioned research related the four causal beliefs only to measures of expectancy rather than actual measures of subsequent performance (the latter apparently assumed to be implied by the former). Secondly it should be noted that the evidence supportive of a relationship between causal stability and expectancy for success was either correlational (Weiner et. al., 1972; McMahon, 1973) or involved "hypothetical-other, simulation-type" designs (Fontaine, 1974; Rosenbaum, 1972; Valle & Frieze, 1976). In the only previous study which attempted to manipulate subjects' causal beliefs (as independent variables) regarding their own task performance, no relationship between the stability dimension and the measure of expectancy was found (see Reimer, 1975). It has already been pointed out that the degree to which Reimer's subjects actually attributed causality in a manner consistent with the manipulations was no more impressive than in the present study. It is unfortunate that she did not perform additional analyses on groups realigned according to self attributions of causality as was done in the present study. In the light of the present findings it would be most interesting to see what causal factors, if any, related to expectancy when groups were homogeneous with respect to causal belief. Getting back to the evidence in support of a relationship between causal stability and expectancy we may tangentially note the obvious fact that in the correlational studies there is no way to determine if expectancy for success was determined by attribution to stable versus unstable causal factors or if attribution of causality was determined by expectancy for success. For the moment, however, let us focus our attention on the hypothetical-other studies. Noteworthy is the fact that subjects in these studies were passively involved as observers rather than actively involved as actors.

It has been well documented that individuals' perceptions as observers tend to differ markedly from their perceptions as actors. On the basis of their extensive review, Jones and Nisbett (1972) characterized the perceptual stance of the observer versus the actor as follows:

> For the observer behavior is figural against the ground of the situation. For the actor it is the situational cues which are figural and that are seen to elicit behavior. Moreover the actor is inclined to see his judgements about the situational cues as being perceptions or accurate readings of them. These cues are therefore more "real" as well as more salient than they are for the observers. (p. 93).

This may in fact explain why expectancy for success was more clearly a function of solvability rather than of the interaction of solvability and locus of control which determined the differential performance on the anagram problems. Perhaps for subjects in the present study the fact of success or failure on the pretreatment problems provided more real and salient situational cues upon which they could base their expectancies for success than the more "reason-bound" implications of the causal factors they believed to determine their outcome. As actors caught in the immediacy of an "ego-involving" performance situation their stated expectancies could have been predominantly influenced by a more emotionally based reaction to success or failure per se. Thus while the mean differences on their expectancy ratings were consistent with the solvability by locus of control interaction effect they were insufficient to attain significance at the univariate level. There is a small body of evidence to suggest that the fact that subjects in the hypothetical-other simulation-type experiments were observers rather than actors may also account, at least in part, for the observed relationship between causal stability and expectancy for success.

Two studies by Fontaine (1975) directly examined the circumstances under which subjects make causal attributions for outcomes on the basis of logical inferences based on consistency as opposed to circumstances under which more ego oriented, less rational considerations prevail. The first study employed an other-attribution, simulation design emphasizing the use of interpersonal consistency information in attribution. Subjects were to imagine that a psychology student attempted each of eight tasks. The tasks were then described to represent various combinations of outcome (success or failure) achieved by that particular student, by others generally, similar others (psychology students) and by dissimilar others (businessmen). Upon reading these descriptions, subjects rated the importance of ability, effort, task difficulty and luck in determining the hypothetical students' outcome.

The second study involved the same independent variables in a between subjects design in which subjects participated in a real task (pursuit rotor) ambiguous enough to allow outcome to be independently manipulated. Following completion of the task and receipt of bogus information regarding the performance of general, similar and dissimilar others, subjects made attributional ratings regarding their own performance. In the first study strong support for a logical consistency model of attribution was found. In the second study little support for such a model was found; rather, subjects appeared to base their attributions upon ego oriented considerations. For example, in the first study the failure of the hypothetical psychology student in conjunction with the success of the general other led to high attribution to ability whereas in the second the same conditions (with the exception that the subject made causal attributions regarding his own performance) led to the lowest ability attribution.

Fontaine (1975) generalized the above findings to other within subject designs in which subjects were observers rather than actors in minimum information simulation studies promoting the use of reason and logic:

> ...this biasing toward logic might be exacerbated by the largely within-subjects design. Typically, subjects are presented with printed descriptions of a series of situations, each differing on rather obvious dimensions because of the minimal information provided. Subjects are certainly aware that they are expected to respond differently to the situation based on those dimensions. As such the experiment becomes a test or game in which the subject tries to respond with the logic the experimenter expects. Since the logic of the consistency model was drawn from "common-sense psychology" to begin with, most subjects would hit upon the correct logic. (p. 1024).

Langer made a similar point in reference to two unpublished studies in which she was unable to get the "illusion of control effect" so clearly indicated in her six reported studies. The two aberrant findings emerged from studies characterized by the passive involvement of the participants and hence hypothetical nature of the situation. Langer noted that many of the subjects' responses betrayed a perceived demand to be rational and that this perception mitigated against a demonstration of the effect. Both Fontaine (1975) and Langer (1975) provide evidential support for the contention that the relationship between causal stability and expectancy found in previous hypothetical-other simulation experiments (Fontaine, 1974; Rosenbaum, 1972; Valle & Frieze, 1976) may be an artifact of conditions in which subjects were observers rather than actors, passively involved rather than actively involved and in which the perceived demand to be rational was high.

The same argument may apply to the correlational evidence. The Meyer study (see Weiner et. al., 1972) measured high school students' expectancies for success following series of five digit symbol substitution tasks upon which repeated success or failure was artificially induced. McMahon (1973) measured sixth grade, tenth grade and college students' expectancies following exposure to five five-letter anagrams ranging in difficulty level. It seems unlikely that either of the above tasks would be especially involving in the sense that results would carry important implications for subjects' self-evaluations. Further, from the fact that attributions of causality and ratings of expectancy were both taken following each trial, subjects would no doubt have been able to infer that the experimental interest had more to do with those attributions and expectancy ratings than task performance per se. Thus the perceived demand to be objective and logical (see Orne, 1962) was likely to have been high.

Because the pretreatment problems in the present study were falsely indicated to be related to college apptitude they were more likely to be perceived as important and hence were more likely to be ego involving (see Roth & Kubal, 1975). (This factor may also have been enhanced by the fact that subjects were preparing for and/or writing final exams at the time the present study was conducted.) Also the only measures which were taken between the pretreatment and test phase were the three ratings of affect and the single rating of expectancy. The fact that subjects did not rank the causal factors until after the experiment was actually over probably reduced any perception of a demand to be rational. In summary then, unlike the research supportive of a relationship between causal stability and expectancy for success (and by implication, task performance) subjects in the present study operated as actors on ego involving tasks under conditions which implied little need to be particularly logical. Thus their stated expectancies and attributional rankings were more likely to reflect ego-oriented concerns rather than logical ones. As will be discussed further below, this probably explains why their actual performance on the anagrams was more a function of locus of control rather than causal stability.

The solvability by locus of control interaction found in the present study casts doubt upon the validity of Weiner's (1974) and Weiner et. al.'s (1971) postulated relationship between causal stability and task performance. Along with the literature just critiqued, part of the case for such a relationship was based upon a reanalysis of some early locus of control literature. This research was described in some detail in Chapter I; however, very briefly it indicated that expectancy shifts

(Phares, 1957) and actual extinction behavior (Holden & Rotter, 1962; James & Rotter, 1958; Rotter, Liverant & Crowne, 1961) was determined by whether subjects perceived the task as skill (internal) versus chance (external) determined. Weiner et. al. (1971) suggested that the stability dimension was confounded with the locus of control dimension and that the former constituted a more plausible determinant of the findings. The results of the present study would suggest that whether or not the two dimensions were confounded, it was locus of control which probably determined the between group differences in these studies. Noteably, like the present study, each of these studies was characterized by the fact that subjects performed actual tasks (as actors rather than observers) in between-groups designs in which the demand characteristics emphasized the task to be performed rather than the relationship between causal factors and expectancy, i.e., in which the demand to be rational was minimized. In this light, then, these studies, particularly those involving actual behavior (Holden & Rotter, 1962; James & Rotter, 1958; Rotter, Liverant & Crowne, 1961) serve to reinforce the relationship between locus of control and anagram performance found in the present study.

It may also be noted that the study by Klein et. al. (1976) cited in Chapter I also serves to partially support the above relationship. In this learned helplessness study both depressed and nondepressed subjects in the unsolvable condition received an instructional set encouraging the attribution of failure to an internal versus an external locus of control. Those depressed subjects receiving external attribution of failure instructions subsequently performed better on the test task problems than those who received internal attribution of failure instructions. Klein et. al. speculated that these results may have been specific to the depressed subjects because their already low expectancy for success was reinforced by the external attribution of failure set in a manner which absolved them from blame ("the problems are very difficult and almost no one has been able to solve them"). The authors further suggested that this same instructional set may have posed a challenge to the nondepressed subjects who did not automatically expect to fail. This would in turn have raised the perceived importance of the pretreatment problems and subsequent failure would have been more devastating.

The above explanation betrays a basic confusion as to the nature of the importance variable as well as the nature of Klein et. al.'s own experimental manipulations. It seems reasonable that in the absence of tangible external reinforcement, the perceived importance of a set of problems would be directly proportional to the degree that outcome carried implications for the problem solver's sense of personal competence. While it may be plausible to suggest that the unsolvable problems posed a challenge to nondepressed subjects receiving an external attribution of failure set, this does not imply greater importance in the sense that failure would tax those subjects' sense of personal competence. Were that true, these subjects would in effect be operating from an internal attribution of failure set, the opposite of the set supposedly encouraged by the external attribution of failure manipulation. That anything like that occurred is not suggested by Klein et. al.'s own post-experimental questionnaire data. Subjects receiving external instructions had much higher scores on externality (attribution to task difficulty rather than ability) than subjects receiving internal instructions. Thus their explanation not only implies the invalidity of their own experimental manipulations but is also belied by their own data.

A more parsimonious explanation for the fact that the differences among the depressed subjects were not replicated among the nondepressed subjects takes as its starting point Klein et. al.'s (1976) own post-experimental questionnaire data indicating the former subjects to have considerably higher internality scores than the latter subjects. Presumably, then, results were a priori more important to the depressed subjects in the sense that they were more likely to be interpreted as having implications regarding personal competence or ability. Notably this was probably also the case for subjects in the present study in view of the fact that it was presented as having to do with the measurement of college aptitude. For both Klein et. al.'s depressed subjects and subjects in the present study, then, the attribution of failure to internal causal factors was likely to at least temporarily deepen depression whereas the attribution of failure to external factors was likely to minimize or even relieve it. (This relationship was, of course, empirically validated in the present study.) This may not have been the case, however, for the subjects which Klein et. al. (1976) selected for their lack of depression (and also it seems for their lack of internality). For these subjects, being encouraged to attribute failure externally did little for them that they were not already fully prepared to do. This interpretation would tend to be supported by evidence indicating that lowered response initiation goes hand in hand with depression whether it is naturally occuring or induced by exposure to uncontrollability (Klein

& Seligman, 1976; Miller & Seligman, 1975). The argument carries with it the advantage of being able to more parsimoniously and (in this writer's view) more cogently explain the differential findings between Klein et. al.'s (1976) depressed versus nondepressed subjects as well as the findings from the unsolvable condition in the present study where degrees of naturally occurring depression were presumably randomly distributed within groups.

In closing this discussion of the findings on anagram performance we may note a recently published report by Brickman, Linsenmeier and McCareins (1976) which essentially replicated these findings from a rather different conceptual framework. The authors noted that both success and failure feedback could enhance subsequent performance under certain conditions. They suggested that success would be more effective than failure if the feedback is considered _relevant_, i.e., is believed to be predictive of future performance, whereas failure would be more effective than success if the feedback is considered _irrelevant_, i.e., believed not to be predictive of future performance. In their experiment, Brickman et. al. gave subjects success or failure feedback on a series of estimation tasks and informed them that their results were predictive or nonpredictive of future performance. The hypotheses were substantially confirmed. Brickman et. al.'s (1976) comments on their own results are relevant here:

> ...feedback may affect people's performance orientations in two different ways: (a) by influencing their estimates of how likely they are to succeed if they work and (b) by influencing their estimates of how hard they will have to work in order to succeed. Relevant success is beneficial because it indicates that ability is sufficiently high, relative to task difficulty, to permit successful completion of the task.

> Irrelevant failure suggests that this relationship may exist, but that ability is not sufficiently high to guarantee success without an increase in the amount of effort expended. (p. 157)

Noteably, Brickman et. al. suggested that the relevant versus irrelevant feedback distinction was directly analogous to the distinction between stable versus unstable causality postulated by Weiner and his associates. The present analysis would suggest, however, that this would only apply in situations where individuals are encouraged to be (or have the luxury of being) rational and objective. That is, in contexts exemplified by the experiments supportive of the relationship between causal stability and subsequent performance, i.e., in situations in which subjects operate as observers rather than actors (or if as actors, on tasks which are not ego-involving) stable causal factors would be perceived as "relevant" to future performance whereas unstable causal factors would be perceived as "irrelevant". However, when individuals are personally involved as actors on tasks which are perceived to be important because of their implications for their sense of personal competence or self worth then it is the internal causal factors which will be perceived as relevant to future performance and the external causes which will be perceived as irrelevant. This may be the major implication of the present study even though it was not predicted on an a priori basis.

Affective Response

Emotional response following the causal belief manipulation was directly determined by the solvability of the DLT problems on both the orthogonal and nonorthogonal designs. Subjects who received unsolvable problems reported significantly more depression and hostility than subjects who received solvable problems. This effect was particularly pronounced with the depression variable, a finding consistent with Seligman's (1975) view of uncontrollability as a precursor to reactive depression. As validation of this relationship, we may also note here that subjects exposed to unsolvable DLT problems perceived themselves to be significantly less in control of how well they did on those problems and significantly less successful on them.

Of primary interest in the analyses of the three affect dependent variables was the solvability by locus of control interaction. The multivariate test of this interaction was clearly significant on the orthogonal design with equally clearly significant univariate effects on the dependent variable of depression. Subjects who received unsolvable pretreatment problems and information indicating that their failure was determined by internal causal factors were subsequently more depressed than subjects who received unsolvable problems and information indicating that their failure was determined by external causal factors. Conversely subjects who received solvable problems and information indicating that their success was determined by internal causal factors were less depressed (more happy) than subjects who received solvable problems and information indicating that their success was determined by external causal factors. On the nonorthogonal design these same findings were clearly replicated. These results may have some rather important implications for the understanding and treatment of depression (and possibly of manic or hypomanic reactions as well).

