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The Effects of Reward and Reinforcement on Intrinsic Interest

Alyce Muzette Dickinson

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THE EFFECTS OF REWARD AND REINFORCEMENT 
ON INTRINSIC INTEREST

by

Alyce Muzette Dickinson

A Dissertation
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
Degree of Doctor of Philosophy
Department of Psychology

Western Michigan University
Kalamazoo, Michigan
August 1985
The Effects of Reward and Reinforcement on Intrinsic Interest

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Western Michigan University, 1985

Under certain circumstances, rewarding individuals for performing a task that they enjoy may decrease their subsequent interest in that activity when rewards are no longer available. Decreased task interest is not, however, an inevitable outcome of reward and the subsequent termination of reward. This study investigated one variable that may influence whether task interest will increase or decrease following reward termination: the degree to which the reward is reinforcing. The study also examined how long post-reward performance changes persisted when they occurred.

A multiple-trial, within-subject comparison design was employed in which three reward phases were alternated with post-reward phases. Two of seven subjects completed all phases of the study. These subjects responded in a consistent manner to both the termination of reward and to the termination of reinforcement, although one subject exhibited temporary performance decrements while the other subject did not exhibit performance decrements. These results suggest that an individual's reinforcement history
may be an important determinant of post-reward and post-reinforcement task performance.

Post-reward decrements may be a form of counter-control evoked by social control techniques. The performance decrements may have been reinforced in the individual's past by withdrawal of the control techniques or by signs of irritation or anger on the part of the controller.

When post-reward decrements occurred, they were very transient. Neither reward nor reinforcement termination resulted in permanent decrements in task performance. These results are consistent with results of other studies that have continued to measure performance for several sessions following reward and reinforcement termination.

All of the subjects displayed considerable day-to-day variability in task performance during baseline as well as during subsequent phases. Such variability suggests that task interest was not a strong controlling variable compared to uncontrolled variables such as subject interactions with the experimenter and other subjects.
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ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to the members of my doctoral committee, Drs. Dale Brethower, Norman Peterson, Jack Michael and Howard Poole, for their helpful guidance and criticism throughout this project. I would also like to thank Paul Whitley who assisted in the design of this study, Vicky Pelleitiere who served as the co-experimenter, and Jeanne LaMere who served as an observer. In addition, I would like to thank the staff of the Child Development Center for their help and cooperation, the children who participated as subjects and the parents of those children. Finally, I would be remiss if I did not express my thanks and my love to my parents who have always given me their support and encouragement and who have, without complaining, attended many family gatherings where only one family member was missing.

Alyce Muzette Dickinson
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CHAPTER I
INTRODUCTION

Researchers have discovered that under certain circumstances rewarding individuals for performing an activity that they enjoy may decrease their subsequent interest in that activity when rewards are no longer available (for example: Deci, 1971, 1972a, 1972b; Lepper, Greene & Nisbett, 1973). That is to say, after rewards are terminated individuals may display less interest in the task than they did before they received the rewards. Yet it is also clear that decreased task interest is not an inevitable outcome of reward and the subsequent termination of reward (for example: Davidson & Bucher, 1978; Feingold & Mahoney, 1975; Vasta & Stirpe, 1979).

Due to the popularity of performance-contingent reward systems practitioners as well as theoreticians have become concerned that rewards may have some hidden costs. Based on the results of early studies (Deci, 1971, 1972a, 1972b; Lepper et al., 1973) some educational researchers maintain that a child's intrinsic interest or "love of learning" may be destroyed if rewards are provided for performing academic activities. The results of these early studies also appear to challenge several popular work-motivation
theories. Unlike the results of these studies that suggest that extrinsic rewards may decrease an individual’s intrinsic interest in a task, these theories state that extrinsic and intrinsic rewards combine in an additive manner to increase overall task motivation (Porter & Lawler, 1968; Staw, 1975; Vroom, 1964). Finally, several individuals have stated that the findings from these studies challenge the ethics and efficacy of behavioral interventions in educational and business settings since most of these interventions involve some type of performance-contingent rewards (Condry, 1977; Deci, 1972b, 1975, 1978; Deci & Porac, 1978; Jones, 1981; Levine & Fasnacht, 1974). To quote Deci (1978):

People in our society have lost much of their sense of inner direction; there is widespread alienation, and people seem to be striving unendingly for more status, power, and wealth than they realistically need. I interpret these behaviors as motivated by substitute needs that develop as replacement needs when people lose touch with the intrinsic satisfaction of competence and self-determination. From an early age, people’s behaviors are so strongly governed by extrinsic rewards and controls that behavior becomes largely a pathway to extrinsic rewards rather than a means of satisfying interest or curiosity. I suspect that as rewards continue to co-opt intrinsic motivation and preclude intrinsic motivation, the extrinsic needs – for money, for power, for status – become stronger in themselves. Thus, people develop stronger extrinsic needs as substitutes for more basic, unsatisfied needs. Then they develop strong linkages between their behaviors and these needs, so they end up behaving as if they were addicted to extrinsic rewards (cf. Chapter 10). (p. 202)

Because of these beliefs Deci has recommended that
managers abandon performance-contingent reward systems in favor of employee participative management systems and job enrichment programs; that educators abandon performance-contingent reward systems and other "restrictive" educational practices in favor of more intrinsically-oriented systems such as those described by Bruner (1962), Holt (1964), Montessori (1967), and Neill (1960); and that therapists abandon behavior modification and therapy programs in favor of therapeutic processes that encourage self-determination and self-responsibility rather than dependence on rewards. Similarly, Levine and Fasnacht (1974) cautioned against the use of token economies in school settings on the grounds that such systems lead to "token learning", learning that does not persist outside of the reward situation.

The results of studies that have investigated this effect clearly indicate that rewarding a person for performing an interesting task may lead to decreases in task interest under some circumstances. Variables that have been identified as influencing (either increasing or decreasing) post-reward or post-intervention task performance include task success and failure (Arkes, 1979; Karniol & Ross, 1977; Salancik, 1975), the initial level of task interest (Calder & Staw, 1975), the reinforcing value of the reward (Williams, 1980), temporal deadlines (Amabile, DeJong & Lepper, 1976), close monitoring or
surveillance of performance (Lepper & Greene, 1975; Pittman, Davey, Alafat, Wetherill & Kramer, 1980), whether the experimenter praises or ignores the subject's task performance (Anderson, Manoogian & Reznick, 1976), competition (Deci, Betley, Kohle, Abrahms & Porac, 1981), requiring the subject to perform one task in order to gain access to another task of equal initial interest (Lepper, Sagotsky, Dafoe & Greene, 1982), and whether subjects are informed of the reward procedure when they are recruited for the experiment (Jones, 1981; Staw, Calder, Hess & Sandelands, 1980). The main purpose of the current study was to investigate one of the variables that may influence whether task interest will increase or decrease following reward termination: the degree to which the reward is attractive or reinforcing to the individual. The study also had two other goals. First, it examined whether the size of post-reward changes is a function of the reinforcing value of the reward. Second, the study examined how long post-reward performance changes persist when they occur.
CHAPTER II

REVIEW OF SELECTED LITERATURE

The Distinction Between Reward and Reinforcement

The terms "reward" and "reinforcement" are not synonymous. This distinction needs to be discussed before the relevant literature is reviewed. "Reward" is defined in terms of the variables controlling the giver's behavior while "reinforcer" is defined in terms of the behavior of the receiver. The term "reward" is used to refer to "something given in return for good or, sometimes, evil or for service or merit" (Guralnik, 1970, p. 1219). In behavioral psychology, the term "reinforcer" is a technical term that refers to a stimulus change that immediately follows a behavior and increases the strength of the behavior. As can be seen from these definitions, all rewards are not reinforcers. For example, a teacher may smile and praise a disruptive student's good behavior as a reward for such behavior but the smile and praise may decrease the frequency of good behavior in the future. In that situation, the smile and praise could not be called reinforcers. Similarly, all reinforcers are not rewards. For example, a supervisor may inadvertently increase a worker's complaining behavior by attending to...
such behavior. The attention is a reinforcer but would not be called a reward. In the discussion that follows the term reinforcer will be used only to refer to stimulus changes or rewards that have been shown to increase the task performance of the receiver.

Reward Versus Reinforcement

Cognitive theorists (Calder and Staw, 1975; Deci, 1975; Lepper, 1981) have maintained that in the absence of strong, salient external contingencies individuals perceive that their task behavior is a function of their own interest. Rewarding individuals for performing a task they enjoy may cause individuals to perceive that their behavior is a function of the rewards, not of their own interest. When this occurs, individuals may decide that the task is not as interesting as they once thought it was. This being the case, when rewards are no longer available, individuals will perform it less than they did before they received the rewards. The stronger, more salient the external reward contingency, the greater the likelihood that individuals will attribute their behavior to that contingency, and thus the greater the likelihood of post-reward performance decrements.

Williams (1980) noted that according to this position, rewards that increase task behavior should increase the probability of post-reward decrements since such
rewards should increase the probability that individuals will perceive them as "controlling". In more behavioral terms, the likelihood of post-reward decrements should increase as the reinforcing value of the additional reward increases. However, data from a study conducted by Williams (1980) suggest an opposite relation. Williams found that rewards that were not reinforcing resulted in post-reward decrements while rewards that were reinforcing did not result in such decrements. He found, further, that the more reinforcing the reward, the smaller the post-reward decrement and the larger the post-reward increment.

