THE EFFECT OF MATERIAL REWARD ON INKBLOT PERCEPTION AND ORGANIZATION

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PREFACE

The major aim of our research until now has been to look for the detrimental effects of reward upon performance in a variety of standard laboratory tasks. The major task which faces us now is that of providing an adequate explanation of reward's detrimental effect. This study was an attempt to search for an explanatory mechanism to account for these effects.

The author wishes to express his deepest and warmest appreciation to his major adviser, Dr. John C. McCullers, for his guidance and assistance throughout this study. Moreover, the author wishes to thank Dr. McCullers for his patience and understanding of the problems and processes involved in this study. Appreciation is also expressed to the other committee members, Dr. Frances Stromberg and Dr. Kenneth Sandvold, for their helpful guidance. The author also wishes to express his thanks to Dr. Jim Moran, who was there when he was needed.

Additional thanks also goes to the Department of Psychology at Oklahoma State University for their cooperation and assistance in obtaining subjects. Thanks also goes out to all subjects who participated in this study and to the National Institute of Mental Health for their support through NIMH Grant MS 30570.

Finally , I would like to thank my parents for their support and sacrifices. Without their contribution, this would not have been possible.

This thesis is dedicated to my grandparents.

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CHAPTER I

RESEARCH PROBLEM

Introduction

A general acceptance of the idea that behavior can be shaped by proper reinforcement is evident in the widespread application of rewards in our society. The terms "reward", "incentive", "bonus", "prize", etc. all carry positive connotations. If one wishes to improve or maintain performance, he or she often resorts to the use of incentives. The dominant view has been that rewards enhance performance, no matter what the task, and the greater the amount or value of the reward, the greater the enhancement.

In recent years, however, there has been an increasing body of evidence that reward does not always enhance performance. In some instances, reward can have a detrimental effect on performance. A detrimental effect of reward on performance is obtained whenever subjects who are offered tangible, extrinsic incentives do not do as well on some dependent variable as subjects who are not offered incentives.

The major aim of the McCuller's research group until now has been to look for detrimental effects of material rewards on performance and to establish reliable empirical relationships between task, subject, and treatment variables. Very little effort has been devoted to providing an explanation of which psychological processes are altered by reward, or why these changes should be detrimental.

The purpose of this research was to explore these questions and attempt to find a mechanism that may account for the detrimental effects of material rewards, and to test a model that predicts when rewards should produce detrimental effects. Several attempts to account for the detrimental effect of rewards will be reviewed. The aim of the present research was to extend research on the detrimental effect of material rewards into the area of perceptual organization, partly to learn if perceptual and organizational processes are actually altered under reward and partly to search for an appropriate explanatory mechanism.

This study was concerned with the effect of material rewards on inkblot perception. The primary objective was to determine what effects material reward have on inkblot perception and to search for an explanatory mechanism to account for these effects.

CHAPTER II

REVIEW OF THE LITERATURE

The Detrimental Effects of Material Rewards

Since the 1920's, there has been much attention given to the effects of reinforcement on behavior and performance. The idea that behavior can be shaped by reinforcement has found its place in many theories of learning and behavior (Thorndike, 1913; Hull, 1943; Miller & Dollard, 1941; Skinner, 1938). Although there is some disagreement as to the exact mechanism involved, these theories maintain that reinforcing stimuli serve to shape behavior and strengthen learned responses. The influence of reinforcement has also been widespread in society and is evident in education (grades, gold stars), industry (bonuses), psychotherapy (behavior modification, biofeedback), and child rearing practices. It has been commonly thought that positive reinforcement or rewards function only to improve performance.

In recent years, researchers have discovered that material rewards can at times have a detrimental effect on performance. This detrimental effect has been found in various types of tasks including; discrimination learning (McCullers & Martin, 1971; Spence, 1970); concept attainment (McGraw & McCullers, 1975); insight learning (Viesti, 1971); complex problem solving (Glucksberg, 1962; McGraw & McCullers, 1976); incidental learning (Bahrick, 1954; Bahrick, Fitts, & Rankin, 1952; McNamara & Fisch, 1964); and IQ test performance (Moran, McCullers,

& Fabes, 1978). The detrimental effects of rewards have been obtained across a wide range of ages of subjects, tasks, methods of reward presentation, reward contingencies, and types of reward. Detrimental effects of rewards have been found to a greater degree on tasks that require higher cognitive processes. Much of the literature has been reviewed recently by McGraw (1978). The subjects generally have been humans, but it appears that the detrimental effects of reward may apply to nonhuman organisms as well (Harlow, Harlow, & Meyer, 1950).

Accounting for the Detrimental Effect

In an attempt to account for the detrimental effects of rewards, several models will be discussed. These models may offer some insight into why rewards have a detrimental on performance in certain tasks.

An Empirical Prediction Model

McGraw (1978) has proposed a model that attempts to predict when rewards will have either a detrimental or facilitating effect on performance. It was suggested that

> . . . there are two important dimensions along which a task must be scaled before a prediction for the effect of reward on performance can be made. These were the attractive-aversive and algorithmic-heuristic dimensions (p. 48).