In a number of works, Beck (1963, 1964, 1967, 1971) has argued that depression is not primarily an affective disorder with secondary cognitive symptoms but, rather, the reverse is true. It is the idiosyncratic content and reasoning processes of depressives, which, in Beck's view, produces the affective disorder. From patient verbalizations Beck has noted predominant and recurring themes involving low self esteem, overwhelming problems and duties, self commands and injunctions, escapist and suicidal wishes as well as self criticism and self blame. According to Beck, as these exaggerated and distorted cognitions become more predominant, the noncognitive symptoms of depression (affective, motivational and physical) increase in intensity. Of interest here is the role of internal attributions of blame. Beck (1967) studied the symptomatology of 966 psychiatric patients classified in terms of depth of depression (none, mild, moderate and severe). Of the patients with mild to severe depression, 67 to 80% showed self blame and criticism (relative to 43% of the nondepressed patients) and 60 to 81% had low self evaluations (relative to 38% of the nondepressed patients). The present findings suggest that self blame may be primary among the cognitive components as a determinant of depression. Specifically, it appears from these results that internal attributions of causality following exposure to uncontrollable outcomes mediate the intensity of subsequent depression.

Wortman (in press) also noted the tendency of depressed individuals to exaggerate personal blame for their inability to control uncontrollable life events and/or unsolvable problems. She, however, cited a body of theoretical literature (Becker, 1962; Chodoff, Friedman & Hamburg, 1964; Averill, 1968) suggesting that self blame may have an adaptive function to the degree that it gives meaning to aversive events such as the loss of a loved one. She further draws on Lerner's "just world hypothesis" (see Lerner & Mathews, 1965; Lerner & Simmons, 1966) to suggest that self blame may serve to combat a view of the world as uncontrollable, a perspective which could be even more painful than that implied by the self criticism. Wortman (in press) quotes Medea and Thompson's (1974) discussion of self blame among rape victims as illustrative.

> What appears to be guilt...may be the way the woman's mind interprets a positive impulse, a need to be in control of her life. If the woman can believe that somehow she got herself into the situation, if she can feel that in some way she caused it, if she can make herself responsible for it, then she's established a sort of control over the rape. It wasn't someone arbitrarily smashing into her life and wreaking havoc. The unpredictability of the latter situation can be too much for some women to face: If it happened arbitrarily without provocation, then it could happen again. This is horrifying to believe, so the victim creates an illusion of safety by declaring herself responsible for the incident. (pp 105-106).

Rape is a particularly good example of an uncontrollable aversive event which often precipitates reactive depression in the victim. Wortman's analysis, however, ignores much. First of all, it has been well documented that rape is often regarded in both Western and non-western cultures as an event precipitated by the victim (see Brownmiller, 1975). (This writer recently witnessed the direct and indirect expression of such views by staff psychiatrists in response to a seminar on the topic of rape presented at a large urban mental health center.) Surely, the presence of such dominant attitudes provides a less hypothetical explanation of why victims of rape tend to engage in self blame. Perhaps even more relevant to the present discussion is the fact that the "just world hypothesis" has been examined primarily, if not exclusively, in hypothetical, simulation experiments in which subjects were passively involved as observers (e.g., Lerner, 1970; Lerner & Mathews, 1967; Lerner & Simmons, 1966; Walster, 1966). From the previous discussion of evidence germane to this issue (Fontaine, 1975; Jones & Nisbett, 1972), it is apparent that generalizations from the perceptions of observers to those of actors are hazardous at best.

That some degree of depression follows naturally from uncontrollable aversive events such as the loss of a loved one, may be a normal, adaptive reaction as in grief (Averill, 1968) or as a part of a necessary process of disengagement (Klinger, 1968). Such a view is consistent with the present findings. These findings also suggest, however, that attributing causality for truly uncontrollable events to internal causal factors exacerbates (and by inference, maintains) the depressive reaction. What are the implications for treatment? Beck's (1967) cognitive therapy proceeds through four stages: (1) identification of maladaptive cognitive patterns in the patient's life history, such as those reinforcing low self esteem; (2) identification of specific depression generating cognitions ("automatic thoughts"); (3) attacking the logic of these cognitions and (4) repeatedly reciting the reasons that these cognitions are invalid whenever they occur. The present findings suggest that it is most particularly the inappropriate internal attributions of causality (e.g., "I am responsible for the fact that I was raped."), that can be most facilitatively attacked by therapeutic intervention.

Before leaving the solvability by locus of control interaction on affective responses we may note, in a purely speculative vein, some possible implications for manic reactions essentially similar to those just described for depression. Beck (1967) points out that manic symptomatology is, in most respects, the reverse of depressive symptomatology. Indeed, the elation, extremely positive self image and expectations for success, high drive and impulsivity, increased sexual interest as well as a tendency to deny problems and/or blame others are striking in their contrast. Perhaps since severe depressive reactions may be precipitated by unrealistic internal attributions of causality following exposure to uncontrollable aversive outcomes, so may manic reactions be initiated by unrealistic attributions of internal causality following exposure to apparently controllable positive outcomes. Langer (1975) has made a similar proposition. In noting the possibility that an illusion of control may be the inverse of learned helplessness, she suggested that:

> ...the illusion of control may contribute to manic or hypomanic reactions, since reactive depression is in many ways similar to psychotic depression, the believed counterpart to mania. Mania is characterized by goal directed overactivity and very high self esteem. Beck (1967) describes the manic patient as "optomistic about the outcome of anything he undertakes. Even when confronted with an unsolvable problem he is confident he will find a solution". (p.93). Thus he appears to have an illusion of control. If this is true then deficient contingency learning, in which the individual misattributes causal effectors to himself as a result of prior training, may be an etiological factor in manic reactions. This speculation and the treatment it suggests should be explored in future research. (p. 325)

In concluding this discussion of the significant differences on the affect dependent measures in the present study, it is noteworthy that they are clearly supportive of Weiner and his associates' (Weiner, 1974; Weiner & Kukla, 1970; Rest et. al., 1973; Weiner & Sierad, 1975) notion that it is locus of control which is the causal dimension most influential in determining emotional response following success or failure. Noteably from the unexpected results on the anagram performance measures emergent from the analysis on the nonorthogonal design this was also true of task performance, a fact which is contrary to Weiner's theoretical framework (Weiner, 1974; Weiner, et. al., 1971). Subjects exposed to unsolvable problems were significantly more depressed than subjects exposed to solvable problems. However when failure on the unsolvable problems was attributed to internal causal factors more depression and more subsequent debilitation on anagram performance was produced than when failure was attributed to external causal factors. On the other hand, when success on the solvable problems was attributed to internal causal factors more positive affect and greater enhancement of subsequent anagram performance was produced than when success was attributed to external causal factors. In a spirit of "second guessing" it would seem to make sense (at least within this writer's phenomenological world) that affect and subsequent performance would tend to be associated regardless of one's attribution of causality for success and failure. Be that as it may, the degree to which affect is causally related to performance (or to which they are independent effects of a common cause) is a matter for further research.

Methodological Considerations

The present research endeavor involved an attempt to integrate two distinct areas of psychology. The issues involved in such an undertaking were relatively complex. Much of this complexity involved methodological issues, either those which complicated the meaningful integration of previous research findings or those which complicated the understanding of subjects' responses in the present study. The latter complications were, of course, highlighted by the reanalyses of these responses in what was in some respects a completely different type of design. There are, however, two methodological issues which have not been adequately dealt with in terms of their implications for the present as well as future research, namely, the effectiveness of the causal belief manipulations and the adequacy of the control group from an external validity standpoint. These issues are discussed below.

Manipulations of causal belief. Subjects' rankings of the degree to which the four causal factors influenced their success or failure on the pretreatment problems served as a partial check on the manipulations. As indicated previously, the fact that from 40 to 80% of the subjects within individual experimental groups did not attribute causality to the factor they were told was most influential casts considerable doubt upon the effectiveness of the manipulations. This as well as the fact that anagram performance appeared to be little affected by either of the causal dimensions provided the rationale for a reanalysis on the homogeneous groups formed according to measured attribution of causality. The fact that such a clear interaction of solvability and locus of control emerged from these analyses all but demonstrates the limited potency of the belief manipulations. This lack of potency appeared to be particularly problematic in the solvable/external conditions (i.e., the S-TD and S-LU groups) where only five out of 20 subjects attributed in a manner consistent with the manipulations. Indeed, considering all experimental groups, only slightly more than 46% of the subjects rank ordered the manipulated causal factor first. This compares to 54% in Reimer's (1975) study, the only other to attempt similar belief manipulations. Does this spell doom for research attempting to manipulate the four causal beliefs as independent variables? In this writer's view, if the subjects are to operate as actors on ego-involving tasks the answer is probably affirmative.

The above statement is based upon the author's belief (nutured during the course of this study) that the manipulation does not exist which is capable of getting all the subjects in specified groups to attribute their outcome on an important task to ability, effort, task difficulty or luck at the experimenter's whim. On the basis of reactance theory alone (see Brehm, 1966; 1972) it is predictable that a considerable proportion of subjects would successfully resist even the most persuasive deceptions, except perhaps those aided and abetted by the skillful use of hypnosis, psychoactive drugs and/or physical torture. In the present study, subjects' attributions were consistent with the manipulations at a level beyond what would be expected by chance. The most blatant inconsistencies would seem to be explainable in terms of ego-defensive/enhancing motives. For example of the 20 subjects told that their success was determined by external factors (the ease of the task or good luck), a total of 13 attributed their success to their high ability or exemplery effort. This tendency to attribute positive outcomes to internal causes has been repeatedly observed (e.g., Feather, 1969; Weiner et. al., 1971; Wortman, Costanzo & Witt, 1973) and appears to be augmented when the outcome carries implications germane to self esteem (Fontaine, 1975; Snyder, Stephan & Rosenfield, 1970). Smith (1968) expressed it well when he wrote that, "...consistency seeking processes operate in conjunction with an essentially unrelated trend, a bias toward thinking as well of oneself as one can get away with" (p. 368).

At the very least it would seem unsporting to fault individuals for exhibiting the ego-enhancing tendencies described above. Indeed, for unless the data from the present study bears false witness, it would appear that they do so solely at the expense of increased depression coupled with greater debilitation in future performance situations. Back to the point of the present discussion, however, it must be admitted that these defensive tendencies do not augur well for those researchers interested in producing studies where causal beliefs regarding success or failure on important tasks also have status as manipulated independent variables. Such would seem only feasible in simulation designs in which subjects observe the performance of others, hypothesized or real. Those committed to studying "real-life" actors in real life situations may have to resign themselves to identifying the cognitions (e.g., causal beliefs) and measuring the consequences or correlates (e.g., affect, expectancy and/or performance).

External validity: The control group. The external validity of the findings from the present study are, like those of most studies, subject to certain limitations. The most salient have to do with the degree to which the results can be generalized to learned helplessness. While this is clearly an important issue, in this writer's view it is also secondary to the more general purpose of the study. That purpose was to explore the influence of beliefs regarding the causes of success (controllable outcomes) and failure (uncontrollable outcomes) upon subsequent emotional response, expectancy for success and actual task performance. In a more specific sense, the aim was to test Weiner's theory regarding the differential mediational function of the stability and locus of control causal dimensions. This aim was rather neatly served in the context of the 2 X 2 X 2 factorial design with pretreatment solvability, causal stability and locus of control as the independent variables. The results were viewed as being generally applicable to those performance situations in which individuals operate as actors on ego-involving tasks, precisely the type of situation operationalized by the learned helplessness paradigm.

It must be noted, however, that the above statement rests primarily upon an analogical argument, i.e., that the procedure from which the present findings emerged was essentially identical (with the exception of the causal belief manipulations) to procedures in which the helplessness effect has been demonstrated (Benson & Kennelly, 1976; Hiroto & Seligman, 1975; Jones, Nation & Massad, 1977; Klein & Seligman, 1976). The single uncrossed no pretreatment control group in the present study constituted a baseline against which debilitated anagram performance in the experimental groups could be compared. However, because an unsolvable (uncontrollable) pretreatment and a solvable (controllable) pretreatment group were not also included, it is not possible to demonstrate that unsolvability per se (uncontaminated by any particular causal belief) was capable of producing the learned helplessness effect. It is for this reason that the study was titled "Causal Attributions as Mediators of Affect and Performance in a Learned Helplessness Paradigm" rather than "Causal Attributions as Mediators of Depression and Learned Helplessness". Inherent in this distinction is the limitation on external validity.