Referring to the rewards used by Williams as "reinforcers" presents a problem. In Williams' study as well as in many other studies, the rewards were not actually delivered during the experimental session, but rather at the end of the experimental condition. In Williams' study, for example, rewards were delivered several days after subjects had participated in the experimental sessions. Performance changes that occur during the experimental session cannot be directly attributed to the rewards since such changes occur prior to reward delivery. These changes are caused by the promise of the rewards, not by the rewards themselves. Promises of rewards evoke behavior as discriminative stimuli because such promises have in the past been followed by the
specified reward. Promises of highly attractive or "reinforcing" rewards may increase behavior more than promises of less attractive or less "reinforcing" rewards. Because of this, the performance changes that are observed during the experimental session may accurately reflect the reinforcing value of the reward specified in the promise. It cannot, however, be assumed that such performance always reflects the reinforcing value of the reward. The degree to which behavior controlled by promises of rewards resembles behavior controlled by the rewards themselves depends upon several variables including the verbal sophistication of the subject, the nature and extent of the subject's prior exposure to the specified reward, and the history of the subject with respect to whether promises have indeed been followed by rewards in similar situations in the past.

To date Williams (1980) has been the only researcher to examine the different effects of rewards that do not increase task performance and those that do increase task performance (reinforcers) on post-intervention performance. Cognitivists typically do not distinguish between rewards and reinforcers but do distinguish between "attractive" rewards and "unattractive" rewards. However, most have maintained that such a distinction is not important. For example, Lepper (1981) has stated that attractive rewards are "benign" social constraints but
nonetheless social constraints and as such have the same effect as unattractive rewards. Probably due to these beliefs, cognitive researchers have rarely assessed the reinforcing value of their rewards either prior to or during their experiments. Further, Lepper (1981) has argued that cognitive researchers intentionally use rewards that are not likely to increase task engagement in order to eliminate possible explanations of performance changes in terms of variables associated with increased task engagement such as task boredom or fatigue.

With the exception of Williams (1980), behavioral psychologists have not investigated the differential effects of reward and reinforcement either. The primary mission of behavioral researchers has been to demonstrate that post-reward decrements are not an inevitable result of additional reward, not to determine the cause of such decrements when they occur (with the exception of Deal & Madsen, 1980 and Scott & Erskine, 1980). Further, behaviorists would not [at least knowingly] design a reward system in which the rewards were not reinforcers.

As indicated previously the main purpose of the current study was to examine whether rewards that do not increase task performance decrease post-reward performance and whether rewards that do increase task performance [reinforcers] increase post-reward performance. The

The Size of Post-reward Performance Changes

In addition to the results discussed previously, Williams [1980] found that the more reinforcing the reward the smaller the post-reward decrement and the larger the post-reward increment. Williams did not, however, directly manipulate the reinforcing value of the reward. Rather, he retroactively examined the relation between the reinforcing value of the reward and the size of the post-reward performance changes. His results suggested a linear relation between the reinforcing value of the reward and the size of post-reward performance changes.

Calder and Staw [1975] have proposed that the critical determinant of post-reward performance changes and the size of those changes is the initial level of task interest, not the reinforcing value of the reward as proposed by Williams. These researchers maintain that rewarding a task of initially high interest will result in relatively large post-reward decrements while rewarding a task of initially low interest will probably result
in post-reward performance increments. To quote Calder and Staw [1975]:

When a task involves high intrinsic interest, introduction of extrinsic rewards may lead to the self-perception that one is performing the activity primarily to obtain the extrinsic reward. Thus, for an intrinsically interesting task, extrinsic rewards may lead to a decrease in satisfaction and persistence on a task. On the other hand, when a task involves less intrinsic interest, the self-perception effect is not expected to apply. One would expect, for a task not high in intrinsic interest, a direct [or reinforcement] relationship between extrinsic rewards and task satisfaction and persistence. [p. 600]

Similar to other cognitive theorists (Deci, 1975; Lepper, 1981), Calder and Staw maintain that if rewards cause individuals to perceive that they are no longer performing the task because they find it interesting but in order to obtain the rewards, then post-reward task performance will decrease. If rewards do not cause individuals to change their original perception that they are performing the task because they find it interesting, then post-reward task performance will not decrease. Based on these premises, Calder and Staw maintain that if the task is a highly interesting one, individuals initially perceive that they are performing the task because they find it interesting. When rewards are provided for performing such a task, the rewards may cause individuals to change this perception so that they then believe that they are performing the task in order to obtain the rewards. Such a perceptual shift will be accompanied by
decreases in task satisfaction and persistence. The same type of perceptual shift does not occur when a task is of low interest because individuals do not perceive that they are very interested in the task in the first place.

According to Calder and Staw (1975) rewards may not always decrease task persistence and satisfaction even if the tasks are initially of high interest. For instance, when both the task and the rewards are highly reinforcing, perceptions regarding the reasons for task performance will be unstable. Individuals may perceive that they are performing the task because it is interesting even though they are receiving the rewards. On the other hand, when rewards are delivered, they may perceive that they are performing the task in order to obtain the rewards. In that case, task persistence and satisfaction would decrease. In any event, when perceptual shifts do not occur, and they are less likely to occur when the task is not initially very interesting, then post-reward performance decrements will not be observed. When perceptual shifts do occur, and they are likely to occur when the task is initially very interesting, then post-reward decrements will be observed.

Eight studies have systematically examined the effects of rewards on tasks that differed with respect to the degree to which subjects found them interesting (Calder & Staw, 1975; Davidson & Bucher, 1978; Greene,
Sternberg & Lepper, 1976; Lee, Syrnyk & Hollschmid, 1977; Loveland & Olley, 1979; McLloyd, 1979; Mynatt, Oakley, Arkkelin, Piccione, Margolis & Arkkelin, 1978; Vasta, Andrews, McLaughlin, Stirpe & Comfort, 1978. Results of four of these studies (Calder & Staw, 1975; Lee et al., 1977; Loveland & Olley, 1979; McLloyd, 1979) supported Calder and Staw's contention that rewards increase the post-reward performance of tasks that have little initial interest and decrease the post-reward performance of tasks that have high initial interest. Results of three of the studies (Davidson & Bucher, 1978; Mynatt et al., 1978; Vasta et al., 1978) did not support Calder and Staw's contention. The results of the eighth study (Greene et al., 1976) were unclear due to the instability of the performance of the control group over time.

Results from investigations of behavioral contrast (results that are empirically similar to the results of studies in the present area) suggest another possibility; one that takes into account both the initial level of task interest and the reinforcing value of the reward. This literature (cf. Dunham, 1968 and Williams, 1983) suggests that the size of performance changes in successive components depends upon the relative reinforcing value of the consequent stimuli in those components. While these effects have generally been demonstrated using a multiple schedule procedure in which each
component is correlated with a different stimulus and the components are repeatedly alternated, similar effects have been observed in human infants following changes in the amount or quality of reinforcement in studies that did not involve the use of multiple schedules (Fagen & Rovee, 1976; Kobre & Lipsitt, 1972; Lipsitt & Kaye, 1965).

Investigations of behavioral contrast have differed from investigations of the effects of extrinsic reward on intrinsic interest in one additional important respect: the subject population. Behavioral contrast studies have not used verbally-sophisticated humans as subjects while all but one (Lee et al., 1977) of the studies of the effects of extrinsic reward on intrinsic interest have used verbally-sophisticated humans as subjects. When subjects bring with them an extensive verbal repertoire combined with a long history of following self-developed rules or rules provided by others more complexity is added to an already complex phenomenon. Because of this it is not clear that the results from the studies of the effects of extrinsic rewards on intrinsic interest can be attributed to the same cause or causes as the empirically similar results from the studies of behavioral contrast. However, at the very least, the behavioral contrast literature shows that the reinforcement conditions of one
phasB can certainly influence performance in an adjacent phase.

With respect to the literature being reviewed here, the relative reinforcement value of the task variables in comparison to the reinforcement value of the additional rewards could determine whether post-intervention performance changes will occur and, if they occur, the size of the changes. This notion is also intuitively appealing. If a task was highly reinforcing but the additional reinforcement was of low reinforcing value, then decrements would not be expected following the termination of additional reinforcement. On the other hand, if the task was of relatively low reinforcing value but the additional reinforcement was highly reinforcing, decrements would be expected following the termination of the additional reinforcement since the value of the task would seem less because of the recent experience with the additional reinforcement.

Questionnaire data collected by Levine, Broderick and Burkart (in press) in two studies support the behavioral contrast explanation. Subjects were asked to rate their preferences for working a puzzle and receiving money. In one condition, the item about receiving money (How would you enjoy receiving $2.00 right now?) was listed on the questionnaire before the item about working a puzzle (How would you enjoy doing a puzzle right now?).
In the other condition, the puzzle item was listed before the money item. Since money was assumed to be more reinforcing than working a puzzle, it was predicted that working a puzzle would be rated lower when the item followed the money item than when it preceded it. Similarly it was predicted that the rating of the money would be higher when the money item followed the puzzle item than when it preceded it. The results of the two studies confirmed the predictions of the researchers.

The behavioral contrast position differs from Williams' contention (1980) that there is a linear relation between the reinforcing value of the additional rewards and the size of post-reward performance changes. It also differs from Calder and Staw's contention that the critical determinant of post-reward performance changes is the initial level of task interest. Thus, a second purpose of the current study was to investigate whether the size of post-reward performance changes is a function of the relative reinforcing value of the task variables in comparison to the reinforcing value of the reward as suggested by the behavioral contrast literature.

Transience of Post-reward Performance Changes

Regardless of what causes post-reward decrements if, when they occurred, they were temporary then
practitioners would have little to fear and much to gain from implementing performance-contingent reinforcement systems. To quote Williams [1980], "From a practical standpoint, the most important conclusion drawn from the experiments on the overjustification effect [post-reward performance changes] is that extrinsic rewards may have long-term deleterious effects on attitudes toward and performance of the rewarded activity" [p.600].

