IMMEDIATE AND SUSTAINING EFFECTS OF EXTRINSIC REWARDS ON EXPLORATORY BEHAVIOR

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Nature of the Problem

The question of how to motivate a child to pay attention in the classroom has been a major topic of concern to educators for years. The child in the classroom is exposed to numerous sources of stimulation that constantly compete for his attention and try to gain favor in motivating him to perform in a certain fashion.

Over the years educators have employed numerous techniques in an effort to direct and hold the child's attention to the source of stimulation of the teacher's choosing. Many of these techniques consist of increasing the child's motivation by either making nonattending have undesirable consequences or by making attending have desirable ones. The latter method, which is more commonly endorsed in today's American educational systems, is based on the highly defendable premise that the more rewards the child can gain from his efforts, the more likely he is to attend. However, many of the ways used to accentuate the desirability of the source, compel the child to attend for reasons other than the satisfaction that may be derived from involvement with the source itself. Rewards that are foreign are imported and offered to the child in exchange for his attention while rewards that are inherent in working with the source are given little consideration.

Although recognizing the potential and desirability of enhancing the intrinsic quality of the curriculum, many educators justify the use of extrinsic rewards by pointing out that the motivation generated by intrinsic appeal may not be sufficient to continually sustain the level of motivation necessary for the learning required in everyday classroom experiences. Use of a variety of motivational techniques other than sole concentration on intrinsic motivation is encouraged. Day and Berlyne (1971) state:

> Youth dreams of self-fulfillment and a world in which he can find involvement in significant matters. He seeks relevant materials and ways which can help him contribute to the world's well being as well as that of his own. A teacher must not miss the opportunity to utilize these potent motivational forces to move the pupil through periods when the stimulus material has lost some of its intrinsic appear (Day and Berlyne, 1971, p. 325).

Consequently, candy, money, special favors and praise have all been employed and shown effective in commanding attention and increasing learning of children in the classroom (see Bandura, 1969, for an excellent review).

Despite evidence of their effectiveness, techniques employing extrinsic incentives have troubled many educators who contend that increasing the child's motivation by such methods has detrimental side effects. Kruglanski, Friedman and Zeevi (1971), for example, lend evidence to the possibility that the use of extrinsic rewards results in a reduction in the quality of learning.

Another undesirable by-product, and the focal point of the present investigation, is the long range consequences these methods are believed to have on a person's desire to learn. Several educators, from Dewey to Silberman, have maintained that the very intent of education to preserve

the intrinsic interest in learning and exploration in children is undermined by the use of extrinsic rewards (Lepper, Greene and Nisbett, 1973). The child is believed to permanently lose sight of formal education as a means of appeasing his natural curiosity and rather performs as a means of gaining benefits from an external source.

Looking at it from another perspective, Lepper, Greene and Nisbett (1973), for example, have pointed out the possibility that before the intrinsic value of some school related tasks (such as reading) could be utilized, certain basic skills with minimal intrinsic appeal (e.g., letter recognition, word attack skills, etc.) must be learned. It is in this capcity, they argue, that extrinsic rewards prove advantageous. However, Lepper et al. (1973) as well as others (Deci, 1971, 1972; Kruglanski, Alon and Lewis, 1972) have recently provided some empirical evidence that the use of extrinsic rewards for tasks which are already intrinsically interesting, sometimes acts to reduce the amount of intrinsic motivation for later performance of the task. The present investigation attended to this problem. Specifically, the central concern of the present study was to examine both the immediate and sustaining effects, over approximately a two week period, of monetary and social rewards on exploratory behavior.

Need for the Study

Strategies employing extrinsic rewards in the classroom continue to grow in popularity and use. Consequently, the relationship between these rewards and their sustaining effects on a person's intrinsic motivation is both a necessary and desirable one. The problem is

complex and investigations conducted so far are only the beginning of a long line of research that needs to be done.

One of the major criticisms recently cited by Calder and Staw (1975) of the research presently being conducted in this area, is their lack of a theoretically sound definition of intrinsic motivation as an actual psychological process and their operationalization of intrinsic motivation as a dependent variable. Calder and Staw (1975) conclude their critique by stating: " . . . the present experimental evidence is inconclusive though it does provide a basis for further research" (p. 79).

The present study continued this line of research and attempted to delineate alternative methods of defining and measuring intrinsic motivation in examining this problem.

Definition of Terms

Extrinsic Motivation

Motivation resulting in behavior which has a goal external to the act itself is considered extrinsic.

Extrinsic Rewards

Extrinsic rewards are defined as the goal of behavior directed by extrinsic motivation. Two types of extrinsic rewards were operationally defined for the purposes of the present investigation: money and social rewards. Twenty-five cents was paid to one group of subjects for each correct identification in a series of slides which were blurred and tachistoscopically presented to them. Another group received the verbal responses, "that's good," "good" or "you're doing better than average" made by the experimenter for each of their correct responses.

Intrinsic Motivation

Theoretically, the present investigation argues for the possibility of two qualitatively different types of intrinsic motivation: opensure and closure (Suchman, 1971). Opensure motivation is the consequence of arousal resulting from a lack of sufficient stimulation. It behaviorally expresses itself in diverse exploration. Closure motivation is the consequence of arousal resulting from excessive stimulation. One of the major circumstances believed to be responsible for its initiation is cognitive conflict. Closure motivation behaviorally expresses itself in specific exploration.

Both opensure and closure motivation are considered to have a goal inherent in the act itself.

Cognitive Conflict

Cognitive conflict is defined as two or more incompatible responses aroused simultaneously in the person (Berlyne, 1960). It is the major initiator of closure motivation and consists of two factors: (1) response uncertainty, and (2) importance.

Response Uncertainty

Response uncertainty is defined as one of the major components of cognitive conflict and varies as a function of two properties: (1) the total number of competing response tendencies available to the individual and (2) the nearness in strength of the competing response tendencies (Berlyne, 1960). Operationally, the relationship between the two is defined by information theory after Berlyne (1960) as:

$$H = -\Sigma p_{(i)} \log_2 p_{(i)}$$

where H = response uncertainty

$p_{(i)}$ = the probability associated with response tendency i which is measured by the frequency of each class of responses divided by the total number of responses.

The unit of measurement of response uncertainty is "bits."

Importance

Importance is considered to be the second major component of cognitive conflict. It is defined after Schultz (1972) as being determined by (1) how well the elements in conflict have been acquired, and (2) the centrality of the elements in the person's value-belief system.

Exploratory Behavior

Exploratory behavior is defined as a type of behavior generated by either intrinsic or extrinsic motivation or a combination of both. In the present investigation, exploratory behavior was the dependent measure and was operationally defined as the number of additional requests for viewing a series of seven slides in each of two sessions.

Hypotheses

The objective of the present study was to examine the immediate and the sustaining effects of monetary and social rewards on exploratory behavior across varying degrees of cognitive conflict.

The following hypotheses were advanced:

1. When a person is exposed to circumstances which create uncertainty, the number of additional requests for viewing the

slides will significantly increase with an increase in the level of uncertainty, regardless of extrinsic reward conditions.

2. When a person is exposed to circumstances which create uncertainty, the number of additional requests for viewing the slides will significantly increase with an increase in the level of uncertainty, regardless of previous extrinsic reward conditions.
3. Subjects who receive monetary and social rewards during the first session will show significant increases in exploratory behavior over those subjects who receive no extrinsic rewards.
4. Extrinsic reward conditions will not significantly interact with the levels of uncertainty during the first session.
5. Subjects having previously received extrinsic rewards for their performance during session one, will not significantly differ in their requests for additional viewing of the slides from those who had previously received no extrinsic rewards.
6. Sex will not significantly interact with extrinsic reward conditions in predicting the number of requests for additional viewing in session one.
7. Sex will not significantly interact with previous extrinsic reward conditions in predicting the number of requests for additional viewing in session two.

Assumptions and Limitations

It was assumed in the present study that since none of the subjects under the control conditions received any designed extrinsic rewards which may otherwise influence the number of times they requested to view

the stimulus slides, their requests for additional viewings were, for the most part, a function of their cognitive conflict. To help keep extrinsic influences down to a minimum, subjects under all conditions were told that it was not necessary to view the slides more than once if they did not wish. In addition, the responses of the subjects under the control conditions were kept anonymous. This helped reduce any extrinsic incentives that observation by experimenter may have had.

Precautions were also taken to help avoid negative effects which may have influenced the unpaid subjects' performance during the second session as a result of their finding out that some of the subjects were paid during the first session. These are described in Chapter III.

All subjects were exposed to two slide identification sessions approximately two weeks apart. Consequently, two different sets of slides were used. It is assumed that factors other than those included in the uncertainty measurements for the different sets of slides were not responsible for any change in exploratory behavior which may have reflected itself in differences between the control and experimental groups.

Subjects for the study were Oklahoma State University students enrolled in educational psychology courses and who were volunteering their time. Consequently, any limitations concerning the generalizability of the findings should necessarily include the fact that the subjects were volunteers.

CHAPTER II

REVIEW OF RELATED LITERATURE

Introduction

The review of the literature will be divided into two sections: (1) a discussion of the literature related to theoretical models of intrinsic motivation and (2) the research related to the effects of extrinsic rewards on intrinsic motivation.

Theoretical Models

Up until about two decades ago most researches interested in the question of motivation concerned themselves primarily with the interpretation of motives from a very biological perspective (Hunt, 1971). Drive theory, for example, which lays the foundation for an extensive amount of research done in this field, basically postulates four primary drives: hunger, thirst, pain and sex. All of these drives have a basis in the viseral needs of the organism and the replenishing of tissue deficits is described as the primary motive ultimately responsible for the initiation of all behavior. Behaviors directed by forces other than these four primary drives are considered secondary in nature and only gain their powers of motivation through their association with the "big four."

This landmark theory, however, has come under serious question in recent times. White (1959), for example, in his classic treatise on

the state of motivation theory, expresses a concern for the need to expand our view of motivation to account for other than the consummatory needs of the organism. He effectively argues that continually attempting to explain motivation in terms of the four basic primary drives is no longer appropriate when explaining activities such as exploration and manipulation. There is an impressive collection of empirical evidence which supports this position (e.g., Berlyne, 1960; Butler, 1953; Butler and Harlow, 1957; Harlow, Harlow and Meyer, 1950; Montgomery, 1955; and Nissen, 1930). These studies all tend to show that there is a distinct group of behaviors which (1) will occur in the absence of the four basic primary drives or stimuli which has been associated with them or (2) will be worked for as a reward even though they could not be considered to have obtained secondary reinforcement properties.