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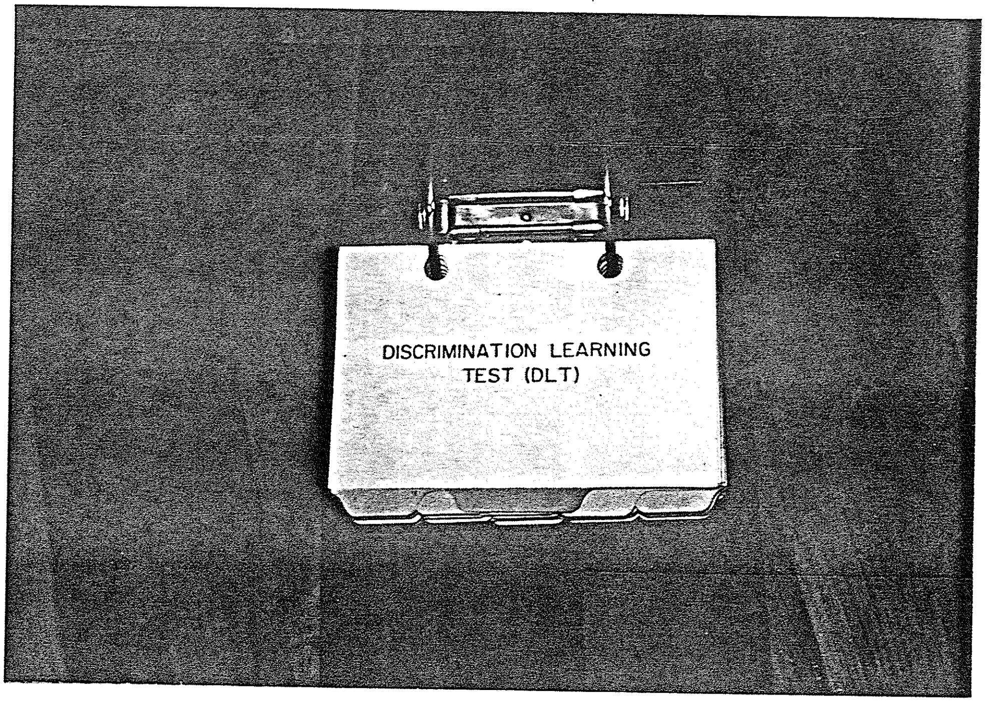
APPENDIX A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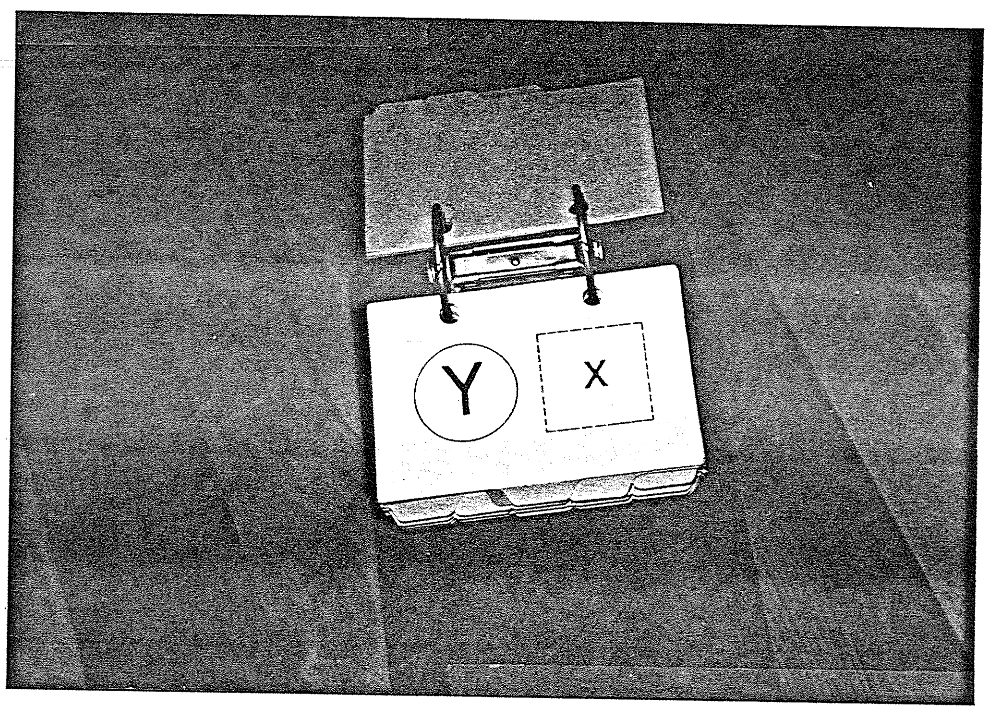
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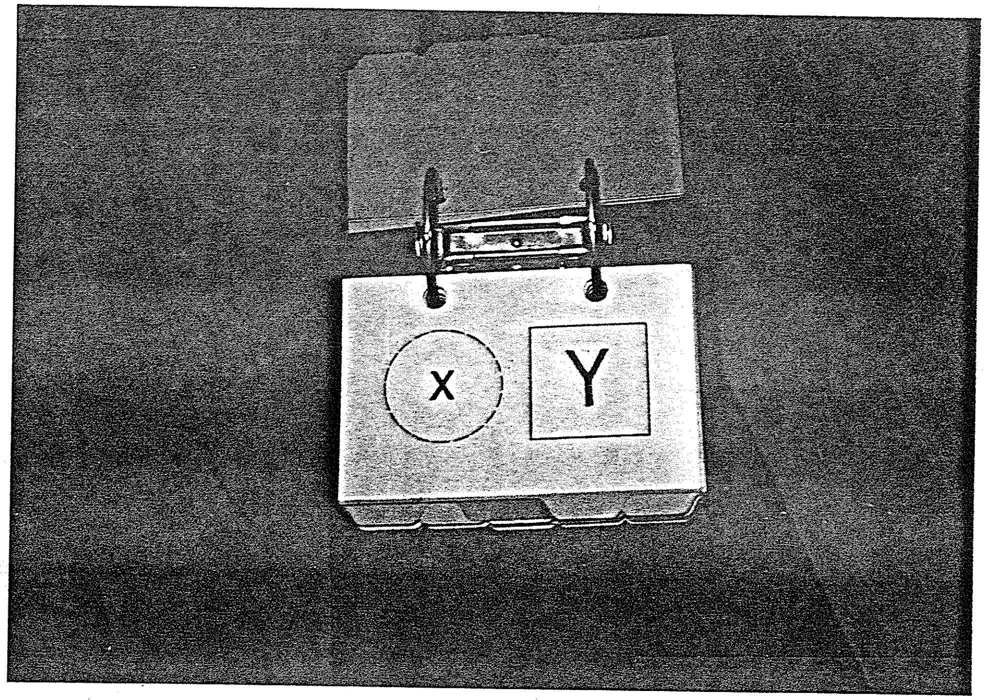
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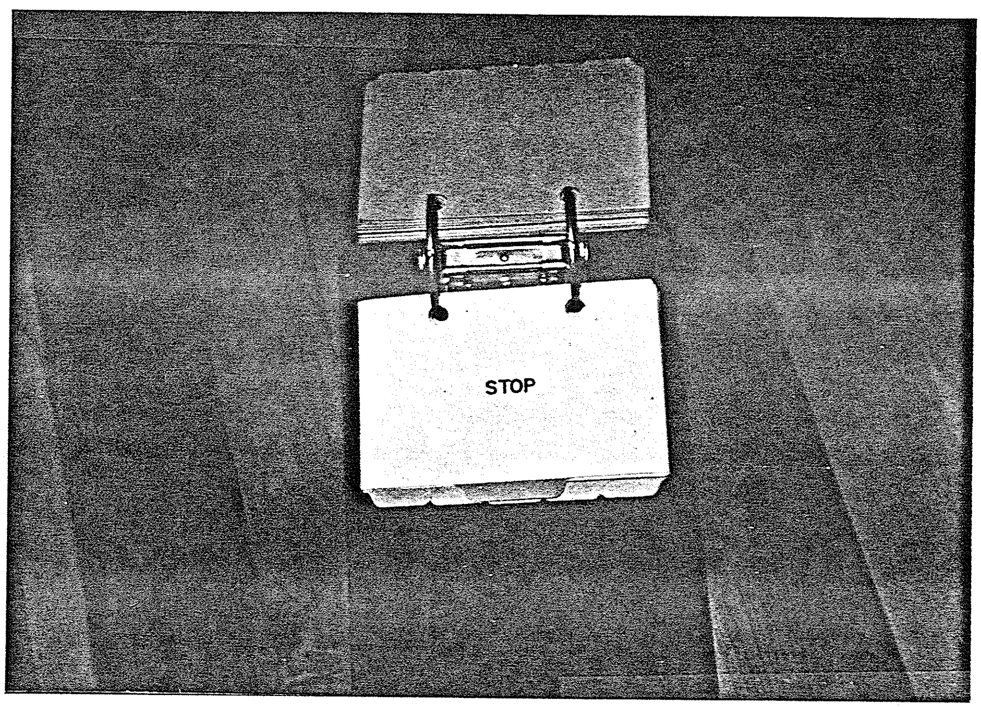
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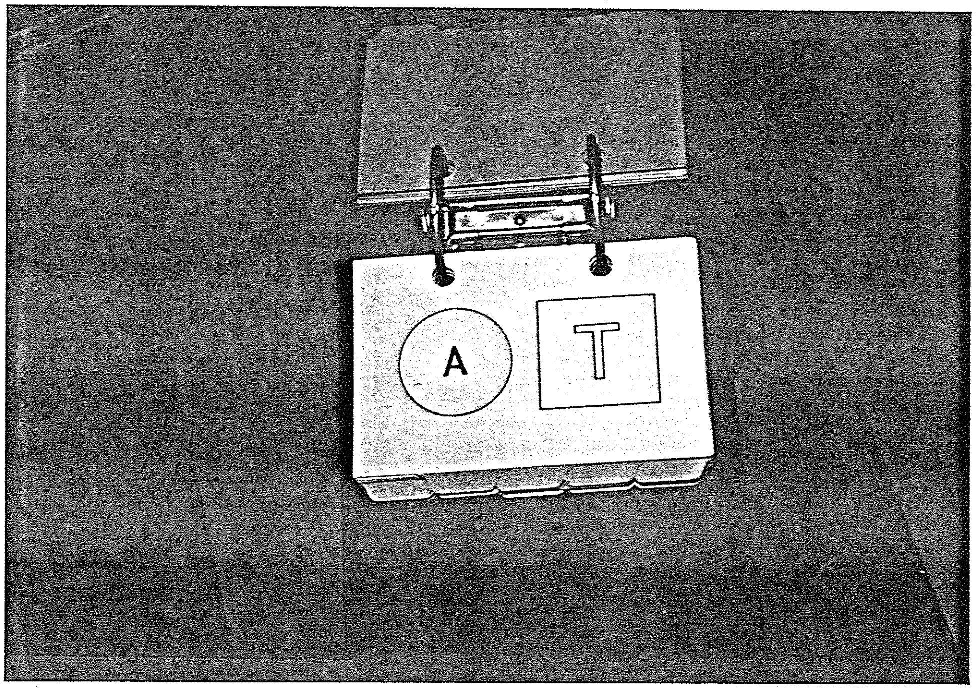
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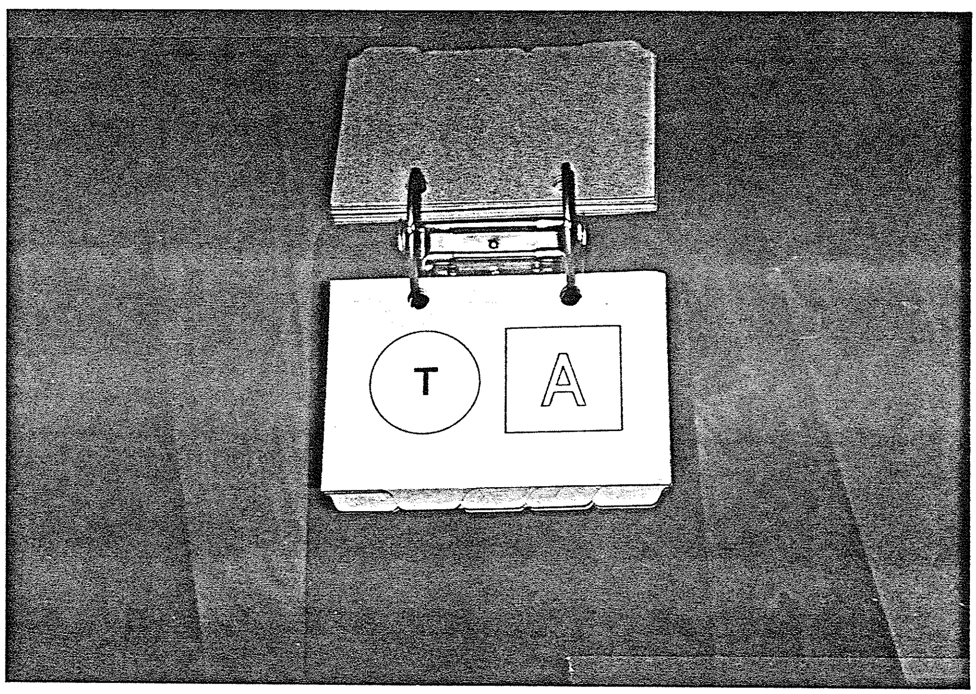
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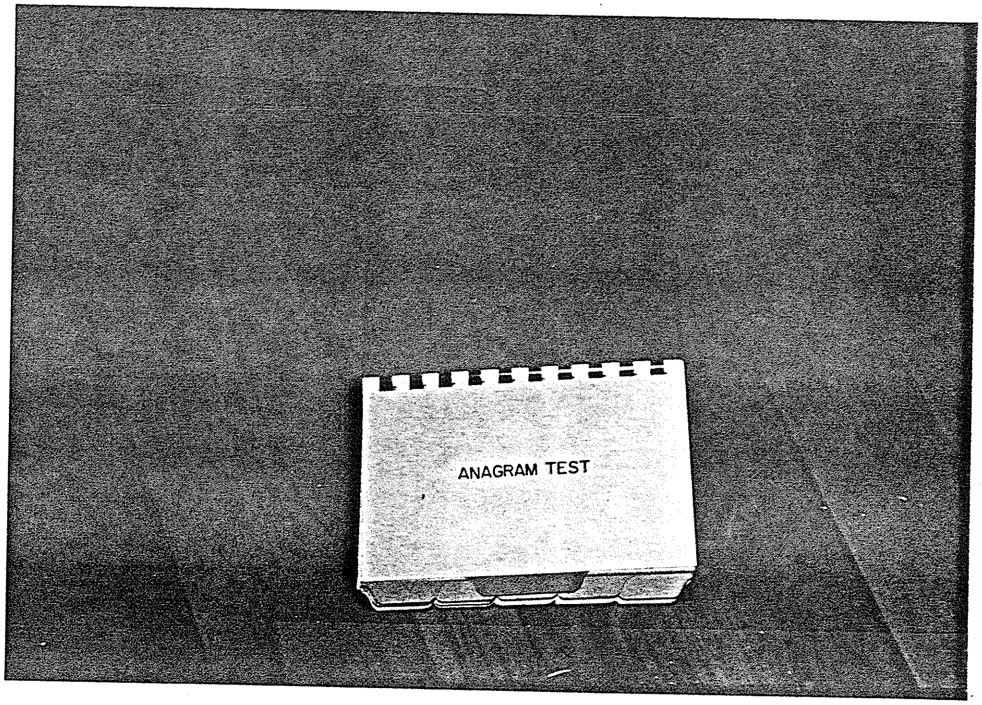
APPENDIX B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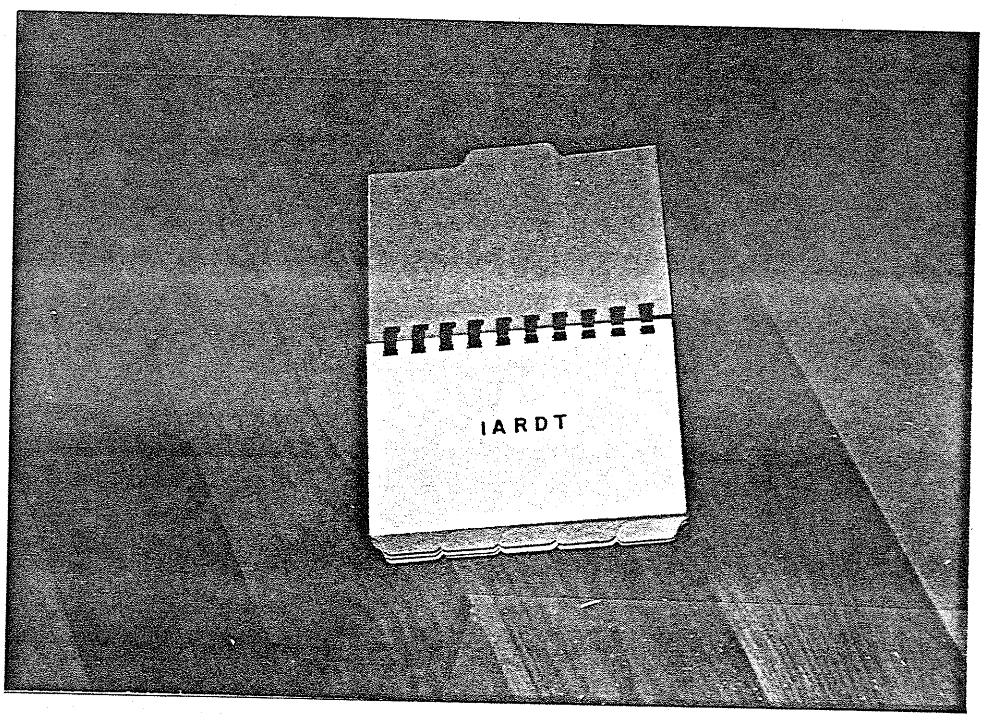
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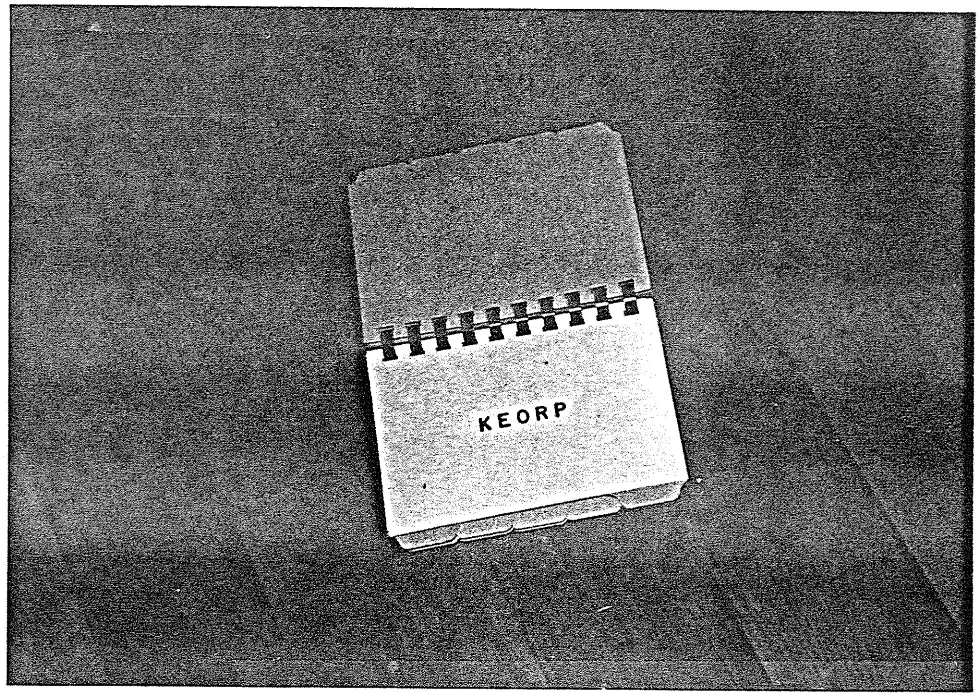
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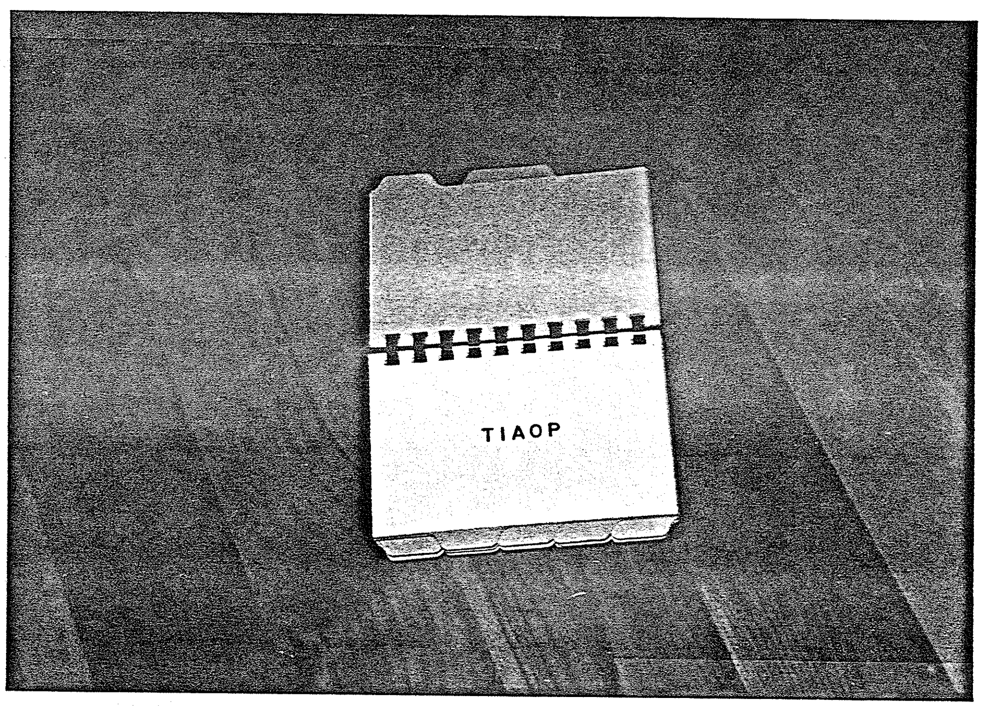
TIAOP

