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THE EFFECTS OF REWARD AND PERCEPTION OF COMPETENCY UPON SUBSEQUENT TASK INTEREST

by

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In recent years, a considerable body of literature has developed around the issue of intrinsic and extrinsic motivation. DeCharms (1968) attacked the notion of additivity with respect to these processes and suggested that intrinsic and extrinsic motivation may in fact be interactive. DeCharms' suggestion was that extrinsic reward may actually result in a decrease in intrinsic task interest.

Empirical support for this notion has come from a number of experiments (e.g. Deci, 1971, 1972; Lepper, Greene & Nisbett, 1973; Lepper & Greene, 1975). Several theories have been proposed to account for the effect. An information-processing model offered by Greene and Lepper (1975) has incorporated a competing-response theory offered by Reiss and Sushinsky (1975a, 1975b) and a self-perception theory offered by Bem (1967). Lepper and Greene's model suggests that reward may reduce intrinsic task interest in two ways. The theory suggests, firstly, that reward may reduce intrinsic motivation by directing attention away from important task subgoals and thereby result in poor task performance (a competing-response viewpoint). Secondly, Greene and Lepper argue that extrinsic reward may alter an individual's perception of the purpose or goal of his behavior. This may cause the individual to perceive his behavior as goal rather than task oriented (a self-perception viewpoint). Lepper and Greene (1975) suggest, however, that

extrinsic reward may lead to increases in intrinsic motivation if reward directs attention toward task subgoals. Reward which is delivered contingent upon successful performance, may direct attention toward relevant task subgoals and may lead to the perception of competence in one's ability to perform. The importance of a self-perception of competency has been stressed by others (e.g., White, 1959; Maslow, 1954, 1955; and Seligman, 1975) and may be an important determinant of task interest.

An experiment was conducted to evaluate the effects of contingent, noncontingent and no-reward procedures upon subsequent task interest. The variable of perceived competency was also manipulated by giving subjects false feedback as to the quality of their performance. In a 3 x 3 design, 90 subjects were randomly assigned to one of nine groups. In three reward conditions, subjects received monetary reward contingent upon successful performance during a decoding task. In three noncontingent-reward conditions, subjects received monetary reward for their involvement in the task but no performance requirements were made. Subjects in three no-reward conditions did not receive extrinsic reward during their task involvement. The variable of competence was manipulated by informing subjects that their performance was either significantly above (high competence) or below (low competence) the norm or that their performance did not deviate from that of the average college student (average competence).

Subjects were left alone in the experimental room for a 20-minute period following the treatment phase while the experimenter supposedly performed a computer analysis of the subjects' data. During this free choice period, subjects could have elected to either work on a decoding task similar to the one employed during the first part of the experiment, or they could have elected to read a magazine available in the experimental room.

The major dependent variables of interest were the number of words and cartoons correctly decoded during the posttest decoding task. Other dependent variables of interest included responses to postexperimental questionnaire items. The results of the study indicated that there was a trend in which contingent reward resulted in a detrimental effect upon task interest as compared to a no-reward procedure. The effect of noncontingent reward was less detrimental. The competency manipulation was found to have no effect upon subsequent task interest. The results were discussed in terms of the algorithmic nature of the decoding task.

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CHAPTER I

INTRODUCTION

In recent years, a considerable body of literature has developed around the issue of intrinsic and extrinsic motivation. DeCharms (1968) attacked the notion of additivity with respect to these processes and suggested that intrinsic and extrinsic motivation may in fact be interactive. Specifically, DeCharms suggested that when one perceives his behavior to be under the control of extrinsic reward, the result may actually be a decrease in intrinsic task interest.

DeCharms attributed this interaction to the extrinsic reward's effect upon the individual's perceived locus of control. That is, he suggested that when an individual performs an act for an external reward, he loses his feeling of "personal causality" and becomes a pawn to the reward. DeCharms argued that:

> Whenever a person experiences himself to be the locus of causality for his own behavior...he will consider himself to be intrinsically motivated. Conversely, when a person perceives the locus of causality for his behavior to be external to himself...he will consider himself to be extrinsically motivated. (p.328)

As Ross (1975) has pointed out, the existence of an actual dichotomy between intrinsic and extrinsic motivation is a questionable notion. Skinner (1953) has argued that it is always possible to trace control for a behavior to a particular environmental contingency for which the individual may or may not be aware. Some theorists, such as DeCharms, therefore have approached the problem from the standpoint of the perceived rather than the actual cause of behavior. A similar approach, taken also by Bem (1965, 1967) is consistent with Kelly's (1967) attribution theory and involves the study of the individual's perception of the causes of his own behavior.

Bem's (1965, 1967) theory of self-perception assumes that individuals are taught by society to be observers of their own behavior. Consistent with Skinner's (1957) analysis, Bem argues that an individual may perceive his behavior to be under the control of specific reinforcers ("mands") or under the control of his attitude statements or beliefs ("tacts"). Thus, a child who receives a token for painting a picture will perceive the cause of his behavior as being the token, according to Bem. On the other hand, a child who paints without receiving payment will attribute the cause of his behavior to his dispositional attitude toward the task, i.e. he may infer that he painted "because he wanted to," or "because he enjoys it."

The first empirical investigations of the DeCharms hypothesis were conducted by Deci (1971). In the first of these experiments, a pretest-posttest design was employed and subjects were asked to work on a Soma puzzle. This plastic puzzle is made up of seven pieces which can be fitted together to form millions of configurations including a three-inch cube. Deci chose the Soma puzzle as a task item because of its apparent intrinsic interest to a college student population. Subjects were asked to reproduce three sets of four configurations. One group of subjects was rewarded with one dollar for each correct puzzle solution while another group was not rewarded. During a free operant posttest, rewarded subjects played with the puzzles for a significantly lesser amount of time than did non-rewarded subjects. In a second experiment, Deci attempted a field replication using as subjects students who were headline writers for a college newspaper. Subjects in the experimental group, consisting of four students, were paid 50 cents for each headline written during a treatment phase. A control group also consisting of four students received no payment for their work. At the conclusion of the treatment phase, experimental subjects were informed that due to the shortage of funds they would no longer receive payment for their work. Results indicated that during a posttest phase, control subjects wrote headlines significantly faster than experimental subjects. Also, experimental subjects were absent a significantly greater number of times during the posttest phase than were control subjects. Deci interpreted these results as indicating that reward had reduced intrinsic motivation for headline writing in experimental subjects.

Finally, in a third experiment, Deci (1971) attempted to replicate the findings of his first experiment using verbal praise in place of monetary incentive. In this study, subjects in an experimental group were given verbal feedback and praise contingent upon correct puzzle solutions while subjects in a control condition were not. Results indicated that during a free operant posttest, experimental subjects played with the Soma puzzles for a significantly greater amount of time ($p < .10$) than control subjects.

In a later experiment, Deci (1972) directly compared the effects of verbal and material reinforcement. In this experiment, subjects were presented either with monetary reward or with verbal encouragements for working on Soma puzzles. Deci predicted that intrinsic motivation would be decreased by material reward but would be increased by verbal reward. Deci reasoned that verbal reinforcement should lead to increases in intrinsic motivation because verbal rewards should not be "phenomenologically distinquishable" from internal satisfaction. The results of the experiment supported the prediction for material reward for both male and female subjects. The prediction for verbal reinforcement, however, was supported only for male subjects. The effect was not obtained for females because, according to Deci, a "very attractive and personable male graduate student" acted as experimenter. Interaction with the experimenter may have served to increase the intrinsic interest of females in the no verbal reinforcement condition. Even though these females received no specific verbal reinforcement, they still may have experienced positive interpersonal reinforcement. This reinforcement, according to Deci, increased their intrinsic motivation to a level equal to that of females and males in the verbal reinforcement conditions.

Deci's (1972) study confounded material and verbal reinforcement with the variable of expectancy. That is, material reward was expected beforehand while verbal reward was not. This might have caused behavior to be perceived as a mand in the former case and as a tact in the latter. A study by Lepper, Greene and Nisbett (1973) points to the significance of the expectancy variable. The authors observed the behavior of children in a classroom through a one-way mirror during a free play period. A number of items were placed on a table and were available to the children. Included in these materials were the novel stimulus items, Magic Markers. During this baseline period, drawing with the crayons was found to be a highly probable behavior. Several weeks later, the experimenter removed the children from the classroom individually and escorted them to a small room where they were asked to draw some pictures. One group of children was told that they would be rewarded for drawing and each of these children was presented with a "good player award" at the conclusion of the treatment session.

A second group of children was given the award but was not informed about its presentation until after their drawings has been completed. For these children, the reward was unexpected. Finally, a third group did not expect and did not receive the reward. A posttest conducted three weeks after treatment indicated that subjects who expected the reward and were rewarded for drawing showed significant decreases in this behavior, whereas the other groups of children showed no such decrease.

Lepper et al. (1973) noted that while the effect of reward upon a high probability behavior may be to reduce the subsequent probability that the behavior will be engaged in, the effect may not occur with low probability behaviors. Calder and Staw (1975) tested this hypothesis. The authors asked subjects to work on either blank or picture puzzles for pay or for no pay. Subjects in the payment conditions received one dollar at the end of the experimental session. The reward was expected and contingent upon the completion of 15 five-piece puzzles. The interaction effect predicted by the authors was supported by the results of the study. Ratings of task enjoyment increased in the low intrinsic motivation (blank puzzle) condition with the introduction of monetary reward. However, in the high intrinsic motivation condition (picture puzzle), ratings of enjoyment decreased with the introduction of monetary payment. The data for amount of time volunteered for future experiments paralleled the data for task enjoyment, but fell short of reaching conventional significance levels. The authors concluded that the initial probability of the behavior in question may be of crucial importance in predicting the effects of reward upon intrinsic motivation.