Since this time, many researchers who wish to maintain the basic structure of drive theory along with the rigors of its physicalistic approach have attempted to name new primary drives to account for these behaviors. Manipulatory drive, exploratory drive and the drive for visual exploration all have emerged in an effort to explain these phenomena (Hunt, 1971). Concern, however, is expressed by traditional drive theorists who envisioned the possible delineation of new lists of primary drives whose purpose would be of little use other than to give a name to the behavior. This would serve no more of a useful purpose than the listing of instincts had done in the early part of the century. This concern is expressed by Bindra (1959) when he writes:

> Exploratory activity seems not to be easily interpretible as a secondary drive acquired on the basis of association with hunger, thirst, sex and pain drives. Some workers have, therefore, resorted to postulating another primary drive to account for exploratory activity . . . if one were

> to continue this procedure of postulating new drives to account for data not easily interpretable in terms of the four primary drives as they are usually listed, one would end by postulating a "problem-solving drive," a "play drive" and perhaps many more (Bindra, 1959, p. 90).

Recognizing this possible pitfall, Hunt (1971) also cautions:

> . . . drive naming may be useful as a way to indicate topical areas, but it is an explanatory blind alley unless the drives named serve to indicate a variety of empirical relationships (Hunt, 1971, p. 6).

He further points out, however, that this dilemma could be avoided and advantage gained by the use of a term such as intrinsic motivation to indicate a general motivational condition which would provide a theoretical foundation for establishing the relationship between these drives. The proposed distinguishing feature of intrinsic motivation and the theoretical thread which ties these drives all together, is that it is not considered to be activated solely by viseral needs but rather has the primary function of servicing the nervous system. Berlyne (1971) writes: " . . . the nervous system, and in particular the brain, has its needs no less than other parts of the body, and intrinsic motivation is bound up in these" (p. 188).

The result of these arguments, as well as arguments maintaining the inability of drive theory to account for an organism's desire to seek out as well as reduce stimulation, has led many to outline more contemporary motivation theories which may be called theories of optimal level functioning (McReynolds, 1971). Some of these theories attempt to be comprehensive enough to consume traditional drive theory while others attempt to supplement it. The commonality among these theories is that they all postulate an optimum level of functioning which an organism endeavors to maintain. Some of these theories concern themselves primarily with an understanding of the psychological phenomenon

of maintaining cognitive consistency while others speak more specifically to the physiological needs to maintain an optimal level of arousal in the central nervous system (Deci, 1975). These two approaches are not incompatible but rather differ mainly in emphasis. While the former deals with the psychological phenomena surrounding intrinsic motivation, the latter draws implications for the physiological basis of these psychological phenomena.

As mentioned above, theorists who describe purely psychological models generally concern themselves with the need of the individual to maintain cognitive consistency. Heider (1958), for example, drawing heavily from Gestalt psychology, speaks about steady and unsteady states. Steady or balanced states exist when cognitive configurations fit together harmoniously. The organism prefers this balanced state and is motivated to resolve states of disequilibrium.

Much research has been generated in recent years as a function of a similar theory advanced by Festinger (1957). His theory of cognitive dissonance also postulates a motivational state resulting from dissonant cognitive elements. Similarly, Kelly (1955) postulates a type of motivation which is primarily generated as a function of the organisms continual attempts to predict and control his experiences.

In a most recent endeavor, Deci (1975) outlines a theory of intrinsic motivation which he calls a theory of cognitive evaluation. Deci argues that intrinsically motivated behaviors are behaviors engaged in by the person in an effort to feel competent and self-determining. His theory goes on to draw the distinction between two separate conditions which arouse intrinsically motivated behavior. The first type, similar to other cognitive theories of motivation, is the consequence

of specific stimulation which results in an incongruity between a person's cognitions and his experiences, behaviors and/or other cognitions. Deci prefers to view these circumstances as inducing a challenge rather than a state of incongruity. The resulting behavior, then, involves "conquering" the challenge. The second type of intrinsically motivated behavior results from too little stimulation and generates "seeking" behavior. "A person who gets no stimulation will not feel competent and self-determining. He will seek out challenge" (Deci, 1975, p. 61). Both types of behaviors, conquering and seeking, are motivated by the singular need to feel competent and self-determining.

The inclusion in Deci's theory of a type of behavior generated by too little stimulation is a valuable effort to not only explain intrinsic motivation in terms of cognitive dissonance or conflict but also to account for an impressive collection of empirical evidence which supports the assumption that states of stimulus deprivation also result in intrinsic motivation (Deci, 1975).

Several other theorists have also distinguished between these two types of antecedent conditions in developing comprehensive theories of intrinsic motivation. One of the most detailed and well thought out comprehensive theories is that of Berlyne (1960, 1963, 1971, 1973). Berlyne's model provides for both a physiological as well as a psychological understanding of intrinsic motivation. It is Berlyne's psychological conceptualization that was used as a model for the present investigation.

From a psychological perspective, Berlyne differentiates between specific and diverse exploration to account for behavior generated by too much or too little stimulation, respectively. Specific exploratory

behavior is the result of conflict which is defined as two or more incompatible responses aroused simultaneously in the person (Berlyne, 1960). The major function of this behavior is to provide information which will reduce conflict. This motivation to acquire information will continue until uncertainty, an essential ingredient of conflict, is reduced to a comfortable or threshold level. "Specific exploration depends on uncertainty and on the conflict that results from uncertainty" (Berlyne, 1971, p. 190).

The degree of conflict aroused in the person is believed to be a function of at least three important elements: (1) the number of the response tendencies available to the person (2) how equal in strength these response tendencies are and (3) the absolute strength of the competing response tendencies. The first two of these variables are defined as uncertainty and with the use of information theory, as suggested by Berlyne (1960), could be empirically investigated by the use of the formula:

$$H = -\Sigma\, p_{(i)} \log_2 p_{(i)}$$

where H = response uncertainty

$p_{(i)}$ - the probability of the i^{th} response occurring.

The unit of measurement for response uncertainty is "bits."

Much empirical evidence has been amassed to validate the use of information theory in predicting specific exploratory behavior (e.g., Driscoll and Lanzetta, 1965; Driscoll, Tognoli and Lanzetta, 1966; Hawkins and Lanzetta, 1965; Sieber and Lanzetta, 1964). One conclusion concerning a general hypothesis formulated from the results of such studies is given by Lanzetta (1971) where he states: ". . . information seeking and processing responses is a monotonic, increasing function of

magnitude of response uncertainty, over a wide range of uncertainty" (p. 136).

It is from the above empirical evidence that the first two null hypotheses for the present study were derived.

1. There will be no significant differences in the number of requests for additional viewing of the slides across varying levels of uncertainty regardless of extrinsic reward conditions.
2. There will be no significant differences in the number of requests for additional viewing of the slides across varying levels of uncertainty regardless of previous extrinsic reward conditions.

The third component of conflict which has been suggested by Berlyne (1960) is postulated to act as a scaling factor in its determination. He expresses its relationship to response uncertainty in the equation:

$$C = H \times \Sigma E$$

where C = conflict

H = response uncertainty

ΣE = absolute strength of competing responses

Berlyne (1960) has implied that this third component is the importance one places on the resolution of the uncertainty. This importance factor has been interpreted by others in several different ways. For example, Lanzetta and Driscoll (1968) and Crawford (1974) define importance in terms of extrinsic influences in the forms of money or ego-threats. However, if one wishes to define the behavior resulting from cognitive conflict as intrinsically motivated, then in keeping with our definition of intrinsic motivation, the importance factor must be defined as one which influences cognitive conflict in such a way as to keep the goal

of the resulting behavior centered on the act itself. If the importance placed on the act results in the desire for an external goal, as in the Lanzetta et al. (1968) and Crawford (1974) studies, then the behavior may be considered to be a reflection of both intrinsic and extrinsic motivation. A definition for the importance factor offered by Shultz (1972) seems to be appropriate for maintaining the distinction. He hypothesizes that importance is determined by (1) how well the elements in conflict have been acquired and (2) the centrality of the elements in the person's value - belief system.

In summary, both uncertainty and importance are theorized to generate cognitive conflict which results in intrinsically motivated behavior with a goal inherent in the act itself. This behavior is defined as specific exploratory behavior.

The second type of intrinsic exploratory behavior identified by Berlyne (1960) is diverse exploration. It is considered to be the result of a lack of a sufficient amount of uncertainty. It is the product of too little stimulation and results in behaviors commonly classed as play and entertainment. It is called diverse because of its nonspecific attempts to generate activity from whatever sources are available.

Effects of Extrinsic Rewards on Intrinsic Motivation

The differentiation between intrinsic and extrinsic motivation is somewhat difficult since both could be stimulated by either internal or external events and many behaviors, including exploratory behavior, could be instrumental in the gratification of either (Berlyne, 1971). As mentioned previously, however, the major distinction may be derived from an

understanding of the desired goal of the resultant behavior. Berlyne (1963) argues that the desired results of intrinsically motivated behavior provides consequences which in themselves are reinforcing. The primary function of these behaviors is to rearrange the stimulus field to provide information or generate activity which will appease the intrinsic motive. The behavior is described as an end in itself. Behaviors which are generated by extrinsic motivation only provide cues for subsequent responses which will in turn provide reinforcement. Extrinsically motivation behavior, then, is only a means to an end.

In recent years, researchers have become interested in the relationship between intrinsic and extrinsic motivation. Immediate thought may lead one to the heuristic conclusion that the two combine to yield a total motivational force. Empirical evidence seems to bear out the fact that behavior does increase with the introduction of extrinsic rewards (Deci, 1971, 1972; Lanzetta and Driscoll, 1968; Lepper, Greene and Nisbett, 1973). A plausible explanation for these findings is that the desire for extrinsic rewards supplements intrinsic with extrinsic motivaltion and the sum of these forces energizes the individual to behavior.

