THE EFFECT OF MATERIAL REWARD ON
FOUR- AND FIVE-YEAR-OLDS'
PERFORMANCE ON
COMPUTER TASKS

By

LAUREN LAYLE REESE

Bachelor of Science

Oklahoma State University

Stillwater, Oklahoma

1994

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
MASTER OF SCIENCE
May, 1996

OKLAHOMA STATE UNIVERSITY

THE EFFECT OF A MATERIAL REWARD ON

FOUR- AND FIVE-YEAR-OLDS'

PERFORMANCE ON

COMPUTER TASKS

Thesis Approved:

Mona Lane

Thesis Advisor

Elaine Wilson

Kay R. Murphy

Thomas C. Collins

Dean of the Graduate College

PREFACE

This study focused on providing further information on the detrimental effects of extrinsic rewards. Specifically, this study examined the effect of an extrinsic reward on young children's performance on a cognitive computer task.

I would like to express appreciation to all who have assisted and supported me in this project and throughout my graduate study at Oklahoma State University. First and foremost, I wish to express thanks and appreciation that words cannot express to my major advisor, Dr. Mona Lane for her patience, guidance, financial and moral support, and advice throughout the project and my graduate career as a Masters student. Dr. Lane's expertise, experience, and devotion to learning how to provide the best we know how for young children has helped make the project exciting and inspired me to carry my research and work with young children further. I am also extremely grateful to my committee members: Dr. Kay Murphy, for her motivation, strength, and genuine interest in my career, and Dr. Elaine Wilson, for her enthusiasm in my project and expertise in research with rewards and children. A special thanks goes to professor emeritus Dr. John McCullers for his time and expertise devoted to the methodology development and review of this study; his insight helped us all rest a little easier.

Special thanks and appreciation are due to all of those who helped with the loaning of computers and software selection for this project. Dr. Daniel Shade and

Mr. Warren Bunklightner were invaluable in sharing their expertise in software uses by young children and advice on appropriate software choices. Thanks go to those at the EDMARK Corporation in Redmond, Washington who donated the software and provided technical information: Taryn Mayhew, Amy Shottenstein, and Rita Conley. Gratitude is expressed to Dr. Carolyn Henry, Mr. Scott Plunkett, and Dr. Harriett Kuykendall for their help and loaning of computers to help me complete the project. Thanks also goes to Janice French for all her time and help in getting the software loaded onto various machines in order to find the appropriate one to run the software.

Appreciation is also due to those who helped with the statistical analyses and interpretations. Thanks to Iris McPherson whose help with running the ANOVA on my raw data was invaluable. Gratitude goes to my good friend and colleague, Ms. Sai Jambunathan, and to Dr. William Warde for their help with interpreting the statistical results.

Also, I thank all of those involved in allowing me to do research in the Child Development Laboratories. Appreciation goes to Dr. Nancy Hurlbut for her advice and interest in my study. Thanks also goes to Dr. Harriet Kuykendall for her help in providing a research room and allowing me to use a computer for data collection; and the classroom teachers: April Baumgartner, Jody Kennedy, and Camilla Dallas who helped gather consent forms, and for their cooperation during data collection; and to the children who participated in the project for the joy and learning experiences they provided while working with them.

Gratitude is due to the Department of Family Relations and Child Development for their support of my study and especially to my fellow graduate students and colleagues who also provided advice and moral support throughout the entire project. Also, appreciation is due to Ms. Sherre Davidson who introduced me to Dr. Kohn's book, Punished by Rewards, inspired me to study the effect of rewards on young children further.

Finally, I would like to say thanks to my entire family for their love, support and encouragement of pursuing my true interests and graduate studies. Thanks especially goes to my mom who was my first model of what Early Childhood Educaiton is all about. And to Gary, thanks for your patience, love, and support; this is what I've been doing in Oklahoma.

This thesis is dedicated to the memory of the late Ms. Barbara Heister, one of my early supervisors, who will continue to be one of the most important role models throughout my career.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

Bribes and threats are used frequently with children in various home and school settings. If a punishment is aversive enough or a reward is appealing enough, children agree to do much of what adults would like them to do. For this reason, parents and teachers insist that rewards and punishments are effective when dealing with young children (Kohn, 1994). However, according to research, rewards have been found to enhance certain kinds of behavior, but not all behaviors. A social psychology research period in the 1970's and early 1980's on intrinsic motivation produced findings that under certain conditions, extrinsic rewards and incentives could undermine an intrinsic motivation to learn (Condry & Stokker, 1992). Studies have also shown that rewards have detrimental effects on attractive-heuristic task performance; such as those involving problem solving and creativity and have facilitating effects on aversive-algorithmic tasks; such as drill and practice tasks or those that are mundane (McGraw, 1978). In a study investigating the effects of material reward on the ideational fluency of preschool children, Groves, Sawyers, and Moran (1987) found that even the promise of an extrinsic reward was enough to hamper ideational fluency in preschool children and suggest that additional research is needed to determine the effects of rewards on other areas of cognitive functioning since the use of rewards in the educational system is so widespread.

For several years, McCullers and his research group have been working on an explanation of the effects of material rewards on task performance that is based on the concept of developmental regression. According to this view, material rewards produce a temporary regression in psychological organization and functioning; people perform more primitively under reward than nonreward. This research group has explored the concept of developmental regression through the study of reward effects on intelligence tests, perceptual techniques, cognitive tasks, moral reasoning scales, creativity tasks, and internal control of behavior questionnaires; however, they have not explored this concept in a computer context. Although cognitive tasks and rewards have been examined, computer tasks and rewards with young children have not been studied.

There was a body of research on computers and young children in the 1980's, which explored the appropriateness of using computers in early childhood programs and the effect of a computer on various developmental areas in the early childhood curriculum (Anselmo & Zink, 1987; Barnes & Hill, 1983; Beeson & Williams, 1985; Fein, Campbell, & Schwarz, 1987; Healy & Schilmoeller, 1985; Hoover & Austin, 1986; Lipinski, Nida, Shade & Watson, 1984; Lipinski, Nida, Shade & Watson, 1986; McBride & Austin, 1986; Muller & Perlmutter, 1985; Perlmutter & Behrend, 1985; and Riding & Powell, 1987), but the current emphasis in computer research in early childhood programs focusses more on software uses and appropriateness (Shade, 1994; Elliot, 1993; and Haugland, 1992), patterns of motivation and social behavior with the computer (Bergin, Ford, & Hess, 1993 and Podmore, 1991), and reports on usage and current issues in the classroom (Kaden, 1990; Shade & Watson, 1990 and Ward, 1990.)