Several aspects of the reward itself have been found to be of crucial importance in determining its effect upon intrinsic motivation. Kruglanski, Riter, Amital, Marzolin, Shablai and Zaksh (1975), for example, demonstrated that if a reward was intrinsic to the nature of the task, subjects' evaluations of the task would not be effected as they would when the reward was extrinsic to the task. The authors either paid or did not pay subjects for participating in a coin toss game or for building models with wooden blocks. In the money conditions, payment was contingent upon correct guesses in the coin toss game and contingent upon correct constructions in the model-building task. The dependent variable was the subjects' ratings of the extent to which they enjoyed the games and would play them in the future. Results indicated that subjects in the money coin game condition gave higher ratings of the coin game than did subjects in the no-money coin game condition. On the other hand, subjects in the money model-building condition gave lower ratings of their task as compared to subjects who were not paid for building models.

In a second experiment, the authors rewarded or did not reward subjects for playing either a stock market or an athletics game. The findings of this experiment paralleled those of the first study with subjects' ratings being higher in the stock market game when money was present and highest in the athletics game when money was absent.

Another variable of importance is the saliency of the reward. Ross (1975) has pointed out that the reward in previous research has always been salient to the subject. Ross proposed that as reward saliency was increased, subjects would perceive their behavior as under the control of external stimuli (mands). As the mand elements of a task increase (and presumably the internal or tact elements consequently decrease), the individual will be less likely to engage in the behavior when the controlling mand elements are withdrawn. Ross conducted an experiment in which he placed a reward under an attractive box. The box was in plain view as subjects in a salient-reward group engaged in the task behavior (playing a drum). Reward was promised but not placed in view for subjects in a nonsalient-reward condition, and subjects in a control condition were neither promised nor given a reward. Results indicated that subjects in the salient-reward group subsequently played the drum for shorter periods of time as compared to subjects in the nonsalient-reward and control conditions. In addition, a significantly greater percentage of subjects in the nonsalient-reward and control conditions chose to play with the drum as the first toy during a free operant posttest period. Finally, a significantly greater number of subjects in the nonsalient-reward and control conditions chose the drum as "the most fun toy".

Ross proposed, in a second study, to investigate the hypothesis that the distracting properties of the reward were responsible for the subsequent decrease in the task behavior. Ross instructed one group of subjects to think about the reward (marshmallows) while engaging in the task. Another group of subjects in a distraction condition were instructed to think about the snow which was lying on the ground outside of the classroom. Subjects in a control condition were neither promised nor presented with the reward and subjects in a nonideation condition were promised the reward but were given no specific instructions regarding ideation.

The results of the study revealed that control subjects played with the drum during a five-minute free play period for a significantly longer period than subjects in the think reward and nonideation conditions. The distraction condition also produced more drum play during the free play posttest than did the think-reward and nonideation conditions. Ross concluded that intrinsic interest in a task is most likely to wane when the task behavior is rewarded with a highly salient reinforcer. Ross further commented that the decrease in intrinsic interest does not appear to be due to the distracting properties of the reward since the think-snow subjects displayed greater subsequent interest in the task than did the think-reward subjects. Ross suggested that when the reward is a central focus of the subject's attention (i.e. when reward is salient) waiting for the reward may cause an aversive emotional state. The greater the anticipation of the reward, the greater is the aversiveness of the delay period before the reward's delivery. This delay of gratification, according to Ross, leads to frustration which in turn becomes associated with the task, thereby making the task itself aversive. The result is a reduction in the probability that the child will subsequently engage in the task. Ross derived this interpretation from a competing response hypothesis offered by Reiss and Sushinsky (1975a, 1975b).

While Ross' theoretical interpretation is commensurate with the data of his experiment, the frustration hypothesis is not a parsimonious explanation of the results of a study by Lepper and Greene (1975). In this study, subjects either expected or did not expect to receive a reward (the opportunity to play with highly attractive toys) for working on a set of puzzles. In addition, the children in two experimental conditions were led to believe that their behavior was under either high or low surveillance. Subjects in a control condition were not informed concerning the surveillance of their behavior.

One to three weeks after the experimental manipulation, a free operant posttest was conducted. The results of the study indicated a significant main effect for both reward and for surveillance. Subjects who expected reward and were rewarded and subjects who were under "high surveillance" showed subsequent decreases in the amount of time spent working on puzzles.

The authors have explained the results of their study in terms of Bem's self-perception theory. This explanation parsimoniously accounts for both main effects. That is, subjects in both the expected reward and surveillance conditions perceived their behavior as being under the control of external factors (reward or adult surveillance). Therefore, when these pressures were removed, a decrease in task behavior resulted.

Considering the findings from the standpoint of Ross' frustration hypothesis, the main effect of reward expectancy was predictable. That is, subjects who expected reward played with the puzzles for significantly lesser periods of time during the posttest because the task had taken on an aversive quality via its pairing with an aversive delay period. The frustration hypothesis does not appear to account, however, for the finding that subjects who were under high and low surveillance showed a subsequent decrease in interest for the puzzle task. These subjects played with the puzzles for a significantly lesser percentage of time during the posttest when compared to subjects in the nonsurveillance condition. Surveillance in the Lepper and Greene (1975) study was carried out supposedly by a TV camera. If surveillance of this sort was perceived as a reward by the children in the Lepper and Greene study, then the reward was simultaneous with the behavior. That is, there was no delay of gratification and therefore no frustration should have occurred. A subsequent decrease in task behavior was noted for these subjects, however. If TV surveillance was perceived to be aversive, the reduction in subsequent interest in the task may have been the direct result of the task's association with an aversive event. In this case, the need for the intervening construct of frustration dissappears.

Theoretical Accounts of the Decreased Play Effect

Several models have been proposed to account for the effect of reward upon subsequent task interest. The theoretical explanation offered by Reiss and Sushinsky (1975a, 1975b) is actually more expansive than has been described by Ross. Reiss and Sushinsky have suggested that a reward may elicit behaviors which are incompatible with the task. According to Reiss and Sushinsky's competing response hypothesis, a negative emotional state is created to the extent that task and reward-elicited behaviors are incompatible. The authors note that exposure to a salient reward may elicit many responses which can interfere with task behavior. Task behavior might be disrupted by perceptual distraction, cognitive distraction (e.g. thinking about reward), excitement in anticipation of reward or frustration from delay or withdrawal of reward (Reiss & Sushinsky, 1975a). The authors argue that this temporary emotional state created by the conflict between task- and reward-elicited behaviors will normally decrease with multiple presentations of the reward; however, a relatively long-lasting decrement in performance may occur under some conditions. The competing response hypothesis suggests a second process whereby the negative emotional state created by the competing responses is paired with the task. The task, thereby, takes on aversive properties via Pavlovian conditioning. The permanence of the effect is determined by the extent of the conditioning.

Reiss and Sushinsky (1975a) have suggested that the decreased play effects obtained in most of the previous research was due to the temporary distracting effects of the reward. The authors argued that, with multiple presentations of the reward, habituation occurs, competing emotional responses dissipate, and the decreased play effect vanishes. In order to test this hypothesis, a study was conducted in which nine children were rewarded on a multiple basis for listening to one of three Christmas songs. Subjects were rewarded on a variable interval schedule with tokens which they could later exchange for one of several attractive toys. Forty-eight hours following training, a 10-minute posttest was conducted. Results revealed that children spent, on the average, more than twice as much time listening to the target song than to the next preferred non-target song.

An interpretation of the Ross (1975) study in terms of the competing response hypothesis would suggest that in the expected reward condition, the "think snow" manipulation eliminated the decreased play effect because it interfered with the subjects ability to "think reward". Distracting the subjects' attention away from the reward prevented, according to Reiss and Sushinsky (1975b), the occurrence of competing responses elicited by the aversive emotional state associated with the delay of reward. The competing response hypothesis, however, might also predict that subjects in the think snow-nonexpected reward condition would also show decrements in subsequent play behavior. This would seem to be true unless thinking about snow elicits responses which are less distracting and less incompatible with the task than does thinking about reward. Reiss and Sushinsky (1975b, p.9) have, in fact, suggested that "...the think-snow instruction alone did not produce decreased play effects because, unlike think-reward, it does not elicit affective competing responses (frustration)". While this appears to be a reasonable argument, it points out that one of the difficulties with the competing response hypothesis is that it is difficult to disconfirm. That is, in the face of seemingly incongruous data one can easily argue that the experimental operation was insufficient to produce a competing response.

Another difficulty with the competing response hypothesis is that it cannot deal with the data from a study by Weiner and Mander (1975). These authors asked one group of subjects to solve word anagrams for which they would receive electric shock on a fixed ratio schedule. Subjects in a threat of shock condition were told to expect but never actually received shock. Finally, control subjects did not expect nor receive shock. During a free choice posttest period, subjects in the shock condition solved significantly more anagrams from a second list than did no-shock subjects. Furthermore 77% of the subjects in the shock group increased in the number of anagrams solved from pretest to posttest while 77% of the no-shock subjects decreased in the number of anagrams solved. The authors interpreted the results of the study in terms of self-perception theory. That is, when a behavior is engaged in with the expectancy that an aversive consequence will follow, the individual will perceive his behavior as a tact. The frequency of the behavior, therefore, will increase when the aversive consequence is withdrawn.

According to the competing response hypothesis, shock should have elicited emotional responses incompatible with solving anagrams. Shock elicited emotional responses should have increased the aversiveness of the situation. The task should then have taken on an aversive quality via its pairing with a negative emotional state. The result should have been a decrease in the task behavior during the posttest. An increase in the task behavior, however, was indicated by the results of the study.

Greene and Lepper (1975) have offered an information-processing theory to explain the decreased play effect. These authors suggest that rewarding an intrinsically interesting behavior may result both in a decrease in subsequent interest in the task and in a decrease in the quality of performance. Two programs are offered to explain these effects.