In order to study the persistence of performance decrements, researchers using between-group designs have measured performance during a post-reward measurement session conducted two to four weeks after the end of the reward phase. During the two to four week period, subjects did not have the opportunity to perform the experimental task. Performance decrements have consistently been found for subjects who received rewards relative to nonrewarded control subjects [Greene & Lepper, 1974; Harackiewicz, 1979; Lepper & Greene, 1975; Lepper et al., 1973; Morgan, 1983; Ross, 1975].

Researchers who have adopted within-subject designs have continued to measure performance for several sessions following reward termination [Colvin, 1971; Davidson & Bucher, 1978; Deal & Madsen, 1980; Feingold & Mahoney, 1975; Greene et al., 1976; Hom & Maxwell, 1980; Mawhinney & Taylor, 1981; Vasta et al., 1978; Vasta & Stirpe, 1979]. Five of these studies have reported
post-reward decrements immediately following reward termination (Colvin, 1971; Davidson & Bucher, 1978; Feingold & Mahoney, 1975; Horn & Maxwell, 1980; Vasta & Stirpe, 1979).

In studies conducted by Feingold & Mahoney (1975), Horn and Maxwell (1980) and Vasta & Stirpe (1979), two of four subjects, three of five subjects and two of ten subjects, respectively, exhibited initial performance decrements following the termination of reward delivery. In each case the initial performance decrement was followed by a recovery in which performance returned to or rose above pre-reward levels. Vasta and Stirpe measured task performance again two weeks later and found that performance had remained at or above baseline levels. Similarly, in a series of three studies, Deal and Madsen (1980) observed that the initial performance decrements of rewarded subjects quickly disappeared. Colvin (1971) also reported a slight recovery trend for rewarded subjects although these data are difficult to interpret due to considerable variability.

The above data suggest that when post-reward decrements occur they may be transient. Observation of performance recoveries was precluded in between-group studies because the performance of subjects was sampled only once during the post-reward phase. If performance had only been sampled once by researchers who adopted a
within-subject design, they too would have reported post-reward decrements. Data from these within-subject studies, however, suggest that over a relatively short period of time continued contact with the task brings behavior under the control of the variables that maintained it initially.

A third purpose of the present study was to observe how transient post-reward performance changes are when they occur.

Research Objectives

The present study examined three issues: whether the degree to which the reward is attractive or reinforcing affects post-reward performance changes; whether the size of post-reward changes is a function of the reinforcing value of the reward or the relative reinforcing value of the task variables in comparison to the additional reward; and whether post-reward performance changes are relatively stable or transient.
CHAPTER III

METHOD

Subjects

Subjects consisted of seven children, three females and four males, who were four to six years of age. They were enrolled at the Child Development Center (CDC), a licensed day care center in Kalamazoo, Michigan. A letter was sent to the parents of all children who were four to six years of age and who attended CDC five days a week requesting permission to include their child in the study. The seven children whose parents gave their permission by signing a consent form served as subjects. The consent form signed by the parents had previously been approved by the Director of the Child Development Center and by the Human Subjects Review Committee of Western Michigan University.

Five subjects did not complete the study. Two subjects were eliminated from the study because of frequent absences; one subject refused to participate after the twenty-sixth session; one subject left on an extended vacation during the sixth phase (there were seven phases); and one subject was eliminated from the
study after the nineteenth session because he would ask to leave before performing the experimental tasks.

Apparatus and Setting

The study was conducted in a large classroom with a partition separating the experimental area from an observation area. The partition was 48 inches high, 32 inches wide and 96 inches long. In the experimental area, three small tables were placed adjacent to each other at right angles. A chair was placed at each table. The tables and chairs were positioned so that the subject either sat with his or her back to the partition or perpendicular to the partition.

One of five activities was placed on each table: tinker toys [Child Guidance Company]; scented markers and sheets of paper; an Etch A Sketch with several reusable plastic overlays that consisted of mazes, figures to trace, and connect-the-dot pictures [Ohio Art Company]; puzzle blocks that consisted of a set of twelve cubes, each having part of a picture on each side so that six different pictures could be assembled; and a Stick N Lift My Little Pony game [Presto Magic Company] in which small vinyl figures could be placed and repositioned on a farm background. These activities were selected because they were not available to subjects at the day care center and

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because subjects could not easily play with the parts or pieces of two activities at the same time.

A video camera was hidden among toys on the top of the partition with the camera lens directed toward the experimental area. A video monitor was connected to the camera and placed on a table in the observation area so that the behavior of the subjects could be observed by watching the video monitor. A video tape recorder was also connected to the camera. Every session was recorded.

To measure the total number of seconds in a session and the total number of seconds that subjects spent performing each of three activities during the session, four travel alarm clocks with second hands were fastened to a desk top that measured approximately 14 inches by 15 inches. One clock, operated by an on/off switch, was used to record the total number of seconds in a session. Each of the other three clocks was used to record the total number of seconds a subject spent performing one of the three experimental tasks. These clocks were operated by separate spring-loaded switches so that when the switch was depressed the clock started timing. When the switch was released the clock stopped timing. The observer, then, depressed one of the three switches when a subject began performing a particular activity, held it down as long as the subject continued to perform the activity and
released it when the subject stopped performing the activity.

The three switches that operated the three activity clocks were also connected to three pens of a six-pen Gerbrands event recorder. The event recorder provided information about the number of different times a subject played with a particular activity during the session, the duration of each contact with the activity, and the order in which the activities were played. These data while used occasionally to verify the accuracy of the clocks and the accuracy of the observers when reading and transcribing the number of seconds from the clocks were not found to be very useful or interesting. It was originally felt that the duration of contact with the activities and the sequence of switching from activity to activity might have yielded important data. However, visual inspection of these data indicated that most of the subjects did not switch from one task to another very often. Instead, subjects usually spent several minutes playing with one task then switched to another task and spent several minutes playing with that one. Because these data do not add any important information they will not be reported.

During three phases, subjects received rewards contingent upon performing their most preferred tasks. Rewards were administered according to a programmed
variable interval 90-second (VI 90") schedule. The intervals were recorded on a cassette tape. The end of an interval was indicated by a beep on the tape. The experimenter carried a portable cassette tape recorder with an earphone so that the beep could not be heard by subjects. If subjects were not performing their most preferred task when the beep sounded, the tape recorder was turned off. The next time that subjects made contact with the most preferred task, a reward was provided and the tape recorder was turned on again.

Procedure

General Experimental Procedure

Each subject participated in one or two fifteen-minute sessions per day. When subjects participated in two sessions one session was conducted before 9:00 a.m. and the other session was conducted after 3:00 p.m. Subjects were individually escorted to the classroom in which the study was conducted. Daily participation was voluntary. If subjects indicated that they did not want to play with the toys on any particular day the session was cancelled. Subjects were also permitted to terminate the session at any time. If subjects terminated a session before ten minutes had elapsed, the session was not counted. These procedures were adopted so that subjects
would not be coerced, or feel coerced, to play with the toys since such coercion might have affected task performance.

The study consisted of seven phases: a baseline phase, three reward phases and three post-reward phases. During the baseline phase, subject interest in each of three activities was assessed by observing the number of seconds subjects spent performing each one. The baseline phase was followed by an unattractive reward phase in which "rewards" were provided to subjects for performing their most preferred tasks. The rewards that were provided in this phase were items that the subjects had previously identified as being things that they did not like very much. A post-reward phase followed this phase. No rewards were provided to subjects during this phase. An attractive reward phase followed the post-reward phase. In contrast to the previous unattractive reward phase, the rewards that were provided in this phase were items that subjects had identified as things that they liked very much. The rewards used in this phase consisted of either one or two scratch and sniff stickers delivered on a variable interval ninety-second (VI 90") schedule. A second attractive reward phase followed the post-reward phase. Once again subjects were provided with rewards that they had previously identified as things that they liked very much. Subjects who received one scratch and
sniff sticker on a VI 90" schedule in the preceding reward phase received two scratch and sniff stickers. Subjects who received two scratch and sniff stickers in the preceding reward phase received one scratch and sniff sticker. The only difference between the preceding reward phase and this reward phase was the number of stickers used as the reward. The length of each phase was determined by examining the data for each subject and thus differed for each subject.

**Detailed Experimental Procedure**

**Experimenters**

Two individuals served as experimenters. One experimenter was the author of the study and the other was a student in the Applied Behavior Analysis Masters Degree program at Western Michigan University. Each conducted one-half of the experimental sessions.

**Dependent Variables**

The dependent variables consisted of the number of seconds a subject spent performing each of the three tasks during the experimental session. "Performing the task" was operationally defined as touching, manipulating or looking at the toy while in view of the camera. Verbal interactions with the experimenter or the observer

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were considered to be off-task behavior regardless of whether or not the subject was touching or manipulating one of the toys while talking with the experimenter. During the reward phases, playing with the rewards was also considered to be off-task behavior. The number of seconds that a subject spent off-task was determined for each session by adding the number of seconds that the subject spent performing the three tasks and subtracting that figure from the total number of seconds in the session. Because the total number of seconds in a session occasionally varied (for example, when a session was terminated early by a subject) the data are presented in terms of the percent of the session spent performing each of the tasks.

Observation Procedures and Interobserver Agreement

Three individuals served as observers. Both experimenters served as observers for some of the sessions. The third observer was an undergraduate student in the Psychology program at Western Michigan University. Using the timing apparatus that was previously described the observer watched the video monitor and recorded the number of seconds that the subject spent performing each of the three tasks.

Every session was videotaped. In order to determine interobserver agreement a second observer rescored
randomly selected sessions for each subject. At least 10% of a subject's weekly sessions was rescored.