Since computers are now an integral part of many early childhood classrooms, and rewards have shown detrimental effects on some cognitive tasks, the primary goal of the present research study was to explore the relationship between extrinsic rewards and a computer cognitive task with four- and five-year-old children.

Purpose of the Study

The major goal of this research study was to examine the effects of extrinsic rewards on cognitive computer tasks with young children. Previous research on cognitive tasks and material rewards supports a regression model. This study is a continuation of this research project.

Hypotheses

The following general hypothesis was developed for this study:

Material rewards will have detrimental effects on four- and five-year-old's performance on cognitive computer software, and result in temporary regression in children's cognitive behavior.

More specifically, two research hypotheses were developed for the study:

1) The offer and presence of an extrinsic reward will lower four- and five-year-olds' computer cognitive task performance.

2) The decrease in computer cognitive task performance will be temporary in nature; that is, the scores will return to near their original level when performing the task under the non-reward condition.

CHAPTER II

REVIEW OF LITERATURE

Detrimental Effects of Extrinsic Rewards on Children

Social psychology research regarding the differences in intrinsic and extrinsic motivation began to flourish in the 1970's and early 1980's. These special studies soon suggested that extrinsic rewards and incentives could undermine intrinsic motivations to learn (Condry & Stokker, 1992). Thus, "It was also suggested that learning which occurred in more intrinsically motivating conditions was more stable, long-lasting, and more integrated with the identity of the individual learner. In a phrase, it was a better way to learn" (Condry & Stokker, 1992, p.157). Current researchers and educators are beginning to voice even stronger opinions about the use of extrinsic rewards in the home, school and workplace:

> Gold stars, smiley faces, trophies, certificates, high grades, extra recess time, candy, money, and even praise all share the feature of being "extrinsic" to whatever behavior is being rewarded. Like sticks, carrots are artificial attempts to manipulate behavior that offer children *no reason to continue acting in the desired way when there is no longer any goody to be gained*. Do

rewards motivate students? Absolutely. They motivate students to get rewarded. What they fail to do is help children develop a commitment to being generous or respectful (Kohn, 1991, p.500).

Extrinsic rewards are extensively used with children in various home and school settings. Despite the common use of extrinsic rewards to motivate children, it has been proven that rewards can undermine interest in classroom activities (Csikszentmihalyi, 1975; Deci, 1975; Lepper, Greene, & Nisbett, 1973) and have detrimental effects on immediate task performance (Condry, 1977; Kruglanski, Friedman & Zeevi, 1971; McGraw, 1978). These 1970s studies are still highly regarded in the field of motivational research. In an attempt to account for the detrimental effects of rewards, two models have been proposed; developmental regression and McGraw's Algorithmic-Heuristic Model.

Developmental Regression

In the past decade, McCullers and other researchers (Fabes, McCullers, & Hom, 1986; Fabes, Moran, & McCullers, 1981; Fabes, McCullers, & Moran, 1985; Lane, 1989; McCullers, Fabes, and Moran, 1987; Mickle, 1979; Moran, McCullers, & Fabes, 1984; O'Malley, 1986; Vafaie, 1985; Wilson, 1985) have been working on an explanation of these detrimental effects based on the concept of developmental regression. They have explored this through the study of reward effects on intelligence tests, perceptual techniques, cognitive tasks, moral reasoning scales, creativity tasks, and internal control of behavior questionnaires. They have found that children tend to regress to an earlier stage of development when presented with a material reward; i.e., their behavior represents that of a younger child.

In an early study of this research group, Fabes et al. (1981) found that female undergraduate students in a non-reward condition performed significantly better on subscales of the Wechsler Adult Intelligence Scale that require more insight and discovery than did the subjects in the reward condition. Subsequently, Fabes et al. (1986) administered the mazes and block design subscales of the Wechsler Intelligence Scale for Children-Revised to third grade children under reward or nonreward conditions. Supporting the notion that rewards can affect the developmental level at which a subject approaches a task, the results indicated that the rewards adversely affected immediate task performance. Also, McCullers et al., (1987) administered the Peabody Picture Vocabulary Test and Goodenough's Draw-a-Man Test to four- and five-year-olds under reward and non-reward conditions. Subjects performed at a lower level on both tests, but when shifted back to a non-reward condition, the subjects scores dramatically improved. This is consistent with another prediction of the regression model; that is, that the detrimental effects of the extrinsic reward would be temporary in nature.

McGraw's Algorithmic-Heuristic Model

McGraw (1978) proposed a model that predicts when rewards will have a detrimental or facilitating effect on children's performance. He suggests that

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

Through this model, material reward is expected to enhance performance on unattractive or algorithmic tasks and have a detrimental effect on attractive or heuristic tasks. Attractive-heuristic tasks require insight to organize and integrate available information in a more creative, problem solving manner (Fabes, 1978). Algorithmic tasks are tasks in which the solution is clear, straightforward and no time is needed to discover how to work it.

Research with Computers and Early Childhood Education

With a technological age in America rapidly increasing, so has the abundance of computer technology in early childhood programs increased. Current guidelines for early childhood curriculum presented by the National Association for the Education of Young Children are based on the concept that children construct knowledge through interaction with materials and people (National Association for the Education of Young Children & National Association of Early Childhood Specialists in State Departments of Education, 1991). Critics argue that computers should not be a part of this curriculum, as computers are not concrete learning materials (Clements, Nastasi, and Swaminathan, 1993). Research indicates, however, that even preschool children can use appropriate computer programs (Clements & Nastasi, 1992). Consistent findings have shown that young children like working with computers, their parents like them to use computers, and teachers are generally positive about computer use with young children (Fite, 1993). The research on computer usage by young children has focused on the following categories: gender differences, social and emotional aspects, cognitive aspects, parental attitudes, software uses, and appropriate uses of the computer in early childhood settings.