The choose program is concerned with the processes involved in determining the way in which one selects a particular activity. At any given time, a number of alternative behaviors are available to an individual. According to Greene and Lepper, each of these behaviors has associated with it intrinsic and extrinsic factors represented in memory and an individual chooses an activity so that the net incentive is maximized. When a reward is withdrawn, the probability that a behavior will be engaged in depends on the sum of intrinsic factors. Intrinsic and extrinsic factors are assumed to be additive up until a point of reward saliency after which they become interactive. The intrinsic and extrinsic factors associated with each activity in memory are continuously updated with intrinsic and extrinsic values changing according to experience.

The engage program is responsible for the way in which the task is performed. Engage receives direct input from the choose program which determines the exit or stop point for engage. If an activity is engaged in for reward then the program exits when the reward is received.

Subgoals of the engage program are also determined by the choose program. A subgoal such as "which color to add next to a picture", is determined by whether the task is engaged in for extrinsic or for intrinsic factors. If a person is drawing in order to earn a reward, the selection of which color to add next will be determined by information about which color the external judge (who is offering the reward) thinks should be added. The goals of the judge may be too ridgid or conversely, they may be too ambiguous. Either of these cases may lead to a less desirable state when compared to a situation in which the artist determines the subgoals and may experiment and redefine goals according to his own criterion.

Greene and Lepper point out that working on a task for external reward reduces the possibility that the individual will be aware of the subtle aspects of the task. This is said to be true because when external reward is involved, attention is directed toward a different set of subgoals than the ones encountered when a task is engaged in for its own inherent rewards. In this manner, the theory addresses the problem of the distractibility of rewards. The theory explains the Kruglanski et al. (1975) findings, therefore, by suggesting that rewards which are inherent in the nature of a task, direct attention toward the subgoals necessary for good performance on that task. On the other hand, rewards not inherent in the nature of the task, presumably distract one's attention from the task and encourage focus on another set of subgoals.

The Greene and Lepper theory suggests, therefore, that reward may reduce interest in a task in two ways. First, extrinsic reward may alter the goal of an individual's behavior in such a way that the stop or exit point is the reward rather than the successful completion of the task. This may effect the way in which the individual perceives his own behavior (i.e., as a mand rather than as a tact). Second, reward may distract an individual's attention away from the subgoals and rewards intrinsic to the task itself.

The discussion thus far has suggested that there exists some important differences between Greene and Lepper's information-processing model and Reiss and Sushinski's competing-response hypothesis. A comparison between these two theories reveals that the models differ in their major area of focus. The competing-response hypothesis accounts for the direction and patterning of behavior in terms of the compatibility or incompatibility between responses. According to the competing-response hypothesis, the directionality of behavior is determined to a large extent by the behavior which precedes it; i.e., behavior is determined by its antecedents. The information-processing hypothesis on the other hand accounts for the direction and patterning of behavior partially in terms of terminal goals or consequences.

There is, however, a sense in which the two theories are identical. Greene and Lepper's hypothesis suggests that one of the ways in which reward may be detrimental is if it distracts an individual from the subgoals and rewards intrinsic to the task. This is equivalent to saying that reward-oriented behaviors are competing with task-oriented behaviors. Greene and Lepper, therefore, have actually contained a competing-response hypothesis within their information-processing model. The same criticisms which were lodged against the competing-response hypothesis are, of course, applicable to this portion of the Greene and Lepper model. However, Greene and Lepper have begun to construct a model which is more inclusive than the Reiss and Sushinski hypothesis in that, as previously noted, they have also called attention to the importance of "goals" or the expected consequences of behavior.

The Importance of Perceived Competence

Part of the basic appeal of the information-processing model is that it views man as an active information-seeking system. Inherent in this view is the idea that man has a tendency to collect, analyze and organize information. He goes about this often in a way which appears to be independent of other goals. That is, oftentimes information appears to be its own reward. Skinner (1953) has observed that:

> Some forms of stimulation are positively reinforcing although they do not appear to elicit behavior having biological significance. A baby is reinforced, not only by food, but by the tinkle of a bell or the sparkle of a bright object. Behavior which is consistently followed by such stimuli shows an increase in probability. It is difficult, if not impossible, to trace these reinforcing effects to a history of conditioning...we may plausibly argue that a capacity to be reinforced by any feedback from the environment would be biologically advantageous, since it would prepare the organism to manipulate the environment successfully before a given state of deprivation developed. (p. 83)

Several theorists have conceptualized this phenomenon in terms of a drive for mastery or competence. White (1959) has discussed the prominence of the concept of competence in the literature. He has discussed the view of Freud who is reported to have said that "the task of the nervous system is--broadly speaking--to master stimuli" and the view of Hendrick who proposed an "instinct to master". In addition, the theories of Goldstein (1940) and of Maslow (1954, 1955) have stressed a tendency towards "self-actualization". Others, e.g. Groos (1901) and Piaget (1952), have remarked upon the facination shown by infants and children for behaviors which have an effect upon their environment. White has summarized this viewpoint by noting:

> ...it is clear that the child or animal is by no means at the mercy of transient stimulus fields. He selects for continuous treatment those aspects of his environment which he finds it possible to effect in some way. His behavior is selective, directed, persistent--in short, motivated. (1959, p.320)

The importance of an individual's "controllability" over his environment has also been stressed by Seligman (1975). Seligman has proposed a theory of "learned helplessness" to account for anxiety and depression. The cornerstone of his theory is the proposition that an animal or person can learn not only that his behavior leads to certain consequences, but also that his behavior is independent of certain other consequences. According to Seligman, a psychological state of anxiety and depression frequently results when an individual believes that the events in his environment are uncontrollable, i.e., independent of his responding. Support for Seligman's theory comes from a series of laboratory investigations in which one group of dogs are restrained in a Pavlovian classical conditioning hammock and subjected to unavoidable shocks. Following this procedure, the experimental dogs were placed in a two compartment chamber. The dogs could avoid or escape shock in this chamber by jumping over a barrier from a shock compartment to a safe compartment. This is a relatively easy task for a dog to learn and Seligman's naive control animals learned to jump the barrier in approximately 50 trials. In contrast, however, dogs who had been initially subjected to uncontrollable shock were unable to learn the escape or the avoidance response.

In other experiments, Seligman (1975) has compared groups of dogs who could control shock with yoked control dogs who were subjected to uncontrollable shock. In these experiments, similar results were found. The yoked animals who were exposed to uncontrollable shock were subsequently unable to learn an escape response. In comparison, animals who were able to terminate shock with a bar press and animals who received no shock were able to learn the escape response in a normal fashion. Seligman concluded that helplessness appears to be related to controllability rather than merely to the "trauma of shock" per se.

Seligman (1975) also reports on experiments demonstrating learned-helplessness effects in rats, primates and in man. In an experiment conducted by Glass and Singer (1972), subjects listened to a loud melange of sound. The study was one of a series designed to evaluate the role of stress upon performance. One group of subjects was able to turn off the noise by pushing a button. A yoked control group was exposed to the same noise presentation but was unable to control the offset of noise. A third group was also "uncontrollable" but these subjects were given a "panic button" and told "You can terminate the noise by pressing the button. But we'd prefer you not do it." These subjects had the false belief that they could control the noise if they had to. Results indicated that these perceived-control subjects performed as well as actual control subjects on a problem-solving task.

Subjects in the uncontrollable shock condition who did not have access to the "panic button" yielded the poorest performance. The authors concluded that the expectation of controllability per se is a crucial determinant of helplessness. It should be noted that Bem's self-perception theory would account for this finding in terms of differences in the inferences perceived-control and no-perceived-control subjects make about their behavior. Perceived-control subjects were given the choice of terminating the noise but did not exercise this choice. Therefore, they may have inferred that the noise was not extremely noxious. In support of this hypothesis, the authors noted that perceived-control subjects rated the noise as less irritating and less distracting as compared to no-perceived-control subjects. However, later experiments (Mayhew, 1969; Glass, Reim and Singer, 1971) have failed to corroborate these findings. Glass et al. has concluded that self-perception and dissonance theories do not offer a viable explanation of the data.

In summary, there has been a great deal of speculation and some experimental support for the notion that effective interaction with one's environment is of crucial importance from a motivational point of view. Seligman (1975) has expressed the opinion that:

> For voluntary responding to occur, an incentive must be present in the form of an expectation that responding may succeed. In the absence of such an expectation, that is, when an organism believes responding is futile, voluntary responding will not occur. (p. 50)

Along a similar vein, Greene and Lepper (1975) have noted the importance of an individual's self-perception of competence. These authors have suggested that reward may not always have a detrimental effect upon task interest. They have noted that:

> ...extrinsic rewards will not necessarily decrease intrinsic motivation. In fact, if they are used in such a way as to convey to a person that he or she has been successful, particularly in a socially comparative sense, and that he or she is personally responsible for the success, the result should be an <u>increase</u> in intrinsic motivation. (p. 15)

The authors conclude that the effect of extrinsic rewards depends not only on the extent to which rewards produce the self-perception of extrinsic motivation, but also on the extent to which rewards convey to an individual information concerning his competence for the task.

Statement of the Problem

During the course of the present disscussion, the variables of reward and task competency have been highlighted as being of significance in determining an individual's motivation for a task. In review, Greene and Lepper have suggested that reward may reduce task interest in two ways. First, extrinsic reward may alter the goal of an individual's behavior. That is, when reward is administered, the stop or exit point becomes the reward rather than the successful completion of the task. This may affect the way in which one perceives the cause of his own behavior. Second, reward may distract an individual's attention away from the subgoals and rewards intrinsic to the task.

Greene and Lepper's (1975) theory, therefore, would seem to suggest that if extrinsic reward directs attention to the subgoals necessary for successful performance of a task, intrinsic interest in the task should increase. Reward may direct attention towards task subgoals when it is delivered contingently upon successful completion of sub-units of the task. The extent to which reward provides information concerning successful task strategies and the extent to which reward directs attention toward salient elements of the task should determine the effect reward will have upon subsequent task interest.