One study of particular importance to the present investigation is the study conducted by Lanzetta and Driscoll (1968). In this particular investigation, Lanzetta et al. used Berlyne's theoretical formula for defining the degree of conflict (see above). From this, they hypothesize that response uncertainty (H) would combine multiplicatively with the absolute strength of competing responses (ΣE) in predicting information search which they define as the behavioral expression of conflict. In their study, male undergraduate volunteers were each given three sets of

tasks: (1) twelve complex decision problems, (2) twenty tachistoscopically presented picture identifications, and (3) thirty-two word guessing problems. The level of response uncertainty was established for each stimulus presentation by use of information theory and measurements of information search were obtained from each subject on each task. This was accomplished by recording the amount of additional information which was sought by the subjects before making a decision. Three treatment groups were exposed to the tasks under different conditions: low importance (LI), high importance-gain (HI-G), and high importance-loss (HI-L). Lanzetta et al. assume extrinsic influences to be a reasonable interpretation of importance. LI was defined as presenting the subjects with instructions which deemphasized the importance of the tasks. This was accomplished by explaining to the subjects that there was no strict criteria for correct or incorrect answers and that the experimenters were just measuring the different ways in which people make decisions. The HI-G group was instructed that they would receive ten cents for each correct response and that there was no specific requirement as to how they were to arrive at their answers. The HI-L group received instructions which the authors called ego-threatening. They were told that the tasks discriminate between inferior and superior decision makers which related to their effectiveness as leaders. The results of the study indicate that both HI-G and HI-L groups increased search over the LI group by approximately a constant amount. This suggests that uncertainty and importance combine in an additive rather than a multiplicative fashion in predicting information search.

However, as argued previously, if one wishes to draw a distinction between intrinsic and extrinsic motivation and view cognitive conflict

as generating a form of intrinsic motivation, the results of the above study may be reinterpreted as the combined effects of extrinsic influences and uncertainty on information search.

In a more recent study by Crawford (1974), similar findings were reported concerning how extrinsic exploratory behavior appears to summate with specific exploratory behavior by a constant amount across varying levels of uncertainty.

The third and fourth null hypotheses for the present investigation are drawn from these findings.

3. There will be no significant difference in the number of requests for additional viewings across varying extrinsic reward conditions during the first session.
4. Extrinsic reward conditions will not significantly interact with levels of uncertainty during the first session.

Although given that extrinsic rewards increase behavior on intrinsically interesting tasks, several have argued that the combination results in an undesirable by-product. DeCharms (1972) argues, for example, that when a person receives an external reward for an inherently interesting task, the locus of control shifts to the agent in charge of the reinforcement and consequently reduces the intrinsic quality of the task. This is believed to show itself when the extrinsic rewards are removed. Festinger (1957) takes a similar position while arguing from his theory of cognitive dissonance. He believes that a person's attitude toward his work will change in such a way as to reduce the initial amount of intrinsic motivation when provided with external rewards for his performance.

This position has recently received some mixed empirical support. While tangible rewards such as money seems to decrease performance on an initially interesting task once the rewards are removed, social rewards seem to increase later performance for male subjects but decrease it for females.

In one study, for example, Deci (1971) examined what lasting effects money and social rewards have on what he calls an interesting and enjoyable task. The study reports two laboratory investigations. One tested the effects of monetary rewards while the other tested the effects of social rewards on intrinsic motivation. The task for each investigation consisted of a puzzle which the subjects were asked to assemble in different configurations under different conditions. In the first investigation, the experimental group was paid for their work, while the control group of subjects received only the intrinsic satisfaction obtained from their involvement with the task. The dependent measure was the amount of time the subjects later engaged in the task after they believed the experiment to be concluded and while they were left alone to wait for the results of their performance. During this period they were free to do as they pleased. The author reports "they could read magazines, work on the puzzle, stare around the room, and so on" (Deci, 1971, p. 109). The results of the study show a marginally significant decrease in the amount of free time the paid subjects spent with the task over those who received no extrinsic rewards.

In the second investigation, all conditions remained the same except the experimental group received social rewards instead of money for their efforts. This was accomplished by continually telling the subjects they were doing very good and that they were performing better than average

on the tasks. These subjects subsequently showed significant gains in involvement with the task during the free time period over a control group.

Deci draws theoretical implications for his studies in terms of cognitive evaluation theory (1975). This theory, as stated previously, defines intrinsically motivated behavior as that which allows a person to feel competent and self-determining and asserts that extrinsic rewards can affect intrinsic motivation by changing the perceived locus of causality and/or feelings of competence (Deci, 1975). When the locus of causality shifts from the person who is performing the task to an external agent, the person is believed to lose his intrinsic interest for the task. It is further argued that even if the person maintains his perception of control, a decrease in intrinsic interest can be experienced if the person receives negative feedback which reduces his confidence in performing the task (Deci, 1975). Conversely, if the person maintains his perception of control but receives positive feedback, his intrinsic motivation for the task will increase.

In the 1971 study, Deci argues that the locus of causality shifted when the subjects received money for their efforts and consequently resulted in a reduction in the intrinsic appeal of the task. Social rewards, however, were not perceived by the subjects as controlling but rather provided positive feedback which resulted in an increase in intrinsic motivation.

In a similar investigation conducted with preschool children (Lepper, Greene and Nesbett, 1973), it was again found that children played less frequently with magic markers when they were previously induced to perform an already interesting task with the promise of an

extrinsic reward. The extrinsic reward was in the form of a good player award which consisted of a gold star and red ribbon on which the experimenters wrote the child's name and school and hung on an honor roll board. The measurement of intrinsic interest was obtained by recording the amount of time the child later spent in free play with the felt tip pens.

The theoretical implications discussed by Lepper et al. are similar to those of Deci (1975). Drawing from Bem's (1965) self-perception theory, they argue that when no external rewards are provided, the person infers that his behavior was self-directed. While under the influence of extrinsic rewards the person infers that his behavior was directed by some external pressure and that he engaged in the activity in order to obtain some extrinsic goal (Lepper, Greene and Nesbett, 1973). This, in effect, was theorized to be the reason for the decrease in further involvement with the task.

Deci's cognitive evaluation theory argues for the possibility of two distinct antecedent conditions responsible for the instigation of intrinsic motivation. As mentioned previously, the first is the consequence of a challenge and results in conquering behavior while the second is the consequence of boredom and results in seeking behavior. However, the desired end state of both intrinsically motivated behaviors is to satisfy a need to feel competent and self-determining. Consequently, since the aim of both behaviors is the same, Deci does not seem to feel it necessary to distinguish which of the antecedent conditions induced the intrinsic motivation responsible for the results of his studies. No mention is made as to whether the person was intrinsically motivated to conquer or seek. If the intrinsic motivation generated by either a

poverty or wealth of stimulation has a singular goal than the distinction is unimportant. However, other researchers argue the contrary.

Berlyne (1971) theorizes that specific exploratory behavior is spurred by a short term emergency and is keyed to the resolution of a specific source of stimulation which is overly complex or deviates sufficiently from the person's expectations. It is aimed at information which will fulfill the immediate needs of the person and has as its goal the reduction of the high degree of uncertainty attached to a specific stimulus or set of stimuli. Diverse exploration, on the other hand, is generally not an urgent need and seems to have no specific source of stimulation to which the person is compelled to attend. The aim of diverse exploratory behavior appears to be the creation of a limited amount of uncertainty by casual involvement with available stimuli and manifests itself in activities commonly referred to as play or entertainment. Berlyne (1971) cites the necessity for this distinction by arguing:

> One piece of evidence for the biological and psychological significance . . . is the difference in order of priority. Play generally comes low down on the list . . . This is not true of specific exploration. There are plenty of experiments showing that animals seeing something new or unusual will interrupt eating to explore, even when they are very hungry (p. 196).

The motivation resulting in specific exploratory behavior, then, may be generally viewed as more demanding and having a different goal than that resulting in diverse exploratory behavior. Consequently, Berlyne lays the theoretical foundation for two qualitatively different types of intrinsic motivation, each having its own desired end state.

Similar distinctions have been made by other authors. Suchman (1971) for example, classifies what he calls the sensory-cognitive

motivational system into two categories. First he identified cognitive closure as: ". . . the motivation to resolve a conflict, to allay a doubt, to find the answer, to achieve enough certainty to either turn away to something new or to take action upon a conclusion" (Suchman, 1971, p. 68). Suchman (1971) differentiates this from cognitive-opensure motivation. He writes:

> This motivation to experience, to sense, feel, think, explore, or play, belongs to sensory-cognitive motivational system but seems so different from closure. The person seeks to expand and continue rather than to narrow and cnnclude. He does not try to know so he may act. He acts so that he may experience. It is so anticlosure in its manifestation I have termed it "opensure" (Suchman, 1971, p. 69).

Another necessity for the distinction may be found in Fiske and Maddi's (1972) activation theory. They suggest the possibility that under moments of high uncertainty a person's level of activation rises and motivates him to decrease this high level to its customary level by trying to integrate the information at hand. When a person's level of activation falls below its customary level, he is motivated to raise the level by the process of differentiation.

Consequently, it may be theorized that there are two different antecedent conditions which result in two different types of intrinsic motivation which in turn express themselves in different behaviors for different reasons. Situations involving stimuli which create a high degree of uncertainty, motivate the person to integrate information to reach some conclusion about a specific source of stimulation and is generally more demanding than situations involving no specific stimuli of immediate concern.

In the light of the above theoretical position, the antecedent conditions used to establish intrinsic motivation would be of much importance in determining the type of intrinsic motivation and the goal of

the consequent behavior. On reviewing the Deci (1971, 1972) and Lepper et al. (1973) studies, it could be argued that the types of motivation induced in these experimental situations may be defined after Suchman (1971) as opensure and resulted in diverse exploratory behavior. In the studies by Deci (1971, 1972), the subjects were left by themselves in the experimental room to do as they pleased (read a magazine, etc.). In the Lepper et al. study (1973) the children were allowed to play with whatever they wished.

> . . . the studies presented so far by Deci and his associates and by Lepper et al. used as their measure of intrinsic motivation the amount of time which subjects spent working on the target activity in a free-choice situation where there were other things to do . . . (Deci, 1975, p. 148).

Consequently, it may be argued that none of these investigations examine the sustaining effect of extrinsic rewards on closure motivation.

The above discussion provides the theoretical justification for the fifth null hypothesis to be investigated in the present study:

5. Subjects having previously received extrinsic rewards for their performance during the first session will not differ significantly in their requests for additional viewing during the second session from those who had previously received no extrinsic rewards.

In two other studies reported by Deci (1975) the sex of the subject was shows to be an important factor in determining whether social reinforcement would increase or decrease intrinsic motivation. When females receive social rewards for performing an intrinsically interesting task, their later interest seems to decrease while the opposite is true for males. The sex of the person administering the social rewards does not seem to make a difference.