Reward is expected to facilitate performance on unattractive tasks and have a detrimental effect on attractive tasks, i.e. those tasks that are enjoyable and in which the subjects are motivated to participate regardless of whether or not they are rewarded. Detrimental effects of rewards are also found in tasks that are heuristic in nature. Heuristic tasks are those in which the problem is unclear and the solution often requires

insight in order to organize and integrate available information. In algorithmic tasks, the solution strategy is clear and straightforward, and no time need be spent discovering what to do. When the algorithmic-heuristic dimension is added to the attractive-aversive dimension, the detrimental effect of reward is predicted only in attractive tasks that require heuristic solutions.

Motivational Theories

Traditional learning theories (Crespi, 1942; Hull, 1943; Spence, 1956; Yerkes & Dodson, 1908) provide for a detrimental effect of material rewards. In general, these theories have treated reward as a determinant of motivation. If reward affects motivational level, then reward's effects on performance might be mediated through increases in general drive, incentive motivation, or stress or some related emotional variable. None of these models has been used to any extent to account for the detrimental effects of reward, and whether or not these theories could be modified to handle this effect is questionable.

Recently researchers have suggested that detrimental effect of material rewards are a product of extrinsic rewards producing a decrease in intrinsic motivation (deCharms, 1968; Deci, 1971; Festinger, 1967; Lepper, Greene, & Nisbett, 1973). Deci (1975) has pointed out that these social psychological theories have centered around two major processes by which material rewards can affect intrinsic motivation: (a) a change in the perceived locus of causality, and (b) a change in the feelings of confidence and self-determination.

Alternative Explanations

Although most of the attempts to account for the detrimental

effects of reward rely upon motivational formulation, it is also possible that reward directly affects perceptual, cognitive, and other processes. If so, there are several possible explanations for it. One is that reward may distract the subject's attention (Spence, 1970). Another alternative explanation is that reward may act to shift perception and cognition to a developmentally more primitive level of functioning. The theories of Werner (1948), Lewin (1935), and Freud (1924) may provide some basis from which to account for these detrimental effects of material rewards as a function of developmental regression.

Research with Inkblots

The interpretation and organization of inkblot stimuli is thought to involve: (a) the perception of the inkblot, (b) the association of images and ideas, (c) the integration of these associations with the inkblot, and (d) the restructuring of the percept to fit the images into congruence with the inkblot itself (Schachtel, 1966). This integration of an amorphous inkblot appears to require insight and creativity, which allows the subject to act on the inkblot stimuli and organize available information into a meaningful structure. These operational processes involve a conscious effort to find congruence in the inkblots and are closely related to Piaget's (1958) concept of logical operations. These processes may be affected by reward. Since inkblot perception involves both perceptual and cognitive operations, and appears to be an attractive task that requires a heuristic solution, it would seem to be an appropriate task to examine the detrimental effects of reward on perception and cognitive organization, and to test the McGraw (1978) prediction model.

Developmental Changes in Inkblot Perception

Werner (1957) used responses to the Rorschach Inkblots to investigate the principle of microgenesis in development. He used tachistoscopic presentation to examine the development of perceptual responses to Rorschach Inkblots by slowing down the developmental process through very brief exposure times. Werner (1957) compared the responses of children at several ages to those of normal adults under tachistoscopic exposure time intervals of .01, .10, 1.0, and 10.0 seconds. In this way, Werner confirmed his hypothesis that with briefer exposure times, adult responses closely resembled young children's responses, and that responses can be interrupted in the course of development.

Similar developmental trends were observed among clinically pathologic groups differing in the degree of impairment. Responses of schizophrenics patients resembled those of children and those of normal adults under the briefest tachistoscopic exposure intervals. Responses of paranoid patients were also similar to those of young children (Friedman, 1952; Phillips & Framo, 1954; Siegel, 1950).

Werner (1957) asserts that development "proceeds from a state of relative globality and lack of differentiation to a state of increasing differentiation, articulation, and hierarchic integration" (p. 126). To test this principle, Hemmendinger (1951) compared the Rorschach responses of children to those of adults and found that the proportion of genetically high responses (precisely formed, whole percepts consisting of integrated sub-wholes) increases with age.

Problems with the Rorschach Inkblots

While the Rorschach Inkblots are well known and popular, there are

certain psychometric scoring problems and deficiencies that have become apparent in their usage. Zubin (1954) has outlined some of the problems of the Rorschach technique. In an attempt to overcome these deficiencies, Holtzman, Thorpe, Swartz, and Herron (1961) developed a set of inkblots that attempts to achieve a higher quality of psychometric precision. The goal of the Holtzman Inkblot Technique (HIT) was to develop a "new inkblot technique having scores of demonstrated psychometric value, while still preserving the rich, qualitative essence of the Rorschach" (Holtzman et al., 1961, p. 7). The advantages of the HIT over the Rorschach include: (a) number of responses is relatively constant, (b) richer variety of stimuli, (c) parallel forms of inkblots, and (d) interscorer reliability ranges from .89 - .97 (Holtzman et al., 1961).