On the other hand, self-perception theory would predict that contingent reward may call attention to the fact that one's behavior is under the control of a specific reinforcer. Therefore, contingent reward may make the mand characteristics of the situation more salient and therefore lead to greater subsequent decreases in task behavior as compared to non-contingent reward procedures.

In past research, reward has sometimes been delivered contingent upon successful performance (e.g., Deci, 1971, 1972; Calder & Staw, 1975; Kruglanski et al., 1975) and has sometimes been delivered contingent upon subject involvement without a performance requirement (e.g., Lepper, Greene & Nisbett, 1973; Ross, 1975). The previous discussion would suggest that these two approaches may yield different results.

reward and perception of task competency, were manipulated separately in an attempt to determine their individual and combined effects upon subsequent task interest.

In a 3 x 3 factorial design, 90 subjects were randomly assigned to one of nine groups. During a treatment phase, the subjects in three contingent-reward conditions earned monetary reward contingent upon successful performance during a cartoon-decoding task. In three noncontingent-reward conditions, subjects earned monetary reward for simple task involvement. No performance requirement was made for these subjects. Subjects in three no-reward conditions earned no extrinsic reward during their task involvement. The variable of competence was manipulated by informing subjects that their performance was either above (high-competence) or below (low-competence) the norm or that their performance did not deviate from the average performance of college students (average competence).

Subjects were left alone in the experimental room for a 20-minute period following the treatment phase while the experimenter supposedly performed a detailed computer analysis of the subject's data. During this free choice period, subjects elected to either work on a decoding task similar to the one employed during the treatment phase of the experiment or they chose to read a recent issue of Psychology Today which was available in the experimental room.

As noted above, contingent and noncontingent reward may result in different attentional behaviors and/or may differ in the ways in which they affect a subject's perceptions of his own behavior. To date, a direct comparison between these two methods has not been made.

Based upon the previous literature review, it would also seem that an individual's perception of his ability for a task should affect his interest in that activity. The discussion would suggest that as one's self-perception of competency increases, so should one's interest in the task. It is also possible, however, that one might be "challenged" by low competency for a task. White (1959) has suggested that interest is not aroused by a familiar stimulus field but rather that a certain amount of novelty or optimal stimulation is necessary to maintain task involvement. It may be, therefore, that under some conditions a certain degree of "perceived incompetence" may result in greater task interest. The function may be an inverted U in which task interest drops off under conditions of extremely low or extremely high perceptions of ability.

The variables of reward and competency may interact such that the detrimental effects of reward may be offset by the conditions of competency which yield high subsequent task interest. In an experiment described below, the variables, The major dependent variables of interest were the number of words and the number of cartoons correctly decoded during the posttest.

The hypotheses tested were the following:

1) Based upon self-perception theory, it was predicted that contingent-reward would focus attention upon the fact that an individual's behavior was under the control of reward. It was hypothesized that this perception would be less pronounced under conditions of noncontingent-reward and least pronounced under conditions of no-reward. Contingent-reward therefore, was expected to have the most detrimental effect upon subsequent task interest. Noncontingent-reward was expected to have a less detrimental effect and no-reward was expected to have the least detrimental effect upon task interest. Specifically, it was predicted that there would be a significant main effect for reward with subjects in the no-reward groups decoding a significantly greater number of words and cartoons during the posttest than contingent-and noncontingent-reward subjects. It was also predicted that no-reward subjects would spend significantly more time (according to the subjects' estimates) working on the posttest decoding task as compared to subjects in the contingent and noncontingent-reward groups. In addition, it was predicted that subjects in the noncontingent-reward groups would solve a significantly greater number of encoded words and cartoons and would spend significantly more time working on the posttest decoding task as compared to subjects in the contingent-reward groups.

2) Lepper and Greene (1975) have suggested that an individual's perception of his task competency may effect his intrinsic interest in the activity. Based upon this hypothesis, it was predicted that subsequent task interest would be a direct function of the degree to which subjects perceived themselves to be competent at the decoding task. Specifically, it was predicted that there would be a main effect for competence with high-competence subjects solving a significantly greater number of words and cartoons during the posttest than average-or low-competence subjects. In addition, it was predicted that high-competence subjects would spend significantly more time working on the posttest task than would average-competence or low-competence subjects. Also, it was hypothesized that average-competence subjects would solve a significantly greater number of words and cartoons and would spend significantly more time working on the posttest as compared to low-competence subjects.

3) It was predicted that the effects of reward and competency would interact in complex fashion. Specifically, it was predicted that there would be a significant interaction effect between the variables of competency and reward such that the detrimental effects of contingent reward will be offset by the perception of high-competency and the beneficial effects of no-reward will be offset by the perception of low-competency. That is, it was predicted that there would be no significant difference between contingent-reward, non-contingent-reward and no-reward subjects in the high-competency condition. In

addition, it was predicted that there would be no significant difference between contingent-reward, noncontingent-reward and no-reward subjects in the low-competency condition.

CHAPTER II

METHOD

Subjects and Experimenters

Ninety female students were recruited for the study from a subject pool at the University of North Carolina at Greensboro. Participation was in partial fullfillment of a course requirement in introductory psychology. The subjects were randomly assigned to the experimental conditions.

The experimenters included two female psychology graduate assistants and two female advanced undergraduate psychology majors enrolled in an independent studies project.

Experimental Setting and Materials

The experiment was conducted in an 8' x 10' room lighted by an overhead florescent lamp. The subject was seated across from the experimenter at a table on which was placed two booklets, each containing 12 cartoons, several pads of note paper and a stack of answer sheets.

The cartoons were ones selected from Playboy magazine and were pretested for their humorous quality. One hundred cartoons were presented to 20 undergraduate and graduate females who were asked to rate them on a scale of one to 10, one being "very unfunny" and 10 being "very funny". The 24 cartoons with the highest mean ratings were selected for use in the study. The cartoons were assigned to one of two collections such that the mean ratings for each collection did not differ significantly. The means for each group of cartoons were 5.32 and 5.34 ($t < 1$).

Each cartoon caption was in coded form and each subject was provided with a code key which described and gave examples of three codes (see Appendix A). One of the codes has been previously described by Shaw (1973). The words of each caption were divided into three groups and each group was coded in a different fashion. Each caption could be completely decoded, therefore, only by using the three different code systems. Each collection of 12 cartoons was arranged in three groups of four cartoons. Each cartoon was placed on a separate 8 1/2" x 11" sheet of paper and subjects were provided with an answer sheet on which to record their responses (see Appendix B). Within each group, the codes were employed in a systematic order. For example, the cartoons of one collection were encoded such that within each group of four cartoons the particular code sequence employed for cartoon one was reversed for cartoon 2, reversed back to the original sequence for cartoon three, and reversed again for cartoon four. Once a subject learned the reversal pattern, therefore, she needed only to discover the order of the codes for cartoon one and she was able to predict the order for the remaining cartoons in that group. The codes were designated by the numbers 1, 2 and 3 and the following code sequences were employed:

Collection 1 (treatment cartoons)

	Cartoon 1	Cartoon 2	Cartoon 3	Cartoon 4
Group 1	123	321	123	321
Group 2	213	312	213	312
Group 3	132	231	132	231

Collection 2 (posttest cartoons)

	Cartoon 1	Cartoon 2	Cartoon 3	Cartoon 4
Group 1	123	123	321	321
Group 2	213	213	312	312
Group 3	132	132	231	231

Procedure

Subjects were escorted into the experimental room and seated in front of the task materials. All subjects were instructed that they would be participating in a preliminary investigation designed "...to evaluate the appropriateness of a decoding task for use in future experimentation". The three coding methods were introduced at this point and subjects were informed that they would be required to decode the captions for a series of cartoons. Subjects were informed to attend to the sequence in which the codes were used within each caption and within each group and they were encouraged to attempt to discover the systematic principle underlying the code orders. It was pointed out that the discovery of this principle would aid them in breaking the codes more quickly than was possible using a simple trial and error procedure. The use of a systematic code sequence which the subjects might decipher was used in order to increase the complexity of the task and therefore increase practice effects.

At this point, subjects were informed that some of the cartoons dealt with material of a sexual nature. Subjects were told that if they objected to viewing this material, they could choose to withdraw from the study without losing their experimental credit. Two subjects withdrew from the study at this point and they were replaced by two other randomly selected subjects. The experimenter presented a sample cartoon to the subjects who agreed to continue, in order to make certain that the subjects understood the task. Complete task instructions are given in Appendix C.

After the sample cartoon was presented, and when it was clear that the subject understood the task, the subject was instructed that she would be working on one of two other collections of cartoons. The particular collection was supposedly determined randomly by having the subject select one of two slips of paper. Actually, both slips of paper read "collection 1" and that collection was therefore always selected for use during the treatment phase of the experiment.

After the subject had selected the task materials, contingent-reward subjects were informed that they would receive five cents for each group of words successfully decoded within each cartoon. It was explained that they might therefore, receive as much as 15 cents for each cartoon successfully decoded. Subjects were asked to read each group of words to the experimenter after they had been decoded. If the subject's response was correct, the experimenter informed the subject as to the amount that she had earned up until that point. The monetary incentive, however, was not actually given to the subject until the conclusion of the experimental session. Noncontingent-reward subjects were also informed that they would receive monetary incentives; however, they were told that they would earn money "for your continued involvement in the task". These subjects earned payment according to the amount of money earned by the previously run contingent-reward subject. Noncontingent-reward subjects were not required to meet a performance requirement in order to earn their reward. Once again, actual payment was not given until the conclusion of the experimental session. No-reward subjects did not receive payment and no mention was made of monetary incentive for these subjects.

Actual monetary payment was witheld until the conclusion of the experimental session because of a finding by Deci (1972). In Deci's (1972) study, subjects were either rewarded before or after a free choice posttest period. Results indicated that subjects who were paid after the posttest, demonstrated the decreased play effect. In contrast, subjects who were paid before the posttest actually showed an increase in task involvement during the posttest. Deci interpreted the results of his study in terms of inequity theory; i.e., he suggested that subjects may have yielded the posttest increase in task behavior because they felt overcompensated for their efforts.