Anagram Test

	Anagrams	Solutions
1.	IARDT	TRIAD
2.	TIAOP	PATIO
3.	USOTJ	JOUST
4.	OUHLG	GHOUL
5.	BIATH	HABIT
6.	TOANB	BATON
7.	OULRF	FLOUR
8.	OPDTA	ADOPT
9.	BLOEN	NOBLE
10.	KEORP	POKER
11.	TCAHB	BATCH
12.	UNATJ	JAUNT
13.	WEORP	POWER
14.	ACOHR	ROACH
15.	ANITG	GIANT
16.	AIRNT	TRAIN
17.	GAURS	SUGAR
18.	ULATF	FAULT
19.	INRKD	DRINK
20.	ERLKC	CLERK

APPENDIX C

Summary Report of the College
Aptitude Measurement Project

THE DISCRIMINATION LEARNING TEST: A "PURE" MEASURE OF ABILITY*

Gregory G. Sherwood and James B. Nickels
University of Manitoba

During the early months of the University of Manitoba's College Aptitude Measurement Project, it became apparent that the Discrimination Learning Test (DLT) required closer study. Since its development in 1965, the DLT has become increasingly prominent as a measure of intellectual ability. In the original study, Bruning (1966) stated that "...an individual's score on eight series of these tasks provides a good index of his ability to discriminate at an abstract level (p.106)." Generally, the available literature has supported this conclusion (see the review by Bruning, 1974). Of particular importance was a study by Moore (1969) which indicated that the DLT was highly predictive of success in college. In this study students with the highest DLT scores achieved significantly higher grade point averages and were more likely to successfully graduate. Because of these findings, several of the College Aptitude measures developed or revised within the last five years have had the DLT (or a modification of it) incorporated into their test packages.

Five alternate versions of the DLT (Forms A, B, C, D and E), are presently available. Each was designed to be of equal difficulty and therefore interchangeable. Each consists of a series of four-dimensional stimulus patterns. Every dimension has two associated values, for example, (a) letter (A or T); (b) letter color (black or white); (c) letter size (large or small); (d) border surrounding letter (circle or square). During each set of trials one value of one of the dimensions, for example, black, is always correct. Six sets, each consisting of 10 trials, are required to get a standardized score for each subject.

The investigations of the DLT conducted by the College Aptitude Measurement Project produced some rather surprising findings. On the basis of our research it appears that the DLT may provide one of the "purest" measures of an individual's

* This is the 10th summary report of an ongoing project supported by Educational Research Grant #ED 0846-01, from the National Institute of Educational and Vocational Research.

fundamental ability presently available. This possibility first became apparent following our review of the previous DLT research. While consisting of relatively few studies, this research tended to be of high methodological quality. Our conclusions were generally in line with those of Bruning (1974), that is, the DLT appears to provide a quick measure of an individuals intellectual ability. Of particular interest to us however were the several unusually high correlations between the DLT and more comprehensive standardized tests of intelligence (e.g. Isaac, 1970). The implications of this relation were explored in a major study conducted by the College Aptitude Measurement Project.

Nickels and Sherwood (1975) gave 200 University students several college aptitude tests (including the DLT), as well as the Wechsler Adult Intelligence Scale (WAIS). During each test the subjects' electromyogram (EMG) was recorded. Because EMG levels are strongly related to the amount of mental effort being expended (concentration), these readings provided an index of how hard each subject was "trying" on each of the tests. The results of this study with regard to the DLT can be summarized as follows:

(1) The correlation between the DLT scores and the intelligence test scores was higher than those calculated between any other combination of two measures. Clearly the DLT measures something virtually identical to what a standardized intelligence test measures -- at least within a University student population.

(2) The correlation between the DLT scores and the EMG readings was lower than those between any other written test and its associated EMG readings. Apparently, the amount of effort an individual expends on the DLT is not a major determinant of his/her final score. This may partially account for the "purity" of the DLT score as a measure of ability.

(3) In a subsequent factor analysis of the total data from the 200 subjects, Sherwood and Nickels (1976, in press) programmed an IBM-360 computer to allocate test score variance in terms of four determining factors: ABILITY, EFFORT, TASK DIFFICULTY AND CHANCE/LUCK. More than any other measure, the DLT scores produced the highest loadings on the ABILITY factor. The fact that the DLT Loaded so heavily on the ABILITY factor (to the exclusion of the other three primary factors) clearly establishes its purity as a measure of ability.

Conclusion. On the basis of the above findings, we may safely conclude that the DLT is an extremely valid assessment device which can profitably be used (in conjunction with other measures) to select University students. We further, and more importantly, conclude that the DLT provides what is probably the purest measure of fundamental ability presently available. This aspect of the measure should be further explored.

N.B. Currently the College Aptitude Measurement Project is investigating the feelings and perceptions of individuals taking the DLT as well as a variety of other tests. At the conclusion of this study, the findings will be incorporated into the final report to the National Institute of Educational and Vocational Research.

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APPENDIX D

Summary Report of the College
Aptitude Measurement Project

THE DISCRIMINATION LEARNING TEST: A "PURE" MEASURE OF EFFORT*

Gregory G. Sherwood and James B. Nickels
University of Manitoba

During the early months of the University of Manitoba's College Aptitude Measurement Project, it became apparent that the Discrimination Learning Test (DLT) required closer study. Since its development in 1965, the DLT has become increasingly prominent as a measure of intellectual ability. In the original study, Bruning (1966) stated that "...an individual's score on eight series of these tasks provides a good index of his ability to discriminate at an abstract level (p.106)." Generally, the available literature has supported this conclusion (see the review by Bruning, 1974). Of particular importance was a study by Moore (1969) which indicated that the DLT was highly predictive of success in college. In this study students with the highest DLT scores achieved significantly higher grade point averages and were more likely to successfully graduate. Because of these findings, several of the College Aptitude measures developed or revised within the last five years have had the DLT (or a modification of it) incorporated into their test packages.

Five alternate versions of the DLT (Forms A, B, C, D and E), are presently available. Each was designed to be of equal difficulty and therefore interchangeable. Each consists of a series of four-dimensional stimulus patterns. Every dimension has two associated values, for example, (a) letter (A or T); (b) letter color (black or white); (c) letter size (large or small); (d) border surrounding letter (circle or square). During each set of trials one value of one of the dimensions, for example, black, is always correct. Six sets, each consisting of 10 trials, are required to get a standardized score for each subject.

The investigations of the DLT conducted by the College Aptitude Measurement Project produced some rather surprising findings. ~~On the basis of our research it appears that an individual's score on the DLT may simply indicate how hard he/she has tried to do the task.~~ This possibility first became apparent following

*This is the 10th summary report of an ongoing project supported by Educational Research Grant #ED 0846-01, from the National Institute of Educational and Vocational Research.

our review of the previous DLT research. We found this research to be not only sparse, but also of poor quality. Our conclusions were markedly different from those of Bruning (1974) in that we could find no methodologically acceptable evidence to indicate that the DLT provided a measure of intellectual ability. Of interest to us, however, were the several unusually high correlations between the DLT and measures of achievement motivation (e.g. Isaac, 1970). The implications of this relation were explored in the context of a major study conducted by the College Aptitude Measurement Project.

Nickels and Sherwood (1975) gave 200 University students several college aptitude tests (including the DLT) as well as the Wechsler Adult Intelligence Scale (WAIS). During each test the subjects' electromyogram (EMG) was recorded. Because EMG levels are strongly related to the amount of mental effort being expended (concentration), these readings provided an index of how hard each subject was "trying" on each of the tests. The results of this study with regard to the DLT can be summarized as follows:

(1) The correlation between the DLT scores and the intelligence test (WAIS) scores was lower than those calculated between any other combination of two measures. Clearly the DLT is not measuring anything similar to what a standardized intelligence test measures -- at least within a University student population.

(2) The correlation between the DLT scores and the EMG readings were higher than those between any other written test and its associated EMG readings. In other words, it appears that within certain obvious limits, the amount of effort an individual expends on the DLT (the amount he/she tries) largely determines his/her final score. Therefore, while not providing a good measure of a person's ability, the DLT would seem to indicate how hard he/she tried in the test situation.

(3) In a subsequent factor analysis of the total data from the 200 subjects, Sherwood and Nickels (1976, in press) programmed an IBM-360 computer to allocate test score variance in terms of four determining factors: ABILITY, EFFORT, TASK DIFFICULTY and CHANCE/LUCK. More than any other measure, the DLT scores generated the highest loadings on the EFFORT factor. The fact that the DLT loaded so heavily on the EFFORT factor (to the exclusion of the other three primary factors) clearly establishes the fact that it primarily reflects the amount of effort or concentration that an individual puts into it.

Conclusion: On the basis of the above findings, we conclude that the DLT is not a valid assessment device and therefore should not be used to select University students. We further conclude, however, that the DLT does provide a remarkably pure measure of the degree to which an individual is trying or concentrating in the test situation. This aspect of the measure should be further explored.

N.B. Currently the College Aptitude Measurement Project is investigating the feelings and perceptions of individuals taking the DLT as well as a variety of other tests. At the conclusion of this study, the findings will be incorporated into the final report to the National Institute of Educational and Vocational Reserach.

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APPENDIX E

Summary Report of the College
Aptitude Measurement Project

THE DISCRIMINATION LEARNING TEST: CONFOUNDING DIFFICULTY LEVELS*

Gregory G. Sherwood and James B. Nickels
University of Manitoba

During the early months of the University of Manitoba's College Aptitude Measurement Project, it became apparent that the Discrimination Learning Test (DLT) required closer study. Since its development in 1965, the DLT has become increasingly prominent as a measure of intellectual ability. In the original study, Bruning (1966) stated that"...an individual's score on eight series of these tasks provides a good index of his ability to discriminate at an abstract level (p.106)." Generally, the available literature has supported this conclusion (see the review by Bruning, 1974). Of particular importance was a study by Moore (1969) which indicated that the DLT was highly predictive of success in college. In this study students with the highest DLT scores achieved significantly higher grade point averages and were more likely to successfully graduate. Because of these findings, several of the College Aptitude Measures developed or revised within the last five years have had the DLT (or a modification of it) incorporated into their test packages.

Five alternate versions of the DLT (Forms A, B, C, D and E), are presently available. Each was designed to be of equal difficulty and therefore interchangeable. Each consists of a series of four-dimensional stimulus patterns. Every dimension has two associated values, for example, (a) letter (A or T); (b) letter color (black or white); (c) letter size (large or small); (d) border surrounding letter (circle or square). During each set of trials one value of one of the dimensions, for example, black, is always correct. Six sets, each consisting of 10 trials, are required to get a standardized score for each subject.

The investigations of the DLT conducted by the College Aptitude Measurement Project produced some rather surprising findings; namely, that the alternate versions were not of equal difficulty. ~~On the basis of our research it appears~~

* This is the 10th summary report of an ongoing project supported by Educational Research Grant #ED 0846-01, from the National Institute of Educational and Vocational Research.

that an individual's score on the DLT is a direct function of the particular form (A, B, C, D or E) which was administered to him/her. This possibility first became apparent following our review of the previous DLT research. We found this research to be not only sparse, but also of poor quality. Our conclusions were different from those of Bruning (1974) in that we could find little methodologically acceptable evidence to indicate that the DLT provided a good measure of intellectual ability. Of interest to us, however, was the inconsistent results of different studies. Some studies found average DLT scores to be very high, others found them to be very low. The implications of these contradictory results were explored in a major study conducted by the College Measurement Project.