**Reward Selection**

At the beginning of each session, the experimenter showed seven items to the subjects: a scratch and sniff sticker, a small toy dinosaur, a penny, a Popsicle stick, a small piece of styrofoam, a price tag, and a small piece of wood. The experimenter asked the subject which item he or she liked the "very best". The subject was then asked which item he or she liked the "next best" and the "next best". After the items were verbally ranked the experimenter asked the subject to pick any of the items that he or she would like to keep. The subject was then given those items. The experimenter recorded both the verbal ranking of the items and the items that the subject kept.

For some of the subjects the verbal rankings were highly consistent with the selection procedure. For others, there was less correspondence between the verbal rankings and the selection procedure. When this correspondence was low, it was assumed that the selection procedure was a more valid indicator of item preference than the verbal ranking procedure. On the first few days the subjects' selections of their most preferred items were somewhat variable. For several weeks after that,
however, their selections were quite stable. Items selected for use as rewards and reinforcers were selected during this stable responding period. Eventually, most of the subjects selected all of the items in the order in which they were displayed.

**Baseline Phase**

One of three tasks was placed on each of the three tables. The experimenter told subjects that they could play with any of the toys on the tables. The experimenter then stated that she had some work to do and walked behind the partition where she could not be seen by the subjects. At the end of the fifteen-minute session the experimenter walked over to the subject and said that time was up for the day. She then escorted the subjects back to their regular classroom.

If a subject did not play with a particular task very much during the first several days of the study another activity was substituted for it. Following this initial activity selection a subject received the same three toys every day. A list of the activities that were presented to each of the subjects can be found in Appendix A.
Unattractive Reward Phase

During this phase subjects received unattractive rewards contingently upon performing their most preferred task. The most preferred task was defined as the task that the subject spent the most time performing during baseline. If two or more tasks were performed approximately the same amount of time, then the task that showed the least day-to-day variability was selected. The item used as the reward in this phase consisted of the item that the subject consistently rejected or selected last during the reward selection procedure that was conducted at the beginning of each session during baseline. The reward selection procedure was continued throughout this phase and the rest of the study. If the subject altered his or her selection of the items during the present phase, the item used as the reward was not changed.

The experimenter told subjects that every now and then when they played with the particular task, they would receive the item that they had identified as being the least attractive item. Both the task and the item were specified for each subject. The experimenter further explained that subjects could play with any of the activities that they wanted to play with, "just as before". These instructions were worded as follows: "Every
now and then when you play with the [task specified] I will give you one of these [the unattractive reward was shown to the subject]. That means that the more you play with the [task specified] the more of these you will get. But you can play with any of the three tasks on the tables, just as before." If subjects then asked the experimenter which one they should play with the experimenter responded "I don't care which one you play with. You can play with any one you want to." The experimenter then walked behind the partition. The experimenter rewarded the task on a VI 30" schedule. In order to deliver the reward, the experimenter walked over to where the subject was playing and either handed the reward to the subject or placed it on the table next to him or her. The experimenter then returned to the observation area.

**Post-reward Phase**

Task performance was no longer rewarded. The experimenter told subjects that rewards would no longer be given for performing a particular task. The instructions were worded as follows: "Today, I am not going to give you one of these [the unattractive reward was shown to the subject] when you play with the [task specified]. But you can play with any of the three tasks on the tables, just as before." The experimenter then walked behind the partition.
Attractive Reward Phase

Performance of the subjects' most preferred task was again rewarded. During this phase the item used as the reward consisted of the item that was consistently selected first during the reward selection procedure. Because all of the subjects consistently selected the scratch and sniff sticker as their favorite item this item was used as the attractive reward for all of subjects. Subjects were told at the beginning of each session that they would receive "smelly stickers" every now and then when they played with their most preferred activity. These instructions were worded as follows: "Every now and then when you play with the [task specified] I will give you a smelly sticker. That means that the more you play with the [task specified] the more smelly stickers you will get. But you can play with any of the three tasks on the tables, just as before."

As indicated earlier, this was the first of two attractive reward phases. One-half of the subjects were given one scratch and sniff sticker on the VI 90" schedule while one-half of the subjects were given two scratch and sniff stickers on the VI 90" schedule.
Post-reward Phase

As in the previous post-reward phase task performance was no longer rewarded. The experimenter told subjects that the stickers would no longer be given for performing a particular task. The experimenter then walked behind the partition.

Second Attractive Reward Phase

The performance of the subjects' most preferred task was again rewarded with scratch and sniff stickers. Only three of the seven subjects were still participating in the study at this point. The one subject who had received one sticker on a VI 90" schedule during the first attractive reward phase received two stickers. The other two subjects who had received two stickers received one. As before, subjects were told that they would receive some "smelly stickers" every now and then when they played with their most preferred task. After telling the subjects this the experimenter walked to the observation area.

Post-reward Phase

Performance of the subjects' most preferred task was no longer rewarded. Subjects were told at the beginning of the session that they would no longer receive "smelly
stickers" for playing with a particular activity. The experimenter, after saying this, walked to the observation area.
CHAPTER IV

RESULTS

Interobserver Agreement

The total number of sessions rescored ranged from seven of fourteen sessions for Subject 7 to fourteen of fifty sessions for Subject 1. The number and percent of sessions rescored for each subject can be found in Appendix B.

For each session that was rescored, two times were obtained for each of the three tasks; one obtained by the original observer and one obtained by the second observer. These times did not always sum to the total number of seconds in a session since subjects often spent a certain number of seconds engaged in off-task behavior. These scores are shown in Appendix C. Also shown in this appendix are the absolute differences between the scores of the two observers. The absolute differences are the discrepancies between the two scores without regard for whether the direction of the difference is positive or negative. For example, if Observer 1 indicated that a particular subject spent 52 seconds on a task and Observer 2 indicated that the subject spent 57 seconds on the task, the absolute difference would be 5 seconds.
Interobserver agreement was determined for each of the table positions upon which tasks were placed and for each of the seven subjects. For Table Positions 2 and 3, the tasks placed on the table were confounded with the table positions since the tasks, the tinker toys and markers, were always placed on the same tables and were the same for each subject. Task 1 varied from subject to subject. For four subjects Task 1 consisted of the Stick N Lift game, for two subjects Task 1 consisted of the Etch a Sketch, and for one subject Task 1 consisted of the puzzle blocks.

There is no conventional method for determining interobserver agreement for duration or time-on-task data. Interobserver agreement was calculated in two ways. The first method that will be discussed was based on the median absolute differences between the observers. The median absolute difference in seconds between the scores for the two observers was determined for each table position for each subject. For example, the median discrepancy for Subject 1 for Table Position 1 was 0.0 seconds, the median discrepancy for Subject 1 for Table Position 2 was 5.5 seconds and the median discrepancy for Subject 1 for Table Position 3 was 0.0 seconds. These data are presented in Table 1. As can be seen from this table, the median absolute differences for the tasks
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<th>Table 2</th>
<th>Table 3</th>
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<table>
<thead>
<tr>
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<th>Table 3</th>
<th>Average</th>
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<tr>
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<td>100.0</td>
</tr>
</tbody>
</table>

5 Median

| 10 seconds | 1.0  | 1.0  | 3.0  | 1.7  |
| 20 seconds | 1.0  | 1.0  | 3.0  | 1.7  |
| 40 seconds | 1.0  | 1.0  | 3.0  | 1.7  |

Percent of agreement

| 10 seconds | 87.5  | 75.0  | 87.5  | 83.3  |
| 20 seconds | 100.0 | 87.5  | 100.0 | 95.8  |
| 40 seconds | 100.0 | 87.5  | 100.0 | 95.8  |

6 Median

| 10 seconds | 0.5  | 17.5 | 4.0  | 7.3  |
| 20 seconds | 0.5  | 17.5 | 4.0  | 7.3  |
| 40 seconds | 0.5  | 17.5 | 4.0  | 7.3  |

Percent of agreement

| 10 seconds | 75.0  | 25.0  | 75.0  | 58.3  |
| 20 seconds | 75.0  | 50.0  | 75.0  | 66.7  |
| 40 seconds | 100.0 | 100.0 | 100.0 | 100.0 |

7 Median

| 10 seconds | 0.0  | 2.0  | 0.0  | 0.7  |
| 20 seconds | 0.0  | 2.0  | 0.0  | 0.7  |
| 40 seconds | 0.0  | 2.0  | 0.0  | 0.7  |

Percent of agreement

| 10 seconds | 85.7  | 85.7  | 85.7  | 85.7  |
| 20 seconds | 100.0 | 100.0 | 100.0 | 100.0 |
| 40 seconds | 100.0 | 100.0 | 100.0 | 100.0 |

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To determine how difficult it was to accurately record the behavior of each subject, the medians for the three table positions were averaged for each subject. These averages are shown at the far right of Table 1. The average median discrepancies for each subject across the three tasks ranged from 0.7 second (Subject 7) to 7.3 seconds (Subject 6). These discrepancies are well within a reasonable range particularly when compared to both the total number of seconds in a session (usually 300) and to the total time a subject spent performing a particular task (see Appendix C). These data indicate that Subject 7 was the easiest subject to accurately observe and that Subject 6 was the most difficult. This is not surprising.
since Subject 6, in spite of repeated instructions to remain seated while playing with the toys, frequently carried the toys around the room with him roaming in and out of the view of the video camera.