Gender Differences in Computer Usage by Young Children

The evidence of gender similarities and differences in computer usage and preferences of children is not consistent in the literature, but most researchers agree that not many differences exist. Findings from one study suggest that girls used the computer more than boys in one part of their study, but found no gender differences in another part of their study (Lipinski et al, 1984). The computer has been found to be a more male oriented activity in some settings (Elliot, 1993). However, findings have been consistent that no gender differences exist (Muller & Perlmutter, 1985; Beeson & Williams, 1985; Elliot, 1993). Bergin, Ford, and Hess (1993) found that kindergartners are equitable and cooperative in their interactions and that teachers are equitable in their interactions with boys and girls. Thus, this element of computer use should be evaluated in light of each setting and monitored by the teachers in the classroom (Kaden, 1990).

Experts suggest that the sex differences that have been found are due to some children who are already "experts" or have more computer experience than other children (Lipinski et al, 1986). They also attribute any differences found to the high ratio of children to few computers in classroom settings and the aggressive behavior that results from it (Kaden, 1990; Lipinski et al, 1986).

Social and Emotional Aspects of Young Children and Computers

When computers were first introduced to early childhood settings, critics were skeptical that computers would isolate children at a crucial time when they should be developing social skills (Kaden, 1990). Many studies show differently (see Podmore for a review, 1991). For example, Muller and Perlmutter (1985) were one of the many to show that social isolation effects do not occur when pre-school age children use the computer.

Research has consistently shown that the computer elicits high levels of spoken communication and cooperation when young children interact with it. The computer is a socializing agent that has been shown to encourage group play (Hoover & Austin, 1986). Compared to traditional classroom activities, the computer elicits more social interaction and different types of interaction. Young children more frequently initiate interactions and take turns in the computer environment (Clements et al, 1993). After being exposed to computer activities for only two months, preschool children have been found to have an increase in functional activities (Fein et al, 1987). When compared to other activities such as jigsaw puzzles, children working with computers spend significantly more time working with a peer, spontaneously sharing and instructing each other (Muller & Perlmutter, 1985).

Not only do children positively interact with peers more at the computer, children seem to enjoy working with computers. McBride and Austin (1986) found that most preschool children had a positive affect toward the computer and chose to use the computer in a free-play setting. They also found a positive relationship between computer usage frequency and positive affect. In studying affective facial expressions while using the computer, children show interest in the computer when working alone, but display enjoyment when working with a peer (Shade, 1994). Four- and five-year-olds have displayed more positive affect when working with a peer, rated the affect higher, and retained more about the computer experience than children who work alone (Perlmutter & Behrend, 1985).

Cognitive Aspects of Computers and Young Children

Computers are now integrated into most cognitive aspects of the early childhood curriculum, such as language and literacy, math and science. Experts believe that computers can enhance children's early literary experience by creating computer environments that reinforce representational print and the reading and writing connection (Rowland & Scott, 1992). Riding and Powell (1987) have found that reading skills can be improved through the use of computer-presented critical thinking activities. Computers, along with the appropriate software, have proved to emphasize the four thinking skills of a process-oriented curriculum: comprehension, memory, evaluation, and creativity; as well as encourage non-readers to read (Anselmo & Zinc, 1987).

Parental Attitudes Toward Computers and Young Children

Parents whose young children use computers have positive and optimistic attitudes towards computers and their children's use of the computer, as well as perceive them to be important for children (Scherer, 1990). Parents whose children use computers in a school setting generally have more positive attitudes about computer use by young children than parents whose children were not using computers in school. Negative correlations between parental educational level and attitudes toward computer usage have been found, but family income is positively correlated with both general attitudes toward computers and attitudes toward computer use by young children (Healy & Schilmoeller, 1985).

Software Uses by Young Children

With the proliferation of computer usage in early childhood programs, the varieties of software available has also increased. With this, there is a range of software types that include drill-and-practice software and more open-ended problem solving software. Children have shown to prefer the open ended problem solving software and consistently choose it over other software when given a choice (Sherman, Divine, & Watson, 1985).

Studies that investigated children working with problem solving software have shown that greater gains were made in reading than with children who worked with reading-drill software (Riding & Powell, 1987). With drill-and-practice software, competition may be encouraged, thus discouraging the exchange of ideas and independence. Also, boredom with pencil and paper tasks is thought to be a detrimental side effect of the usage of drill-and-practice software (Clements et al, 1993). However, in more open-ended software environments, children are more prone to formulate and solve their own problems, to evaluate their work in a positive manner, appear more motivated, and develop positive attitudes about learning (Clements et al, 1993). Children who use open-ended software have made significant gains in intelligence, non-verbal skills, structural knowledge, long-term memory, complex manual dexterity, and self-esteem (Haugland, 1992).

Appropriate Uses of Computers in Early Childhood Settings

Computers in the early childhood setting were originally met with some concern and criticism, but have become increasingly accepted as research continues (Shade & Watson, 1990). Fearing the worst, in the computer's early days in early childhood curricula, Barnes and Hill (1983) envisioned isolated behavior, stunted language development, and the case of abstract concepts being encouraged more than concrete experiences. None of their fears have proved true, in fact, Walker (1983) lists seven key contributions the computer can make to education: "1) more active learning, 2) more varied sensory and conceptual modes, 3) less mental drudgery, 4) learning nearer the speed of thought, 5) learning better tailored to individuals, 6) more independent learning, and 7) better aids to abstraction". As part of a rich and varied program, the computer is able to supplement the strong elements of the curriculum and become another avenue for play and imaginative thinking (Ward, 1990).

In response to the influx of computers in early childhood programming, the Southern Association of Children Under Six (SACUS; now called SECA, the Southern Early Childhood Association) has put forth a position statement regarding the role and place of computers in quality programs; involving children with computers; appropriate uses of computers with children; and the roles of staff in integrating computers into the early childhood curriculum (1989). SACUS asserts that computers are valuable to early childhood curriculum, but must not be used as isolated activities or tutorials. The National Association for the Education of Young Children (NAEYC) has two committees who meet annually, the NAEYC Technology Panel and the Young Children Caucus (TYCC), to discuss the wide variety of issues that were raised in their published book on computers and young children (Wright & Shade, 1994).