Again, arguing from his cognitive evaluation theory, Deci (1975) interprets these results as a difference in the perceived locus of causality. He hypothesizes that females, because of their history of social development, are more dependent on social rewards than males. Consequently, social rewards shift the locus of causality in females to the external agent. This is not believed to happen with male subjects.

As mentioned previously, however, the motivation generated in the Deci studies may be considered opensure motivation. Consequently, sex differences appears to interact with extrinsic rewards in affecting opensure motivation. However, if there is a difference between opensure and closure motivation, sex differences will not necessarily have the same effect. Since closure motivation is conceived as the consequence of a specific source of stimulation to which the person attends, it is presently theorized that behavior resulting in the resolution of any uncertainty involving that source will be perceived as intrinsically motivated. The locus of causality, then, will not shift with the introduction of supplemental inducements. Consequently, sex differences are not hypothesized to be a differentiating factor in the generation of specific exploratory behavior. Stated in the null:

6. Sex differences will not significantly interact with extrinsic reward conditions in predicting the number of requests for additional viewing in the first session.
7. Sex differences will not significantly interact with previous extrinsic reward conditions in predicting the number of requests for additional viewing in session two.

CHAPTER III

DESIGN AND METHODOLOGY

Introduction

Literature cited in the preceding chapter has established the theoretical basis for the investigation of intrinsic motivation and arguments concerning the effects of extrinsic rewards on intrinsic motivation. The present chapter describes the research methodology and design which was employed in the present study. Included is a description of the subjects and procedures, independent variables, dependent variable and the experimental design.

Subjects and Procedures

The experiment was conducted during the spring semester of 1976 at Oklahoma State University. The subjects were 80 undergraduate volunteers enrolled in upper division educational psychology classes. Each of the subjects, when they were recruited, were told that they would be required to attend one or two sessions of not more than fifteen minutes each. From the total population of volunteers, twenty were randomly selected and assigned to a standardization group which defined the degree of response uncertainty elicited by each slide for the population. From the remaining volunteers, ten males and ten females were randomly assigned to one of three treatment groups: (1) no extrinsic rewards (NER) (2) extrinsic rewards-money (ER-M), and (3) extrinsic rewards-social (ER-S).

In order to help avoid motivational shifts as a function of the unpaid subjects learning that some of the subjects were paid, each treatment group was composed of members from the same classes. A similar procedure has been employed by Deci (1971). To reduce the possibility of confounding as a result of all the subjects in each of the extrinsic reward conditions being members of the same class, subjects were randomly drawn from three classes for each treatment condition.

Both the standardization and treatment groups were exposed to the same experimental setting. Each subject was seen individually. They were brought to the experimental room and seated at a desk approximately four feet in front of a projection screen. The experimenter was seated next to the subject at a table with a Kodak carousel projector on it. Before viewing any slides, the subject was read those instructions appropriate for his or her group[1] and given a piece of paper and a pencil.

The standardization group was seen only one time before the treatment groups. They were shown fifty-two out of focus slides of animals which were tachistoscopically presented. After showing each slide, they were required to guess the identity of the animal. They were shown the slides at proper exposure after their guess if they wished. The responses of the subjects were kept anonymous by screening the experimenter, not having them use any identifying marks on their answer sheet and by having them seal their answers in an envelope and placed in a box with other similar envelopes at the conclusion of the session.

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[1]For the exact texts see Appendix A.

Subjects in the treatment groups were seen on two separate occasions approximately two weeks apart. During the first session, all the subjects viewed nine out of focus tachistoscopically presented slides of animals (the first two slides were practice slides) whose identity they tried to guess. Subjects in all treatment groups were told that they could view the slides as little as once or as many as twenty times before making their guess. The instructions deemphasized the importance of how many times it was appropriate to view the slides before guessing. Each subject was shown the slide at correct exposure if he or she wished. During the presentation, the experimenter marked down the number of additional requests for viewing made by each subject for each slide without the subjects' knowledge.

In addition to the general instructions, which were read to all, subjects in the ER-M group were told that they would receive twenty-five cents for each of their correct responses. At the end of the session, the number of correct responses was counted by the experimenter and the money paid.

During the slide presentation, the responses of subjects in the ER-S group were observed by the experimenter and social rewards dispensed contingent on correct responses. Subjects in the NER group received no designed extrinsic rewards and their responses were kept anonymous in the same way as was described for the standardization group.

Throughout the second session none of the subjects received extrinsic rewards. Subjects who were previously paid were told that there was only enough money available to pay them for one session. This procedure is similar to that employed by Deci (1971). All responses during the second session for all subjects were kept anonymous. During all slide

presentations, the out of focus level as well as the time per exposure was held constant.

Independent Variables

Extrinsic Rewards

Extrinsic rewards were manipulated by the actual dispensing of the social and monetary rewards during and after the viewings, respectively.

Response Uncertainty

A procedure similar to that employed by Lanzetta and Driscoll (1968) was used to define response uncertainty. The responses given by the standardization group were used to define the population's response uncertainty to each of the slides. The responses obtained from these subjects were given to three independent judges[2] who were instructed to sort the responses into similar groups when the responses indicated the subjects saw the same thing. A response uncertainty estimate was computed for each picture for each judge. This was done by use of the formula:

$$H = -\sum p(i)\log_2 p_{(i)}$$

where $p_{(i)}$ is the probability of i^{th} response

Agreement in response uncertainty between the three judges was assessed by product-moment correlations. The amount of response uncertainty for each slide was calculated by an average of the three measures and

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[2]The author, his wife and a graduate student.

rounded off to the nearest .5 interval. Two slides for each .5 interval from .5 to 3.5 bits inclusive were selected for use in the experiment. The two slides at each interval were then randomly divided to make two sets of seven slides. Two practice slides were used at the beginning of each set. One set was used for the first session and the other for the second session.

Sex

Sex of the subject was an independent variable investigated in the present study. Ten male and ten female subjects were assigned to each of the three extrinsic reward condition groups.

Dependent Variable

The number of additional requests for viewing the slides was the dependent measure in this study.

Experimental Design

A 7 x 3 x 2 factorial design with repeated measures on the seven-level factor was the statistical method employed to analyze the data collected during the first session. The first factor represented the seven levels of uncertainty, the second represented the three extrinsic reward conditions while the third represented the sex of the subject. A similar design was employed for data analysis after the second session. To differentiate the three no extrinsic reward conditions during this session, those subjects who had previously received money for their performance are referred to as PER-M, those who had

previously received social rewards are referred to as PER-S while PNER is used to denote those in the control group.

The confidence levels used to establish significance in the present study were .05 and .01.

CHAPTER IV

STATISTICAL RESULTS

Introduction

This chapter contains a detailed account of the statistical treatment of the data, the analysis of the results, and the extent to which the various hypotheses were supported. The chapter is divided into three major sections: the first presents the results of the interjudgmental correlations for standardizing the slides, while the second and third sections present the results of the two factorial designs used to analyze the data from the first and second sessions, respectively.

Standardization Session

Pearson product-moment correlations were used in the present study to help ascertain the reliability of the judged estimate of uncertainty for each of the fifty-two slides used in the standardization session. As the coefficients in Table I indicate, there was very high agreement among the three independent judges.[1]

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[1] Uncertainty estimates for each judge for each slide is presented in Appendix B.

TABLE I

PEARSON PRODUCT-MOMENT CORRELATION COEFFICIENTS
RELATING UNCERTAINTY ESTIMATES AMONG JUDGES

	Judge 1	Judge 2	Judge 3
Judge 1	---	.97	.95
Judge 2	---	---	.96

First Session

The data collected during the first session were analyzed by means of a 7 x 3 x 2 split plot analysis of variance design with repeated measures on the seven-level factor (Kirk, 1968). The between subjects, independent variables consisted of extrinsic reward conditions [extrinsic rewards-money (ER-M), extrinsic rewards-social (ER-S), and no extrinsic rewards (NER)] and sex (male and female). The within-subjects independent variable was uncertainty (.5, 1.0, 1.5, 2.0, 2.5, 3.0, and 3.5 bits). The dependent variable was the number of additional requests for viewing each of seven slides. The results of the analysis of variance are reported in Table II. The hypotheses of concern and the results bearing on each hypothesis are presented below.

1. When a person is exposed to circumstances which create uncertainty, the number of additional requests for viewing the slides will not significantly increase with an increase in the level of uncertainty, regardless of extrinsic reward conditions.

TABLE II

SUMMARY OF THE ANALYSIS OF VARIANCE ON NUMBER OF REQUESTS FOR ADDITIONAL VIEWING DURING SESSION ONE

Source	Degrees of Freedom	Mean Square	F
Extrinsic reward condition	2	262.77	7.54**
Sex	1	23.81	.68
Extrinsic reward condition x Sex	2	56.73	1.63
Error (between)	54	34.87	--
Uncertainty	6	443.51	52.67**
Uncertainty x Extrinsic reward condition	12	20.49	2.43**
Uncertainty x Sex	6	1.81	.22
Uncertainty x Sex x Extrinsic reward condition	12	11.12	1.32
Error (within)	324	8.42	

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

This hypothesis predicted no main effect for uncertainty. However, as Table II indicates, support for not accepting this null hypothesis was found ($F = 52.67$, $df = 6/324$, $p < .05$). The table of means of the additional requests for viewing at the seven levels of uncertainty (Table III) shows an erratic but definite increase in requests with an increase in uncertainty. The glaring exception is at the 3.0 bits level.

TABLE III

NUMBER OF REQUESTS FOR ADDITIONAL REQUESTS FOR VIEWING MEANS FOR VARIOUS LEVELS OF UNCERTAINTY IN SESSION ONE

	Levels of Uncertainty						
	.5	1	1.5	2	2.5	3	3.5
Additional Viewing Means	2.31	1.47	2.35	7.33	5.92	.93	6.89

3. There will be no significant difference in the number of requests for additional viewings across varying extrinsic reward conditions during the first session.

This hypothesis predicted no significant main effect for extrinsic reward condition. As Table II indicates, this null hypothesis was not supported as the main effect for extrinsic reward condition was significant ($F = 7.54$, $df = 2/54$, $p < .05$). A further analysis of the effects

of extrinsic reward condition is undertaken below in the analysis of its interaction with levels of uncertainty.