All subjects were given 20 minutes to complete the treatment-decoding task. At the conclusion of the task, the competency manipulation took place. After counting the number of cartoons decoded, the experimenter remarked that the subject's overall performance was either considerably lower than (for low-competence subjects) or higher than (for high-competence subjects) or did not differ from (for average competence subjects) the performance of average college students.

After the experimenter informed the subject as to the quality of her performance, she explained that it was necessary for her to leave the room for about 20 minutes in order to feed the subject's data into the computer (a computer terminal was located down the hall from the laboratory) so that she could compare the subject's performance times on individual cartoons with the performance times of a norm group. Subjects were instructed that during the time of the experimenter's absence, they could amuse themselves as they wished. In a casual fashion, the experimenter pointed out that a recent issue of Psychology Today (April, 1976) was available for the subject's use or that the subject might decode cartoons from collection two if she so chose. Several subjects brought books into the laboratory with them and reported reading these during the posttest. The only restriction placed upon subjects was that they not leave the experimental room.

The experimenter left the laboratory for 20 minutes. Upon returning, she questioned the subject regarding the cartoons of collection two, recording the total number of words and the total number of cartoons correctly decoded from this collection. Two post-experimental questionnaires were also administered.

One of the questionnaires administered was the state anxiety subscale of Spielberger, Gorsuch and Lushene's (1968) State-Trait Anxiety Inventory (Appendix D). This subscale has considerable face validity as an index of mood change. The scale was administered as a check on the arousal level of subjects. If the detrimental effects of reward were due to a temporary emotional reaction, this might be reflected in the state anxiety scores of reward subjects.

On a second questionnaire (Appendix E), subjects were asked to rate, on a 10-point scale, the extent to which they found the task enjoyable, the amount of time they spent working on collection 2 during the posttest, and how likely they would be to volunteer for a similar experiment in the future. They were also asked to rate their ability for the task and to answer several open-ended questions to reveal any suspicions they held and to reveal prior knowledge they may have had of the experimental procedure. Two subjects were eliminated from the experiment because they guessed one of the experimental hypotheses and one subject was eliminated because of suspiciousness of the experimental procedure. One additional subject was eliminated because she failed to complete one of the post-experimental questionnaires. Each of these subjects was replaced by another who was randomly selected from the subject pool.

Finally, the subject was debriefed. The experimenter explained the true nature of the study and the necessity for the subject not to reveal the procedure to potential subjects. Contingent- and noncontingent-reward subjects were paid and all subjects were given experimental credit slips before leaving.

Experimental Design

The experimental design was defined by the two between-subject variables, competency and reward. Three levels of competency (low, average and high) were crossed with three levels of reward (no-reward, contingent-reward and noncontingent-reward) resulting in a 3 x 3 factorial design. The independent variables are described below.

Reward. One third of the subjects received reward contingent upon their successful performance on the decoding task. Before the start of the treatment phase, these subjects were instructed that:

> In order to provide incentive for good performance, you will earn five cents each time you correctly decode a group of words. If you successfully decode all three groups within a cartoon, you will earn a total of 15 cents for that cartoon. Each time you have decoded a group of words, read that portion of the caption to me and I will tell you if it is correct. If you correctly decode all three groups of cartoons, you will earn a total of $1.80. This money will be given to you at the end of the experimental session and will be yours to keep. You will have 20 minutes to complete the task. Do you have any questions before we begin?"

Subjects in the noncontingent-reward condition were given the following instructions:

> In order to provide incentive for good performance, you will earn $_____ (amount determined by the previously run contingent-reward subject) for your continued involvement in the task. This money will be given to you at the end of the experimental session and will be yours to keep. You will have 20 minutes to complete the task. Do you have any questions before we begin?[1]

Contingent-reward subjects were kept informed as to the cumulative amount of their earnings. Each time the subject earned five cents, the experimenter stated "you have now earned a total of $_____(amount of money earned)".

No-reward subjects were simply informed that they had 20 minutes to complete the task. The experimenter answered any questions subjects had before beginning treatment.

Competency. As previously explained, subjects were informed as to the supposed quality of their performance. Following the treatment phase, the experimenter examined the subjects' answer sheets, counted up the number of words correctly decoded and remarked "you have correctly decoded (number of words) in (amount of time required) minutes. Your performance:

> is considerably lower than the average college students' (for low-competence subjects);
>
> is considerably higher than the average college students' (for high-competence subjects); or,
>
> does not differ from the average college students' (for average-competence subjects)".

CHAPTER III

RESULTS

The major dependent variables under study were the number of words and the number of cartoons successfully decoded during the posttest. These variables are related and, although both were included in the analysis, the number of words decoded was the more sensitive measure of the two. The reason for this is that no credit was given for partially correct cartoons when the number of decoded cartoons was calculated. Therefore, if a subject decoded a portion of the words within a cartoon and left the remainder in encoded form, she received no credit for her successful words. On the other hand, correctly decoded portions were credited when the number of correctly decoded words was calculated. Another reason why the dependent variable, number of correctly decoded words, was a more sensitive measure of performance, is because some cartoons contained more words than others.

The dependent variable, number of decoded cartoons, was included for analysis because it was felt that once a subject correctly decoded a portion of a particular cartoon, it might be possible for her to guess the remaining words. Under these conditions, the number of correctly decoded cartoons might be a more appropriate measure.

Other dependent variables under study included: 1) subjects' responses on the state anxiety portion of the State-Trait Anxiety Inventory; 2) subjects' ratings of the extent to which they found working on the decoding task pleasant or enjoyable; 3) subjects' ratings of the amount of time they spent working on the decoding task during the posttest; 4) subjects' ratings of their ability for the decoding task; 5) subjects' ratings of the extent to which they found the cartoons humorous; and, 6) subjects' ratings of how likely they would be to volunteer for a similar experiment in the future. Subjects' ratings on the State-Trait Anxiety Inventory were on a four-point scale and their ratings on the remaining questionnaire items were on a 10-point scale.

Analyses of variance were computed for the number of words and for the number of cartoons correctly decoded during the treatment phase of the experiment. The results of these analyses, given in Tables 1 and 2 (Appendix F), indicated no significant differences between groups as a function of the experimental manipulations.

The mean number of words and the mean number of cartoons correctly decoded during the posttest were calculated as a function of reward and competency and are given in Tables 3 and 4 (Appendix F). Because of the nature of the experiment, there were a large number of zero scores; i.e., many subjects chose not to work on the cartoons during the posttest. For this reason, the distribution of posttest scores for the number of words and the number of cartoons correctly decoded, was extremely skewed in a positive direction. Because the analysis of variance assumes a normal distribution, a transformation of the data was necessary to correct for skewness. Winer (1971) has recommended the use of the logarithmic transformation in cases where positive skewness is obtained. The number of words and the number of cartoons decoded were therefore transformed according to the formula given by Winer (1971, p. 400).

A multivariate analysis of variance was computed with the dependent variables being the transformed scores for the number of words and the number of cartoons decoded and the scores for the various post-experimental questionnaire items. The results of a Hotelling-Lawley's trace analysis, summarized in Table 5 (Appendix F), revealed a nonsignificant main effect for reward (approximate F = .75, df = 20/142) a significant main effect for competency (approximate F = 2.97, df = 20/142, $p < .0002$) and a nonsignificant reward x competency interaction effect (approximate F = 1.01, df = 40/282).

A univariate analysis of variance was performed on the transformed scores for the number of cartoons correctly decoded and revealed no significant differences between groups. The results of this analysis are given in Table 6 (Appendix F). A univariate analysis of variance performed on the transformed scores for the number of words correctly decoded, however, showed an effect for reward which reached signififance at $p < .0703$ (Table 7, Appendix F). No-reward subjects solved an average of 61.13 words during the posttest as compared to an average of 46.97 for noncontingent-reward subjects and an average of 34.17 for contingent-reward subjects. Newman-Keuls post-hoc tests were performed on the logarithmic transformations of the mean scores for reward. None of the comparisons reached significance at $p < .10$. The magnitude of effect was computed and indicated that the variable of reward accounted for four percent of the total variance and the variable of competency and the reward x competency interaction each accounted for zero percent of the total variance.

Another way of looking at the data was to consider the following two questions separately: 1) Did the experimental manipulations affect the number of persons who subsequently chose to engage in the decoding task; and, 2) Did the manipulations affect the performance of those subjects who actually engaged in the task during the posttest. The analyses discussed above, clearly confounded these two questions.

In an attempt to answer the first question, a chi-square analysis was performed. The number of subjects who engaged in the decoding task and the number of subjects who did not engage in the decoding task during the posttest, was calculated as a function of reward and competency. Because the expected cell frequency was less than five in half of the cells, the scores were averaged across the competency variable. The resulting contingency table is given in Table 8 (Appendix F). The results of the chi-square analysis indicated that the actual cell frequencies for the reward conditions differed from the expected cell frequencies at approximately $\underline{p} < .12$ ($\underline{X}^2 = 4.18$, $\underline{df} = 2$). Separate chi-square comparisons were made between contingent-and noncontingent-reward conditions, between contingent-and no-reward conditions and between noncontingent-and no-reward conditions. The results of these analyses indicated that a significantly greater number of subjects chose to work on the posttest cartoons in the no-reward condition as compared to the contingent-reward condition ($\underline{X}^2 = 4.34$, $\underline{df} = 1$, $\underline{p} < .05$). The results of the chi-square analysis for the comparison between contingent- and noncontingent-reward conditions were not significant ($\underline{X}^2 = .62$, $\underline{df} = 1$) nor were the results of the analysis for the comparison between noncontingent-reward and no-reward conditions ($\underline{X}^2 = 1.76$, $\underline{df} = 1$).