The Holtzman Inkblot Technique

The Holtzman Inkblot Technique (HIT) has also been used to investigate the process of development. Thorpe and Swartz (Swartz, Lara Tapia, & Thorpe, 1967; Thorpe & Swartz, 1965; Thorpe & Swartz, 1966) administered the HIT at several age levels (6.7, 9.7, 12.7) and obtained consistant results in all three cases. Significant increases in Form Appropriateness, Form Definiteness, Integration, Movement, Human, and Shading scores were found with increasing age. Significant decreases in Pathognomic Verbalization were also obtained with increasing age. The changes in Form Appropriateness, Form Definiteness, and Integration would be in keeping with Werner's (1948) notion that development proceeds away from loosely organized perception twoards increasing differentiation, articulation, and hierarchic integration. The increases in

Human and Movement may reflect an increase in integrative capacity, and an increase in Shading appears to reflect an increase in sensativity to very subtle stimuli. Gamble (1972) points out that these studies reflect strong support for the idea that the HIT can be used to provide a reliable indication of developmental changes in perceptual organization and the results lend support to Werner's (1948) theory of cognitive development.

Cognitive Processes in Inkblot Perception

Changes in HIT variables have also been associated with differences in several types of cognitive functioning. Richter and Winter (1966) found that when the responses of a "high creative" group of females were compared to the responses of a "low creative" group of females, the "high creative" group scored significantly higher on the HIT variables of Form Definiteness (FD), Color (C), Movement (M), Human (H), Integration (I), Pathognomic Verbalization (V), Anxiety (Ax), Hostility (Hs), and Abstract (Ab). It was concluded that the "high creative" group had richer imaginations (increases in M,H,Ab), heightened emotional sensitivity (increases in C,Hs,Ax,V), higher precision of perception (increase in FD), and a higher integrative capacity (increase in I).

Clark, Verldman, and Thorpe (1965) reported that the responses of "high divergent thinkers" were significantly higher than "low divergent thinkers" on the HIT variable of Movement, Anxiety, Hostility, Color, and Penetration, with significantly lower scores on Location, indicating that the "high" group used larger areas of the inkblots. It was concluded that "high divergent thinkers" respond more freely to imaginative processes, but not at a sacrifice of contact with reality. Insua (1972) found that subject who scored high on the Movement variable were more

efficient in problem-solving tasks. Kidd and Kidd (1972) found a high correlation between the Stanford-Gough Rigidity Test and several HIT variables: Location, Anatomy, and Hostility correlated positively, and Color and Movement correlated negatively.

Inkblot Perception and Anxiety

Many researchers (Herron, 1964; Iacino & Cook, 1974; Kamen, 1969; Kamen, 1971; Swartz, 1965; Swartz & Swartz, 1968) have investigated the relationship between HIT variables and stress and anxiety. These studies have produced varying results with relatively little consistency. Increases in scores on Barrier, Anatomy, Hostility, and decreases in Movement, Pathognomic Verbalization, and Penetration seem to be related to increases in stress and anxiety. The lack of consistent findings is possibly due to differences in the subject populations used (children vs. adults) and the ways in which anxiety and stress were produced. This lack of consistent findings on the relationship between anxiety and HIT variables has also been noted by other researchers. Iacino and Cook (1974) point out that the HIT does not appear to be valid at assessing anxiety, and Holtzman et al. (1961) also report that "Anxiety and Hostility as scored in the Holtzman Inkblot Technique are strictly ratings at a fantasy level which are not necessarily related in any simple direct way to overt behavior . . ." (p.180-181).

Regression, Reward, and Inkblot Perception

Regression may be characterized by increasing dedifferentiation and disintegration of the organization of higher action systems. The lower systems of action are subordinated to the higher levels that comprise the more complex organizational processes. Earlier modes

serve as supports for higher modes. However, "under special conditions earlier modes may serve as a substitute (vicarious) means for more advanced modes" (Langer, 1969, p. 93).

It appears that material rewards may provide such a condition. Lewin (1954) points out that reward may increase the strength of an opposing force and this may be

> . . . one of the reasons why increasing incentives favor the solution of detour and other intellectual problems only up to a certain intensity level. Above this level, however, increasing the forces to the goal makes the necessary restructurization more difficult partly because the person has to move against stronger forces, partly because the resultant emotionality leads to primitivation (regression) (p. 942).

Lewin also goes on to point out that

> . . . if pressure is brought to bear on a child by offering a reward, the level of aspiration (that is, the degree of difficulty chosen) will decrease. If a lowering of the level of aspiration is made impossible, the maturity of aspiration may regress, that is, a procedure is used which is characteristic of a younger age level (p. 957).

Although Lewin's (1954) argument for regression under reward does not have much data to support it, he does provide a conceptual basis for psychological regression under material rewards.

Measurement of Regression by the HIT

The influence that reward has on inbklot perception and organization should depend on the particular psychological processes involved. If reward affects development level, then reward would be predicted to lower scores on the HIT variables of Form Definiteness, Form Appropriateness, Integration, Movement, Human, Shading, and to increase scores on Pathognomic Verbalization. These are the variables that have been shown to be sensative to developmental changes in

perceptual organization.

With the lowering of developmental level, subjects under reward would be predicted to become more rigid. The HIT variables that have been related to increased rigidity are decreased scores on Color and Movement, with increases in Location scores. If reward lowers the developmental level and/or increased rigidity of performance, subjects under reward would be expected to have lower scores on Movement and Color and higher scores on Location.