4. Extrinsic reward condition will not significantly interact with the levels of uncertainty during the first session.

This null hypothesis was not supported as the extrinsic reward condition by level of uncertainty interaction was found to be significant ($\underline{F}$ = 2.43, $\underline{df}$ = 12/324, $\underline{p} < .05$). An analysis of the simple main effects for this interaction are shown in Table IV. As indicated, there was no significant differences in the extrinsic reward condition up the the 2.0 bits level of uncertainty. However, between 2.0 and 3.5 bits, significant differences were indicated (except at the 3.0 bits level). As suggested by Kirk (1968) a comparison of means was undertaken by use of Tukey's ratio. An analysis of these results (Table V) as well as an analysis of Figure 1, indicates that at all significant levels, both the ER-S and the ER-M groups requested significantly more viewings of the slides than the NER group. There was no significant difference between the ER-S and the ER-M groups at these significant levels. It can also be seen from Table V and Figure 1 that the number of requests for additional viewing increased with increases in uncertainty for each of the three extrinsic reward conditions.

6. Sex will not significantly interact with extrinsic reward conditions in predicting the number of requests for additional viewing in the first session.

As indicated in Table II, support for this null hypothesis was found ($\underline{F}$ = 1.63, $\underline{df}$ = 2/54, $\underline{p} > .05$).

TABLE IV

SUMMARY OF SIMPLE MAIN EFFECTS ANALYSIS FOR EXTRINSIC REWARD CONDITION BY UNCERTAINTY

Source	df	MS	F
Between subjects:			
Between extrinsic reward conditions at .05	2	27.12	2.14
at 1	2	7.75	.64
at 1.5	2	17.56	1.44
at 2	2	99.12	8.12**
at 2.5	2	112.12	9.19**
at 3	2	1.87	.15
at 3.5	2	120.22	9.85**
Within cell	378	12.2	--
Within subjects:			
Between uncertainty at (ER-M)	6	199.53	23.70**
at (ER-S)	6	219.98	26.13**
at (NER)	6	64.99	7.72**
Error (within)	324	8.42	

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

TABLE V

TUKEY'S COMPARISON OF ADDITIONAL REQUESTS FOR VIEWING MEANS FOR EXTRINSIC REWARD CONDITIONS AT 2.0, 2.5 AND 3.5 BITS OF UNCERTAINTY

		Extrinsic Reward Conditions		
		ER-M	ER-S	NER
Level of Uncertainty	2.0 bits	8.0a	9.15a	4.85b
	2.5 bits	6.25a	8.1a	3.4b
	3.5 bits	9.1a	7.3a	4.25b

Note: Means having different letter subscripts at each level of uncertainty differ from each other at the .05 level.

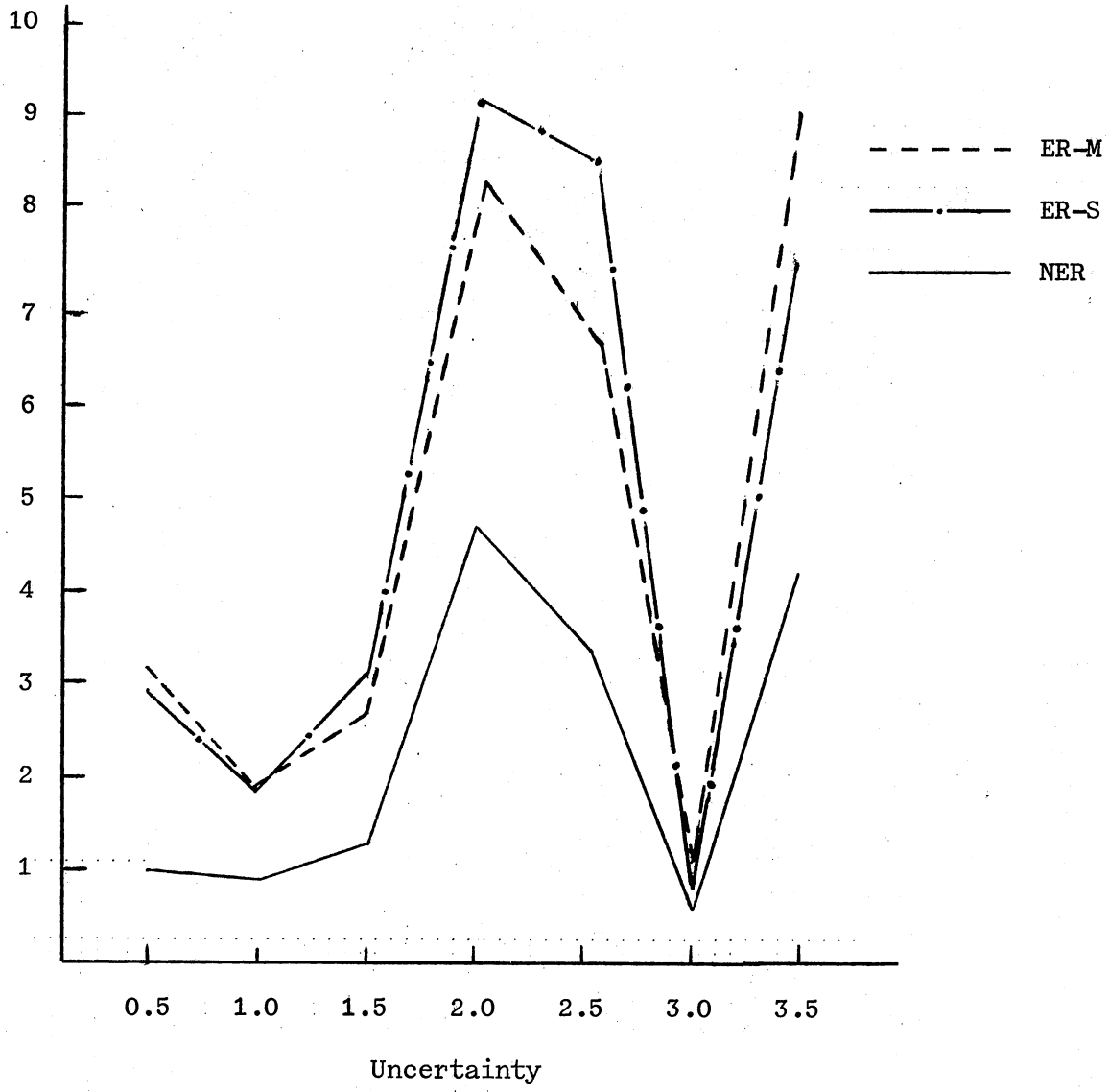

Figure 1. Mean Number of Additional Requests for Viewing as a Function of Uncertainty and Extrinsic Reward Condition

Second Session

The data collected during the second session were also analyzed by a 7 x 3 x 2 split plot analysis of variance design with repeated measures on the first factor. The seven and the two level factors again represented uncertainty and sex, respectively; while the three level factor represented previous extrinsic reward conditions [previous extrinsic rewards-money (PER-M), previous extrinsic rewards-social (PER-S), and previous no extrinsic rewards (PNER)]. The dependent measure was, again, the number of additional requests for viewing each of seven slides. The results of the analysis of variance appears in Table VI. The results bearing on each hypothesis are presented below.

2. When a person is exposed to circumstances which create uncertainty, the number of additional requests for viewing the slides will not significantly increase with an increase in the level of uncertainty, regardless of previous extrinsic reward conditions.

This null hypothesis predicted no main effect for uncertainty during the second session. Table VI indicates, however, that support for not accepting this null hypothesis was found ($\underline{F} = 16.03$, $\underline{df} = 6/324$, $\underline{p} < .05$). As the table of means of additional requests for viewing across the seven levels of uncertainty shows (Table VII), there was again (as in the first session) a definite but erratic increase in requests as uncertainty increased.

5. Subjects having previously received extrinsic rewards for their performance during session one, will not differ significantly in their requests for additional veiwing of the slides from those who had previously received no extrinsic rewards.

TABLE VI

SUMMARY OF THE ANALYSIS OF VARIANCE ON NUMBER OF REQUESTS FOR ADDITIONAL VIEWING DURING SESSION TWO

Source	df	MS	F
Previous Extrinsic Reward Condition	2	210.26	5.55**
Sex	1	2.6	.07
Previous Extrinsic Reward Condition x Sex	2	52.16	1.38
Error (between)	54	37.92	—
Uncertainty	6	90.88	16.03**
Uncertainty x Previous Extrinsic Reward Condition	12	10.87	1.92*
Uncertainty x Sex	6	11.15	1.97
Uncertainty x Sex x Previous Extrinsic Reward Condition	12	55.45	9.78**
Error (within)	324	5.67	—

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

TABLE VII

NUMBER OF REQUESTS FOR ADDITIONAL VIEWING MEANS FOR VARIOUS LEVELS OF UNCERTAINTY IN SESSION TWO

	Levels of Uncertainty						
	.5	1	1.5	2	2.5	3	3.5
Additional Viewing Means	1.82	3.47	3.45	3.33	5.38	5.25	4.12

As indicated in Table VI, support for not accepting this null hypothesis was found ($F = 5.55$, $df = 2/54$, $p < .05$). A more detailed analysis of these results are included in the analysis of the three-way interaction below.

7. Sex will not significantly interact with extrinsic reward conditions in predicting the number of requests for additional viewing in the second session.

This null hypothesis was supported (Table VI) as the previous extrinsic reward conditions by sex interaction was not significant ($F = 1.38$, $df = 2/54$, $p > .05$). However, in light of the significant three-way interaction between sex, uncertainty and previous extrinsic reward conditions ($F = 9.78$, $df = 12/324$, $p < .05$), the contribution of sex to the overall findings must be analyzed. Further examination of some of the simple main effects for the three-way interaction are reported in Table VIII. When the effects of previous extrinsic reward conditions are examined at each level of uncertainty for males and females separately, the

TABLE VIII

SUMMARY OF RELEVANT SIMPLE MAIN EFFECTS ANALYSIS FOR SEX BY UNCERTAINTY BY PREVIOUS EXTRINSIC REWARD CONDITIONS

Source	df	MS	F
Between subjects:			
Between previous extrinsic reward conditions for females at .5	2	3.24	.32
at 1	2	64.3	6.25**
at 1.5	2	39.7	3.86*
at 2	2	19.04	1.85
at 2.5	2	36.64	3.56*
at 3	2	109.9	10.69**
at 3.5	2	21.04	2.05
Between previous extrinsic reward conditions for males at .5	2	1.24	.12
at 1	2	15.44	1.5
at 1.5	2	22.3	2.17
at 2	2	18.44	1.79
at 2.5	2	17.04	1.66
at 3	2	7.3	.71
at 3.5	2	14.7	1.43
Within Cell	378	10.28	
Within Subjects			
Between uncertainty and previous extrinsic reward conditions for female	12	13.42	2.37**
for male	12	2.70	.48
Error (within)	324	5.67	

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

reason for the interaction becomes apparent. As Table VIII indicates, there was no significant difference in requests for previous extrinsic reward conditions at any level of uncertainty for males nor was there an interaction between previous extrinsic rewards conditions and uncertainty. For females, however, the effects were quite different. Previous extrinsic reward conditions interacted with uncertainty and an analysis of the simple main effects for the previous extrinsic reward conditions at each level of uncertainty for females showed significance at four of the seven levels (1.0, 1.5, 2.5, and 3.0 bits).