The median absolute discrepancies were also averaged for each position across all subjects to determine how difficult it was to record task activity at a particular table position. For example, the median discrepancy for Table Position 1 for Subject 1 was 0.0 seconds, the median discrepancy for Table Position 1 for Subject 2 was 0.0 seconds, the median discrepancy for Table Position 1 for Subject 3 was 2.0 seconds, and so on. These median discrepancies were averaged to obtain an average median discrepancy for Task 1 of 0.7 second. As indicated previously for Table Positions 2 and 3, the table position was confounded with the activity itself. The average median discrepancies for each table position across subjects are provided in the first row of the last block of figures in Table 1. The median discrepancy for Position or Task 1 was 0.7 second, for Position or Task 2 the median discrepancy was 6.0 seconds and for Position or Task 3 the median discrepancy was 2.1 seconds. Again, these data are well within a reasonable range. According to these data, Position or Task 1 was the easiest to accurately observe while Position or Task 2 was the most difficult. Since subjects sat with their backs to the
camera while playing with Task 2, it is not surprising that this task or table position was the most difficult one to observe accurately.

The second interobserver agreement calculation was determined by dividing the number of agreements between the observers by the number of agreements plus disagreements and then multiplying that figure by 100. If the ratings of the observers differed by a specific number of seconds or by a fewer number of seconds, an agreement was scored. If the ratings of the observers differed by a greater number of seconds, a disagreement was scored. The extent of agreement between the observers depends upon the number of seconds used to define what an agreement constitutes. The agreement criterion could either be very stringent, for example one second, and thus decrease the percent of agreement between the observers or very lenient, for example sixty seconds and increase the percent of agreement between the observers. Because of this, three criteria were used to define an agreement. The first criterion consisted of ten seconds which is approximately one-one-hundredth of the session; the second criterion consisted of twenty seconds which is approximately two-one-hundredths of a session; and the third criterion consisted of forty seconds which is approximately four-one-hundredths of a session. Since performance data are presented in terms of the percent of the total session
spent performing the three tasks in Figures 2 - 8, the
ten-second criterion represents one horizontal increment
on the graphs, the twenty-second criterion represents two
horizontal increments, and the forty-second criterion
represents four horizontal increments.

Using ten seconds as the criterion, the percents of
agreement for each task for each subject ranged from 25% to 100% with a median of 85.7%. Using twenty seconds as
the criterion, the percents of agreement ranged from 50% to 100% with a median of 92.8%. Finally, using forty sec­
onds as the criterion, the percents of agreement ranged from 87.5% to 100% with a median of 100%.

With the exception of the interobserver data for
Subject 6 using the ten-second and twenty-second criteria, these data are within an acceptable range. These data,
similar to the previously presented median data, suggest
that Subject 6 was the most difficult subject to observe
accurately and that Table Position 2 was the most diffi­
cult position to observe.

Subject Data

Figure 1 shows the median percent of sessions that
subjects performed the rewarded task for each phase and
the range of that performance. The phases for Subject 3
have been labelled differently than the way in which they
were described in the procedure section. A baseline phase
Figure 1. Median percent (and range) of sessions that subjects performed the rewarded task for each phase.
BL = Baseline  PS = Popsicle Stick  S(1) = One Sticker
SF = Styrofoam  P-SF = Post-Styrofoam  P-PS = Post-Popsicle Stick

Figure 1 - continued

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has been inserted between the post-price tag phase and the first sticker phase. The experimental conditions were identical during the post-price tag phase and the baseline phase. They have been separated in the figure because the subject's task preference changed during the final sessions of the post-price tag phase. During the initial baseline phase the subject performed Task 1 considerably more than Tasks 2 and 3. Thus, Task 1 was rewarded during the price tag phase. During the final five sessions of the post-price tag phase, the subject performed Task 2 almost exclusively. In the subsequent reward phases, Task 2 was rewarded. Because of that preference shift, these five phases have been considered as a baseline phase for the purposes of this figure.

With the exception of Subjects 3 and 7, no performance decrements can be observed following the termination of either the unattractive rewards or the stickers in comparison the subjects' baseline performances. Task performance was highly variable for most of the subjects for most of the phases. Performance frequently ranged from 0% to 100% in a particular phase. This variability obscures some of the performance changes that occurred. As a result, the data will now be presented for each subject for each session.
Individual Subject Data

The performance data for individual subjects are presented in Figures 2 - 8. These figures show the percent of the total session that subjects spent performing each of the three tasks. As can be seen from these figures, only two subjects, Subject 1 (Figure 2) and Subject 3 (Figure 4) completed the study. Subject 2 (Figure 3) completed six phases of the study, Subject 6 (Figure 7) completed three phases, and the other three subjects, Subject 4, Subject 5, and Subject 7 (Figures 5, 6, and 8, respectively) completed only two phases.

The major objective of the present study was to determine whether subject performance would decrease following the termination of unattractive and attractive rewards and to determine the extent of performance decreases if they occurred. The critical comparisons consist of comparing the performance of subjects during baseline to their performance during the post-reward phases. As indicated in the previous paragraph three subjects completed only the first two phases (the baseline phase and the unattractive reward phase). Their data are thus not relevant to the major research questions of the study. However, their data will be discussed due to their relevance to the issue of the stability of day-to-day performance.
Figure 2. Percent of session Subject 1 performed Tasks 1, 2 and 3.
Figure 3. Percent of session Subject 2 performed Tasks 1, 2 and 3.
Figure 4. Percent of session Subject 3 performed Tasks 1, 2 and 3.
Figure 5. Percent of session Subject 4 performed Tasks 1, 2 and 3.
Figure 6. Percent of session Subject 5 performed Tasks 1, 2 and 3.
Figure 7. Percent of session Subject 6 performed Tasks 1, 2 and 3.

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Figure 8. Percent of session Subject 7 performed Tasks 1, 2 and 3.
Because of considerable variability between subjects, the results for each subject will be presented separately. Results will be discussed with respect to the following issues: performance fluctuations during baseline; performance changes during the reward phases; and performance changes during the post-reward phases.

Subject 1

As can be seen from Figure 2, Subject 1 completed all seven phases of the study.

Baseline Phase

The data from Session 6 were excluded from analysis. The subject received the Etch A Sketch as Task 1 during the first five sessions. Since he did not play with this task very much during these sessions, a computer game called Simon was substituted for it in Session 6. At the end of Session 6 the subject asked to have the Etch A Sketch returned.

As can be seen from Figure 2, Subject 1 spent considerably more time during sessions playing with Task 2 [the tinker toys] than with Tasks 1 or 3 [the Etch A Sketch and markers, respectively] although day-to-day variability was high. This subject spent an average of 58% of a session performing Task 2, 27% of a session performing Task 3 and
10% of a session performing Task 1. An average of 5% of a session was spent off-task.

**Unattractive Reward Phase**

When the subject was told that he would receive an unattractive reward (which for this subject consisted of a small piece of wood) for performing Task 2, there was an immediate drop in the amount of time spent performing that task. This decrease lasted three sessions, after which performance returned to and remained at the subject's baseline level of performance. For Sessions 14 through 18 (after performance of Task 2 had recovered), the subject spent an average of 62% of a session performing Task 2, 16% of a session performing Task 3 and 9% of a session performing Task 1. The amount of time spent off-task increased from an average of 5% of a session during baseline to 9% of a session. Since Task 2 performance did not increase during this phase these data indicate that the unattractive reward procedure did not function as reinforcement for Task 2 performance.

**Post-reward Phase**

During the first session, the subject did not perform Task 2 at all, while he performed Task 3 97% of the session. The decrease in Task 2 performance was transient, with the subject performing this task 97% of the session.
during the second session of this phase. Performance of Task 2 remained above 80% of the session for the remainder of the post-reward phase. The average percent of a session spent performing Task 2 was 79% which is considerably higher than baseline. When the data from the first session of this phase (during which the subject did not perform Task 2) are excluded from analysis the average percent of a session spent performing Task 2 was 95%. Because the reward did not affect behavior during the reward phase, this increase is probably due to simple task exposure.

The decrease in the performance of Task 2 during the first session of the phase was very transient and may have represented continuation of the downward trend in performance of that task seen in Sessions 16 through 18. On the other hand, it does represent a considerable change in the subject’s behavior from baseline sessions and is similar to the performance pattern observed during the first three sessions of the unattractive reward phase in which similar decreases in Task 2 performance were accompanied by increases in Task 3 performance. This decreased performance, then, may have been caused by reward termination.

The subject refused to attend two sessions that followed Session 18. This behavior is also difficult to interpret. It may have been caused in part by reward termination. On the other hand, because these were the
only two sessions that the subject refused to attend
during the study, the refusal was more likely caused by
variables that had nothing to do with the study itself.
For example, it is possible that the activities that the
subject was engaged in when it was time for his session to
begin competed favorably with the opportunity to partici­
pate in the study.

**Attractive Reward Phase**

During this phase the subject received two scratch
and sniff stickers on a VI 90" schedule for performing
Task 2. The subject spent an average of 81% of a session
performing Task 2. With the exception of Session 26, the
subject played with Task 2 and did not play with either of
the other two tasks. Although the performance of Task 2
decreased in comparison to Task 2 performance during the
preceding post-reward phase this decrease is deceptive.
Off-task behavior increased from an average of 3% of a
session in the preceding phase to 17% of the session
during this phase. This off-task behavior consisted of
playing with the scratch and sniff stickers for a few
seconds each time that they were delivered. This in­
creased off-task behavior resulted in a concomitant
decrease in Task 2 performance.