Nickels and Sherwood (1975) gave 200 University students several college aptitude tests (including all forms of the DLT) as well as the Wechsler Adult Intelligence Scale (WAIS). During each test the subjects electromyogram (EMG) was recorded. Because EMG levels are strongly related to the amount of mental effort being expended (concentration), these readings provided an index of how hard each subject was "trying" on each of the tests. The results of this study with regard to the DLT can be summarized as follows:

(1) The correlations between alternate forms of the DLT were uniformly low, indicating that they were not equivalent in difficulty level. From least to most difficult, they distributed themselves as follows: D, B, E, C, A. Most students performed well on form D, very few did well on form A.

(2) With the exception of form E, the correlations between DLT scores and intelligence test scores were low to moderate. Similarly, the correlations between DLT scores and associated EMG readings were generally low. These findings serve to emphasize the fact that an individuals performance on the DLT is largely a function of which form he/she is administered rather than how intelligent he/she is, or how hard he/she concentrates or tries.

(3) In a subsequent factor analysis of the total data from the 200 subjects, Sherwood and Nickels (1976, in press) programmed an IBM-360 computer to allocate test score variance in terms of four determining factors: ABILITY, EFFORT, TASK DIFFICULTY and CHANCE/LUCK. More than any other measure, the DLT scores produced the highest loadings on the TASK DIFFICULTY factor. The fact that the DLT loaded so heavily on the TASK DIFFICULTY factor (to the exclusion of the other three primary factors) clearly indicates that an individual's score on this test is primarily a function of which form is administered.

Conclusion. On the basis of the above findings, we conclude that the DLT is not a valid assessment device at present, and should not be used to select University students. This is not to say that the test itself is invalid, but simply that the alternate forms are non-equivalent and therefore of questionable utility as assessment devices. Further research is required to refine the DLT, before it can be reasonably used in applied settings.

N.B. Currently the College Aptitude Measurement Project is investigating the feelings and perceptions of individuals taking the DLT as well as a variety of other tests. At the conclusion of this study, the findings will be incorporated into the final report to the National Institute of Educational and Vocational Research.

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Sherwood, G.G., & Nickels, J.B. A factor analysis of intellectual measures: Ability, effort, task difficulty and chance as determinants of performance. Journal of Multivariate Psychological Research, 1976, in press.

APPENDIX F

Summary Report of the College
Aptitude Measurement Project

THE DISCRIMINATION LEARNING TEST: THE INFLUENCE OF CHANCE*

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University of Manitoba

During the early months of the University of Manitoba's College Aptitude Measurement Project, it became apparent that the Discrimination Learning Test (DLT) required closer study. Since its development in 1965, the DLT has become increasingly prominent as a measure of intellectual ability. In the original study, Bruning (1966) stated that "...an individual's score on eight series of these tasks provides a good index of his ability to discriminate at an abstract level (p.106)." Generally, the available literature has supported this conclusion (see the review by Bruning, 1974). Of particular importance was a study by Moore (1969) which indicated that the DLT was highly predictive of success in college. In this study students with the highest DLT scores achieved significantly higher grade point averages and were more likely to successfully graduate. Because of these findings, several of the College Aptitude Measures developed or revised within the last five years have had the DLT (or a modification of it) incorporated into their test packages.

Five alternate versions of the DLT (Forms A, B, C, D and E), are presently available. Each was designed to be of equal difficulty and therefore interchangeable. Each consists of a series of four-dimensional stimulus patterns. Every dimension has two associated values, for example, (a) letter (A or T); (b) letter color (black or white); (c) letter size (large or small); (d) border surrounding letter (circle or square). During each set of trials one value of one of the dimensions, for example, black, is always correct. Six sets, each consisting of 10 trials, are required to get a standardized score for each subject.

The investigations of the DLT conducted by the College Aptitude Measurement Project produced some rather surprising findings. ~~On the basis of our research it appears that an individual's score on the DLT may simply be due to chance factors.~~ This possibility first became apparent following our review of the previous DLT research. We found this research to be not only sparse, but also of poor quality.

* This is the 10th summary report of an ongoing project supported by Educational Research Grant #ED 0846-01, from the National Institute of Educational and Vocational Research

Our conclusions were markedly different from those of Bruning (1974) in that we could find no methodologically acceptable evidence to indicate that the DLT provided a measure of intellectual ability. Of interest to us, however, were the few studies providing complete descriptions of their data. In several of these studies the distribution of scores did not correspond to the normal curve, but rather to the distribution which would be predicted if DLT scores were determined by chance or luck. The implications of this improbably finding were explored in the context of a major study conducted by the College Aptitude Measurement Project.

Nickels and Sherwood (1975) gave 200 University students several college aptitude tests (including the DLT), as well as the Wechsler Adult Intelligence Scale (WAIS). During each test the subjects' electromyogram (EMG) was recorded. Because EMG levels are strongly related to the amount of mental effort being expended (concentration), these readings provided an index of how hard each subject was "trying" on each of the tests. The results of this study with regard to the DLT can be summarized as follows.

1) The DLT scores from the 200 subjects were not distributed in terms of a normal curve but rather formed a distribution which corresponded almost exactly to the distributional model which would operate if scores on the DLT were determined by chance. Thus an individual's score on the DLT reflects the operation of random probability, the same probability that would determine his/her outcomes on a game of chance, when a person does well on the DLT it is because of good luck. When he/she does poorly it is because of bad luck.

2) The correlations between DLT scores and intelligence test scores were uniformally low. Similarly the correlations between DLT scores and associated EMG readings were generally low. These findings serve to emphasize the fact that an individuals' performance on the DLT is largely a function of chance factors rather than of how intelligent he/she is or how hard he/she concentrates or tries.

3) In a subsequent factor analysis of the total data from the 200 subjects, Sherwood and Nickels (1976, in press) programmed an IBM-360 computer to allocate test score variance in terms of four determining factors: ABILITY, EFFORT, TASK DIFFICULTY and CHANCE/LUCK. More than any other measure, the DLT scores, produced the highest loadings on the CHANCE factor. The fact that the DLT loaded so heavily on the CHANCE factor (to the exclusion of the other three primary factors) clearly indicates that an individual's score on the DLT is primarily a function of luck.

Conclusion. On the basis of the above findings, we conclude that the DLT is not a valid assessment device, and should not be used to select University students. Further research should be conducted to determine why luck is such an important determinant of DLT scores, for example, is the randomized versus standardized order of presentation responsible or is chance inherent in the nature of the test itself?

N.B. Currently the College Aptitude Measurement Project is investigating the feelings and perceptions of individuals taking the DLT as well as a variety of other tests. At the conclusion of this study, the findings will be incorporated into the final report to the National Institute of Educational and Vocational Research.

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APPENDIX G

College Aptitude Measurement Project

RESPONDENT INFORMATION FORMS

At several times during this experiment, you will be asked to rate your present feelings as well as to indicate your perceptions regarding the problems you will be doing. It is not important that your ratings be consistent from one time to another. Rather, it is important that you be as honest and accurate as possible. Try to work fairly quickly as it is your immediate feelings and perceptions we are after. All information you provide will be strictly confidential.

DO NOT TURN PAGE UNTIL INSTRUCTED

1. Rate your present feelings on the dimensions below. Simply circle the mark on the scale which best represents how you are feeling now.

calm — nervous

depressed — happy

hostile — friendly

2. Indicate how successful you expect to be on the discrimination problems which you are about to receive.

unsuccessful — successful

DO NOT TURN PAGE UNTIL INSTRUCTED

1. Rate your present feelings on the dimensions below. Simply circle the mark on the scale which best represents how you are feeling now.

calm — nervous

depressed — happy

hostile — friendly

2. Indicate how successful you expect to be on the anagram problems which you are about to receive.

unsuccessful — successful

DO NOT TURN PAGE UNTIL INSTRUCTED

1. Rate your present feelings on the dimensions below. Simply circle the mark on the scale which best represents how you are feeling now.

calm ———————————— nervous

depressed ———————————— happy

hostile ———————————— friendly

2. Indicate how successful you would expect to be on an additional set of anagram problems.

unsuccessful ———————————— successful

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3. How well a person does on a set of problems can be a function of different causes: (a) how much EFFORT the person puts into doing the problems, (b) how DIFFICULT the problems are, (c) how much ABILITY the person has to do the problems and (d) how LUCKY the person is on the problems.

(a) Rank each of the causes in terms of how much it influenced how well you did on the discrimination problems. Indicate your ranking by placing a number from "1" (the most influential) to "4" (the least influential) on the line below each cause.

EFFORT	DIFFICULTY	ABILITY	LUCK
your trying or not trying on the problems	the easiness or hardness of the problems	your ability or inability to do the problems	good luck or bad luck on the problems
______	______	______	______

(b) Rank each of the causes in terms of how much it influenced how well you did on the anagram problems. Indicate your ranking by placing a number from "1" (the most influential) to "4" (the least influential) on the line below each cause.

EFFORT	DIFFICULTY	ABILITY	LUCK
your trying or not trying on the problems	the easiness or hardness of the problems	your ability or inability to do the problems	good luck or bad luck on the problems
______	______	______	______

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4. (a) Indicate to what degree your results on the DLT (discrimination problems) are important to you.

unimportant ______________________________ important

(b) Indicate to what degree you felt you were successful on the DLT (discrimination problems).

unsuccessful ______________________________ successful

(c) Indicate to what degree you felt in control of how well you did on the DLT (discrimination problems).

not at all in control ______________________________ very much in control

5. (a) Indicate to what degree your results on the anagram problems are important to you.

unimportant ______________________________ important

(b) Indicate to what degree you felt you were successful on the anagram problems.

unsuccessful ______________________________ successful

(c) Indicate to what degree you felt in control of how well vou did on the anagram problems.

not at all in control ______________________________ very much in control

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6. How well you do on a set of problems can be influenced by how much ABILITY you have. ABILITY, as a concept, has several dimensions. Indicate what ability means to you by circling the appropriate mark on each of the following three scales.

a function of the self		a function of external circumstances
stable on the same type of problems		changeable on the same type of problems
stable on different types of problems		changeable on different types of problems

7. How well you do on a set of problems can be influenced by how much EFFORT you put into them. EFFORT, as a concept, has several dimensions. Indicate what EFFORT means to you by circling the appropriate mark on each of the following three scales.

a function of the self		a function of external circumstances
stable on the same type of problems		changeable on the same type of problem
stable on different types of problems		changeable on different types of problems

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8. How well you do on a set of problems can be influenced by how DIFFICULT they are. TASK DIFFICULTY, as a concept, has several dimensions. Indicate what TASK DIFFICULTY means to you by circling the appropriate mark on each of the following three scales.

a function of the self	a function of external circumstances

stable on the same type of problem	changeable on the same type of problem

stable on different types of problems	changeable on different types of problems.

9. How well you do on a set of problems can be determined by how LUCKY you are. LUCK, as a concept, has several dimensions. Indicate what LUCK means to you by circling the appropriate mark on each of the following three scales.

a function of the self	a function of external circumstances

stable on the same type of problem	changeable on the same type of problem

stable on different types of problems	changeable on different types of problems

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10. Indicate to what degree you feel that the discrimination problems and anagram problems are similar.

the problems are very different		the problems are very similar

11. Indicate how skillful you feel that you are at playing verbal games such as scrabble, charades, crossword puzzles or anagrams.

not skillful at all		very skillful

12. Indicate to what degree you generally feel that most of life's problems are solvable.

most of life's problems are not solvable		most of life's problems are solvable

13. Indicate to what degree you generally feel that you have personal control over most of life's problems.

no control over life's problems		very much control over life's problems

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14. We would like to know how you felt about the problems that you did in this experiment. Circle the number which best represents how you felt. Generally the problems were....

unfair	1	2	3	4	5	6	7	fair
boring	1	2	3	4	5	6	7	interesting
tricky	1	2	3	4	5	6	7	straightforward
phony	1	2	3	4	5	6	7	real

15. How did you feel when answering the questions in this booklet? Circle the number which best represents how you felt.

bored	1	2	3	4	5	6	7	interested
annoyed	1	2	3	4	5	6	7	cheerful
cautious	1	2	3	4	5	6	7	open
trusting	1	2	3	4	5	6	7	suspicious

16. In a short paragraph tell us what you think this experiment was all about. What were we trying to show?

17. Did you follow instructions to the best of your ability? YES_____ NO_____

If your answer was "NO", in what way did you deviate from the instructions?

APPENDIX H

College Aptitude Measurement Project

RESPONDENT INFORMATION FORMS

At several times during this experiment, you will be asked to rate your present feelings as well as to indicate your perceptions regarding the problems you will be doing. It is not important that your ratings be consistent from one time to another. Rather, it is important that you be as honest and accurate as possible. Try to work fairly quickly as it is your immediate feelings and perceptions we are after. All information you provide will be strictly confidential.

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1. Rate your present feelings on the dimensions below. Simply circle the mark on the scale which best represents how you are feeling now.

calm — nervous

depressed — happy

hostile — friendly

DO NOT TURN PAGE UNTIL INSTRUCTED

1. Rate your <u>present feelings</u> on the dimensions below. Simply circle the mark on the scale which best represents how you are feeling now.

calm — nervous

depressed — happy

hostile — friendly

2. Indicate how successful you <u>expect to be</u> on the anagram problems which you are about to receive.

unsuccessful — successful

DO NOT TURN PAGE UNTIL INSTRUCTED

1. Rate your <u>present feelings</u> on the dimensions below. Simply circle the mark on the scale which best represents how you are feeling now.

calm — nervous

depressed — happy

hostile — friendly

2. Indicate how successful you would expect to be on an additional set of anagram problems.

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3. How well a person does on a set of problems can be a function of different causes: (a) how much EFFORT the person puts into doing the problems, (b) how DIFFICULT the problems are, (c) how much ABILITY the person has to do the problems and (d) how LUCKY the person is on the problems.

Rank each of the causes in terms of how much it influenced how well you did on the anagram problems. Indicate your ranking by placing a number from "1" (the most influential) to "4" (the least influential) on the line below each cause.

EFFORT	DIFFICULTY	ABILITY	LUCK
your trying or not trying on the problems	the easiness or hardness of the problems	your ability or inability to do the problems	good luck or bad luck on the problems
______	______	______	______

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4. (a) Indicate to what degree your results on the anagram problems are important to you.

unimportant — important

(b) Indicate to what degree you felt you were successful on the anagram problems.

unsuccessful — successful

(c) Indicate to what degree you felt in control of how well you did on the anagram problems.

not at all in control — very much in control

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5. How well you do on a set of problems can be influenced by how much ABILITY you have. ABILITY, as a concept, has several dimensions. Indicate what ability means to you by circling the appropriate mark on each of the following three scales.

a function of the self — a function of external circumstances

stable on the same type of problems — changeable on the same type of problems

stable on different types of problems — changeable on different types of problems

6. How well you do on a set of problems can be influenced by how much EFFORT you put into them. EFFORT, as a concept, has several dimensions. Indicate what EFFORT means to you by circling the appropriate mark on each of the following three scales.

a function of the self — a function of external circumstances

stable on the same type of problems — changeable on the same type of problem

stable on different types of problems — changeable on different types of problems

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a function of the self	a function of external circumstances
stable on the same type of problem	changeable on the same type of problem
stable on different types of problems	changeable on different types of problems.