The results of a comparison of means using Tukey's ratio at each of the significant levels (Table IX) and an analysis of Figure 2, showed that there was no significant differences between the PER-M and PNER groups while at all four of these significant levels the PER-S group outsearched the PNER group. There was significant differences between PER-S and PER-M at all significant levels except at 2.5 bits of uncertainty.

TABLE IX

TUKEY'S COMPARISON OF ADDITIONAL REQUESTS FOR VIEWING MEANS FOR PREVIOUS EXTRINSIC REWARD CONDITIONS FOR FEMALES AT 1.0, 1.5, 2.5 AND 3.0 BITS LEVELS OF UNCERTAINTY

		Previous Extrinsic Reward Conditions		
		PER-M	PER-S	PNER
Level of Uncertainty	1.0 bits	2.4a	6.4b	1.7a
	1.5 bits	2.7a	6.2b	2.8a
	2.5 bits	5.2ab	6.2a	2.5b
	3.0 bits	4.7a	9.4b	3.0a

Note: Means having different letter subscripts at each level of uncertainty differ from each other at the .05 level.

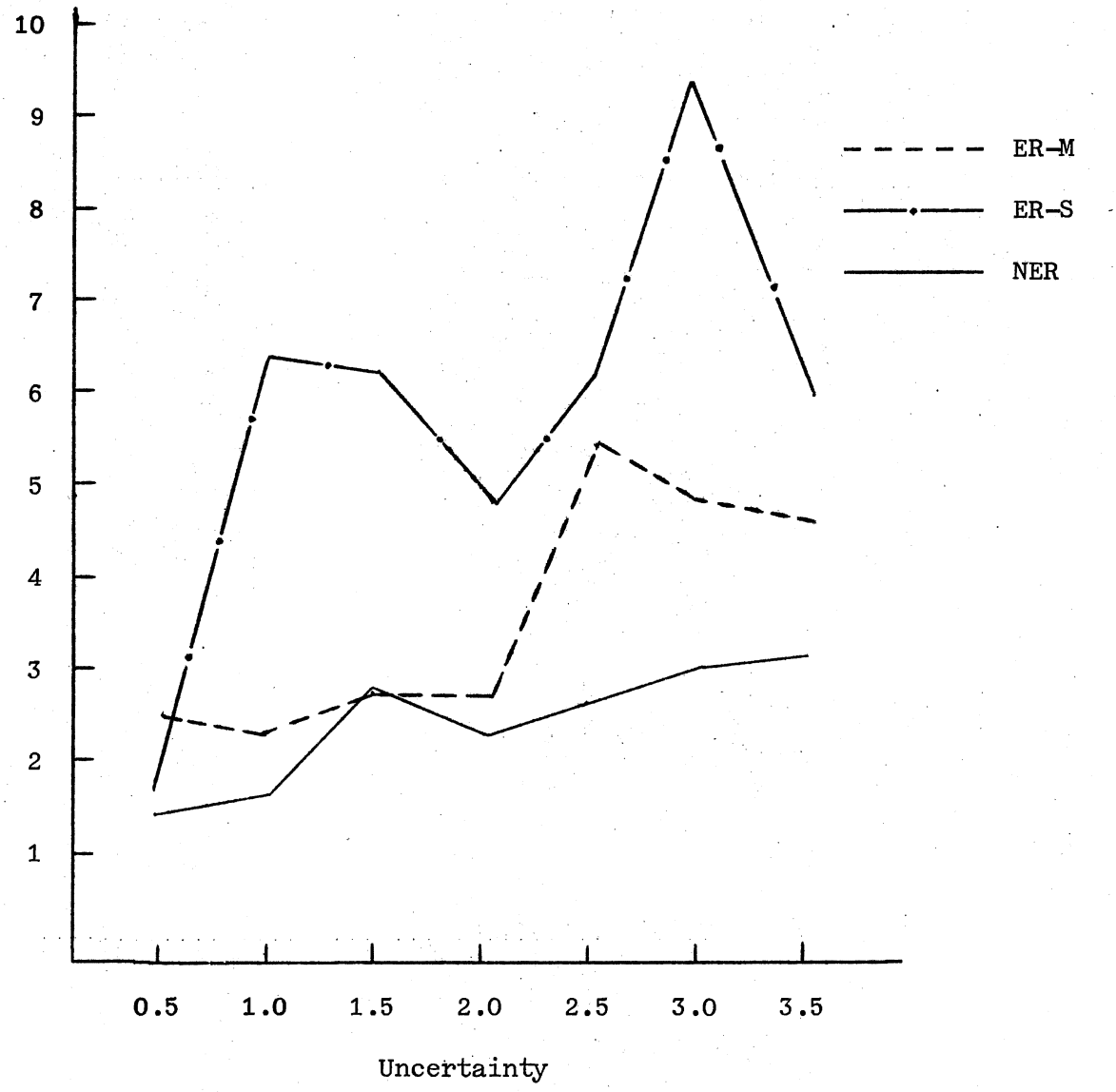

Figure 2. Mean Number of Requests for Additional Viewings for Females as a Function of Uncertainty and Previous Extrinsic Rewards Condition

CHAPTER V

DISCUSSION AND IMPLICATIONS

Introduction

The major purpose of the present investigation was to examine the effects of extrinsic rewards and the removal of extrinsic rewards on exploratory behavior. The theoretical positions of Berlyne (1960, 1963, 1972, 1973), Maddi (1972) and Suchman (1971) as well as the empirical findings of Lanzetta (1972) and his associates, were used to develop the hypotheses of concern. The present chapter is divided into four major parts. The first two parts contain a discussion of the findings from sessions one and two as detailed in Chapter IV. Part three revolves around the educational implications of the findings while part four discusses direction for future research.

First Session

It was predicted in the present study that exploratory behavior would increase as the level of uncertainty increased. Uncertainty was defined as an essential component of cognitive conflict which is theorized to be the major initiator of closure motivation. Although this hypothesis was generally borne out with the higher levels of uncertainty generating more exploratory behavior than the lower levels, the progression across increasing levels of uncertainty was not always consistent. Some slides with less uncertainty produced more exploration than

some slides with greater uncertainty. These findings, however, are consistent with other empirical findings reported in the literature which use information theory to define uncertainty. In the Lanzetta and Driscoll (1968) study, for example, three different tasks were used to examine the relationship between search (exploration) and uncertainty. Search on all three tasks was erratic across varying levels of uncertainty. These findings as well as those from the present investigation suggest that exploration does increase with an increase in uncertainty but that there are components in the stimulus presentations other than those accounted for in the uncertainty measurement which also influence exploration. Factors such as complexity, novelty and aesthetic quality appear to also generate closure motivation and cause variations in exploration.

The most glaring example of this deviation was the 3.0 bits slide used in the first session. However, this deviation could best be accounted for by an error in the methodology of the present study. During the standardization session this slide which proved to generate 3.0 bits of uncertainty was the first slide presented to the standardization subjects. Consequently, the surprise and heightened novelty of the experience resulted in the high degree of uncertainty. This condition was not replicated in the experimental situation and as a result, the slide did not generate the same amount of uncertainty. This problem was avoided for the first slide shown in the experimental session by the use of two practice slides.

In summary, then, exploratory behavior does appear to increase with increases in uncertainty as defined by information theory. However,

there also appears to be other components of a stimulus situation which also influence exploration.

As expected, both social and monetary rewards dispensed contingent on performance during the first session, significantly increased exploratory behavior above the control level. However, in light of the unpredicted interaction between extrinsic reward conditions and uncertainty, this finding needs to be qualified. An examination of the results show that below the 2.0 bits level of uncertainty extrinsic incentives did not significantly increase the amount of exploration while at the 2.0 bits level and above, they did (except at 3.0 bits). These findings seem quite explainable in the light of the task involved. It may be argued that the exploratory behavior generated by cognitive conflict in the animal identification task was sufficient to resolve the conflict and identify the slide at the lower levels of uncertainty and that extrinsic incentives were of no consequence. As uncertainty reached the upper levels, however, the exploratory behavior generated by the uncertainty in combination with importance was not sufficient, as evidenced by an increase in exploration at these levels with the supplementation of social and monetary rewards. It would appear that extrinsic incentives increased the staying power when the exploration which resulted from closure motivation was not sufficient to resolve the conflict. In summary, then, a reasonable explanation for these findings is that extrinsic incentives do appear to combine with cognitive conflict in predicting exploratory behavior but that this does not occur until the exploratory behavior resulting from the conflict proves inadequate. However, this interpretation that extrinsic rewards combine with closure motivation to yield a total motivational force is rivaled by at least one other equally plausible explanation. It may be argued that the exploratory behavior

evidenced in either or both the monetary and social reward conditions was not the result of a combination of both closure and extrinsic motivation but was rather all extrinsic in nature. Supporters of this interpretation would argue that the locus of causality shifts when tangible extrinsic rewards are present and that the extrinsic motivation generated by the use of extrinsic rewards replaced closure motivation at all levels. Deci argues this position for both males and females in monetary reward conditions and for females in social reward conditions. Although the different interpretations may presently seem pedantic since they both predict similar behaviors in session one, their importance comes to light when predicting what effects the removal of the extrinsic rewards may have on exploratory behavior. If extrinsic rewards do, in fact, supplement closure motivation, then it could be expected that exploration, after the removal of the extrinsic rewards, will either sustain itself or at worst fall back to the control level. The latter was predicted for the present study. If, on the other hand, the motivation resulting from extrinsic rewards replaced closure motivation in either the monetary or social reward conditions, then one of two things could be expected with the removal of extrinsic rewards. If the extrinsic rewards have a sustaining effect, then once the extrinsic rewards are removed, one would expect a decrease in exploration below the control level. In fact, these are the findings that have been reported elsewhere in the literature (Deci, 1971, 1972; Lepper et al., 1973). If extrinsic motivation replaced closure motivation during session one, but had no sustaining effect, then one would expect exploration to return to the control level during session two. Since the latter explanation predicts findings similar to the "supplementation" hypothesis, the two

would remain competitive explanations in light of such a finding. The results of session two are reported in the next section.