A faster Response Time under reward conditions may also suggest a lowering of developmental level. Faster Response Times could be viewed as impulsive responding. Young children respond fairly quickly as compared to adult standards. Mandell (1974) reports that based on Werner's (1948) theory of development an inverse relation exists between impulsivity and developmental indices of perceptual organization.

Although the effect of material reward on inkblot perception has not been directly investigated, there is some basis for hypothesizing a detrimental effect on inkblot perception. Holtzman, Swartz, and Thorpe (1971) paid subjects $5.00 for participation in one of their research projects. A total of 85 subjects (31 architects, 28 artists, and 26 engineers) made up the final sample for the study. The subjects were highly selected advanced undergraduate university students who were judged to be outstandingly successful in their fields of study. The experimental differences in the modes of perception used by the three groups were in the predicted directions and statistically significant. However, a post-hoc comparison by the present investigator of the HIT scores of the three groups with the normative data for college students provided by Holtzman et al. (1961) showed that all three groups had very

low scores in an absolute sense on Form Appropriateness, Color, Shading, Movement, and Integration, and high scores on Pathognomic Verbalization and Anxiety. Indeed, the scores obtained by these outstanding advance undergraduates were very similar to the normative scores for elementary school children. These are changes in the same variables and directions that have been related to a lower developmental level, reduced creativity and problem-solving, and increased rigidity. Therefore, there seems to be some evidence that reward hampers inkblot perception and organization, at least on a post-hoc basis.

The effect of reward on inkblot perception was also actively researched in a pilot study to this major thesis. In an attempt to see if reward had an effect of inkblot perception, 10 subjects received the HIT under standard prodedures and six subjects were administered the HIT under standard procedures, but were paid for their participation. Reward subjects performed lower on the HIT variables of Form Definiteness, Form Appropriateness, Integration, Movement, Human, Color, Shading, and quicker Response Time. The reward subjects also had higher scores on Location and Pathognomic Verbalization. Overall analysis on these variables indicated reward/non-reward differences to be significant ($p < .002$). The scores of the reward group on these variables again seemed to be very similar to the normative scores for elementary school children, again suggesting a hampering of perceptual organization under reward (see Appendix A for outline of pilot work).

Purpose of the Study

The purpose of this research is to explore the effect of material reward on inkblot perception and organization. It is hypothesized that

under reward subjects will perform developmentally lower as measured by their responses to the HIT. Reward subjects are predicted to perform lower on the developmental variables of Form Definiteness, Form Appropriateness, Integration, Movement, Human, Color, Shading, quicker on Response Time, and higher on Location and Pathognomic. These 10 variables are designated as "targeted developmental variables" based on previous research.

CHAPTER III

METHODOLOGY

Subjects and Design

The subjects were freshman and sophomore Introductory Psychology students at Oklahoma State University. All subjects were volunteers who received extra credit for participation in the research in the Spring Semester, 1978. A total of 46 subjects participated in the experiment, but to achieve adequate matching, only 40 subjects (20 males and 20 females) were included in the final sample. Only white subjects were included in an effort to control for possible race and race of experimenter/subject effects. Half of the subjects (10 males and 10 females) served in a reward condition and half in a non-reward condition.

Procedure

Each subject participated individually. After initial rapport was established, all subjects were told that the research consisted of two seperate tasks and that one would follow the other. After the subject's age, sex, and educational level were obtained, Parts 1 and 2 of the Ammons Quick Test (1962) were administered as a means of assessing intelligence level. The HIT was then administered after a short break.

To insure that subjects did not come into the experiment with expectations of receiving a reward for particpation, all non-reward

subjects were seen before any reward subjects participated. In an effort to limit communication, reward and non-reward subjects were selected from different class sections.

All subjects were administered Form A of the HIT under standard instructions as outlined by Holtzman et al (1961). Reward subject also received the following statement before the standard instructions:

> This research is being funded by a federal grant and as a result we have been authorized to give money to some of the participants in this experiment. Therefore, you will receive three dollars for your participation. I have here some dollar bills and after the experiment is completed, I'll get you to sign a receipt and then I will give you your money.

Reward and non-reward subjects were matched according to their scores on the Ammons Quick Test. HIT responses were recorded and scored according to standard procedure as outlined by Holtzman et al. (1961). Following completion of the HIT, each subject was interviewed in order to ascertain whether not he or she enjoyed the research, or had any knowledge of what was to happen in the experimental situation beforehand (see Appendix B for the questions asked in this short interview). Each subject then received $3.00 for their participation as promised.

Materials

The HIT consists of two parallel forms, each containing 45 inkblots. A list of the HIT variables and theoretical score range is presented in Table I. Detailed descriptions and scoring procedures for these variables are given in Holtzman et al. (1961).