The results of the chi-square analyses suggested that there was a tendency for the reward conditions to affect the probability that subjects would choose to work on the posttest decoding task. In order to answer the second question, i.e. "Did the experimental manipulations affect the performance of the subjects who shose to work on the posttest decoding task?", an unequal N analysis of variance was performed. In this analysis, the number of words and the number of cartoons which were decoded during the posttest decoding task were analyzed as a function of reward and competency for those subjects who actually worked on the posttest task. The results of these analyses are given in Tables 9 and 10 (Appendix F). The results of both analyses revealed no significant differences between groups as a function of the experimental manipulations.

Questionnaire Responses

Subjects were asked to complete two post-experimental questionnaires. The first of these was the state anxiety subscale of the State-Trait Anxiety Inventory (Spielberger, Gorsuch & Lushene, 1968). Subjects were asked to rate their feelings "at the moment" on 20 descriptive statements. Each of the ratings was on a four-point scale ranging from "not at all" to "very much so". Each subject received one score based on a total calculated from their answers to the 20 questions.

An analysis of variance was performed on the state anxiety scores as a function of the experimental manipulations. The results of this analysis, shown in Table 11 (Appendix F), revealed no significant differences between groups.

A second post-experimental questionnaire was administered on which subjects were asked to answer five questions. Answers were in the form of ratings which were given on a 10-point scale. One question asked subjects to rate the extent to which they found working on the decoding task pleasant or enjoyable. An analysis of variance was performed on these ratings and results indicated no significant differences between groups (Table 12, Appendix F).

The results of an analysis of variance computed for ratings of the amount of time subjects estimated that they spent working on the posttest decoding task revealed an effect for reward significant at $p < .1209$ ($F = 2.15$, $df = 2/81$). The means for ratings of time spent paralleled the results of the analysis for the number of words decoded. The mean rating for contingent-reward subjects was 4.30 and the mean rating for noncontingent-reward subjects was 5.13 and the mean rating for no-reward subjects was 7.87.

An analysis of variance was computed for subjects' ratings of how humorous they felt the cartoons were. The results of this analysis, shown in Table 14 (Appendix F), indicated no significant differences between groups.

An analysis of variance was also performed on subjects' ratings of how likely they felt they would be to volunteer for a similar experiment in the future. The results of this analysis are given in Table 15 (Appendix F) and indicate a main effect for competency which is significant at $p < .10$ ($F = 2.31$, $df = 2/81$). Mean ratings for low-competence, average-competence and high-competence subjects were 6.47, 7.80 and 9.73, respectively.

As a check on the competency manipulation, subjects were asked to rate their ability for the decoding task. An analysis of variance performed on these ratings (Table 16, Appendix F) revealed a significant main effect for competency (F=16.18, df=2.81, $p < .001$). It is this result which in major part accounted for the significant main effect for competency in the multivariate analysis discussed previously.[2] Newman-Keuls post-hoc tests were performed and revealed that low-competency subjects gave significantly lower ratings of their ability as compared to high-competency subjects' ratings ($p < .01$) and significantly lower ratings as compared to average-competency subjects ($p < .05$). There was no significant difference between average-competency and high-competency subjects' ratings of their ability.

CHAPTER IV

DISCUSSION

It was predicted that the various conditions of reward would result in differences in subsequent task interest between subjects. With respect to no-reward subjects, the prediction was straight-forward; these subjects were expected to demonstrate greater interest in the posttest decoding task as compared to subjects in the contingent-and non-contingent-reward conditions. Differences between contingent- and noncontingent-reward subjects, could have been in either direction. On the basis of Lepper and Greene's (1975) information-processing model, contingent reward should have resulted in greater subsequent task interest to the extent that this procedure directed attention towards the subgoals necessary for successful task performance. However, the possibility was also suggested that contingent reward might result in lesser task interest as compared to noncontingent-reward because the former procedure might call greater attention to the fact that the subject's behavior was under the control of the reward.

Hypothesis 1 made the prediction that contingent reward would result in the least amount of subsequent task interest. It was further predicted that noncontingent reward would result in relatively greater subsequent task interest and that no reward would yield the greatest amount of interest in the posttest decoding task. The results of the experiment were in the direction predicted by the hypothesis; however, the findings were not sufficiently strong to reach conventional levels of significance. The trend emerged only for the dependent variable of number of words correctly decoded. As it turned out, the number of cartoons correctly decoded was not a sensitive enough measure to reflect differences. The analyses conducted suggested that reward exerted its effect primarily by influencing the probability with which subjects chose to engage in the posttest decoding test. Once an individual had chosen to engage in the task, the various conditions of reward had no significant influence. The hypothesis that contingent reward, as compared to noncontingent or no reward, brings into greater focus the perception that one's behavior is under the control of external mands, received only modest support from the test results.

It should be noted that subjects in the three reward groups did not differ significantly in the number of words decoded during the treatment phase of the experiment. It might be argued that the contingent-reward procedure did not direct attention towards task subgoals to any greater degree than did the other reward conditions. This might be true since the performance of contingent-reward subjects was not significantly better than the performance of noncontingent-reward and no-reward subjects during treatment. Perhaps under conditions in which contingent reward leads to improved task performance, the effect of this type of reward procedure upon subsequent task interest may be less detrimental.

The results of questionnaire data asking subjects to rate the amount of time spent on the posttest task, paralleled the behavioral data. However, other questionnaire data, dealing with the subjects' evaluations of the task, revealed no significant findings. That is, there were no differences between subjects' ratings of how pleasant or enjoyable they found the task, how humorous they felt the cartoons were or how likely they would be to volunteer for a similar experiment in the future. Self-perception theory would predict that subjects would infer that a task was endowed with a greater percentage of tact elements if they engaged in the task with no apparent incentive. The results of task evaluation questionnaire data, therefore, should have paralleled the behavioral data according to the self-perception hypothesis. This was not, however, the case.

One factor which may account for the weakness of the obtained effect, has been discussed by McGraw (1976). Reward may exert detrimental effects in two ways; i.e., it may interfere with ongoing performance and/or it may effect subsequent task interest. After reviewing the literature on the detrimental effects of reward upon performance, McGraw concluded that incentives are detrimental to ongoing performance when two conditions are met. The first of these concerns the attractiveness of the task and holds that the task must be inherently interesting so that the offer of incentives is a superfluous source of motivation. Recall that Calder and Staw (1975) suggested that the same condition be met before reward would have a detrimental effect upon subsequent task interest. The second condition requires that the solution to the task be open-ended and that the steps leading to the solution not be immediately obvious. That is, the detrimental effects of reward increase as the solutions become more heuristic and less algorithmic.

An algorithmic problem is one whose solution is readily obtainable by following a prescribed set of operations. Simple mathematical calculations such as addition, subtraction, division, etc., are examples of algorithmic problems. Heuristic problems, on the other hand, are problems in which solutions are not readily obtainable by following any one systematic plan. In heuristic problem solving, an individual proceeds according to a number of loosely constructed plans or strategies. In a chess game, for example, it would be inefficient for players to judge each of their moves according to an algorithmic procedure in which all possible moves were tried. Instead, they adopt a number of heuristic strategies such as "protect the king", "control the center of the board", etc.

A number of heuristic tasks have been used to study the detrimental effects of reward upon performance. Kruglanski, Friedman and Zeevi (1971), for example, asked fifth-grade school children to supply as many titles as possible to a literary paragraph and to compose a story from a list of fifty words which they had been given. Glucksberg (1962) asked subjects to solve a "functional-fixedness" problem involving a candle, a box of thumbtacks and a book of matches. The subject's job was to mount the candle on a vertical screen. The solution required that the subject empty the box of thumbtacks and use the container as a platform on which to hold the candle. McGraw (1976) has reported that he and McCullers have employed a series of water-jug problems in which all but the last problem is solvable in a single way by a well-defined rule. The last problem has a novel solution and thus requires the subject to adopt a heuristic strategy.

The results of these investigations of heuristic problem solving, indicated that reward had a detrimental effect upon performance. On the other hand, McGraw (1976) reported that studies have indicated that reward may have a facilitative effect upon performance when the task is an algorithmic one such as mental multiplication (e.g. Weinstein, 1971a, 1971b, and 1972) or serial learning of geometric forms (e.g., Dornbush, 1965; Bahrick, 1954).

The algorithmic-heuristic task dimension has been shown to be of importance in predicting the detrimental effects of reward upon performance. The dimension may also have parallel importance in the area of reward's effect upon subsequent task interest. A reconsideration of the literature in this area reveals that heuristic problems have been used in the majority of experimental investigations. Deci's (1971, 1972) investigations employed Soma puzzles and headline writing as experimental problems. Lepper, Greene and Nisbett's (1973) experimental task was drawing with Magic Markers and Ross (1975) employed drum playing as his experimental activity. All of these tasks are heuristic in nature and in all cases, reward was found to have detrimental effects upon subsequent task interest.

On the other hand, a task used by Reiss and Sushinsky (1975a) was algorithmic and when children were rewarded for engaging in the task, subsequent task interest increased. The task was listening to one of three songs and subjects were rewarded on a contingent basis for their performance.

On the basis of the studies reviewed, it would seem that the algorithmic-heuristic dimension may have a parallel application in the area of reward's effect upon subsequent task interest. In relation to the present investigation, the application is straight-forward. Although the decoding task was one which was seemingly high in attractiveness and intrinsic interest, it was also one which required algorithmic solutions. While the effect of reward upon an attractive task is to reduce subsequent interest, the effect of reward upon an algorithmic task may be to increase subsequent interest. The interaction of these two effects may have resulted in a tendency towards neutralization. The algorithmic quality of the task may have functioned to counteract the detrimental effects of the reward.