8. How well you do on a set of problems can be determined by how LUCKY you are. LUCK, as a concept, has several dimensions. Indicate what LUCK means to you by circling the appropriate mark on each of the following three scales.

a function of the self	a function of external circumstances
stable on the same type of problem	changeable on the same type of problem
stable on different types of problems	changeable on different types of problems

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9. Indicate to what degree you feel that the discrimination problems and anagram problems are similar.

the problems are very different — the problems are very similar

10. Indicate how skillful you feel that you are at playing verbal games such as scrabble, charades, crossword puzzles or anagrams.

not skillful at all — very skillful

11. Indicate to what degree you generally feel that most of life's problems are solvable.

most of life's problems are not solvable — most of life's problems are solvable

12. Indicate to what degree you generally feel that you have personal control over most of life's problems.

no control over life's problems — very much control over life's problems

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13. We would like to know how you felt about the problems that you did in this experiment. Circle the number which best represents how you felt. Generally the problems were....

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boring	1	2	3	4	5	6	7	interesting
tricky	1	2	3	4	5	6	7	straightforward
phony	1	2	3	4	5	6	7	real

14. How did you feel when answering the questions in this booklet? Circle the number which best represents how you felt.

bored	1	2	3	4	5	6	7	interested
annoyed	1	2	3	4	5	6	7	cheerful
cautious	1	2	3	4	5	6	7	open
trusting	1	2	3	4	5	6	7	suspicious

15. In a short paragraph tell us what you think this experiment was all about. What were we trying to show?

16. Did you follow instructions to the best of your ability? YES____ NO____

If your answer was "NO", in what way did you deviate from the instructions?

APPENDIX I

Four-Way Multivariate and Univariate Analyses of Covariance*
for Expectancy and Anagram Performance Measures

Source	df	MS	F	p**
Experimenter				
Multivariate	1		0.0751	.9896
Expectancy	1	0.0188	0.0042	.9489
Trials to criterion	1	0.4875	0.0115	.9151
Number of failures	1	0.0654	0.0047	.9455
Response latency	1	5.0352	0.0113	.9159
Experimenter x Solvability				
Multivariate			0.4475	.7738
Expectancy	1	0.0889	0.0196	.8891
Trials to criterion	1	0.0364	0.0009	.9768
Number of failures	1	3.5291	0.2543	.6159
Response latency	1	14.1797	0.0317	.8593
Experimenter x Stability				
Multivariate			2.0081	.1051
Expectancy	1	5.2292	1.1556	.2866
Trials to criterion	1	0.0498	0.0012	.9729
Number of failures	1	4.7158	0.3398	.5621
Response latency	1	0.1016	0.0002	.9881
Experimenter x Locus				
Multivariate			0.1188	.9754
Expectancy	1	0.4458	0.0985	.7547
Trials to criterion	1	0.4468	0.0105	.9188
Number of failures	1	0.0759	0.0055	.9413
Response latency	1	16.7891	0.0375	.8471
Experimenter x Solvability x Stability				
Multivariate			0.5569	.6948
Expectancy	1	0.0020	0.0004	.9835
Trials to criterion	1	30.9795	0.7282	.3968
Number of failures	1	22.4329	1.6163	.2084
Response latency	1	781.4727	1.7464	.1912
Experimenter x Solvability x Locus				
Multivariate			0.3937	.8124
Expectancy	1	1.4148	0.3127	.5781
Trials to criterion	1	5.0422	0.1185	.7319
Number of failures	1	2.2529	0.1623	.6885
Response latency	1	23.4141	0.0523	.8199

Source	df	MS	F	p**
Experimenter x Stability x Locus				
Multivariate			1.2481	.3007
Expectancy	1	7.5613	1.6710	.2009
Trials to criterion	1	0.1506	0.0035	.9528
Number of failures	1	1.0313	0.0743	.7861
Response latency	1	2.7305	0.0061	.9380
Experimenter x Solvability x Stability x Locus				
Multivariate			0.2015	.9366
Expectancy	1	2.6086	0.5765	.4506
Trials to criterion	1	6.1426	0.1444	.7053
Number of failures	1	0.0483	0.0035	.9532
Response latency	1	6.2656	0.0140	.9062
Subject Within Groups				
Expectancy	62	4.5250		
Trials to criterion	62	42.5449		
Number of failures	62	13.8789		
Response latency	62	447.4668		

* Initial self-rating of expectancy for success and the scaled vocabulary score on the DLT problems served as the covariates.

** *p* - value for multivariate test of equality of mean vectors generated with reference to $F\ (4,59)$.

APPENDIX J

Four-Way Multivariate and Univariate Analyses of Variance for Anxiety, Depression and Hostility

Source	df	MS	F	p*
Experimenters				
Multivariate			0.9588	.4179
Anxiety	1	0.0500	0.0107	.9178
Depression	1	1.8000	0.5097	.4779
Hostility	1	9.1125	2.4099	.1255
Experimenters x Solvability				
Multivariate			0.5710	.6363
Anxiety	1	2.4500	0.5262	.4709
Depression	1	1.8000	0.5097	.4779
Hostility	1	0.6125	0.1620	.6887
Experimenter x Stability				
Multivariate			0.9149	.4390
Anxiety	1	11.2500	2.4161	.1251
Depression	1	0.0500	0.0142	.9057
Hostility	1	0.0125	0.0033	.9544
Experimenter x Locus				
Multivariate			0.9331	.4302
Anxiety	1	1.2500	0.2685	.6062
Depression	1	3.2000	0.9062	.3448
Hostility	1	1.5125	0.4000	.5294
Experimenter x Solvability x Stability				
Multivariate			0.7682	.5162
Anxiety	1	6.0500	1.2993	.2586
Depression	1	0.4500	0.1274	.7223
Hostility	1	0.6125	0.1620	.6887
Experimenter x Solvability x Locus				
Multivariate			1.6419	.1889
Anxiety	1	14.4500	3.1034	.0830
Depression	1	0.0000	0.0000	1.0000
Hostility	1	1.5125	0.4000	.5294
Experimenter x Stability x Locus				
Multivariate			0.7189	.5445
Anxiety	1	6.0500	1.2993	.2586
Depression	1	0.4500	0.1274	.7223
Hostility	1	0.6125	0.1620	.6887

Source	df	MS	F	p*
Experimenters x Solvability x Stability x Locus				
Multivariate			1.0411	.3808
Anxiety	1	4.0500	0.8698	.3546
Depression	1	6.0500	1.7133	.1953
Hostility	1	6.1125	0.0298	.8636
Subject Within Groups				
Anxiety	64	4.6563		
Depression	64	3.5313		
Hostility	64	3.7813		

* p - value for multivariate test of equality of mean vectors generated with reference to F (3,62).

APPENDIX K

Multivariate and Univariate Analyses of Covariance* for Comparisons of Experimental and Control Groups on Anagram Performance

Source	df	MS	F	p**
U-AB vs. C				
Multivariate			5.2559	.0024
Trials to criterion	1	232.8613	6.3066	.0141
Number of failures	1	0.0069	0.0005	.9818
Response latency	1	125.9063	0.3121	.5790
U-TD vs. C				
Multivariate			0.3217	.8097
Trials to criterion	1	21.8163	0.5909	.4444
Number of failures	1	3.1832	0.2448	.6222
Response latency	1	85.2606	0.2114	.6470
U-EF vs. C				
Multivariate			0.8737	.4585
Trials to criterion	1	9.4463	0.2558	.6144
Number of failures	1	6.5391	0.5029	.4803
Response latency	1	53.3572	0.1323	.7171
U-LU vs. C				
Multivariate			0.6943	.5584
Trials to criterion	1	1.6004	0.0433	.8357
Number of failures	1	0.4194	0.0323	.8580
Response latency	1	17.1068	0.0424	.8374
S-AB vs. C				
Multivariate			0.6288	.5987
Trials to criterion	1	37.0805	1.0043	.3193
Number of failures	1	21.9980	1.6917	.1971
Response latency	1	737.7731	1.8291	.1801
S-TD vs. C				
Multivariate			1.5042	.2200
Trials to criterion	1	68.2928	1.8496	.1777
Number of failures	1	0.0004	0.0000	.9956
Response latency	1	88.2454	0.2188	.6413
S-EF vs. C				
Multivariate			1.2948	.2822
Trials to criterion	1	137.0836	3.7127	.0576
Number of failures	1	32.3069	2.4845	.1190
Response latency	1	1340.9397	3.3245	.0790

Source	df	MS	F	p**
S-LU vs. C				
Multivariate			0.2636	.8515
Trials to criterion	1	0.0142	0.0004	.9845
Number of failures	1	2.2957	0.1765	.6755
Response latency	1	73.6302	0.1825	.6704
Subject Within Groups				
Trials to criterion	80	36.9232		
Number of failures	80	13.0033		
Response latency	80	403.3531		

* The scaled vocabulary score served as the covariate.

** p - value for multivariate test of equality of mean vectors generated with reference to F (3,78).

APPENDIX L

Adjusted Cell Means for Analysis of Covariance*

Groups	Dependent variables: Trials to criterion	Number of failures	Mean response latency
U-AB	20.10	5.300	42.97
U-TD	13.60	4.800	36.47
U-EF	16.70	6.600	44.13
U-LU	15.40	6.000	40.89
S-AB	13.50	4.000	32.26
S-TD	12.90	5.300	37.40
S-EF	18.70	6.600	49.35
S-LU	14.80	4.500	35.60
C	14.50	5.400	38.49

* The scaled vocabulary scores served as the covariate.

APPENDIX M

Three-Way Multivariate and Univariate Analyses of Covariance*
for Expectancy and Anagram Performance Measures

Source	df	MS	F	p**
Solvability				
Multivariate			1.9954	.1053
Expectancy for success	1	21.4087	5.0276	.0282
Trials to criterion	1	28.5554	0.7456	.3909
Number of failures	1	1.5930	0.1246	.7252
Response latency	1	17.3125	0.0424	.8376
Stability				
Multivariate			0.4835	.7478
Expectancy for success	1	2.4392	0.5728	.4517
Trials to criterion	1	26.6929	0.6969	.4067
Number of failures	1	16.5286	1.2928	.2594
Response latency	1	369.3672	0.9040	.3451
Locus of Control				
Multivariate			1.8147	.1363
Expectancy for success	1	1.8567	0.4360	.5113
Trials to criterion	1	173.4641	4.5290	.0369
Number of failures	1	4.1431	0.3241	.5711
Response latency	1	387.3242	0.9479	.3337
Solvability x Stability				
Multivariate			2.1864	.0799
Expectancy for success	1	1.4543	0.3415	.5609
Trials to criterion	1	108.6296	2.8362	.0967
Number of failures	1	0.0354	0.0028	.9582
Response latency	1	248.5547	0.6083	.4381
Solvability x Locus				
Multivariate			0.4867	.7455
Expectancy for success	1	1.0590	0.3544	.5536
Trials to criterion	1	10.8906	0.2843	.5956
Number of failures	1	0.0396	0.0031	.9559
Response latency	1	.1328	0.0003	.9857
Stability x Locus				
Multivariate			1.5456	.1992
Expectancy for success	1	0.5583	0.1311	.7184
Trials to criterion	1	1.5569	0.0406	.8409
Number of failures	1	22.0305	1.7231	.1936
Response latency	1	470.9180	1.1525	.2867

Source	df	MS	F	p**
Solvability x Stability x Locus				
Multivariate			.8237	.5147
Expectancy for success	1	7.8420	1.8416	.1791
Trials to criterion	1	96.2527	2.5131	.1175
Number of failures	1	17.5076	1.3694	.2459
Response latency	1	743.5000	1.8196	.1817
Subject Within Groups				
Expectancy for success	70	4.2582		
Trials to criterion	70	38.3011		
Number of failures	70	12.7852		
Response latency	70	408.6084		

* Premeasures of expectancy for success on the DLT and the scaled vocabulary scores served as the covariates.

** *p* - value for multivariate test of equality of mean vectors generated with reference to *F* (4,67).

APPENDIX N

Adjusted Cell Means for Analysis of Covariance*

Condition	Dependent Variables			
	Expectancy for success	Trials to criterion	Number of failures	Mean response latency
Solvability				
Unsolvable (1)	5.923	16.32	5.531	40.360
Solvable (2)	6.977	15.10	5.244	39.410
Stability				
Stable (1)	6.625	15.13	4.932	37.73
Unstable (2)	6.275	16.29	5.843	42.04
Locus of Control				
Internal (1)	6.297	17.200	5.617	42.10
External (2)	6.603	14.230	5.158	37.67
Solvability x Stability				
1, 1	6.235	16.92	5.097	39.990
1, 2	5.612	15.72	5.965	40.730
1, 1	7.015	13.35	4.767	35.470
2, 2	6.938	16.86	5.721	43.350
Solvability x Locus				
1, 1	5.908	18.17	5.783	42.620
1, 2	5.939	14.47	5.279	38.100
2, 1	6.685	16.22	5.451	41.590
2, 2	7.268	13.99	5.037	37.240
Stability x Locus				
1, 1	6.388	16.76	4.635	37.520
1, 2	6.862	13.51	5.229	37.950
2, 1	6.205	17.63	6.599	46.690
2, 2	6.345	14.95	5.087	36.390
Solvability x Stability x Locus				
1, 1, 1	5.820	20.02	5.293	42.88
1, 1, 2	6.649	13.83	4.902	37.10
1, 2, 1	5.995	16.33	6.273	42.35
1, 2, 2	5.229	15.11	5.657	39.10
2, 1, 1	6.955	13.50	3.977	32.15
2, 1, 2	7.075	13.20	5.557	38.80
2, 2, 1	6.416	18.94	6.924	51.02
2, 2, 2	7.460	14.79	4.517	35.67

*Initial self-ratings of expectancy for success and scaled vocabulary test scores served as covariates.

APPENDIX O

Three-Way Multivariate and Univariate Analyses of Variance for the Three Affect Dependent Measures

Source	df	MS	F	p*
Solvability				
Multivariate			6.7746	.0005
Anxiety	1	6.0500	1.2677	.2639
Depression	1	68.4499	20.5517	.0001
Hostility	1	19.0125	5.3452	.0237
Stability				
Multivariate			0.3104	.8178
Anxiety	1	2.4500	0.5134	.4761
Depression	1	1.8000	0.5404	.4647
Hostility	1	0.0125	0.0035	.9529
Locus of Control				
Multivariate			0.3481	.7907
Anxiety	1	0.0500	0.0105	.9188
Depression	1	1.2500	0.3753	.5421
Hostility	1	0.6125	0.1722	.6795
Solvability x Stability				
Multivariate			1.4776	.2281
Anxiety	1	0.4500	0.0943	.7597
Depression	1	5.0000	1.5012	.2245
Hostility	1	12.0125	3.3772	.0703
Solvability x Locus				
Multivariate			3.1946	.0287
Anxiety	1	8.4500	1.7706	.1875
Depression	1	31.2500	9.3826	.0031
Hostility	1	3.6125	1.0156	.3169
Stability x Locus				
Multivariate			0.2002	.8960
Anxiety	1	0.0500	0.0105	.9188
Depression	1	0.0000	0.0000	1.0000
Hostility	1	1.5125	0.4252	.5165
Solvability x Stability x Locus				
Multivariate			0.0355	.9910
Anxiety	1	0.4500	0.0943	.7597
Depression	1	0.0000	0.0000	1.0000
Hostility	1	0.0125	0.0035	.9529

Source	df	MS	F	p*
Subject Within Groups				
Anxiety	72	4.7723		
Depression	72	3.3306		
Hostility	72	3.5569		

* p - value for multivariate test of equality of mean vectors generated with reference to F (3,70).