Summary

The abundance of computer technology in early childhood programs has increased at a rapid pace in the past decade. Despite early critics, researchers and experts have found that children, parents, and teachers have positive attitudes toward computers in early childhood programs. Researchers have also found cognitive and social benefits with computers. The presence of a computer has been deemed a socializing agent (Hoover & Austin, 1968) and it's presence has increased peer interaction (Muller & Perlmutter, 1985), turn taking (Clements et al, 1993), and functional activities (Fein et al, 1987). Reading and other literacy skills have also improved with the presence of a computer (Rowland & Scott, 1992; and Riding & Powell, 1987).

Studies regarding the detrimental effects of extrinsic rewards and young children flourished in the 1970's, and found that extrinsic rewards often have temporary harmful effects on young children's cognitive performance. However, none of these studies investigated the effect of an extrinsic reward on computer performance with young children.

Although the research in the field of young children and computers has flourished in the past decade, there are still gaps in the research. Experts still suggest that "good research is sorely lacking" in this area (Lepper & Gurtner, 1989). Material rewards have been studied also in the past, but further research is needed regarding material rewards and software uses by young children.

CHAPTER III

METHODS AND PROCEDURES

Subjects

A total of 39 subjects from a University Laboratory Program were given parental consent to participate in the study. Three subjects had irregular attendance, two subjects chose not to participate, one subject moved, and one subject's data was not usable since the parent arrived to pick them up during baseline data collection, thus the research sample consisted of 32 children. The sample consisted of 18 males and 14 females and were predominantly white, middle-class children. The subjects were selected from the three classrooms in the program that 4- and 5-year-olds are enrolled in. One class is a three- to five- year old class, one is a four-year-old class, and the other is a Kindergarten class. The three children that were not in the four and five year age range were 3.5-, 6.3-, and 6.4- years old. The rest of the sample consisted of four- and five-year-old children. The four-year-olds range in age from 4.0 to 4.11. The five-year-olds range in age from 5.0 to 5.10.

Design

The research design is a repeated measures experiment that was conducted in three separate sessions: (a) baseline session; (b) reward condition session, and (c) non-reward condition session (see appendix B). The baseline session was designed to obtain the subject's score on the computer game under normal conditions. The reward condition was to determine the subject's score when given an extrinsic reward for playing the game. The non-reward condition was designed to determine the subject's score once again with no reward (see Appendix B).

Materials and Procedure

All data were collected by a white female graduate student experienced in working with young children. All three data collection phases took place in an empty research room near the classrooms. The children in three classrooms had a computer in their classrooms at least two weeks prior to the study. Prior to introducing the computers to the classroom, the classroom teachers were informed as to the upcoming research.

Microcomputers

The computer used for the study was a 486 microcomputer equipped with a color monitor, mouse and a soundcard and external speakers to provide for the auditory aspects of the software program.

Software

The software package used for this study was Thinking Things, a Windows package by Edmark (1994). The program "Fripple Shop" was used. It is an open ended, cognitive program suitable for 4- and 5-year-olds, and was recommended by a researcher and reviewer of early childhood software because of it's quantifying capabilities for research and it's developmentally appropriateness for young children. The setting for the program is a store where "customers" come and "shop" for their "Fripples", which are characters that possess several different attributes such as color, curly or straight hair, size of eyes, and spots or stripes and with or without sunglasses. The customers may shop in person or via facsimile machine or telephone. In order to simplify research procedures, the participants shopped in person, via the door to the shop. When the children click on the door with the mouse, a customer comes in and asks for the attributes of the Fripple they would like. If the child chooses the correct one, it hops down and off with the customer. If the child does not choose correctly, the program says "That is not exactly what the customer wants" or "please try another Fripple", and the child is able to try until he is correct. The program has four levels with 6 sublevels and the difficulty increases as the child progresses through the program.

In relation to McGraw's Algorithmic-Heuristic Model (McGraw, 1978), this software can be somewhat confusing to place in the model. Although the simpler levels of the software only have one right answer, the task does involve thinking, problem solving, and organizational thinking. The software program selected is considered by the researcher to be an attractive-heuristic task, so it can predicted that the reward will have a detrimental effect on the children's performance.

Baseline Testing

The baseline session took one week to complete. The children were individually taken from the classroom. The experimenter said, "I have a new game for you to play on the computer. Would you like to take your turn now?" Upon consent of the child, the experimenter showed the child how to use the mouse to click on the door and the Fripples. The highest level the child reached was recorded as the baseline data. The possible range of scores on the game ranged from 1 to 19. The original guideline for determining the score achieved was to record the score the child reached after missing two Fripple choices in a row. However, when this guideline was followed and the children wanted to continue playing, it was found that sometimes they could go somewhat further in the game before missing two again. In that case, the subject's recorded score was that at which the researcher judged that the child could go no further. In these rare cases, the researcher was consistent in using this scoring procedure; that is all subject's scores were recorded in the same manner, and all children were allowed the opportunity to continue playing futher if they desired. For example, some children reached the point where they missed two in a row, and the score was recorded. Then they wanted to play for a little while longer before returning to their classroom. All children were allowed to do this, if they desired, and occasionally the children would be able to score higher on the game; that is, play for awhile before they missed two again. This procedure was used consistently throughout all phases of data collection.

Experimental Session: Phase I

The experimental session occurred immediately after the baseline session. The experimenter invited each child to play the computer game again, and all children chose to come play again. The child was told that it is the same game as before, except this time they could choose a toy if they would play my game again. The child was allowed to choose their toy from six choices of toys before they played the game. When the child was finished playing the game the toy was put in a paper sack with his/her name on it and was either put in the child's mailbox or given to the classroom teacher for the child to take home at the end of the day.

Experimental Session: Phase II

This session took place immediately after phase I and is identical to the baseline phase; that is the subjects were not rewarded for playing the game. Only a few subjects asked about the toy and were told that the researcher didn't have toys this time.