It was hoped that the scratch and sniff stickers that
were identified by the subject as being items that he
"liked very much" during the reward selection procedure would function as reinforcement for Task 2 performance. Because of the way in which performance was measured it was not possible to determine whether the stickers were functioning as reinforcement. In the previous phase the subject had been performing Task 2 an average of 95% of the session. Therefore, performance could not increase very much. In addition, as previously indicated, performance of Task 2 decreased as off-task behavior increased. The subject did, however, exhibit other behaviors that indicated that the stickers were very attractive to him. The experimenter and the observer both observed that the subject completed the reward selection procedure that occurred at the beginning of the session much more quickly than in previous sessions although no formal record was kept of these data. During the reward selection the subject would say things such as "Let's get this over with and get to the good stuff". The subject indicated verbally how much he liked getting the stickers, and played with the stickers quite a bit both during and after sessions. Another behavior also indicated the attractiveness of the stickers to the subject. At the beginning of Session 26, the subject asked the experimenter if he could get stickers for playing with Task 1. The experimenter said no. In spite of that the subject played with Task 1 for the first 137 seconds of the session. He then
switched to Task 2 and played with that task for the remainder of the session. It appeared as though the subject was "testing the contingency" to see whether he would indeed be given stickers for playing with Task 1. When this did not occur, he spent the remainder of the session performing Task 2. In addition, he did not play with Task 1 again during the remaining four sessions of the phase. Based on these types of behaviors, the experimenter felt quite certain that had the measurement procedure permitted, increases in Task 2 would have occurred. In other words, the experimenter was quite sure that the stickers were indeed reinforcers.

Post-reward Phase

During the first session of this phase, the subject did not perform Task 2. The subject performed Task 3 for 73% of the session and engaged in off-task behavior for the remaining 27% of the session. This performance pattern is very different from the performance pattern in the preceding six sessions but almost identical to the pattern observed during the first session of the first post-reward phase. It appears, then that this decrease in Task 2 performance resulted from the termination of reward.

During the second session of this phase, performance of Task 2 increased to 100% of the session. Again, this is similar to the subject's performance during the second
session of the previous post-reward phase. Performance was, however, more variable during this phase than in the previous post-reward phase.

Excluding the first session of this phase, the subject performed Task 2 an average of 80% of a session. Task 2 was performed considerably more than either Task 1 or Task 3. The performance of these two tasks, excluding the first session of the phase averaged 9% of a session. Task 2 performance increased on the average from baseline performance (from 58% of a session to 80% of a session) but decreased from the previous post-reward phases (from 95% of a session to 80% of the session). As indicated earlier the increase over baseline was probably due to simple task exposure rather than to the manipulation of the independent variable.

**Attractive Reward Phase**

During this phase, the subject received one scratch and sniff sticker on a VI 90" schedule for performing Task 2. For the first four sessions the subject did not perform Tasks 1 and 3, but played with Task 2 or the stickers that were provided as the reward. The subject spent an average of 83% of the session playing with Task 2 during these four sessions. Task 2 performance decreased during the remaining six sessions of this phase. This decrease was accompanied by increases in the performance of Tasks 1
and 3. During these last six sessions, subject performance of Task 2 averaged 62% of a session.

Due to the decrease in variability in Task 2 performance and the decrease in the performance of Tasks 1 and 3 in comparison to the previous post-reward phase, it appears as though the stickers were functioning as reinforcement during the first four sessions, although again, as in the previous attractive reward phase it is difficult to determine because the performance of Task 2 was already very high. However, the stickers appeared to lose their reinforcing effectiveness beginning with Session 41. Subject performance of Task 2 decreased from an average of 80% of a session during the immediately preceding post-reward phase to an average of 62% during the last six sessions of this phase. Thus, there is no evidence of a sustained reinforcement effect.

The other two subjects who were still participating in the experiment at this time also showed similar decreases in the performance of the "reinforced" task on the same day. These decreases can be seen in Figure 3, Sessions 39 through 44 for Subject 2 and in Figure 4, Sessions 40 through 48 for Subject 3. It is not known whether the decreases were coincidental or whether some factor unknown to the experimenter caused the decreases.
Post-reward Phase

This last phase lasted only four days because the subject left the day care center. Performance of Task 2 averaged 80% of a session. Performance during the preceding post-reward phase also averaged 80% of a session. Therefore, performance was unaffected by the prior reward manipulation. In addition, Task 2 was still performed considerably more than either Tasks 1 or 3.

Summary

Performance of the rewarded task did not increase during the unattractive reward phase. The unattractive reward was, thus, not functioning as reinforcement. There was a temporary decrease in the performance of this task during the post-reward phase that could be attributed to the reward removal procedure.

It appeared as though the stickers were reinforcers during the attractive reward phase although this conclusion is based on behaviors other than the performance of the rewarded task due to a measurement ceiling effect.

During the second post-reward phase there was again an immediate, transient performance decrease that could be attributed to the reward-removal procedure. During the second attractive reward phase, the stickers lost their
reinforcing effectiveness. No performance decrement was observed in the third post-reward phase.

**Subject 2**

Subject 2 completed six phases of the study as can be seen in Figure 3. He was unable to complete the study due to an extended vacation that began after Session 44.

**Baseline Phase**

During the first three sessions, Subject 2 did not play with Task 1 (the Etch a Sketch) very much. Because of this, another task was substituted for it during Session 4. Since this toy was too difficult for the subject, another toy, the Stick N Lift game, was presented to the subject. This toy remained as Task 1 for the rest of the study. The data from these first four sessions were excluded from analysis and were not considered to be part of the baseline data.

The subject performed Task 2 (the tinker toys) considerably more than either Task 1 or Task 3. Task 2 was performed an average of 66% of a session, Task 1 was performed an average of 27% of a session and Task 3 was performed an average of 4% of a session. As with other subjects, performance of the tasks varied greatly from day to day.
Unattractive Reward Phase

During this phase performance of Task 2 was rewarded with an item that the subject had previously indicated that he did not like very much during the reward selection procedure. In comparison to baseline, performance of Task 2 decreased from an average of 66% of a session to an average of 56% of a session. Variability of performance increased. In spite of this decrease, Task 2 was still performed considerably more than either Task 1 or Task 3. Performance of Task 3 increased from an average of 4% of a session during baseline to 33% of a session during this phase. Day-to-day variability was extensive. The subject spent considerable time playing with Task 3 during Sessions 12 and 16 but did not play with it at all during Sessions 11, 13, 14 and 15. Performance of Task 1 decreased in comparison to baseline. This task was only performed during one session, Session 15. Since this task was not performed very much by the subject for the remainder of the study, it is likely that the decrease in performance is due to task exposure or "boredom effects".

Since the unattractive reward did not increase performance of Task 2 during this phase over baseline performance, it was not functioning as reinforcement.
**Post-reward Phase**

The subject performed Task 2 an average of 64% of a session. This is very similar to baseline performance of this task. In other words, performance of this task neither increased nor decreased in comparison to baseline performance. The reward manipulation, thus, did not influence post-reward performance.

Task 3 performance increased from an average of 4% of a session during baseline to 34% of a session during this phase. However, since this task was performed an average of 33% of a session during the preceding reward phase, this change in performance was probably due to task exposure effects. Task 1 was not performed during any session of this phase.

**Attractive Reward Phase**

During this phase, the subject received one scratch and sniff sticker on a VI 90" schedule for performing Task 2. Performance of Task 2 during the last five sessions of this phase was consistently higher than performance of Task 2 during the baseline and post-reward phases. During the second session of the phase, Task 3 was performed considerably more than Task 2. At the end of the session the subject asked "Why did I only get three stickers today?" This indicates that the subject did not understand the
relation between Task 2 performance and the receipt of the stickers. This relation was again explained to the subject. At the beginning of the next session the subject stated "I'm going to play with the tinker toys for a long time today." As indicated previously, Task 2 performance increased and remained consistently high during the final five sessions. These data suggest that the performance of Task 2 during the first two sessions was not under the control of the stickers, even though the subject performed Task 2 for 79% of the first session. During the last five sessions of the phase, the subject performed Task 2 an average of 96% of a session which was an increase over previous phases. Tasks 1 and 3 were not performed during these sessions. In addition, Task 2 performance was considerably less variable than in preceding phases. These data indicate that the stickers were functioning as reinforcement for Task 2 performance.

**Post-reward Phase**

The subject spent an average of 68% of a session performing Task 2. Performance of this task is comparable to performance during the baseline phase and to performance during the previous post-reward phase. The reward manipulation thus did not affect post-reward performance. The subject performed Task 3 an average of 31% of a session which was comparable to Task 3 performance in the
previous post-reward phase. Task 1 performance averaged 1% of a session which was also comparable to Task 1 performance during the previous post-reward phase.

**Attractive Reward Phase**

During this phase, the subject received two scratch and sniff stickers on a VI 90" schedule for performing Task 2. Performance of Task 2 was quite high during the first four sessions of the phase. Tasks 1 and 3 were not performed during these sessions. While off-task behavior increased, this off-task behavior consisted of playing with the scratch and sniff stickers each time they were delivered.

During the next five sessions Task 2 performance decreased sharply. During these sessions Task 3 was performed considerably more than Task 2. Task 2 performance shows an increasing trend in Sessions 43 and 44. However, the subject left on an extended vacation at this point so it was not possible to continue this phase. While it appears that the stickers were functioning as reinforcement for the first part of the phase, they seem to have lost their reinforcing effectiveness. As indicated previously, similar decreases in the performance of the rewarded task were observed for Subjects 1 and 3. It is not clear why these decreases occurred.
Summary

The unattractive reward did not function as reinforcement as evidenced by the fact that performance of the rewarded task did not increase during the unattractive reward phase. During the post-reward phase, performance of the previously rewarded task neither increased nor decreased in comparison to the subject's baseline performance.

The stickers did function as reinforcement during the attractive reward phase as evidenced by the increase in performance of the rewarded task. No performance decrements occurred during the post-reward phase.

The stickers lost their reinforcing value during the second attractive reward phase. The study was ended before implementation of the final post-reward phase.

Subject 3

Subject 3 participated in all seven phases of the study.