APPENDIX P

Observed Cell Means

Condition	Dependent Variables		
	Anxiety	Depression	Hostility
Solvability			
Unsolvable (1)	5.600	6.150	7.475
Solvable (2)	5.050	8.000	8.450
Stability			
Stable (1)	5.500	6.925	7.950
Unstable (2)	5.150	7.225	7.975
Locus of Control			
Internal (1)	5.350	6.950	8.050
External (2)	5.300	7.200	7.875
Solvability x Stability			
1, 1	5.850	6.250	7.850
1, 2	5.350	6.050	7.100
2, 1	5.150	7.600	8.050
2, 2	4.950	8.400	8.850
Solvability x Locus			
1, 1	5.950	5.400	7.350
1, 2	5.250	6.900	7.600
2, 1	4.750	8.500	8.750
2, 2	5.350	7.500	8.150
Stability x Locus			
1, 1	5.500	6.800	7.900
1, 2	5.500	7.050	8.000
2, 1	5.200	7.100	8.200
2, 2	5.100	7.350	7.750
Solvability x Stability x Locus			
1, 1, 1	6.100	5.500	7.600
1, 1, 2	5.600	7.000	8.100
1, 2, 1	5.800	5.300	7.100
1, 2, 2	4.900	6.800	7.100
2, 1, 1	4.900	8.100	8.200
2, 1, 2	5.400	7.100	7.900
2, 2, 1	4.600	8.900	9.300
2, 2, 2	5.300	7.900	8.400

APPENDIX Q

Three-Way Multivariate and Univariate Analyses of Variance for the Post-Experimental Self-Ratings of Affect and Expectancy for Success

Source	df	MS	F	p*
Solvability				
Multivariate			0.7761	.5446
Anxiety	1	5.0000	0.8467	.3606
Depression	1	3.2000	0.6520	.4221
Hostility	1	0.1125	0.0306	.8616
Expectancy	1	0.0500	0.0075	.9315
Stability				
Multivariate			1.5208	.2058
Anxiety	1	7.2000	1.2192	.2732
Depression	1	4.0500	0.8251	.3668
Hostility	1	0.3125	0.0851	.7714
Expectancy	1	6.0500	0.9026	.3453
Locus of Control				
Multivariate			1.2848	.2848
Anxiety	1	0.2000	0.0339	.8546
Depression	1	14.4500	2.9440	.0905
Hostility	1	0.3125	0.0851	.7714
Expectancy	1	6.0500	0.9026	.3453
Solvability x Stability				
Multivariate			1.8930	.1215
Anxiety	1	0.0000	0.0000	1.0000
Depression	1	0.0500	0.0102	.9199
Hostility	1	15.3125	4.1714	.0448
Expectancy	1	5.0000	0.7460	.3907
Solvability x Locus				
Multivariate			1.2639	.2926
Anxiety	1	16.2000	2.7432	.1021
Depression	1	0.0500	0.0102	.9199
Hostility	1	3.6125	0.9841	.3246
Expectancy	1	1.8000	0.2685	.6060
Stability x Locus				
Multivariate			0.3996	.8083
Anxiety	1	0.0000	0.0000	1.0000
Depression	1	1.8000	0.3667	.5468
Hostility	1	0.6125	0.1669	.6842
Expectancy	1	0.2000	0.0298	.8634

Source	df	MS	F	p*
Solvability x Stability x Locus				
Multivariate			0.3223	.8622
Anxiety	1	0.0000	0.0000	1.0000
Depression	1	1.8000	0.3667	.5468
Hostility	1	0.3125	0.0851	.7714
Expectancy	1	2.4500	0.3655	.5474
Subject Within Groups				
Anxiety	72	5.9055		
Depression	72	4.9083		
Hostility	72	3.6708		
Expectancy	72	6.7028		

* *p* - value for multivariate test of equality of mean vectors generated with reference to *F* (3,70).

APPENDIX R

Three-Way Multivariate and Univariate Analyses of Variance for the Self-Ratings Relating to DLT Performance: Importance, Success and Control

Source	df	MS	F	p*
Solvability				
Multivariate			63.3221	.0001
Importance	1	39.2000	4.1518	.0453
Success	1	661.2490	174.6493	.0001
Control	1	470.4495	99.5069	.0001
Stability				
Multivariate			.5136	.6743
Importance	1	0.4500	.0477	.8279
Success	1	0.4500	.1189	.7313
Control	1	4.0500	.8566	.3578
Locus of Control				
Multivariate			1.5280	.2149
Importance	1	16.2000	1.7158	.1944
Success	1	5.0000	1.3206	.2543
Control	1	14.4500	3.0564	.0847
Solvability x Stability				
Multivariate			1.2169	.3101
Importance	1	0.0000	0.0000	1.0000
Success	1	9.8000	2.5884	.1121
Control	1	.2000	.0423	.8377
Solvability x Locus				
Multivariate			.4034	.7510
Importance	1	2.4500	.2595	.6121
Success	1	0.4500	.1189	.7313
Control	1	1.8000	.3807	.5392
Stability x Locus				
Multivariate			2.3391	.0809
Importance	1	16.2000	1.7158	.1994
Success	1	4.0500	1.0697	.3045
Control	1	7.2000	1.5229	.2212
Solvability x Stability x Locus				
Multivariate			.1161	.9504
Importance	1	1.2500	.1324	.7171
Success	1	0.2000	.0528	.8189
Control	1	0.4500	.0952	.7586

Source	df	MS	F	p*
Subject Within Groups				
Importance	72	9.4417		
Success	72	3.7861		
Control	72	4.7278		

* p - value for multivariate test of equality of mean vectors generated with reference to F (3,70).

APPENDIX S

Three-Way Multivariate and Univariate Analyses of Variance for the Self-Ratings Relating to Anagram Problems: Importance, Success and Control

Source	df	MS	F	p*
Solvability				
Multivariate			2.0840	.1102
Important	1	21.0125	2.6500	.1080
Success	1	24.2000	2.9127	.0922
Control	1	8.4500	1.1602	.2850
Stability				
Multivariate			1.7483	.1651
Importance	1	0.3125	0.0394	.8433
Success	1	1.2500	0.1505	.6993
Control	1	11.2500	1.5446	.2180
Locus of Control				
Multivariate			1.4351	.2399
Importance	1	32.5125	4.1003	.0466
Success	1	0.8000	0.0963	.7573
Control	1	0.4500	0.0618	.8045
Solvability x Stability				
Multivariate			0.9036	.4440
Importance	1	0.3125	0.0394	.8433
Success	1	4.0500	0.4875	.4874
Control	1	1.8000	0.2471	.6207
Solvability x Locus				
Multivariate			0.5141	.6740
Importance	1	1.5125	1.1908	.6637
Success	1	7.2000	0.8666	.3551
Control	1	0.2000	0.0275	.8689
Stability x Locus				
Multivariate			0.0786	.9714
Importance	1	0.6125	0.0772	.7819
Success	1	0.0500	0.0060	.9384
Control	1	0.8000	0.1098	.7413
Solvability x Stability x Locus				
Multivariate			1.0266	.3862
Importance	1	1.5125	0.1907	.6637
Success	1	22.0500	2.6539	.1077
Control	1	14.4500	1.9840	.1633

Source	df	MS	F	p*
Subject Within Groups				
Importance	72	7.9292		
Success	72	8.3084		
Control	72	7.2834		

* p - value for multivariate test of equality of mean vectors generated with reference to F (3,70).

APPENDIX T

One-Way Multivariate and Univariate Analyses of Variance for the Ratings of Ability, Effort, Task Difficulty and Luck on the IE, STAB 1 and STAB 2 Dimensions

Source	df	MS	F	p*
Between Groups				
Multivariate			1.0807	.2981
IE-Ability	8	4.9861	1.1285	.3534
STAB 1-Ability	8	4.5278	0.6237	.7556
STAB 2-Ability	8	4.9694	0.8489	.5629
IE-Effort	8	3.6500	0.8406	.5698
STAB 1-Effort	8	7.6500	0.6449	.7378
STAB 2-Effort	8	5.8500	0.5977	.7772
IE Task-Difficulty	8	13.5500	1.8778	.0748
STAB 1-Task Difficulty	8	5.7094	0.5557	.8109
STAB 2-Task Difficulty	8	8.5250	2.5930	.0142
IE-Luck	8	7.7211	0.7746	.6261
STAB 1-Luck	8	8.4028	0.6980	.6923
STAB 2-Luck	8	7.0500	0.8679	.5471
Subject Within Groups				
IE-Ability	81	4.4185		
STAB 1-Ability	81	7.2592		
STAB 2-Ability	81	5.8543		
IE-Effort	81	4.3419		
STAB 1-Effort	81	11.8629		
STAB 2-Effort	81	9.7876		
IE-Task Difficulty	81	7.2160		
STAB 1-Task Difficulty	81	10.3827		
STAB 2-Task Difficulty	81	3.2876		
IE-Luck	81	9.3741		
STAB 1-Luck	81	12.0383		
STAB 2-Luck	81	8.1234		

* p - value for multivariate test of equality of mean vectors generated with reference to F (96,481.8086).

APPENDIX U

Correlations[a] Between the Four Additional Exploratory Items and Other Selected Measures

Selected Measures	Exploratory Items: Problem Similarity	Skill at Verbal Games	Life Problem Solvability	Life Problem Control
Vocabulary	-.0523	.1885	-.0457	.1228
Trials to Criterion	.0086	-.1993	-.1323	-.1464
# Failure to Solve	.0673	-.4055***	-.0353	.0164
Response Latency	.0844	-.3671***	-.0855	-.0156
Anxiety 1	-.1760	.0168	-.1084	-.1398
Depression 1	-.0842	-.0608	-.1189	-.1927
Hostility 1	-.0698	-.0502	-.0283	-.0973
Expectancy 1	.0811	.0984	.1313	.3373**
Anxiety 2	.0041	-.0470	-.0882	-.0237
Depression 2	.0056	-.1113	-.0151	-.1555
Hostility 2	-.0386	-.0766	-.0290	-.1013
Expectancy 2	-.0477	.2524*	.0887	.1786
Anxiety 3	-.0696	-.2060*	-.2563*	-.1523
Depression 3	.0535	-.2624*	-.2176*	-.1649
Hostility 3	-.05166	-.0746	-.1816	-.1133
Expectancy 3	.1166	.3277**	.2323	.2835**

Note: The signs of correlations involving ratings of depression and hostility were reversed in order that coefficients reflect increasing levels of these variables.

a N=90, df=88 for all correlations except those involving expectancy 1 for which N=80, df=78.

* $p < .05$.
** $p < .01$.
*** $p < .001$.

APPENDIX V

Correlations (and Probabilities*) Between Dependent Variables

	Trials to criterion	Number of failures	Response latency	Anxiety	Depression	Hostility	Expectancy for success
Trials to criterion	1.0000	.7745 (.001)	.8621 (.001)	.0993 (.352)	-.0051 (.962)	.1924 (.069)	-.2354 (.025)
Number of failures		1.0000	.9644 (.001)	.0119 (.911)	-.0348 (.745)	.0833 (.435)	-.1972 (.062)
Response latency			1.0000	.0495 (.643)	-.0188 (.860)	.1079 (.311)	-.2118 (.045)
Anxiety				1.0000	.4308 (.001)	.3399 (.001)	-.1369 (.198)
Depression					1.0000	.5641 (.001)	-.3662 (.001)
Hostility						1.0000	-.3673 (.001)
Expectancy for success							1.0000

Note: The signs of all correlations involving ratings of depression and hostility were reversed in order that coefficients would reflect increasing levels of these variables.

* For all correlations N = 90, df = 88.

APPENDIX W

Conditions Based on Self-Attribution: Three-Way Multivariate and Univariate Weighted Means Analyses of Covariance* on Expectancy and Anagram Performance Measures

Source	df	MS	F	p**
Solvability				
Multivariate			2.1055	.0898
Expectancy for success	1	21.3926	5.0447	.0279
Trials to criterion	1	36.3948	0.9946	.3221
Number of failures	1	2.3304	0.1924	.6623
Response latency	1	34.7546	0.0900	.7652
Stability				
Multivariate			0.6341	.6400
Expectancy for success	1	0.3842	0.0906	.7644
Trials to criterion	1	0.0363	0.0010	.9750
Number of failures	1	0.0172	0.0014	.9701
Response latency	1	30.9807	0.0802	.7779
Locus of Control				
Multivariate			1.4853	.2165
Expectancy for success	1	0.0530	0.0125	.9114
Trials to criterion	1	81.6868	2.2323	.1397
Number of failures	1	0.0573	0.0047	.9454
Response latency	1	22.3313	0.0578	.8108
Solvability x Stability				
Multivariate			0.6906	.6010
Expectancy for success	1	6.1100	1.4409	.2341
Trials to criterion	1	48.8586	1.3352	.2518
Number of failures	1	2.8662	0.2367	.6282
Response latency	1	256.9641	0.6651	.4172
Solvability x Locus				
Multivariate			3.4094	.0135
Expectancy for success	1	11.7171	2.7631	.1010
Trials to criterion	1	331.4294	9.0572	.0037
Number of failures	1	75.6737	6.2487	.0148
Response latency	1	2196.4314	5.6853	.0199
Stability x Locus				
Multivariate			0.9364	.4484
Expectancy for success	1	1.4035	0.3310	.5670
Trials to criterion	1	78.7417	2.7518	.1469
Number of failures	1	36.6596	3.0271	.0863
Response latency	1	1386.9386	3.5900	.0623

Source	df	MS	F	p**
Solvability x Stability x Locus				
Multivariate			0.6261	.6456
Expectancy for success	1	0.0650	0.0153	.9018
Trials to criterion	1	17.8885	0.4889	.4868
Number of failures	1	0.8124	0.0671	.7965
Response latency	1	6.5493	0.0170	.8968
Subject Within Groups				
Expectancy for success	70	4.2406		
Trials to criterion	70	36.5927		
Number of failures	70	12.1104		
Response latency	70	386.3323		

* Premeasures of expectancy for success on the DLT and the scaled vocabulary scores served as the covariates.