CHAPTER IV

Results

The data were analyzed initially using a multivariate analysis of variance (MANOVA) to test for any differences. The three conditions; baseline, reward and nonreward, were considered as separate dependent variables for the test of MANOVA. The test for conditional effects showed significant differences ($p < 0.0066$). The data were subsequently subjected to another MANOVA to test for differences on sex and condition. There were no differences found here, ($p > 0.6151$). To further find the source of the differences shown in the MANOVA test on condition, a repeated measures analysis of variance (ANOVA) tests of hypotheses for between subjects and also within subjects effects was performed. The between subjects effects, looking at gender as a possible source of the difference, showed statistical significance ($p < .0429$; see Table 2). That is, from looking at the mean scores of males and females, females performed better on the game than did males (see Table 5). The within subjects analysis testing for differences on condition also showed significant ($p < 0.0489$; see Table 3). The within subjects analysis also tested for sex and condition differences and did not find any significance ($p > 0.7441$; see Table 3); thus, being male or female had no effect on whether the child was affected or not affected by the reward. Therefore, the actual source of statistical significance in the results came from the reward condition itself.

When the mean scores of the subjects were compared by ages and classrooms, it is shown that all were affected by the extrinsic reward (see Tables 6 and 7), so it is not possible that differences in ages or classroom environments or composure had any effect on the study.

It can be seen in Tables 4, 5, 6, and 7 that the standard deviations were fairly high in some cases. This is due, however to the wide range of scores the subjects had. This study is not concerned with how well the children performed, but instead how the reward condition affected their performance.

CHAPTER V

Conclusion and Discussion

Support for the regression model was found. In this study, the four- and five-year-old children performed more poorly on the computer task under the reward condition (see Table 3). However this, was temporary. Under a non-reward condition, the children performed at the baseline level; i.e., they performed higher than reward condition. The results of this experiment indicate a significant effect of reward on four- and five-year-olds' computer cognitive task performance. The research hypothesis was supported since the mean score on the reward condition was significantly lower than the baseline level, and the mean score at the non-reward condition was raised significantly. Although gender was not part of the original hypothesis, tests for gender effects showed that although the females had higher scores on the task (see Table 5), gender did not effect being persuaded by a reward. Also, out of interest, mean scores of children broken up by gender, age and the three classrooms were compared to see if any differences existed before the study began. On all three occasions, the mean score on the reward condition was lower than the baseline score and raised again on the non-reward condition (see Tables 5, 6 and 7).

Although statistical level is not impressive given the large variability, this is not uncommon in children at this age. There is often great variability with four- and five-year-olds. However, regardless of age, sex, and classroom, the data went in the direction of the hypothesis. The results in themselves would not be impressive, but the reward condition had a nearly identical effect on each group, age, sex, and classroom.

Findings are relevant for both parents and classroom teachers. Current classroom teachers should take note of the findings since the use of the extrinsic reward actually hampers cognitive performance. Results of this and other studies on the use of extrinsic rewards suggest to educators that perhaps children's classroom behavior and performance should be encouraged in a more intrinsic manner, rather than the controlling use of extrinsic motivation. If one of the purposes of education is cognitive growth and development, then why are educators using extrinsic motivation that hampers cognitive performance? Parents should also be aware that intrinsically motivated children will be less likely to be influenced by extrinsic rewards in an educational setting.

At the suggestion of current researchers in the field of motivation and rewards, this study was conducted in the context of a computer to hold other variables such as teacher and peer motivational interaction constant (Lepper & Cordova, 1992). Additional research is needed in this area to further account for the detrimental effect of extrinsic rewards. Also, training and education for early childhood educators regarding the differences between the benefits of intrinsic motivation and the effects of extrinsic motivation is needed to help "break the cycle" of the use of extrinsic motivation in the classroom.

TABLE I

Raw Data

OBS	SUBJECT	SEX	AGE	BASELINE	REWARD	NONREW
1	302	m	4.80	3	3	5
2	304	m	5.30	5	4	5
3	103	m	5.90	5	4	5
4	105	m	5.50	8	8	9
5	308	m	5.00	3	3	3
6	305	m	4.00	3	2	3
7	309	f	5.40	5	5	5
8	315	m	4.00	2	1	2
9	311	f	5.00	5	3	2
10	314	f	4.20	2	2	2
11	204	m	4.50	2	2	2
12	102	f	5.60	5	4	3
13	109	f	5.50	11	8	9
14	213	f	4.80	2	1	2
15	301	f	4.50	3	4	4
16	212	m	4.10	3	2	4
17	206	m	5.30	2	2	3
18	207	f	5.50	19	19	19
19	205	f	5.20	19	16	17
20	202	f	4.90	2	2	2
21	101	m	5.60	3	2	3
22	106	f	5.10	19	16	19
23	201	m	4.80	3	4	3
24	210	m	5.00	3	1	2
25	316	f	4.50	4	3	3
26	307	m	4.11	3	3	5
27	310	m	4.50	2	2	3
28	306	m	5.30	11	10	9
29	303	m	5.30	2	3	2
30	313	f	3.50	3	2	3
31	107	f	6.40	4	10	11
32	108	m	6.30	6	3	5

TABLE II

General Linear Models Procedure
Repeated Measures Analysis of Variance
Tests of Hypotheses for Between Subjects Effects

Source	DF	Type III SS	Mean Square	F Value	Pr > F
SEX	1	272.59523810	272.59523810	4.47	0.0429*
Error	30	1829.23809524	60.94260317		

* $p < .05$

TABLE III

General Linear Models Procedure
Repeated Measures Analysis of Variance
Univariate Tests of Hypotheses for Within Subject Effects

Source: CONDITION

DF	Type III SS	Mean Square	F Value	Pr > F
2	7.17063492	3.59531746	3.18	0.0489*

Source: CONDITION*SEX

DF	Type III SS	Mean Square	F Value	Pr > F
2	0.67063492	0.33531746	0.30	0.7441*

Source: Error (COND)