The Ammons Quick Test is made up of three forms. Each form consists of 50 vacabulary words and a set of four pictures. Subjects are asked

TABLE I

NAME, ABBREVIATION, AND THEORETICAL RANGE
OF TOTAL SCORE FOR EACH HIT VARIABLE

Variable Name	Abbreviation	Theoretical Score Range
Reaction Time *	RT	
Location *	L	0-90
Form Definiteness *	FD	0-180
Form Appropriateness *	FA	0-90
Color *	C	0-135
Shading *	Sh	0-90
Movement *	M	0-180
Pathognomic Verbalization *	V	0-180
Integration *	I	0-45
Human *	H	0-90
Animal	A	0-90
Space	S	0-45
Rejection	R	0-45
Anatomy	At	0-90
Sex	Sx	0-90
Abstract	Ab	0-90
Anxiety	Ax	0-90
Hostility	Hs	0-135
Barrier	Br	0-45
Penetration	Pn	0-45
Balance	B	0-45
Popular	P	0-25

* Developmental variables

to point out which picture best fits a particular vocabulary word. A detailed description of the Quick Test, its administration and scoring procedures are given by Ammons and Ammons (1962).

Analysis

All data were keypunched onto computer card for analysis. The BMDP2V computer program for analysis of variance with repeated measures was used to analyze overall effects. All variables were scored according to standard procedures except Location and Pathognomic Verbalization. For purposes of this analysis only, the Location scores were inverted such that a score of 0 = Small area of the inkblot; 1 = Large area of the inkblot; and a score of 2 = Whole inkblot used. Pathognomic Verbalization scores were also inverted from the lowest to the highest for the analysis. This procedure was used in order to equalize the direction of predicted outcomes. Tukey's test for individual comparisons was also used to test individual mean differences.

CHAPTER IV

RESULTS

The results of the matching procedures for the two treatment groups (reward and non-reward) by sex of subject are presented in Table II.

TABLE II

MEAN AMMONS QUICK TEST SCORES-
BY TREATMENT AND SEX

Treatment (n=10)	Sex	Ammons IQ
Non-reward	Male	98.3
Non-reward	Female	98.2
Reward	Male	97.9
Reward	Female	97.8

Although the Ammons Quick Test scores underestimate the IQ level, research (Ammons & Ammons, 1962; Mednick 1967; Mednick 1969) has consistently shown high correlations between the Ammons Quick Test and other measures of intellectual ability (.77 to .96 correlations with the

revised Stanford-Binet and the Wechsler).

A 2 (reward/non-reward) X 2 (male/female) analysis of variance with repeated measures on the targeted HIT developmental variables indicated a highly signficant overall main effect of Reward, F (1,36) = 14.26, $p < .001$. As predicted reward subjects performed at a lower level on all variables except Location and Pathognomic Verbalization. Although there was no significant main effect of Sex F (1,36) = 1.48, $p < .231$, a significant Sex X Reward/Non-reward interaction was obtained, F (1,36) = 4.21, $p < .048$. This interaction was due to a lower performance by males under reward. Female subjects under reward also had a lower overall performance than non-reward subjects, but not to the degree of the males. The results of the analysis are presented in Table III.

Significantly different mean scores on Form Appropriateness, Form Definiteness, Shading, and Response Time were obtained via individual comparisons of mean scores on the targeted developmental variables. Reward subjects scored significantly lower on these four variables (Form Definiteness, Shading, and Response Time, $p < .01$, and Form Appropriatness $p < .05$). Although not statistically significant the mean scores for all the developmental variables were in the predicted directions (see Table IV). Raw scores for all subjects on the 10 targeted HIT variables and IQ are presented in Table V (see Appendix C).

The short interview after the experiment was over indicated that most of the subjects found the tasks to be interesting and that there was no loss of interest or attention as the task proceeded. Follow-up interviews are also to be taken at a later date to ascertain whether or not interest will remain high in these tasks.

TABLE III

ANALYSIS OF VARIANCE WITH REPEATED MEASURES
on HIT DEVELOPMENTAL VARIABLES*

Source	Sum of Squares	df	Mean Square	F Ratio	p
Between					
Reward/Non-reward (R/NR)	1133.68	1	1133.68	14.26	.001
Sex	117.72	1	117.72	1.48	.231
R/NR X Sex	334.16	1	334.16	4.21	.048
Error	2860.81	36	79.47		
Within					
HIT Variables (HIT)	175262.31	9	19473.59	389.39	.000
HIT X R/NR	558.79	9	62.09	1.24	.269
HIT X Sex	854.08	9	94.90	1.90	.052
HIT X R/NR X Sex	774.46	9	86.05	1.72	.083
Error	16203.57	324	50.01		

* Developmental HIT variables used in this analysis included: Response Time, Location, Form Definiteness, Form Appropriateness, Color, Shading, Movement, Pathognomic Verbalization, Integration, and Human.

TABLE IV

HIT MEAN SCORES FOR REWARD AND NON-REWARD ON DEVELOPMENTAL VARIABLES

Variable	Non-reward	Reward	p*
Response Time	21.01	14.98	.01
Location	27.00	29.50	ns
Form Definiteness	69.05	61.95	.01
Form Appropriateness	44.30	40.85	.05
Color	16.85	15.00	ns
Shading	13.15	6.05	.01
Movement	26.30	25.35	ns
Pathognomic Verbalization	1.05	1.70	ns
Integration	6.70	5.10	ns
Human	26.70	24.25	ns

* Tukey's test of individual comparisons for repeated measures designs used to test differences among mean scores.

CHAPTER V

DISCUSSION

The results obtained in this study confirm McGraw's (1978) empirical model which predicts the detrimental effect of reward in tasks that are attractive and require heuristic solutions. Even so, it does not provide an adequate explanation of this phenomenon.