In an attempt to identify the mechanisms behind reward's detrimental effect upon heuristic problem-solving behavior, McGraw (1976) entered into a discussion of the incidental learning literature. In these studies, an individual is required to engage in one learning task, and subsequently, performance is measured on a secondary or incidental task. The incidental material may be spatially separate or contiguous to the intentional stimuli which are part of the primary task. Bahrick, Fitts, and Rankin (1954), for example, had subjects engage in a tracking task during which time a sequence of lights flashed in the periphery of the visual field for unexpected five-second durations. Subjects who were rewarded for their tracking performance scored fewer points on the incidental task (recalling the sequence of lights which flashed in the peripheral field) compared to subjects who were not rewarded for tracking. Other studies reviewed by McGraw have also provided support for the notion that reward is detrimental to incidental associations which are both spatially separate and contiguous.

McGraw has suggested that rewarded subjects do less well on heuristic tasks because of their inferiority at incidental learning. He argues that solutions to heuristic tasks require attention to cognitively or perceptually peripheral events. McGraw seems to be saying that reward tends to increase the selectivity of one's attention and focuses it upon the central events of the task. It is for this reason, therefore, that reward is detrimental to heuristic problem solving. On the other hand, in algorithmic problems, it is useful to focus attention upon a restricted set of operations. Therefore, under these conditions, reward may function as a facilitator.

McGraw's hypothesis amounts to a competing response explanation of the data. The suggestion is that reward engenders behavior which is incompatible with the behavior required for adequate performance on heuristically oriented problems. It is possible to apply this model to situations in which we are dealing with subsequent task interest. In such cases, one might reason that subjects subsequently engage in heuristic problems to a lesser extent because during training they learned fewer problem-solving strategies than did unrewarded subjects. Heuristic problems are less interesting to rewarded subjects simply because they may have less success with them.

One problem with this argument, however, is that it is possible to get a decreased play effect when no differences are present between groups during training. Deci (1971), for example, actually found a non-significant increase in performance during training for reward subjects. Weiner and Mander (1975) found no differences between subjects in performance on an anagram task in their study of the effects of punishment upon subsequent task interest. Differences were reported between subjects' performance in Lepper, Greene and Nisbett's (1973) investigation. In that study, expected-reward subjects drew significantly poorer quality drawing (as judged by independent raters) when compared to drawings made by unexpected-reward and no-reward subjects. The point, however, is that the connection between poor task performance and subsequent task interest is not always readily apparent. Subsequent task interest, in some instances at least, appears to decrease in the absence of any performance deficit during training.

An alternative explanation of why the heuristic dimension is important in determining the effect of reward upon subsequent task interest is consistent with self-perception theory. It is necessary to assume, first of all, that there has, in past research, been a correlation between heuristics and task attraction. In the research conducted thus far, the heuristic problems have been ones which have been higher in attractiveness.

Although a positive correlation between the dimension of attractiveness and heuristics is not a necessary condition, it may be more often true than not. Indeed, it is possible for a task to be heuristic and unattractive. Imagine, for example, an unfortunate soldier's task of escaping from behind enemy lines. Also, there may be some individual differences regarding the relative attractiveness of heuristics. For example, subjects from lower socio-economic backgrounds may find heuristic problems relatively less attractive because of a past history of failure with such problems (Spence, 1970). However, in research conducted so far, heuristic problems seem to have been more attractive than algorithmic ones. Perhaps heuristic problems are especially attractive because they are novel and invoke novel solutions. Under conditions of high task attractiveness, the tact elements of the situation predominate and so the introduction of mand elements may be especially noticable. Under these conditions, an individual is likely to assign greater importance to the mand elements and infer that his behavior is, to a greater extent than is perhaps true, under the control of these elements. Kelly's (1973) "discounting principle" would seem to apply here. This principle is a part of Kelly's attribution theory and states that the role of a given cause in producing an effect is discounted when other plausible causes are present. Thus, under conditions when mand elements are perceived to predominate, tact elements are discounted as likely causes of behavior. Subsequent task behavior is, therefore, likely to decrease.

Conversely, under conditions of low task attractiveness, mand elements typically predominate. In this case, the introduction of tact elements are more perceptible than they would be if the proportion of mand and tact elements were more equally balanced. The subject, therefore, infers that the behavior is under the control of these tact elements and his subsequent task interest increases. This is the situation which occurs in most dissonance experiments. The self-perception hypothesis proposed here is, of course, testable and is offered in the interest of stimulating further research.

In the present experiment, subjects were administered the state-anxiety subscale of the State-Trait Anxiety Inventory. The scale was administered as a check on the possibility that the detrimental effects of reward were due to an emotional effect induced by the termination of reward. Such an emotional effect would most likely be short-lived and would not be of considerable theoretical or practical importance. The fact that there were no differences between subjects on this dimension does not necessarily rule out the possibility of a short-term emotional effect. It is possible that such an effect might have been dissipated during the posttest and, therefore, may not have made itself evident on the anxiety subscale. The question of temporary emotional effects is one which should be addressed in future research.

The present experiment revealed no significant main effect for competency. Hypothesis 2, therefore, was not confirmed. The results of questionnaire data, however, seemed to indicate that the manipulation was for the most part successful. Low-competency subjects rated their ability as significantly lower than average and high-competency subjects. The difference between average-competency and high-competency subjects, however, did not reach significance. It is possible that subjects did not attribute much importance to their perceived competence or incompetence. If subjects had been informed that the task was correlated with indices of intelligence, the competency manipulation may have been more effective.

It is also possible that there were individual differences with respect to subjects' reactions to this manipulation. That is, some subjects may have been intimidated by the perception of low-competence and others challenged by it. Similarly, some subjects may have been "spurred-on" by perceptions of high-competence while others may have perceived the high-competence instructions as an indication that the task had been "conquered" and further efforts to test their capabilities were unnecessary. Once again, this is an issue which should be dealt with in future research.

Finally, hypothesis 3 predicted a significant interaction between conditions of reward and competency. It was predicted that the detrimental effects of contingent reward would be offset by the perception of high competency and the beneficial effects of no reward would be offset by the perception of low competency. This prediction was not substantiated because of the fact that a competency effect was not obtained.

In summary, the results of the present investigation revealed a trend in which contingent reward resulted in a detrimental effect upon subsequent task interest when compared to a no-reward procedure. Noncontingent reward also resulted in decreases in subsequent task interest; however, these decreases were not as severe as those demonstrated by the contingent-reward procedure. Although the main effect for reward did not reach conventional levels of significance, the results were suggestive and the problem is deserving of further experimental evaluation.

One area in which future research should be aimed is toward the algorithmic-heuristic dimension of the experimental task. One important question with regard to this issue has to do with the reasons for reward's differential effect upon these two types of problems. One question which has been raised, is the following: "Is the differential effect of reward due simply to differences in task attractiveness, or is the differential effect due to reward's tendency to engender responses which are compatible or incompatible with ongoing behavior?".

The variable of perceived competence in the present investigation had no significant effect upon subsequent task interest. Several explanations of this finding have been offered. Future research might employ a competency manipulation which might encourage a more general sense of mastery. In addition, future research should carefully examine individual differences with respect to the variable of perceived competence.

Finally, one other important issue concerns the permanence of the decreased play effect. Reiss and Shusinsky (1975a, 1975b) have suggested that reductions in subsequent task interest may in some cases be due to a temporary emotional effect due to the withdrawal of reward. The proposition that the decreased play effect is due to a generalized emotional arousal, has not as yet received proper experimental evaluation. This is another issue, therefore, which is worthy of further research.

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FOOTNOTES

[1]Seligman (1975) has suggested that noncontingent reward may lead to learned helplessness since helplessness is said to occur whenever there is independence between behavior and outcome. It should be noted that noncontingent-reward subjects in the present investigation, however, had control over whether or not they received reward. That is, the reward was contingent upon the subjects' participation rather than upon their performance. Therefore, to receive their reward, noncontingent-reward subjects merely needed to continue to participate in the experiment. Since response-outcome independence did not occur in the present study, one would not expect that "learned helplessness" would effect the results.

[2]Inspection of the canonical correlations indicated that the dependent variable of subjects' ratings of their ability correlated .73 with the first cononical variable. The first cononical variable in a multivariate analysis of variance is a composite score composed of weighted scores (discriminant function scores) for all dependent variables in the analysis. A correlation of .73 indicates that the dependent variable of subjects' rated ability accounted for approximately 50% of the variance for the main effect of competency in the multivariate analysis.

APPENDIX A

CODE KEY

Code 1. To break this code, divide the word in half, write the first half backwards and then write the second half backwards.

For example: the word first would look like iftsr.*

Code 2. To break code 2, put the last letter of the word at the beginning and reverse the order of the remaining pairs of letters.

For example: the word first would look like ritsf.

Code 3. To break this code, divide the word in half, write the second half of the letters with wide spaces in between them, write the first half below the letters corresponding to spaces above, and combine the two.

For example: the word first would look like isfrt.* To

decode it: f r t (space around second half)

i s (insert first half)

*You should note that with codes 1 and 3, if the word has an uneven number of letters, as in the example, the second half of the word will always have the extra letter.

APPENDIX B

SUBJECT RESPONSE SHEET

Name____________________________ Date______________

Collection Number____________ Group Number______________

Cartoon One:

Code Sequence: ___ ___ ___

Caption: ____

____

____

____

Cartoon Two:

Code Sequence: ___ ___ ___

Caption: ____

____

____

____

Cartoon Three:

Code Sequence: ___ ___ ___

Caption: ____

____

____

____

Cartoon Four:

Code Sequence: ___ ___ ___

Caption: ____

____

____

____

APPENDIX C

Task Instructions

The experiment you are about to participate in is one in a series of preliminary investigations designed to study problem-solving behavior. We are currently attempting to evaluate the appropriateness of a decoding task for use in future experimentation. Specifically, the task you will be working with today is a decoding exercise in which you will be required to decode the captions for a series of cartoons. Directly in front of you is a code key, describing three codes and providing an example of each. The codes require manipulation of the letters as shown on the code key. Your task, very simply, will be to break the code of the cartoon captions and decipher the words so that the captions make sense. Actually, each caption has been divided into three groups of words and each group uses a different code. Each cartoon caption, therefore, will require the use of all three codes for complete decodification. The order in which the codes are used is of importance and you should attend to the particular sequence of code usage within each caption. For example: a particular caption may be decoded using code 1, followed by code 2 and followed finally by code 3. This then would be a 1,2,3 sequence. Sequences may be arranged in other orders as well; for example, 321 might be another sequence.