DF	Type III SS	Mean Square
60	67.74603175	1.12910053

* $p < .05$

TABLE IV

Mean Computer Task Scores
by Condition

	n	Mean	SD
BASELINE	32	5.3750000	5.0144951
REWARD	32	4.8125000	4.6381135
NONREWARD	32	5.4375000	4.8322672

TABLE V

Mean Computer Task Scores
by Condition and Sex

SEX	n	BASELINE Mean	BASELINE SD	REWARD Mean	REWARD SD
f	14	7.35714286	6.69795770	6.78571429	6.07869636
m	18	3.83333333	2.40709735	3.27777778	2.29861852

SEX	n	NONREWARD Mean	NONREWARD SD
f	14	7.21428571	6.61209348
m	18	4.05555556	2.12747357

TABLE VI

Mean Computer Task Scores
by Condition and Age

Age	N	Condition	Mean	SD
4.0-4.11	13	BASELINE	2.6153846	0.6504436
		REWARD	2.3846154	0.9607689
		NONREWARD	3.0769231	1.1151636
5.0-5.10	16	BASELINE	7.8125000	6.1775804
		REWARD	6.7500000	5.6627437
		NONREWARD	7.1875000	6.0577086

TABLE VII

Means Computer Task Scores
by Condition and Classroom

Classroom	N	Condition	Mean	SD
1	8	BASELINE	7.6250000	5.2355243
		REWARD	6.8750000	4.6425824
		NONREWARD	8.0000000	5.3452248
2	9	BASELINE	6.1111111	7.3219609
		REWARD	5.4444444	6.9302076
		NONREWARD	6.0000000	6.8556546
3	15	BASELINE	3.7333333	2.2824381
		REWARD	3.3333333	2.0930725
		NONREWARD	3.7333333	1.8695556

REFERENCES

Anselmo, S. & Zinck, R.A. (1987). Computers for young children? Perhaps. Young Children, 42(3), 22-27.

Barnes, B.J. & Hill, S. (1983). Should young children work with microcomputers - logo before lego? The Computing Teacher, 11-14.

Beeson, B.S., & Williams, R.A. (1985). The effects of gender and age on preschool children's choice of the computer as a child selected activity. Journal of the American Society for Information Science, 36(5), 339-341.

Bergin, D.A., Ford, M.E., & Hess, R.D. (1993). Patterns of motivation and social behavior associated with microcomputer use of young children. Journal of Educational Psychology, 85, 437-445.

Clements, D.H., Nastasi, B.K., & Swaminathan, S. (1993). Young children and computers: Crossroads and directions from research. Young Children, 56-64.

Clements, D.H. & Nastasi, B.K. (1992) Computers in early childhood education. In M. Gettinger, S.N. Elliot, & T.R. Kratochwill (Eds.), Advances in school psychology: Preschool and early childhood treatment directions (pp. 187-246). Hillsdale, NJ: Lawrence Erlbaum.

Condry, J. (1977). Enemies of exploration: Self-initiated versus other-initiated learning. Journal of Personality and Social Psychology, 35, 459-477.

Condry, J. & Stokker, L.G. (1992). Overview of special issue on intrinsic motivation. Motivation and Emotion, 16(3), 157-164.

Csikszentmihalyi, M. (1975). Beyond boredom and anxiety. San Francisco: Jossey-Bass.

Deci, E.L. (1975). Intrinsic motivation. New York: Plenum Press.

Elliot, A. (1993). Effects of gender on preschoolers' play and learning in logo environments. Journal of Computing in Childhood Education, 4, 103-124.

Fabes, R.A. (1978). The effects of material reward on inkblot perception and organization. Unpublished master's thesis, Oklahoma State University, Stillwater, Oklahoma.

Fabes, R.A., McCullers, J.C., & Hom, H.L., Jr. (1986). Children's task performance and interest: Immediate vs. subsequent effects of rewards. Personality and Social Psychology Bulletin, 12, 17-30.

Fabes, R.A., McCullers, J.C., & Moran, J.D., III. (1985). The effect of material rewards on inkblot perception and organization. American Journal of Psychology, 98, 399-407.

Fabes, R.A., Moran, J.D., III., & McCullers, J.C. (1981). The hidden costs of reward and WAIS subscale performance. American Journal of Psychology, 94, 387-398.

Fein, G., Campbell, P., & Schwartz, S. (1987). Microcomputers in the preschool: Effects on social participation and cognitive play. Journal of Applied Developmental Psychology, 8, 197-208.

Fite, F. (1993). A report on computer use in early childhood education. ED-TECH Review, 18-23.

Groves, M.M., Sawyers, J.K., & Moran, J.D., III. (1987). Reward and ideational fluency in children. Early Childhood Research Quarterly, 2, 335-340.

Haugland, S.W. (1992). The effect of computer software on preschool children's developmental gains. Journal of Computing in Childhood Education, 3, 15-30.

Healy, P., & Schilmoeller, G.L. (1985). Parent attitudes toward computer use by young children. Research in Rural Education, 2(4), 135-140.

Hoover, J.M. & Austin, A.M.B. (1986). A comparison of traditional preschool and computer play from a social/cognitive perspective. (Report No. PS-015-853). San Francisco, CA: A paper presented at the Annual Meeting of the American Educational Research Association. (ERIC Document Reproduction Service No. ED 270 220)

Kaden, M. (1990). Issues on computers and early childhood education. In C. Seefeldt (Ed.), Continuing Issues in Early Childhood Education (pp. 261-275). New York: Macmillan Publishing.

Kohn, A. (1994). Bribes for behaving: Why behaviorism doesn't help children become good people. The NAMTA Journal, 19, 71-94.

Kohn, A. (1991). Caring kids: The role of the schools. Phi Delta Kappan, 72(7), 496-506

Kruglanski, A.W., Friedman, I. & Zeevi, G. (1971). The effects of extrinsic incentives on some qualitative aspects of task performance. Journal of Personality and Social Psychology, 39, 606-617.

Lane, M.A. (1989). A developmental analysis of the effects of material rewards on learning in young children: A test of the regression model (Doctoral dissertation, Oklahoma State University, 1989)

Lepper, M.R. & Chabay, R.W. (1985). Intrinsic motivation and instruction: Conflicting views on the role of motivational processes in computer-based education. Educational Psychologist, 20(4), 217-230.