The last hypothesis of concern addressed itself to the interaction between the sex of the subject and the extrinsic reward conditions. The findings reported in Chapter IV show that the effects of extrinsic rewards on exploratory behavior were no different whether the subject was male or female.

Second Session

During the second session, similar evidence of components influencing exploratory behavior other than uncertainty as defined by information theory was found. The same erratic increase in exploration was shown across increasing levels of uncertainty as in session one.

The hypothesis of major concern in the second session, however, was whether or not there was any sustaining effects on the exploratory behavior of those subjects who had previously received either social or monetary rewards. As the results in Chapter IV indicate, the findings were mixed. For male subjects in both the monetary and social reward conditions, exploration dropped back down to the control level. However, while exploration for female subjects who had previously received monetary rewards did not significantly differ from the control group, females who had previously received social rewards sustained a significantly higher level of exploration at several levels of uncertainty. The trend in these findings, as depicted in Figure 2, shows a fairly consistent sustained increase in exploration above the control level for this group. Although exploration for female subjects in the group who had

previously received monetary rewards was not significantly different from the control group at any level, neither was it significantly different from the female social reward group at the 2.5 bits level. This means that the exploration for the money group at this uncertainty level (2.5 bits) was somewhere between the control and the social reward groups. This overall pattern of results supports the interpretation that the extrinsic motivation generated by extrinsic rewards combines with the closure motivation generated by cognitive conflict and that a withdrawal of the extrinsic rewards results in a withdrawal of the extrinsic motivation; except when social rewards are used with females. The fact that females sustained a high level of exploration after a removal of the social rewards, suggests that females may be more sensitive to social rewards than males -- possibly as a function of cultural variations in child-rearing practices. Consequently, exposure to social rewards in the first session increased the the females' expectation of the task as a means of gaining social approval which resulted in increased exploration above the control level in session two. Monetary rewards for both males and females as well as social rewards for males do not appear to have as strong a reinforcement value for this task with this population.

Although it still may be argued in those cases where exploration dropped back down to the control level that the extrinsic rewards may have replaced closure motivation in the first session, and that in their absence in the second session the incentives resulting from closure motivation were again evident; this interpretation is hard put to explain those findings which did show sustaining effects. If extrinsic rewards replaced intrinsic exploratory behavior in session one and the effects were not sustained in their absence in session two, then there would

be no reasnn for any differences from the control group in any of the other groups in session two.

In examining the findings of the present study against those of previous investigations (e.g., Deci, 1971, 1972; Lepper, Greene and Nisbett, 1973), it appears that when intrinsic motivation is defined in terms of cognitive conflict the results are quite different; and previous interpretations concerning a shift in the locus of causality are not viable for explaining the present phenomena. It seems that statements concerning the effects of extrinsic rewards on intrinsic motivation depend on how you define and measure intrinsic motivation. Upon close examination of those behaviors measured as expressions of intrinsic motivation in the studies referred to above, as discussed in Chapter II, they could be viewed as resulting from boredom or a lack of stimulation (diverse exploratory behavior) while those behaviors in the present study may be viewed as resulting from too much stimulation (specific exploratory behavior). This distinction seems to be a plausible way, at present, to explain the different results.

Educational Implications

Though findings discussed in the last section are for the most part theoretically tentative at present, they do suggest some implications for educational practice. It appears that in making decisions about the use of extrinsic rewards, first consideration must be given as to whether the task has the potential for creating intrinsic motivation. If the task involves rote memory learning then rewards of either a tangible or intangible nature seem appropriate. However, when dealing with tasks involving the mental manipulation of concepts or problem solving tasks,

for example, the type of extrinsic rewards used seems to be important. It appears that when self-initiated tasks are undertaken in an effort to relieve boredom and increase the amount of incoming stimulation, those tasks which had previously resulted in prearranged, perceivable extrinsic rewards are not as readily approached as they would have been if their performance had not been previously encouraged by the use of such rewards. It also appears, however, that when either self-initiated or teacher induced behavior is undertaken in an effort to relieve uncertainty about a specific stimulus or set of stimuli, then the use of extrinsic rewards, at worse, will not last after their removal and may prove beneficial during their use. In light of such an interpretation it would not seem advisable to use expected tangible extrinsic rewards to encourage performance on tasks which are not going to be cognitively stimulating and create uncertainty in the student. However, when the task presented to the student is cognitively challenging, the use of extrinsic tangible rewards such as candy or money may encourage the student to stick with the task longer without having any deletorious effects for later exploration of similar challenging tasks.

Suggestions for Further Research

In the present study, uncertainty as defined by information theory was used to predict exploratory behavior. The results of this study as well as others give sufficient indication that other factors besides those involved in the measurement of uncertainty also contribute to exploratory behavior. Consequently, further research is needed to sort out these variables and find the relationship between them.

The results concerning the immediate and sustaining effects of extrinsic rewards on closure motivation in the present study opens up many new areas that need to be investigated. One factor of importance that was not examined in the present study was the difference in exploration from the first to the second session both in the control group and in the groups of those subjects who received extrinsic rewards in the first session. Because of the possible confounding due to two separate sets of slides being used in this study, two separate factorial designs were used to analyze the data rather than one. Such analyses made it impossible to report findings concerning the different amounts of exploratory behavior subjects exhibited from the first to the second session. However, a post hoc analysis of the data was done and is reported presently in an effort to direct possible research for the future. The means in Table X shows the average search for males and females in sessions one and two. These means are also depicted in Figure 3. Because of the great deal of variability between the two sets of slides, t-tests for each pair of means showed no significance. However, in closely looking at these means, possible direction for future research could be found. As shown, the means for both the control and social groups for both male and female subjects show slight increases from session one to session two, while the means for both male and female subjects who received monetary rewards in the first session decreased in session two.

This pattern of means supports the findings reported in the discussion section that the immediate effects of monetary rewards for both male and female subjects are not sustained while females who receive social rewards do sustain a higher level of exploration. However, these

TABLE X

EXTRINSIC REWARD CONDITION MEANS FOR MALE AND FEMALE SUBJECTS IN SESSIONS ONE AND TWO

		Extrinsic Reward Condition					
		NER - PNER		ER-S - PER-S		ER-M - PER-M	
Sex	Male	2.69	2.79	3.87	4.34	4.36	4.21
	Female	1.93	2.39	5.66	5.81	4.79	3.53

means also suggest that social rewards for males was also a fairly potent reward that maintained increases in exploration in session two. An examination of Figure 4 shows that indeed males who received previous social rewards did out-explore the males in the control group in session two at all levels of uncertainty except the .5 level. Indications as to why the data showed significance for females and not for males in the social rewards condition are provided in Table X. Even though males in the social rewards condition showed an increase in exploratory behavior from session one to session two, they explored more than females in the control condition and did not quite achieve as high a level of increased exploration in the social conditions. Consequently, despite the consistent pattern, significance was not reached. However, as stated previously, this does not mean that a sustaining effect in exploration was found for males who previously received social rewards, but rather suggests that future research should examine the possibility further. It appears that, in general, social rewards may have a longer lasting effect than monetary rewards for both males and females.

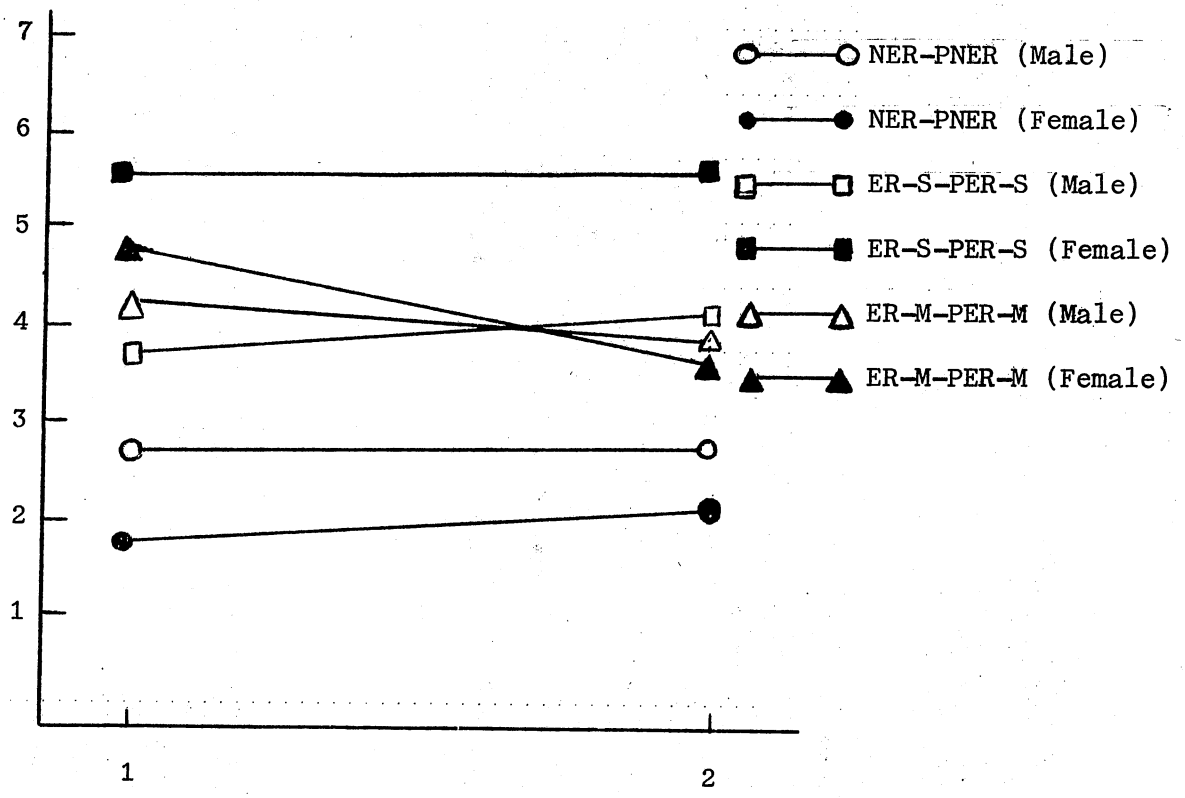

Figure 3. Mean Number of Requests for Additional Viewing as a Function of Extrinsic Reward Conditions and Session