Baseline Phase

The subject performed Tasks 1 and 2 for approximately the same average percent of a session. Task 1 was performed an average of 41% of a session and Task 2 was performed an average of 38% of a session. Both these
tasks were performed considerably more than Task 3, performance of which averaged 13% of a session. Similar to the performance of other subjects, performance of these tasks varied considerably from day to day. Task 1 was selected as the task to be rewarded since performance of this task was less variable than the performance of Task 2.

The subject terminated two of the ten baseline sessions early. One of these sessions was terminated before 10 minutes had elapsed so the data from this session were discarded.

**Unattractive Reward Phase**

The subject increased his performance of Task 1 from an average of 41% of a session during baseline to 52% of a session. Task 2 performance was comparable to baseline performance, averaging 36% of a session. Task 3 performance decreased from an average of 13% of a session to 1% of a session.

Task 1 performance was highly variable during both the baseline phase and during the unattractive reward phase. During the baseline phase Task 1 performance ranged from 18% to 76% of a session. During the unattractive reward phase performance ranged from 27% to 96% of a session. Because of this high variability it is not clear that the increase of Task 1 performance during the
unattractive reward phase was indeed a real increase that was due to the reward manipulation. If the increase in Task 1 performance was in fact a real increase it may have been due to the social interaction between the experimenter and the subject. Each time that the reward was delivered the subject would initiate conversation with the experimenter for several seconds. He would show his Etch a Sketch (Task 1) drawing to the experimenter and ask for some comment. While the experimenter tried to remain as neutral as possible by saying things such as "I am glad you like playing with these games" or "I am glad you are having fun" in order to avoid socially reinforcing Task 1 performance, it was simply impossible to avoid commenting on the subject's Task 1 performance due to his persistence.

The subject terminated two of the eight sessions early. One of these sessions was terminated before 10 minutes had elapsed so the data from this session were discarded.

**Post-reward Phase**

Performance of Task 1 decreased during the first four sessions of this phase, then declined sharply during the final five sessions. Task 3 performance increased during these first four sessions, then it too decreased sharply during the final five sessions. On the other hand, the
subject did not perform Task 2 at all during these first four sessions but performed it extensively during the final five sessions of the phase.

The preceding performance shifts all occurred during the fifth session. The four preceding sessions had been terminated early by the subject. In the first two sessions that were terminated early, the subject asked the experimenter to show him how to play with Tasks 1 and 2. Since he had played with both of these tasks frequently prior to this time, the requests were viewed as mands for social interaction with the experimenter.

Due to the shift in task preference by the subject, it was decided to reward performance of Task 2 in the following phase.

It could be argued that the decline in the performance of Task 1 was due to the reward termination. However, this decline may also have been due to task boredom effects or to some factor that caused an increase in Task 2 performance. For example, the increase in Task 2 performance may have been due to social variables that were not controlled. The subject, during this phase, indicated that he knew that Subject 1 typically played with the tinker toys (Task 2) and asked what Subject 1 made with them. This was the first time during the study that Subject 3 had expressed interest in the performance of other subjects.
Attractive Reward Phase

The subject received one scratch and sniff sticker on a VI 90" schedule for performing Task 2. The subject spent an average of 86% of a session performing Task 2 which was approximately the same amount of time that the subject spent performing this Task in the last five sessions of the preceding post-reward phase. Task 3 was not performed during any session of this phase. Task 1 was performed only during one session of the phase, Session 29, for 3% of the session.

Because Task 2 performance was high during the last five sessions of the post-reward phase, it was not possible to determine the reinforcing effectiveness of the stickers by examining Task 2 performance during this phase. Similar to Subject 1, this subject engaged in other behaviors that indicated that the stickers were indeed very attractive to him. For instance, he talked about the stickers frequently, he decreased the amount of time he spent interacting with the experimenter during the sessions, and at the end of the session he kept only the stickers leaving the other items that he had selected during the reward selection procedure, items that he had kept prior to this phase.

It should be noted that the subject terminated the first session of this phase early. This would seem to
contradict the notion that the stickers were very attractive to him. However, this behavior was due to a competing activity at the day care center. The subject was watching a series of three movies during the time that the session was scheduled. Although the subject was eager to attend the session, throughout the session he made the following comments: "I don't want to miss the next movie"; "I have to hurry"; "The movie will begin soon"; "I am going to miss the movie". The subject had been constructing the same object with the tinker toys for several sessions in a row. As soon as he completed this object, he asked to leave.

Post-reward Phase

Task 2 was performed an average of 82% of a session. This represents only a slight decrease in performance when compared to Task 2 performance during the last five sessions of the previous post-reward phase. Task 1 was performed an average of 3% of a session while Task 3 was not performed at all.

The verbal behavior of the subject during the first session of this phase supported the notion that the stickers were very attractive to him. After the experimenter explained that he would not receive any stickers for playing with Task 2, the subject responded "I'm going to be mad if you don't give me any stickers". The subject
later terminated the session before 15 minutes had elapsed.

The subject also terminated two other sessions early during this phase. The subject, then, terminated three of the six sessions early during this phase.

Performance of Task 2 during this phase was probably influenced by social interaction with the experimenter. During two of the three sessions that he did not terminate early, he spent 22% and 23% of the sessions off-task, initiating frequent social interaction with the experimenter. He made "hamburgers" and "French fries" with the tinker toys and requested that the experimenter come over to the experimental area and "eat them". If the experimenter did not immediately comply the request, the subject would take the objects to the experimenter in the observation area.

**Attractive Reward Phase**

The subject received two scratch and sniff stickers on a VI 90" schedule for performing Task 2. During the first three sessions of the phase, Task 2 was performed an average of 77% a session while Tasks 1 and 3 were not performed at all. Off-task behavior averaged 24% of a session. This off-task behavior consisted of playing with the stickers and interacting with the experimenter for several seconds each time that the stickers were delivered.
It appears as though the stickers lost their reinforcing value beginning with the fourth session as indicated by decreases in Task 2 performance and increases in Task 1 performance. In addition, at the end of Sessions 45 and 46, the subject gave the stickers back to the experimenter saying that he did not want them. As indicated earlier, the stickers appeared to lose their reinforcing value for Subjects 1 and 2 at the same time.

During Sessions 46 and 48 the subject spent 35% of the session engaged in off-task behavior. This off-task behavior consisted of interactions with the experimenter. It appears, then, that the social interaction with the experimenter was more reinforcing than the stickers. The subject terminated the last three sessions of this phase early which supports the notion that the stickers were not very reinforcing.

**Post-reward Phase**

The subject terminated five of the six sessions in the phase early. Four of these were terminated before 10 minutes had elapsed so the data were not included in the analysis. During the one session that was not terminated early, the subject performed Task 2 for 88% of the session.
Summary

While the average performance of the rewarded task increased during the unattractive reward phase, it is not clear, given the high variability in the day to day performance of the task that this increase was a real increase. If the increase was a real increase it was probably due to the social interaction between the subject and the experimenter.

Performance of the rewarded task decreased sharply during the post-reward phase. The decrease appears to have resulted from a shift in task preference due to task exposure or outside social influences rather than to the reward-removal procedure.

The stickers appeared to function as reinforcement during the attractive reward phase although this conclusion is based on behaviors other than the performance of the rewarded task.

No decreases in the previously rewarded task were observed during the post-reward phase. It is possible that performance of the task was being maintained by social interaction with the experimenter.

The stickers appeared to lose their reinforcing value during the second attractive reward phase. While no decrements were observed during the final post-reward phase, the subject terminated the majority of the sessions.
early. These terminations can not be attributed to the reward-removal procedure since the subject also terminated the final three sessions of the attractive reward phase early.

Subject 4

This subject completed two phases of the study. Following this time, she went on a prolonged vacation so she was dropped from the study.

Baseline Phase

During the first three sessions, Task 1 (the Etch A Sketch) was not performed much by the subject. A new task, the puzzle blocks, was introduced in Session 4. Based on the subject’s negative verbal reactions to this task, another task, the Stick N Lift My Little Pony game was introduced as Task 1 in Session 5. The data from Sessions 1-4 were not included in further analysis.

During the first six sessions of baseline, the subject performed Task 2 an average of 30% of a session, Task 3 an average of 32% of a session, and Task 1 an average of 21% of a session. Off-task behavior was high, ranging from 11% of a session to 29% of a session. Almost all of this off-task behavior consisted of interaction with the experimenter.
Following Session 10, the subject was absent for five days. As can be seen in Figure 1, the performance of the subject changed when she returned. Task 3 was performed considerably more than it had been during the first six sessions of the phase. Performance of this task averaged 58% of a session during the last six days of baseline. Task 2 performance averaged 24% of a session during the last six days of baseline.

During Sessions 14 and 15, Task 2 was performed more than Task 3. Performance on these days may have been influenced by interactions with another subject outside of the experimental sessions. Subject 5’s experimental sessions immediately preceded Subject 4’s sessions. Between their sessions, Subject 5 informed Subject 4 that she had built a car with the tinker toys (Task 2) and had placed Subject 4’s family in the car. It is highly likely that this interaction influenced Subject 4’s performance of Task 2 during these two sessions.

Task 3 was selected as the task to be rewarded.

Unattractive Reward Phase

The subject performed Task 3 an average of 53% of a session, Task 2 an average of 14% of a session and Task 1 an average of 10% of a session. Task 3 performance is comparable to Task 3 performance during baseline indicating that the reward was not functioning as reinforcement.
for task performance. Off-task behavior was quite high, ranging from 12% to 34% of a session, with an average of 23% of a session. As with other subjects, there was considerable day-to-day variability in the performance of the tasks.

**Post-reward Phase**

During the first three sessions, performance of all of the tasks resembled their performance during the two preceding phases. However, following Session 25, the subject was absent for two weeks and it was decided to terminate the study at that time. It was felt that if the study had been continued after she returned her performance would have had little relation to the reward-removal intervention.