Before the start of the experiment, I will randomly select a collection of cartoons for you to decode. The collection will be composed of 12 cartoons arranged in three equal groups. Within each group of four cartoons, the code sequences are arranged in a systematic fashion. If you can determine the principle behind the code sequences, you will be able to decipher the captions more quickly as you will not have to rely upon a trial and error process of code selection. The principle will be the same for all three groups of cartoons so that once you discover the principle, it will apply for all remaining groups. If you do not determine the sequence pattern, however, you can still solve the captions by trying the codes in trial and error fashion but this will take you slightly longer. During the task, you are allowed to use the code key and the scratch paper on the table. Before beginning the actual task, it would probably be helpful for you to practice with a sample cartoon. Before giving you this, however, I should like to point out that some of the cartoons deal with sexual material and if you find this objectionable and would like to withdraw from the experiment now or at any time, you are perfectly free to do so. You will receive your experimental credit even if you choose to withdraw from the study.

APPENDIX D

Name ________________________________

Post-Experimental Questionnaire

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you <u>feel</u> right now, that is, <u>at this moment</u>. There are no right or wrong answers. Do not spend too much time on any one statement, but give the answer which seems to describe your present feelings best.

1=not at all   3=moderately so

2=somewhat   4=very much so

1. I feel calm. 1 2 3 4
2. I feel secure. 1 2 3 4
3. I am tense 1 2 3 4
4. I am regretful 1 2 3 4
5. I feel at ease 1 2 3 4
6. I feel upset 1 2 3 4
7. I am presently worrying over possible misfortunes 1 2 3 4
8. I feel rested 1 2 3 4
9. I feel anxious 1 2 3 4
10. I feel comfortable 1 2 3 4
11. I feel self-confident. 1 2 3 4
12. I feel nervous 1 2 3 4
13. I am jittery 1 2 3 4
14. I feel "high strung" 1 2 3 4

15. I am relaxed 1 2 3 4

16. I feel content 1 2 3 4

17. I am worried 1 2 3 4

18. I feel over-excited and "rattled". 1 2 3 4

19. I feel joyful. 1 2 3 4

20. I feel pleasant. 1 2 3 4

APPENDIX E

Name ______________________________________

Post-Experimental Questionnaire

On some of the questions below, you will be asked to give ratings on a ten point scale. The scale will look like this:

/ / / / / / / / / /

You are to circle the line which most represents how you feel. For example, if you were asked to rate how clearly the experimenter explained the task and you felt she explained it very clearly, you would circle the 10th line.

very unclearly / / / / / / / / / (/) very clearly

Please circle the lines only, not the spaces between lines.

1) Rate the extent to which you found working on the decoding task pleasant or enjoyable.

extremely unenjoyable / / / / / / / / / / extremely enjoyable

2) Rate the amount of time that you spent working on the cartoons of collection 2 during the time when the experimenter was absent from the laboratory.

none of the time / / / / / / / / / / all of the time

3) Rate your ability for the decoding task.

very low ability / / / / / / / / / / very high ability

4) Did you find the cartoons humorous?

none of them / / / / / / / / / / all of them

5) How likely would you be to volunteer for a similar experiment in the future?

very unlikely / / / / / / / / / / very likely

6) Had you ever seen any of the cartoons used in this study before today? How many?

7) Did you know anything about this experiment before participating? Explain.

8) Please mention any suspicions you had concerning this experiment.

APPENDIX F

TABLE 1

Analysis of Variance Summary Table for the Number of Words Decoded During the Treatment Phase of the Experiment

Source	SS	df	MS	F
Reward	17.622	2	8.811	.01
Competency	388.022	2	194.011	.23
Reward x Competency	3392.044	4	848.011	1.01
Error	67835.600	81	837.477	

APPENDIX F

TABLE 2

Analysis of Variance Summary Table for the Number of Cartoons Decoded During the Treatment Phase of the Experiment

Source	SS	df	MS	F
Reward	5.422	2	2.711	.98
Competency	7.222	2	3.611	.50
Reward x Competency	22.244	4	5.561	.81
Error	586.100	81	7.236	

APPENDIX F

TABLE 3

Mean Number of Words Decoded During the Posttest as a Function of Reward and Competency

	Low-Competency	Average-Competency	High-Competency	$\bar{X}$ =
Contingent-Reward	25.5	32.5	44.5	34.17
Noncontingent-Reward	38.9	49.3	52.7	46.97
No-Reward	50.4	77.2	55.8	61.13
$\bar{X}$ =	38.27	53.00	51.00	

APPENDIX F

TABLE 4

Mean Number of Cartoons Decoded During the Posttest as a Function of Reward and Competency

	Low-Competency	Average-Competency	High-Competency	$\bar{X}$ =
Contingent-Reward	1.70	3.00	3.10	2.60
Noncontingent-Reward	3.00	3.70	3.50	3.40
No-Reward	3.20	5.70	3.80	4.23
$\bar{X}$ =	2.63	4.13	3.47	

APPENDIX F

TABLE 5

Hotelling-Lawley's Trace Multivariate Analysis
of Variance Summary Table

Source	S	M	N	df	Approximate F
Reward	2	3.5	35.0	20/142	.75
Competency	2	3.5	35.0	20/142	2.97*
Reward x Competency	4	2.5	35.0	40/282	1.01

*$p < .0002$

APPENDIX F

TABLE 6

Analysis of Variance Summary Table for the Logarithmic Transformation of the Number of Cartoons Decoded During the Posttest Phase of the Experiment

Source	SS	df	MS	F
Reward	.4675	2	.2338	1.1847
Competency	.3677	2	.1839	.9141
Reward x Competency	.3024	4	.0756	.3759
Error	16.2889	81	.2011	

APPENDIX F

TABLE 7

Analysis of Variance Summary Table for the Logarithmic Transformation of the Number of Words Decoded During the Posttest Phase of the Experiment

Source	SS	df	MS	F
Reward	4.829	2	2.415	2.72*
Competency	1.216	2	.608	.68
Reward x Competency	2.371	4	.593	.67
Error	71.982	81	.889	

*$p < .0703$

APPENDIX F

TABLE 8

Chi-Square Contingency Table for Number of Subjects Choosing to Work on Cartoons During the Posttest

	Contingent-Reward	Noncontingent-Reward	No-Reward
Subjects choosing to work on cartoons	EF=16.67 AF=13.00	EF=16.67 AF=16.00	EF=16.67 AF=21.00
Subjects not choosing to work on cartoons	EF=13.33 AF=17.00	EF=13.33 AF=14.00	EF=13.33 AF= 9.00

APPENDIX F

TABLE 9

Analysis of Variance Summary Table for the Number of Words Decoded During the Posttest by Subjects who Chose to Work on the Decoding Task

Source	SS	df	MS	F
Reward	756.3759	2	378.1880	.24
Competency	1305.5988	2	652.7994	.42
Reward x Competency	4571.2774	4	1142.8194	.74
Error	63522.1619	81	1549.3210	

APPENDIX F

TABLE 10

Analysis of Variance Summary Table for the Number of Cartoons Decoded During the Posttest by Subjects who chose to work on the Decoding Task

Source	SS	df	MS	F
Reward	2.1269	2	2.0635	.09
Competency	23.6322	2	11.8161	1.01
Reward x Competency	55.2954	4	13.8239	1.18
Error	478.7750	81	11.6774	

APPENDIX F

TABLE 11

Analysis of Variance Summary Table for Subjects' Ratings on the Subscale of the State-Trait Anxiety Inventory

Source	SS	df	MS	F
Reward	94.489	2	47.245	.60
Competency	292.956	2	146.478	1.85
Reward x Competency	479.044	4	119.761	1.51
Error	6404.000	81	79.062	

APPENDIX F

TABLE 12

Analysis of Variance Summary Table for Subjects' ratings of the extent to which they found working on the decoding task pleasant or enjoyable

Source	SS	df	MS	F
Reward	130.7556	2	65.3778	.84
Competency	236.0222	2	118.0111	1.51
Reward x Competency	386.2444	4	96.5611	1.24
Error	6331.3000	81	78.1642	

APPENDIX F

TABLE 13

Analysis of Variance Summary Table for Subjects' Ratings of the amount of Time They Spent Working on the Decoding Task During the Posttest

Source	SS	df	MS	F
Reward	208.8667	2	104.4334	2.15*
Competency	62.6000	2	31.3000	.64
Reward x Competency	39.7333	4	9.9333	.20
Error	3932.9000	81	48.5543	

APPENDIX F

TABLE 14

Analysis of Variance Summary Table for Subjects' Ratings of how Humorous They Found the Cartoons

Source	SS	df	MS	F
Reward	7.6222	2	3.8111	.57
Competency	6.1556	2	3.0778	.46
Reward x Competency	13.6444	4	3.4111	.51
Error	545.3000	81	6.7321	

APPENDIX F

TABLE 15

Analysis of Variance Summary Table for Subjects' Ratings of How Likely They Would be to Volunteer for a Similar Experiment in the Future

Source	SS	df	MS	F
Reward	62.0667	2	31.0334	.89
Competency	161.8667	2	80.9333	2.31*
Reward x Competency	252.6667	4	63.1667	1.81
Error	2833.4000	81	34.9802	

*$p < .10$

APPENDIX F

TABLE 16

Analysis of Variance Summary Table for Subjects' Ratings of Their Ability for the Decoding Task

Source	SS	df	MS	F
Reward	3.8889	2	1.9444	.59
Competency	107.0889	2	53.5444	16.18*
Reward x Competency	17.6444	4	4.4111	1.33
Error	268.0000	81	3.3086	

*$p < .0001$