Lepper, M.R. & Cordova, D.I. (1992). A desire to be taught: Instructional consequences of intrinsic motivation. Motivation and Emotion, 16(3), 187-207.

Lepper, M.R., Greene, D., & Nisbett, R.E. (1973). Undermining children's intrinsic interest with extrinsic rewards: A test of the overjustification hypothesis. Journal of Personality and Social Psychology, 28, 129-137.

Lepper, M.R. & Gurtner, J.L. (1989). Children and computers: Approaching the twenty-first century. American Psychologist, 44, 170-178.

Lipinski, J.M., Nida, R.E, Shade, D.D., & Watson, J.A. (1984). Competence, gender and preschooler's free play choices when a microcomputer is in the classroom. (Report No. PS-014-454). Greensboro, N.C.: North Carolina University Family Research Center.

Lipinski, J.M., Nida, R.E., Shade, D.D., & Watson, J.A. (1986). The effects of microcomputers on young children: An examination of free-play choices, sex differences, and social interactions. Journal of Educational Computing Research, 2(2), 147-168.

McBride, K.M. & Austin, A.M.B. (1986). Computer affect of preschool children and perceived affect of their parents, teachers, and peers. The Journal of Genetic Psychology, 147, 497-506.

McCullers, J.C., Fabes, R.A. & Moran, J.D., III. (1987). Does intrinsic motivation theory explain the adverse effects of rewards on immediate task performance? Journal of Personality and Social Psychology, 52, 1027-1033.

McGraw, K.O. (1978). The detrimental effects of reward on performance: A literature review and a predictive model. In M. R. Lepper & D. Greene (Eds.), The hidden costs of reward (pp. 33-60). Hillsdale, NJ: Erlbaum.

Mickle, L. (1979, March). Reward effect on Piagetian task performance. Paper presented at the meeting of the Oklahoma Home Economics Association, Weatherford, OK.

Moran, J.D., III., McCullers, J.C. & Fabes, R.A. (1984). A developmental analysis of the effects of reward on selected Wechsler subscales. American Journal of Psychology, 97, 205-214.

Muller, A.A. & Perlmutter, M. (1985). Preschool children's problem-solving interactions at computers and jigsaw puzzles. Journal of Applied Developmental Psychology, 6, 173-186.

National Association for the Education of Young Children & National Association of Early Childhood Specialists in State Departments of Education. (1991). Guidelines for appropriate curriculum content and assessment in programs serving children ages 3 through 8. Young Children, 43, 21-38.

O'Malley, A.J. (1986). Paradoxical regression in moral reasoning in college students subjects: Artifact of material rewards? (Doctoral dissertation, Oklahoma State University, 1986). Dissertation Abstracts International, 47, 3684A.

Perlmutter, M. & Behrend, S. (1985). Social influence on preschool children's computer activity. (Report No. PS-015-556). Los Angeles, CA: Annual Convention of the American Psychological Association. (ERIC Document Reproduction Service No. ED 264 962).

Podmore, V.N. (1991). 4-year-olds, 6-year-olds, and microcomputers: A study of perceptions and social behaviors. Journal of Applied Developmental Psychology, 12, 87-101.

Riding, R.J. & Powell, S.D. (1987). The effect on reasoning, reading, and number performance of computer-presented critical thinking skills in five-year-old children. Educational Psychology, 7, 55-65.

Rowland, K.L., & Scott, D. (1992). Promoting language literacy for young children through computers. Journal of computing in childhood education, 3(1), 55-61.

Scherer, C. (1990). Parent perceptions of the importance of computer knowledge for young children. (Report No. PS-019-892). Bowling Green, OH: Bowling Green State University. (ERIC Document Reproduction Service No. ED 337 290)

Shade, D.D. (1994). Computers and young children: Software types, social contexts, gender, age, and emotional responses. Journal of Computing in Childhood Education, 5, 177-209.

Shade, D.D., & Watson, J.A. (1990). Computers in early education: Issues to put to rest, theoretical links to sound practice, and the potential contribution of microworlds. Journal of Educational Computing Research, 6(4), 375-92.

Sherman, J., Divine, K.P., & Johnson, B. (1985). An analysis of computer software preferences of preschool children. Educational Technology, 25, 39-41.

The Southern Association on Children Under Six. (1989). Appropriate uses of computers in the early childhood curriculum: Position statement. [Brochure]. Little Rock, AR.

Stanger, D., Clough, S. & Wood, T. (1994). Thinkin' Things (Collection 1) [Computer Software]. Redmond, WA: Edmark Corporation.

Vafaie, M.E. (1985). The effects of monetary reward on artistic creativity (Doctoral dissertation, Oklahoma State University, 1985). Dissertation Abstracts International, 46, 2978A.

Walker, D. (1983). Reflections on the educational potential and limitations of microcomputers. Phi Delta Kappan, 65, 103-107.

Ward, C.D. (1990). Possibilities at their fingertips. Dimensions, 18(4), 7-9.

Wilson, E.M. (1985). The effect of reward on cognitive tempo (Doctoral dissertation, Oklahoma State University, 1984). Dissertation Abstracts International, 46, 1413A.

Wright, J.L. & Shade, D.D. (Eds.). (1994). Young Children: Active learners in a technological age. Washington, D.C.: The National Association for the Education of Young Children.

APPENDIXES

APPENDIX A

HUMAN SUBJECT CORRESPONDENCE

November 27, 1995

Dear Parents:

I am a graduate student at Oklahoma State University in the Department of Family Relations and Child Development. As part of the requirements for my Master's thesis, I am conducting research in the Child Development Laboratories.

This study involves young children and computers and the effect a material reward has on computer task performance. Additional details are described on the enclosed consent form.

I would like to work with your child individually at the Child Development Laboratories for three 30 minutes sessions. The sessions will take place approximately between January 15 and February 7. The time will be determined by the classroom teacher as to not interfere with the ongoing program. To study the effect of reward, all the children in the programs will be rewarded with a small toy having a value of $2 or less.

In order for your child to participate I need for you to fill out the enclosed consent form and return it to me by November 30, 1995. For your convenience, you may return the form in the envelope on the inside door of your child's classroom labeled "computer research consent forms". Thank you very much for your cooperation.