The relative differences between the reward and non-reward groups are presented in Figure 1. As predicted, the reward subject had lower scores on the HIT developmental variables of Response Time, Form Appropriateness, Form Definiteness, Shading, Movement, Color, Integration, Human, and higher scores on Pathognomic Verbalization and Location. In general, these are the same variables that have been found to be related to developmental level, creativity, problem-solving, and flexability thought. The significantly lower mean scores for Form Definiteness, Form Appropriateness, Shading indicate that the reward group was less concerned and responsive to the details and subtleties of form and structural organization. The significantly quicker Response Time in the reward group reflects a more impulsive quality of response. In fact, although only the reward and non-reward differences for Form Definiteness, Form Appropriateness, Shading, and Response Time were statistically significant, results for all targeted HIT developmental variables were in the predicted direction, with a high level of significance ($p < .001$) of the overall reward/non-reward differences.

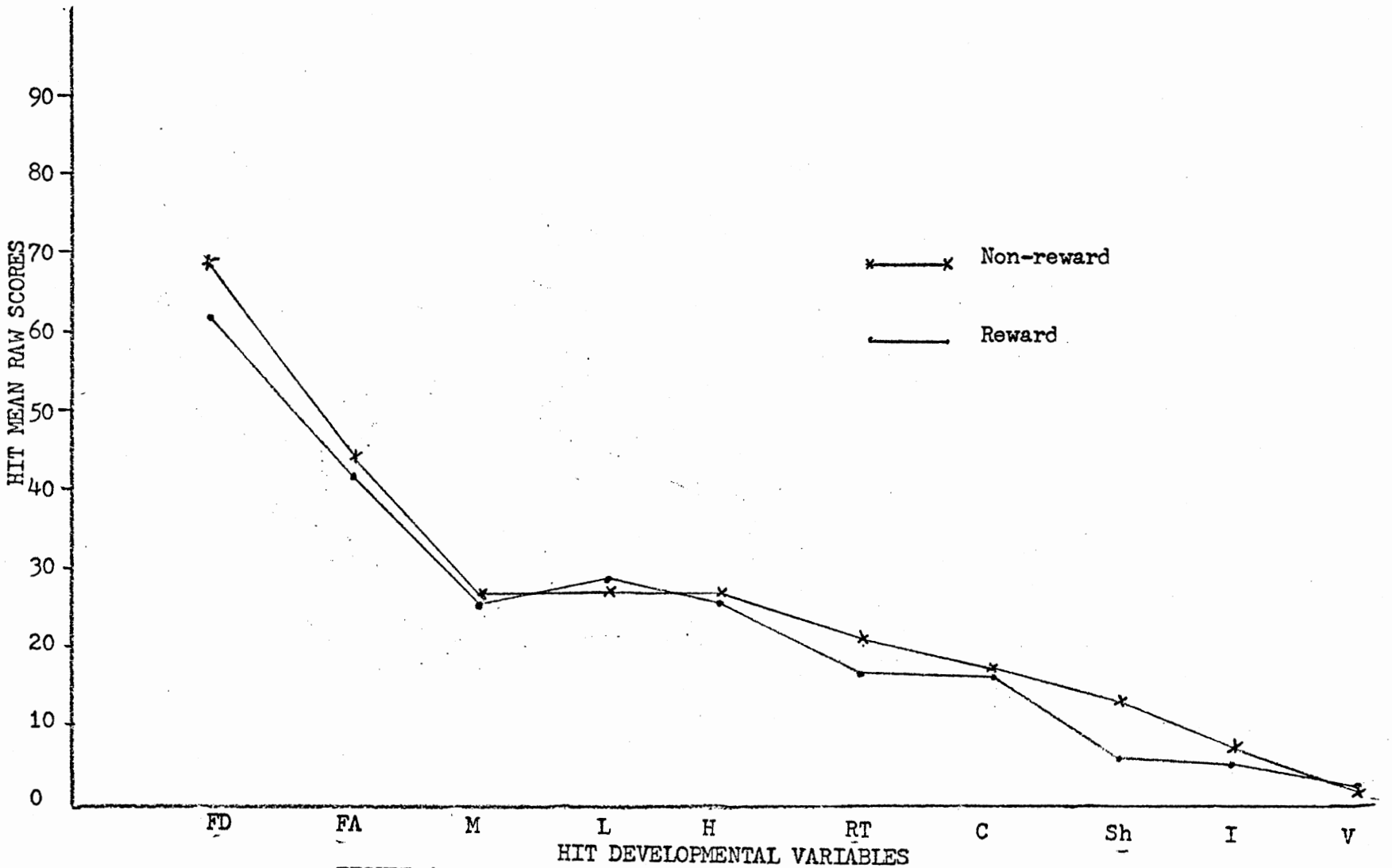

FIGURE 1. HIT MEAN RAW SCORES FOR REWARD AND NON-REWARD GROUPS

Given the differences between the two groups, what mechanism may best account for this effect of material reward on inkblot perception and organization? The short interview seemed to indicate that reward did not undermine intrinsic interest in the task, or significanly affect motivation. Clearly, however, a higher developmental level of performmance was achieved by the non-reward group. This finding is not an isolated occurance. Pilot work for this research was replicated by this thesis.