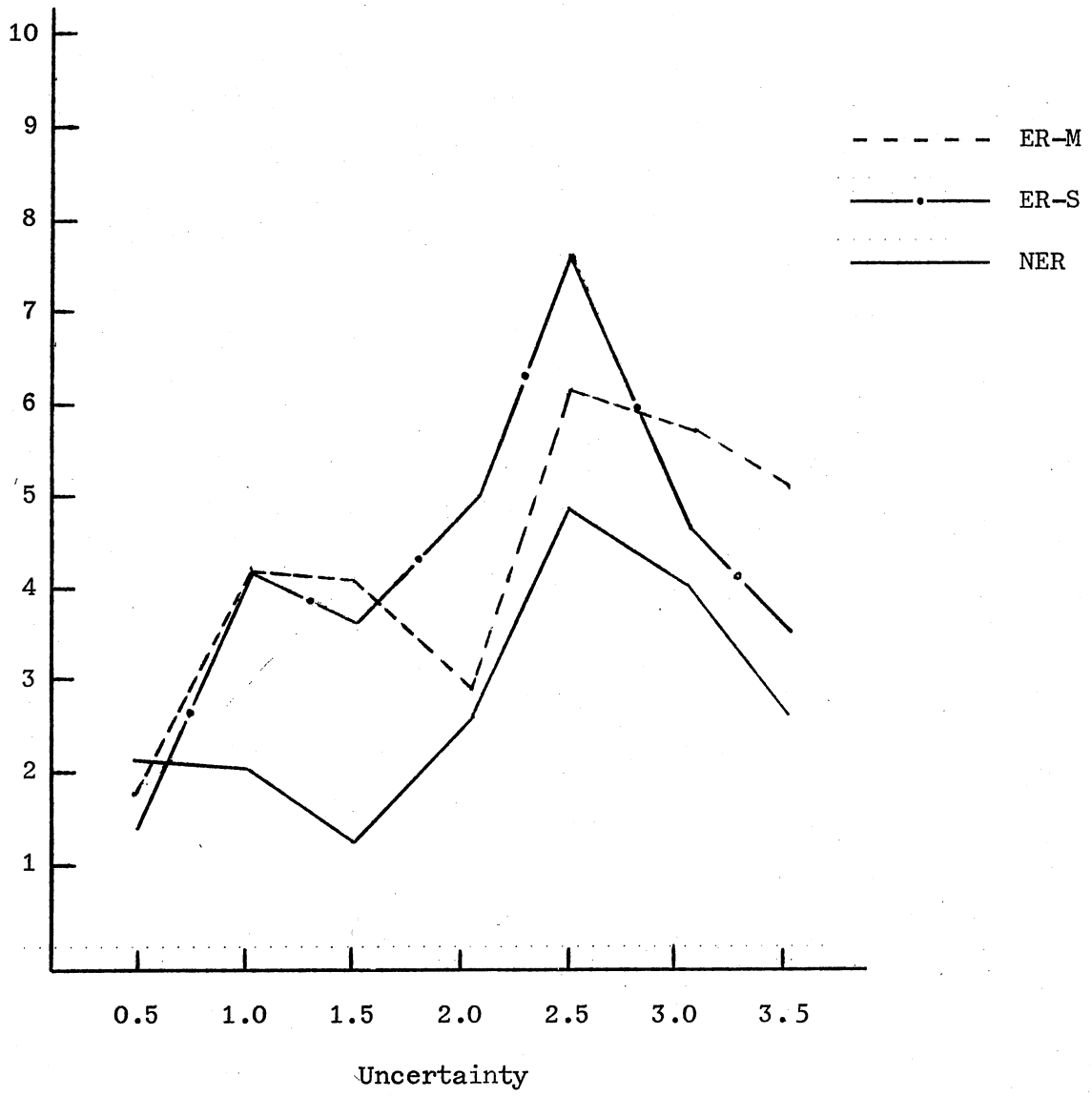

Figure 4. Mean Number of Requests for Additional Viewings for Males as a Function of Uncertainty and Previous Extrinsic Reward Condition

Two variations concerning the dispensing of social rewards are recommended for future research. First, it would be interesting to see if a female dispensing the rewards would have varying sustaining effects on the exploration of male and female subjects. Although Deci (1975) found no difference as a function of the sex of the person administering the rewards, since present findings run contrary to those of Deci's in so many other respects, this finding does not lend much evidence to the present discussion. Secondly, it would also be very interesting to see what effects it would have on the results to have a different experimenter showing the slides during the second session. This raises the question as to whether the social rewards increase the desirability of the task or whether they are more directly associated with the experimenter.

Many more important questions are raised as a result of the present findings. For example, what are the effects of the removal of extrinsic rewards over longer periods of time or for longer periods of exposure? Also, a greater variety of rewards as well as varying levels of those rewards used in the present experiment need to be investigated.

Another important area that also needs to be studied is the relationship between the importance of the task generated by extrinsic motivation and that generated by closure motivation. As discussed in Chapter II, uncertainty is theoretically defined as combining multiplicatively with importance in producing cognitive conflict. It was also argued that the importance generated by extrinsic rewards is of a different type. Whether this distinction between the two types of importance is a viable one needs to be investigated.

As more evidence is compiled concerning the relationship between intrinsic and extrinsic motivation it will be necessary to trace this relationship developmentally in an effort to ascertain how they interact differently for different age groups.

In conclusion, the present study suggests many new areas of research that have not as yet been directly investigated. Considering the importance of this research with its eventual educational implications, it is an area that other researchers should seriously consider.

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APPENDIX A

INSTRUCTIONS READ TO SUBJECTS

Instructions Read to Standardization Group

As you have already been told, this is an experiment on visual acuity. You are going to be shown fifty slides of animals which will be out of focus. Each slide will be flashed on the screen in front of you very quickly. We would like you to try to guess the identity of the animals. Write your guess on the piece of paper I have given you. Indicate when you are ready to go on to the next slide by saying "next."

Some of the slides will be more difficult to identify than others. Try to be as specific as you can in your identification, but if you don't know the animal's specific name, you may be as general as you like in making your guess. We would prefer, however, that you write something down if you can. If you wish to see the focused slide after you make your guess, tell me and I will focus it for you. When we are finished, fold your answer sheet, put it in an envelope by the box next to you and place it in the box with the others. Are there any questions?

General Instructions Read to All Subjects at the Start of Session One

As you have already been told, this is an experiment on visual acuity. You are going to be shown ten slides of animals which will be out of focus. Each slide will be flashed on the screen in front of you very quickly. We would like you to try to guess the identity of the animals. We have learned from previous studies that people differ in how many times they like to view the slides before making their guess. Since we are only concerned with your final response in this experiment, the number of times you choose to view each slide is up to you.

Consequently, you may wish to view the slide only once or up to a maximum of twenty times. Each time you wish to see the slide over, tell me by saying "again." When you are ready to make your guess, write your answer on the sheet of paper I have given you. We will go on to the next slide when you say "next."

Some of the slides will be more difficult to identify than others. Try to be as specific as you can in your identification, but if you don't know the animal's specific name, you may be as general as you like in making your guess. We would prefer, however, that you write something down if you can. If you wish to see the focused slide after you make your guess, tell me and I will focus it for you. The first slide will be a practice slide. Are there any questions?

Additional Instructions Read to Subjects in the ER-M Group

In order to provide an extra incentive for good performance, you will be paid 25¢ for each correct response. A total of $2.50 could be earned if all the slides are identified correctly. Are you ready?

Additional Instructions Read to Subjects in the NER Group

When we are finished, fold your answer sheet, put it in an envelope by the box next to you and place it in the box with the others. Are you ready?

General Instructions Read to All Subjects at the Start of the Second Session

You are going to again be shown ten slides of out of focus animals. The procedure will be identical to those I outlined for you the last time. Remember you will be allowed to view each slide as many times as you like. Are there any questions?

Additional Instructions Read to Subjects in the PER-S Group

Since we are only interested in the responses of the group as a whole, we have decided since the last time that there is no reason why your responses can't be kept anonymous. So don't write your name on the paper and when we're finished, fold your answer sheet, put it in an envelope by the box next to you and place the envelope in the box with the others. Are you ready?

Additional Instructions Read to Subjects in the PER-M Group

Unfortunately, there was only enough money to pay you for one session so we can't give you any money this time. Since there is no longer any need for me to know your responses, we felt it would be better if they were kept anonymous. So don't write your name on the paper, and when we're finished, fold your answer sheet, put it in an evelope by the box next to you and place it in the box with the others. Are you ready?

APPENDIX B

UNCERTAINTY ESTIMATES

Uncertainty Estimates for Each Slide For Each Judge

Slide	Judge 1	Judge 2	Judge 3
1	2.90	2.90	2.90
2	3.55	3.625	3.625
3	.666	.666	.666
4	1.496	1.496	1.496
5	.666	.954	2.01
6	.994	.994	.994
7	3.58	3.75	3.75
8	1.62	1.62	1.62
9	3.45	3.75	3.625
10	0.00	0.00	0.00
11	1.425	1.627	1.496
12	2.28	2.779	2.28
13	2.22	2.22	2.22
14	.994	.994	.994
15	.666	.666	.666
16	2.375	2.375	2.375
17	2.092	2.092	2.217
18	1.3	1.3	1.3
19	1.675	1.8	1.8
20	.696	1.329	.696
21	1.008	1.008	1.008
22	3.125	3.125	3.327
23	.666	.666	.666
24	1.775	2.55	2.25

Slide	Judge 1	Judge 2	Judge 3
25	1.627	2.077	2.077
26	1.9	2.65	2.65
27	1.681	1.306	1.306
28	1.496	2.046	2.0
29	2.404	2.404	2.179
30	1.306	1.306	1.621
31	2.25	2.25	2.25
32	.334	.869	1.371
33	3.25	3.375	3.25
34	1.919	2.092	2.092
35	.869	.994	.994
36	1.9	1.679	2.65
37	1.627	1.627	1.627
38	1.496	1.496	1.496
39	2.348	2.731	2.852
40	1.775	1.775	1.775
41	1.306	1.496	1.181
42	1.967	1.8	1.967
43	.666	.666	.666
44	1.008	1.008	1.181
45	.988	1.246	1.246
46	0.00	0.00	0.00
47	.869	.869	.869
48	0.00	0.00	0.00
49	.334	.344	0.00
50	1.775	1.875	1.875

Slide	Judge 1	Judge 2	Judge 3
51	1.306	1.306	1.306
52	.334	.334	.334

VITA[2]

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