Respectfully,

Layle Reese
Graduate Student

CONSENT TO PARTICIPATE IN RESEARCH PROJECT

I, ______________, agree for my child, ________________, to participate in the masters thesis research project of Layle Reese, which has been approved by the Department of Family Relations and Child Development, the Child Development Laboratories, and the Institutional Review Board of Oklahoma State University.

This research will be carried out by Layle Reese, principal investigator, under the supervision of Dr. Mona Lane. The purpose of this study is to determine what effects material rewards have on children's computer performance in the four- and five-year-old age range. All children participating in the study will receive a small reward for their participation at some point during the study.

The research procedure will involve asking your child to play a computer game. The task will take approximately 30 minutes for each of the three sessions.

Your child's participation in this study is voluntary. The child will be asked if he/she would like to play a game and if the child agrees, he/she has the right to discontinue the game at any time if he/she becomes disinterested. You also have not waived any of your legal rights or released this institution from liability for negligence. You may revoke your consent and withdraw your child from this study at any time. Records and results of this study will protect your family's confidentiality by not identifying you or your child by name. All records will be stored in a locked filing cabinet until they are destroyed.

As a parent, you will be asked to answer the attached questionnaire regarding your child's use of a specific children's computer program and submit it with the signed consent form.

If you have questions about your child's rights as research subjects, you may consult with Layle Reese or Dr. Mona Lane, FRCD, by calling (405)744-5057 or Jennifer Moore at the Institutional Review Board at (405) 744-5700.

I have read this consent form and understand its contents, and I freely consent for my child to participate in this study under the conditions described. I also freely give my consent to participate in the project as a parent by filling out the attached questionnaire. I understand that I will receive a copy of this signed consent form. I understand that I may revoke my consent or consent for my child at any time.

________________________ ______________

Name of Child Birthdate

________________________ ______________

Signature of Parent Date

________________________ ______________

Signature of Principal Investigator Date

PLEASE ANSWER THE FOLLOWING QUESTIONS AND RETURN WITH THE ATTACHED CONSENT FORM

The software to be used for this research is "Thinkin' Things" by EDMARK. The specific program on Thinkin' Things to be used is "Fripple Shop".

1. Do you have this software package at home? yes no

2. Does your child use this software package at home? yes no

IF NO, YOU MAY DISCONTINUE WITH THE QUESTIONNAIRE, BUT WE STILL NEED IT TO BE TURNED IN.
IF YOU ANSWERED YES TO #1 AND #2,
PLEASE CONTINUE WITH THE FOLLOWING QUESTIONS:

3. How long have you had the program at home?__________________

4. Does your child enjoy using it? yes no

5. How often does your child use the program?

   daily weekly monthly hardly ever

6. What is the highest "level" (on the grow slide) that your child has ever reached on Fripple Shop?

Thank you for your help. Please turn in your responses with the informed consent form.

APPENDIX B

THE RESEARCH DESIGN

APPENDIX B - The Research Design

Repeated Measures Design

	Reward	NonReward
Baseline		X
Phase I	X	
Phase II		X

APPENDIX C

DATA COLLECTION SCORESHEET

COMPUTER TASK PERFORMANCE
Score Sheet

Subject Number ___ Sex ___ Birthdate ______ Age ___ Group ____

Experimental Condition _B R N_

Date: ________

	LEVEL I	LEVEL II	LEVEL III	LEVEL IV
1.	____(1)	____(7)	____(13)	____(19)
2.	____(2)	____(8)	____(14)	n/a
3.	____(3)	____(9)	____(15)	n/a
4.	____(4)	____(10)	____(16)	n/a
5.	____(5)	____(11)	____(17)	n/a
6.	____(6)	____(12)	____(18)	n/a

VITA

Lauren Layle Reese

Candidate for the Degree of

Master of Science

Thesis: THE EFFECT OF A MATERIAL REWARD ON FOUR- AND FIVE-YEAR-OLDS' PERFORMANCE ON COMPUTER TASKS

Major Field: Family Relations and Child Development

Biographical:

Education: Graduated from Westmoore High School,Moore, Oklahoma in May 1990; received Bachelor of Science degree in Family Relations and Child Development, specializing in Early Childhood Education, from Oklahoma State University, Stillwater, Oklahoma in May 1994. Completed the requirements for the Master of Science degree with a major in Family Relations and Child Development at Oklahoma State University in May 1996.

Experience: Extensive child care experience throughout high school and college; private and public school student teaching experiences as an undergraduate; internship with Child Guidance Specialist in Payne County; employed by Oklahoma State University, Department of Family Relations and Child Development as an undergraduate academic advisor and as a graduate research assistant; Oklahoma State University, Department of Family Relations and Child Development, 1990 to present.

Professional Memberships: Southern Early Childhood Association, Oklahoma Early Childhood Association, National Association for the Education of Young Children, Oklahoma Association for the Education of Young Children, Friends of Day Care, Society for Research in Child Development, Child Life Council.

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
HUMAN SUBJECTS REVIEW

Date: 09-26-95 **IRB#:** HE-96-012

Proposal Title: THE EFFECT OF MATERIAL REWARD ON FOUR- AND FIVE-YEAR-OLDS' PERFORMANCE ON COMPUTER TASKS

Principal Investigator(s): Mona Lane, Layle Reese

Reviewed and Processed as: Expedited

Approval Status Recommended by Reviewer(s): Approved

ALL APPROVALS MAY BE SUBJECT TO REVIEW BY FULL INSTITUTIONAL REVIEW BOARD AT NEXT MEETING.
APPROVAL STATUS PERIOD VALID FOR ONE CALENDAR YEAR AFTER WHICH A CONTINUATION OR RENEWAL REQUEST IS REQUIRED TO BE SUBMITTED FOR BOARD APPROVAL.
ANY MODIFICATIONS TO APPROVED PROJECT MUST ALSO BE SUBMITTED FOR APPROVAL.

Comments, Modifications/Conditions for Approval or Reasons for Deferral or Disapproval are as follows:

Revisions received and approved.

Signature: John H. Wheeloff [signature]
Chair of Institutional Review Board

Date: October 20, 1995