Is this difference in the level of performance of reward and non-reward due to an actual developmental regression under reward conditions or perhaps reward merely disrupts the subject's perceptual organizational processes? If a disruption of organizational processes had taken place, reward subjects might be expected to perform like adults whose processes are known to be disrupted, such as a schizophrenic or a mentally retarded population. A comparison of the HIT scores for the reward group and the normative scores for schizophrenic and mentally retarded adults given by Holtzman et al. (1961) reveals that the performance of the reward subject did not resemble the performance of these abnormal subjects (see Table VI).

The median scores for the reward subjects closely resemble the normative scores at the 50th percentile for elementary school children. The median scores for the non-reward subjects were clearly different from the elementary school normative data and were closer to the normative data for college students presented by Holtzman et al. (1961). See Table VI.

The decreased scores in Color and Movement, and increased scores in Location under reward are in line with the findings by Kidd and Kidd

TABLE VI

MEDIAN SCORES FOR NORMATIVE GROUPS ON HIT DEVELOPMENTAL VARIABLES

	Treatment Groups		Population Normative Scores*			
Variable	Non-reward	Reward	Elementary School Children	College Students	Chronic Schizophrenics	Mentally Retardates
Response Time	19.8	12.9	13.5	21.5	20.5	17
Location	26	27.5	30.5	21.5	15.8	14.5
Form Definiteness	70	62	75	79	66	77.5
Form Appropriateness	44	40	42.3	43.5	37	34.5
Color	18	14.5	21	21.8	15	9.5
Shading	14.5	6	8	16	5	3.5
Movement	24.5	22.5	23.5	41.5	5.5	9.5
Pathognomic Verbalization	1.0	1.5	2.5	3	10	9
Integration	6	5	2.5	9.8	.5	.5
Human	25	24	15.5	24	6	6

* Normative scores for subject populations were obtained by taking the score at the 50th percentile in the norms presented by Holtzman et al. (1961).

(1971) who compared the relationship between rigidity and HIT variables. This finding suggests that under reward, subjects may be more rigid in their ability to process information. This increase in rigidity is also in line with the findings of McGraw and McCullers (1975) that reward hampers subject's ability to break set on Luchin's water-jar problems, and would fit Werner's (1948) hypothesis that development proceeds in the direction of increasing flexibility. Thus the increase in rigidity of responses under reward may also be an indication of developmental regression.

The significance of the Sex X Treatment interaction is difficult to interpret. There have been few reports of sex differences in responses to the HIT. There have also been few sex differences found in the detrimental effects of material reward literature. Given this, there was no reason to predict a differential effect of reward on sex of subject. The intrepretation of this interaction perhaps should be suspended until this finding can be replicated.

Implications

Given the high degree of significance of the overall reward/non-reward differences, the agreement of present findings, and the Holtzman et al. (1971) study, there does appear to be evidence that material rewards affect inkblot perception and organization. Although not wholly convincing, this research does provide some support for a regression of permance under reward conditions. Further research into these mechanism is needed before a final accounting for the effects of reward can be made. This research needs to be replicated using blind experimenters who are unaware of which condition a subject belongs to. Perhaps independent examiners and scorers may help tighten the control and eliminate any possible unconscious experimenter bias.

The comparison of the reward group to the normative data of elementary school children (Holtzman et al., 1961) revealed close similarities to the performance of adults under reward. These comparisons, although compelling, need to be made with with actual samples of elementary school children. An important extension of this research should include the inclusion of a elementary school population under reward and non-reward conditions. In this way, a comparison of adults and young children may be readily made.

Conclusion

The effect of material reward on inkblot perception and organization is readily apparent and measureable. Reward subjects' inkblot perceptions closely resembled the percepts of young children and support a developmental regression hypothesis to account for reward's effect.

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APPENDIXES

APPENDIX A

PILOT STUDY

PILOT STUDY

In an attempt to determine whether or not reward would have any effect on inkblot perception and organization, a pilot study was undertaken before the main research was conducted. 16 subjects (10 non-reward and 6 reward) were administered Form A of the HIT following the same procedures as outlined in Chapter III.

The results of this pilot work were analyzed using the same analysis of variance with repreated measures as stated in Chapter IV. Although sample size did not permit an analysis of sex, the overall analysis of reward/non-reward differences proved significant at the .002 level for the HIT developmental variables described previously. Results of the analysis are presented below.

Source	Sum of Squares	Degrees of Freedom	Mean Square	F Ratio	p
Between					
Treatments	558.73	1	558.73	14.61	.002
Error	535.55	14	38.25		
Within					
Within Subjects	51591.27	9	5732.36	112.44	.000
Within Subjects X Treatments	712.73	9	79.19	1.55	.136
Error	6423.55	126	50.98		

Again, as in the main thesis research, the results on all 10 HIT variables were in the predicted directed. Results are presented below.