** p - value for multivariate test of equality of mean vectors generated with reference to F (4,67).

APPENDIX X

Adjusted Cell Means for Analysis of Covariance*

Condition	Dependent Variable: Expectancy for success	Trials to criterion	Number of failures	Mean response latency
Solvability				
Unsolvable (1)	6.006	16.22	5.565	40.51
Solvable (2)	6.891	16.16	5.901	42.28
Stability				
Stable (1)	6.221	15.93	5.538	41.39
Unstable (2)	6.676	16.45	5.928	41.40
Locus of Control				
Internal (1)	6.243	16.81	5.431	40.67
External (2)	6.654	15.57	6.035	42.12
Solvability x Stability				
1,1	5.512	17.21	5.612	42.33
1,2	6.500	15.23	5.517	38.70
2,1	6.929	14.64	5.464	40.44
2,2	6.853	17.68	6.338	44.11
Solvability x Locus				
1,1	5.562	19.29	6.524	46.51
1,2	6.450	13.15	4.606	34.51
2,1	6.924	14.32	4.338	34.84
2,2	6.857	18.00	7.464	49.72
Stability x Locus				
1,1	6.134	16.21	4.812	37.64
1,2	6.307	15.65	6.264	45.13
2,1	6.353	17.41	6.050	43.71
2,2	7.000	15.50	5.806	39.10
Solvability x Stability x Locus				
1,1,1	5.125	19.12	6.125	45.07
1,1,2	5.900	15.30	5.100	39.58
1,2,1	6.000	19.46	6.923	47.95
1,2,2	7.000	11.00	4.111	29.44
2,1,1	7.143	13.29	3.500	30.20
2,1,2	6.714	16.00	7.429	50.69
2,2,1	6.706	15.35	5.176	39.47
2,2,2	7.000	20.00	7.500	48.75

* Initial self-ratings of expectancy for success and scaled vocabulary test scores served as covariates.

APPENDIX Y

Conditions Based on Self-Attribution: Three-Way Multivariate and Univariate Weighted Means Analyses of Variance on the Affect Dependent Measures

Source	df	MS	F	p*
Solvability				
Multivariate			7.0188	.0004
Anxiety	1	6.0500	1.3215	.2541
Depression	1	68.4500	21.5071	.0001
Hostility	1	19.0125	5.5954	.0208
Stability				
Multivariate			3.6032	.0176
Anxiety	1	3.4674	0.7574	.3871
Depression	1	11.1447	3.5017	.0654
Hostility	1	5.4766	1.6118	.2084
Locus of Control				
Multivariate			1.1231	.3457
Anxiety	1	2.0445	0.4466	.5062
Depression	1	0.1984	0.0623	.8036
Hostility	1	9.3573	2.7538	.1014
Solvability x Stability				
Multivariate			0.5289	.6639
Anxiety	1	1.2697	0.2773	.6001
Depression	1	1.3728	0.4313	.5135
Hostility	1	5.4255	1.5967	.2105
Solvability x Locus				
Multivariate			4.4426	.0065
Anxiety	1	12.4033	2.7093	.1042
Depression	1	42.5633	13.3735	.0005
Hostility	1	10.2675	3.0217	.0865
Stability x Locus				
Multivariate			0.1705	.9165
Anxiety	1	0.3830	0.0837	.7733
Depression	1	1.5745	0.4947	.4842
Hostility	1	0.9262	0.2726	.6033
Solvability x Stability x Locus				
Multivariate			1.0892	.3595
Anxiety	1	0.0228	0.0050	.9440
Depression	1	8.3580	2.6261	.1095
Hostility	1	5.5554	1.6350	.2051

Source	df	MS	F	p*
Subjects Within Groups				
Anxiety	72	4.5781		
Depression	72	3.1827		
Hostility	72	3.3979		

* p - value for multivariate test of equality of mean vectors generated with reference to F (3,70).

APPENDIX Z

Observed Cell Means

Condition	Anxiety	Depression	Hostility
	Dependent Variables		
Solvability			
Unsolvable (1)	5.600	6.150	7.475
Solvable (2)	5.050	8.000	8.450
Stability			
Stable (1)	5.538	6.692	8.231
Unstable (2)	5.122	7.439	7.707
Locus of Control			
Internal (1)	5.442	7.038	7.712
External (2)	5.107	7.143	8.429
Solvability x Stability			
1,1	5.722	5.778	8.000
1,2	5.500	6.455	7.045
2,1	5.381	7.476	8.429
2,2	4.684	8.579	8.474
Solvability x Locus			
1,1	6.095	5.476	6.857
1,2	5.368	6.895	8.158
2,1	5.806	8.097	8.290
2,2	6.556	7.667	9.000
Stability x Locus			
1,1	5.591	6.818	8.000
1,2	5.471	6.529	8.529
2,1	7.500	5.333	7.200
2,2	8.273	4.545	8.091
Solvability x Stability x Locus			
1,1,1	6.375	5.250	7.625
1,1,2	5.200	6.200	8.300
1,2,1	5.923	5.615	6.384
1,2,2	4.889	7.667	8.000
2,1,1	5.143	7.714	8.214
2,1,2	5.857	7.000	8.857
2,2,1	4.882	8.412	8.353
2,2,2	3.000	10.000	9.500

APPENDIX AA

Conditions Based on Self-Attributions: Three-Way Multivariate and Univariate Weighted Means Analyses of Variance on Post-Experimental Affect and Expectancy Measures

Source	df	MS	F	p*
Solvability				
Multivariate			0.7640	.5524
Anxiety	1	5.0000	0.8599	.3569
Depression	1	3.2000	0.6731	.4147
Hostility	1	0.1125	0.0316	.8595
Expectancy for success	1	0.0500	0.0078	.9299
Stability				
Multivariate			0.5911	.6703
Anxiety	1	0.0001	0.0000	.9964
Depression	1	0.9251	0.1946	.6605
Hostility	1	5.4766	1.5381	.2189
Expectancy for success	1	2.2125	0.3454	.5586
Locus of Control				
Multivariate			0.9780	.4254
Anxiety	1	6.1736	1.0617	.3063
Depression	1	7.3934	1.5552	.2164
Hostility	1	12.4452	3.4951	.0657
Expectancy for success	1	0.0352	0.0055	.9412
Solvability x Stability				
Multivariate			0.5335	.7116
Anxiety	1	3.0986	0.5329	.4678
Depression	1	0.4832	0.1016	.7508
Hostility	1	0.9680	0.2718	.6038
Expectancy for success	1	6.1397	0.9586	.3309
Solvability x Locus				
Multivariate			1.0476	.3892
Anxiety	1	0.1200	0.0206	.8862
Depression	1	4.3200	0.9087	.3437
Hostility	1	3.3075	0.9289	.3384
Expectancy for success	1	20.2800	3.1663	.0794
Stability x Locus				
Multivariate			0.3784	.8234
Anxiety	1	0.9760	0.1679	.6833
Depression	1	3.3841	0.7118	.4017
Hostility	1	5.4059	1.5182	.2219
Expectancy for success	1	0.6500	0.1015	.7510

Source	df	MS	F	p*
Solvability x Stability x Locus				
Multivariate			1.5362	.2014
Anxiety	1	20.1127	3.4590	.0670
Depression	1	16.7550	3.5244	.0646
Hostility	1	0.5998	0.1685	.6828
Expectancy for success	1	10.7378	1.6765	.1996
Subjects Within Groups				
Anxiety	72	5.8146		
Depression	72	4.7540		
Hostility	72	3.5607		
Expectancy for success	72	6.4050		

* p - value for multivariate test of equality of mean vectors generated with reference to F (4,69).

APPENDIX BB

Conditions Based on Self-Attribution : Three-Way Multivariate and Univariate Weighted Means Analyses of Variance for DLT Importance, Success and Control Ratings

Source	df	MS	F	p*
Solvability				
Multivariate			65.9039	.0001
Importance	1	39.2000	4.1602	.0451
Success	1	661.2500	180.8362	.0001
Control	1	470.4500	101.0397	.0001
Stability				
Multivariate			0.3107	.8176
Importance	1	0.1404	0.0149	.9033
Success	1	1.0358	0.2833	.5963
Control	1	1.1288	0.2424	.6240
Locus of Control				
Multivariate			8.2867	.0001
Importance	1	13.8907	1.4742	.2287
Success	1	86.1626	23.5634	.0001
Control	1	49.4505	10.6206	.0018
Solvability x Stability				
Multivariate			1.8092	.1535
Importance	1	24.3922	2.5887	.1120
Success	1	11.8478	3.2401	.0761
Control	1	8.8278	1.8960	.1728
Solvability x Locus				
Multivariate			10.3101	.0001
Importance	1	2.0833	0.2211	.6397
Success	1	110.4133	30.1954	.0001
Control	1	56.3333	12.0989	.0009
Stability x Locus				
Multivariate			2.1560	.1010
Importance	1	4.4372	0.4709	.4948
Success	1	0.0373	0.0102	.9199
Control	1	24.4004	5.2405	.0251
Solvability x Stability x Locus				
Multivariate			4.1039	.0097
Importance	1	0.1404	0.0149	.9033
Success	1	40.7806	11.1525	.0014
Control	1	27.0450	5.8085	.0186

Source	df	MS	F	p*
Subjects Within Groups				
Importance	72	9.4227		
Success	72	3.6566		
Control	72	4.6560		

* p - value for multivariate test of equality of mean vectors generated with reference to F (3,70).

APPENDIX CC

Observed Cell Means

Condition	Dependent Variables		
	Importance	Success	Control
Solvability			
Unsolvable (1)	4.961	2.612	3.295
Solvable (2)	6.581	8.029	7.578
Stability			
Stable (1)	5.650	5.044	5.745
Unstable (2)	5.892	5.598	5.128
Locus of Control			
Internal (1)	5.868	5.630	5.809
External (2)	5.674	5.012	5.063
Solvability x Stability			
1,1	5.550	2.587	3.525
1,2	4.372	2.637	3.064
2,1	5.750	7.500	7.964
2,2	7.412	8.559	7.191
Solvability x Locus			
1,1	5.288	2.630	3.356
1,2	4.633	2.594	3.233
2,1	6.447	8.630	8.263
2,2	6.714	7.429	6.893
Stability x Locus			
1,1	5.786	5.509	5.446
1,2	5.514	4.579	6.043
2,1	5.950	5.751	6.172
2,2	5.833	5.444	4.083
Solvability x Stability x Locus			
1,1,1	5.500	2.875	3.250
1,1,2	5.600	2.300	3.800
1,2,1	5.077	2.385	3.462
1,2,2	3.667	2.889	2.667
2,1,1	6.071	8.143	7.643
2,1,2	5.429	6.857	8.286
2,2,1	6.824	9.118	8.882
2,2,2	8.000	8.000	5.500

APPENDIX DD

Conditions Based on Self-Attribution: Three-Way Multivariate and Univariate Weighted Means Analyses of Variance for Anagram Importance, Success and Control Ratings

Source	df	MS	F	p*
Solvability				
Multivariate			2.2098	.0946
Importance	1	21.0125	2.5992	.1113
Success	1	24.2000	3.1693	.0793
Control	1	8.4500	1.1706	.2829
Stability				
Multivariate			0.4138	.7437
Importance	1	2.7676	0.3423	.5604
Success	1	0.1902	0.0249	.8751
Control	1	1.8313	0.2537	.6161
Locus of Control				
Multivariate			1.7693	.1610
Importance	1	25.9924	3.2153	.0772
Success	1	9.8659	1.2921	.2594
Control	1	9.8659	1.3668	.2462
Solvability x Stability				
Multivariate			1.2252	.3071
Importance	1	4.7189	0.5837	.4474
Success	1	5.1803	0.6784	.4129
Control	1	18.4398	2.5545	.1144
Solvability x Locus				
Multivariate			3.4176	.0220
Importance	1	0.8008	0.0991	.7531
Success	1	37.4533	4.9050	.0300
Control	1	0.1200	0.0166	.8978
Stability x Locus				
Multivariate			2.3199	.0828
Importance	1	0.0453	0.0056	.9406
Success	1	16.0682	2.1044	.1513
Control	1	0.9760	0.1352	.7142
Solvability x Stability x Locus				
Multivariate			0.4933	.6882
Importance	1	0.1034	0.1034	.9103
Success	1	9.7362	9.7362	.2626
Control	1	2.4166	2.4166	.5647

Source	df	MS	F	p*
Subjects Within Groups				
Importance	72	8.0841		
Success	72	7.6357		
Control	72	7.2185		

* p - value for multivariate test of equality of mean vectors generated with reference to F (3,70).

APPENDIX EE

Groups Based on Self-Attribution: Multivariate and Univariate Weighted Means Analysis of Covariance* for Comparisons of Experimental and Control Groups on Anagram Performance

Source	df	MS	F	p**
U-AB vs. C				
Multivariate			1.6444	.1860
Trials to criterion	1	115.6184	3.1850	.0782
Number of failures	1	6.1944	0.4947	.4839
Response latency	1	281.7161	0.7254	.3970
U-TD vs. C				
Multivariate			0.2339	.8725
Trials to criterion	1	2.2077	0.0608	.8059
Number of failures	1	0.1196	0.0096	.9224
Response latency	1	38.0189	0.0979	.7552
U-EF vs. C				
Multivariate			3.2839	.0252
Trials to criterion	1	204.0123	5.6200	.0202
Number of failures	1	21.7073	1.7337	.1917
Response latency	1	629.7744	1.6216	.2066
U-LU vs. C				
Multivariate			1.9097	.1349
Trials to criterion	1	177.4208	4.8875	.0300
Number of failures	1	21.3858	1.7080	.1950
Response latency	1	1276.2067	3.2862	.0737
S-AB vs. C				
Multivariate			0.9122	.4391
Trials to criterion	1	24.7326	0.6813	.4116
Number of failures	1	29.8278	2.3822	.1267
Response latency	1	842.2444	2.1687	.1448
S-TD vs. C				
Multivariate			1.3461	.2656
Trials to criterion	1	0.9408	0.0259	.8726
Number of failures	1	22.5079	1.7976	.1838
Response latency	1	572.6596	1.4746	.2282
S-EF vs. C				
Multivariate			0.0238	.9950
Trials to criterion	1	0.0913	0.0025	.9602
Number of failures	1	0.0867	0.0069	.9339
Response latency	1	0.0066	0.0000	.9968

Source	df	MS	F	p**
S-LU vs. C				
Multivariate			1.1672	.3277
Trials to criterion	1	25.2184	0.6947	.4701
Number of failures	1	2.9900	0.2388	.6265
Response latency	1	27.0071	0.0695	.7927
Subject Within Groups				
Trials to criterion	80	36.3009		
Number of failures	80	12.5212		
Response latency	80	388.3572		

* The scaled vocabulary score served as the covariate.

** p - value for multivariate test of equality of mean vectors generated with reference to F (3,78).

APPENDIX FF

Adjusted Cell Means for Analysis of Covariance*

Groups	Dependent Variables		
	Trials to criterion	Number of failures	Mean response latency
U-AB	19.12	6.125	45.07
U-TD	15.30	5.100	39.58
U-EF	19.46	6.923	47.95
U-LU	11.00	4.111	29.44
S-AB	13.29	3.500	30.20
S-TD	16.00	7.429	50.69
S-EF	15.35	5.176	39.47
S-LU	20.00	7.500	48.75
C	14.50	5.000	38.49

* The scaled vocabulary scores served as the covariate.