MEAN SCORES FOR HIT DEVELOPMENTAL VARIABLES

Variable	Non-reward	Reward
Response Time	23.91	13.61
Location	30.20	30.33
Form Definiteness	76.30	64.50
Form Appropriateness	42.50	42.30
Color	24.70	19.50
Shading	15.30	8.33
Movement	30.30	26.17
Pathognomic Verbalization	2.70	3.17
Integration	7.20	6.33
Human	30.5	28.33

This pilot work adds additional significance to the main body of research in that the phenomenon has been replicated with a high degree of statistical significance, using very small samples. The pilot work served as a starting point for the main research and seems to bear out the fact that reward does have an regressive effect on perception and organization, and gave way to the conducting of the formal body of this research.

APPENDIX B

INTERVIEW QUESTIONS

INTERVIEW QUESTIONS

1. Did you enjoy these tasks?
2. Which of these tasks did you find more enjoyable?
3. Did you have any idea what was to go on in this experiment?
4. Had anybody said anything to you about this experiment?
5. Do you know anybody else who has participated in this experiment?

APPENDIX C

RAW SCORES FOR EACH SUBJECT

TABLE V

RAW SCORES FOR EACH SUBJECT ON HIT DEVELOPMENTAL VARIABLES AND IQ

Subject	Treatment	Sex	Response Time	Location	Form Definiteness
1	Non-reward	Male	45.5	27	81
2	Non-reward	Male	20.3	20	50
3	Non-reward	Male	27.7	19	62
4	Non-reward	Male	34.4	26	73
5	Non-reward	Male	14.8	29	70
6	Non-reward	Male	11.6	22	65
7	Non-reward	Male	18.1	20	71
8	Non-reward	Male	33.7	24	85
9	Non-reward	Male	15.4	30	83
10	Non-reward	Male	12.1	21	69
11	Non-reward	Female	20.0	43	70
12	Non-reward	Female	41.4	38	57
13	Non-reward	Female	25.2	42	68
14	Non-reward	Female	16.5	27	62
15	Non-reward	Female	6.6	21	62
16	Non-reward	Female	20.0	22	76
17	Non-reward	Female	13.6	26	60
18	Non-reward	Female	13.0	31	71
19	Non-reward	Female	19.5	14	75
20	Non-reward	Female	12.5	38	71
21	Reward	Male	9.0	26	53
22	Reward	Male	10.4	14	57
23	Reward	Male	31.4	31	81
24	Reward	Male	18.4	38	65
25	Reward	Male	15.7	28	50
26	Reward	Male	9.0	14	44
27	Reward	Male	33.3	23	64
28	Reward	Male	21.5	55	62
29	Reward	Male	6.8	26	39
30	Reward	Male	11.6	17	72
31	Reward	Female	11.1	25	56
32	Reward	Female	10.3	36	62
33	Reward	Female	14.7	38	62
34	Reward	Female	13.9	21	67
35	Reward	Female	9.8	29	56
36	Reward	Female	14.6	34	74
37	Reward	Female	12.0	24	65
38	Reward	Female	21.7	42	64
39	Reward	Female	10.6	38	86
40	Reward	Female	13.7	31	60

TABLE V

RAW SCORES FOR EACH SUBJECT ON HIT DEVELOPMENTAL VARIABLES AND IQ - CONTINUED

Subject	Form Appropriatness	Color	Shading	Movement	Human
1	45	12	15	42	26
2	45	20	14	20	20
3	44	19	15	42	25
4	46	12	17	56	37
5	46	27	21	39	34
6	42	13	18	26	22
7	44	12	12	19	34
8	41	13	06	23	18
9	44	12	14	23	17
10	47	18	19	37	21
11	46	14	11	11	33
12	43	19	16	11	24
13	47	20	15	15	25
14	43	21	21	31	25
15	42	18	16	16	32
16	44	19	12	27	43
17	44	30	03	13	16
18	44	15	02	23	32
19	47	19	09	38	33
20	42	04	07	14	17
21	42	10	09	38	26
22	30	23	07	14	21
23	32	05	02	40	29
24	39	27	18	23	24
25	48	18	06	21	20
26	39	17	07	16	13
27	43	16	07	37	20
28	40	11	02	07	19
29	40	15	09	14	15
30	41	19	03	23	25
31	47	26	07	22	32
32	39	13	03	48	38
33	40	14	13	20	31
34	38	12	03	21	17
35	39	16	06	35	31
36	45	10	09	32	30
37	45	13	03	52	23
38	48	09	05	18	27
39	39	10	01	06	17
40	43	17	01	20	27

TABLE V

RAW SCORES FOR EACH SUBJECT ON HIT DEVELOPMENTAL VARIABLES AND IQ - CONTINUED

Subject	Pathognomic Verbalization	Integration	IQ
1	0	7	96
2	0	6	96
3	0	10	96
4	4	9	96
5	5	11	107
6	0	6	96
7	0	6	94
8	2	9	94
9	0	4	102
10	0	12	106
11	0	3	94
12	0	1	95
13	0	3	91
14	2	12	90
15	0	5	106
16	2	12	104
17	2	2	106
18	1	3	95
19	3	10	106
20	0	3	95
21	1	8	96
22	0	6	104
23	2	8	98
24	2	5	100
25	6	5	100
26	0	5	96
27	5	4	100
28	1	2	92
29	1	1	98
30	0	8	95
31	3	7	98
32	2	9	98
33	6	4	94
34	2	7	98
35	0	5	104
36	0	4	94
37	1	7	102
38	0	2	99
39	0	2	93
40	2	3	98

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