**Summary**

Performance of the rewarded task did not increase during the unattractive reward phase indicating that the reward was not functioning as reinforcement. The study was terminated before the post-reward phase was completed.

**Subject 5**

This subject completed two phases of the study. The study was terminated when she refused to attend experimental sessions.

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Baseline Phase

During the first two sessions, Task 1 consisted of the Etch A Sketch. The subject had difficulty playing with this toy so the Stick N Lift My Little Pony game was substituted for it in Session 3.

Tasks 1, 2 and 3 were performed for approximately the same percent of a session, 28%, 29% and 31% respectively. Task 3 was selected as the task to be rewarded because performance of this task was less variable than performance of the other two tasks.

Unattractive Reward Phase

Task 3 was not performed at all during the first session. Task 1 was performed for 86% of this session. This performance pattern is very different from the performance patterns observed during baseline. Performance of Task 3 increased to 68% of the second session. Because the decrement in the performance of Task 3 during the first session was so transient, it is not possible to determine whether the decrement was due to the introduction of the rewards.

Performance of Task 3 averaged 37% of a session which is comparable to baseline performance of this task. Performance of Task 2 increased slightly from an average of 29% of a session during baseline to 36%. Performance of
Task 1 decreased slightly from an average of 28% of a session during baseline to 20%. The day-to-day variability of performance increased considerably over baseline performance.

**Post-reward Phase**

Task performance was very variable during the first six sessions of the phase. During the last two sessions, the subject spent 100% of the session performing Task 2. The subject then refused to attend the next eight sessions. She agreed to attend the ninth session but refused to attend the tenth session. She then agreed to attend the following two sessions but refused to attend the sessions thereafter. Her behavior appeared to be highly affected by factors at the day care center. She would only agree to attend if another child indicated that he or she really wanted to come and play with the games. In the absence of such peer social interactions she would not attend.

**Summary**

Performance of the rewarded task during the unattractive reward phase was comparable to the subject's baseline performance although performance was considerably more variable during the unattractive reward phase. The
study was terminated before the post-reward phase was completed.

Subject 6

This subject completed three phases of the study; the baseline phase, the reward phase and the post-reward phase. As indicated by the interobserver agreement data, this subject was difficult to observe. Because of this, the data for this subject must be viewed cautiously.

Baseline Phase

This subject spent an average of 49% of a session performing Task 2, 23% of a session performing Task 1 and 16% of a session performing Task 3. As was seen with other subjects, performance of the tasks varied greatly from day to day. Since Task 2 was performed considerably more, on the average, than the other two tasks, this task was selected as the task to be rewarded.

Unattractive Reward Phase

Task 2 performance increased from an average of 49% of a session during baseline to an average of 69% of a session. While these data suggest that the reward was functioning as reinforcement, the subject did not take the rewards with him at the end of three of the five sessions. Since the subject initiated interaction with the
experimenter when the rewards were delivered, it is likely that this social interaction was responsible for the performance increase.

**Post-reward Phase**

Task 2 was performed an average of 75% of a session. This represents a considerable increase over baseline performance of this task. Off-task behavior was relatively high during this phase ranging from 7% to 36% of a session. This off-task behavior did not consist of interaction with the experimenter but consisted of wandering around the room and being out of view of the video camera.

**Attractive Reward Phase**

Eight sessions were conducted during this phase. The subject terminated six of these sessions early and the experimenter terminated one session early. The experimenter terminated the session because the subject had used the markers to draw on his face and hands.

During the first three sessions stickers were used as the attractive reward. Although the subject consistently selected the sticker as the item that he liked "the very best" during the reward selection procedure, the stickers did not appear to have much reinforcing value. During the first session in which stickers were provided for task
performance, he spent 33% of the session off-task and then terminated the session early. In addition, he did not play with the stickers at all when they were delivered as did the other subjects in the study. During the second day, he asked to receive the stickers but again spent a relatively high proportion of the session engaging in off-task behavior and displayed no interest in the stickers when they were delivered. The subject terminated the third session after seven minutes. During the next five sessions various items were used as the reward. None was effective. The subject terminated sessions earlier and earlier each day. He finally began to terminate sessions immediately following the reward selection procedure. The subject was dropped after he had terminated five sessions in a row early.

Summary

Performance of the rewarded task increased during the unattractive reward phase. Because the subject did not take the rewards with him at the end of 60% of the sessions, the increase was probably not due to the rewards but due to the social interaction between the subject and the experimenter.

Performance of the rewarded task increased considerably over baseline during the post-reward phase but this performance was comparable to the performance of this task.
during the immediately preceding unattractive reward phase.

The study was terminated during the attractive reward phase.

Subject 7

This subject completed only two phases of the study. In addition she was absent frequently from the day care center.

Baseline Phase

Task 2 performance showed an increasing trend across the five baseline sessions. The subject performed Task 2 on average of 59% of a session although during the final three baseline sessions, she performed this task on average of 91% of a session. Tasks 1 and 3 showed decreasing trends across the five baseline sessions. The subject performed Task 1 on average of 20% of a session although performance declined sharply during the final three baseline sessions. The subject performed Task 3 an average of 15% of a session but did not perform this task at all during the last three baseline sessions. The changes in performance across this phase were probably due to task exposure. Off-task behavior averaged 5% of a session ranging from 0% to 13%.
Unattractive Reward Phase

Performance of Task 2 decreased from an average of 59% of a session during baseline to 47%. Performance of Task 1 also decreased from an average of 20% of a session to 5%. Performance of Task 3 increased from an average of 15% of a session to 25%. Most importantly, off-task behavior increased from an average of 5% of a session during baseline to an average of 23% of a session. During the final three sessions of this phase, off-task behavior ranged from 39% to 47% of a session. While the subject was eager to attend the sessions during these last three sessions, she would spend only a few minutes playing with the tasks and then would wander around the experimental area stomping her feet and singing or saying "I am done now, I don't want to play anymore".

Post-reward Phase

The subject was absent from the day care center for two weeks immediately following the reward phase. While it was recognized that upon her return her performance would have little relevance to the reward-termination intervention it was decided to continue the study and to collect data that would be considered new baseline data. However, the subject terminated all of the next sessions early so the study was ended.
Summary

Performance of the rewarded task decreased during the unattractive reward phase. This decrease is due to an increase in the subject's off-task behavior. During the last three sessions of the phase, off-task behavior occurred for 40% to 50% of a session. The study was terminated before the post-reward phase was completed.

Summary of the Results

Performance Variability

Except when tasks were reinforced, the performance of the tasks varied considerably from day to day for all subjects. This variability suggests that task interest was not a strong controlling variable in comparison to uncontrolled variables such as subject interaction with the experimenter and with other subjects.

Unattractive Reward Phase

For five of the seven subjects, the unattractive reward did not increase the performance of the rewarded task over baseline performance levels. This indicates that the reward was not functioning as reinforcement for task performance. The performance increases observed for the other two subjects, 3 and 6, during this phase may have been due to the social interaction between the
Post-reward Phase

Three subjects were dropped from the study before completing the post-reward phase. As determined by subject task performance in the preceding phase, of the four subjects that remained in the study the unattractive reward was clearly not a reinforcer for two, Subjects 1 and 2. During the post-reward phase Subject 1's performance of the previously rewarded task decreased below baseline levels immediately following the termination of reward delivery. This decrement was very transient with task performance returning to baseline levels after one session. Subject 2's performance of the previously rewarded task neither increased nor decreased in comparison to baseline performance levels following the termination of reward delivery. Performance decrements were, thus, observed for one subject but not for the other subject.

Subject 6's task performance did not decrease below baseline levels following the termination of reward delivery. As previously noted, the social interaction with the experimenter functioned as reinforcement for task performance in the preceding phase.

The data for Subject 3 are difficult to interpret. It is not clear whether or not the reward procedure
functioned as reinforcement in the preceding reward phase. In addition, during the post-reward phase, Subject 3's task preference shifted from Task 1 to Task 2. This task preference shift is believed to have been due to task exposure rather than to the termination of reward delivery.

**Attractive Reward Phase**

Three subjects, 1, 2 and 3, completed this phase. The reward, scratch and sniff stickers, appeared to have reinforcing value for all three subjects, although for two (Subjects 1 and 3) this conclusion is based on behaviors other than the performance of the rewarded task since the performance of that task was subject to a ceiling effect.

**Post-reward Phase**

Subject 1's performance of the previously rewarded task showed an immediate, temporary decrease below baseline levels. This was the same performance pattern observed for this subject following the termination of the delivery of the unattractive reward. Performance decrements were not observed for Subjects 2 and 3, although the task performance of Subject 3 may have been maintained by social interaction with the experimenter. Subject 1's performance showed the same pattern following the termination of the delivery of the unattractive reward. Thus, the performance of both Subjects 1 and 2 showed the same
pattern following the termination of the delivery of unattractive rewards and following the termination of the delivery of attractive rewards although Subject 1’s task performance showed an immediate, transient decrement while Subject 2’s performance neither increased nor decreased in comparison to baseline performance levels.

**Attractive Reward Phase**

The stickers lost their reinforcing effectiveness for all of the three remaining subjects during this second attractive reward phase. It is not known whether this was due to some uncontrolled variable or whether the decreases were coincidental.

**Post-reward Phase**

Performance decrements were not observed for the one subject, 1, who completed this phase. This subject had exhibited performance decrements in both of the previous post-reward phases.
CHAPTER V

DISCUSSION

This study had three research objectives: (a) to examine whether rewards that do not increase task performance result in post-reward decrements and whether rewards that do increase task performance (reinforcers) do not result in post-reward performance decrements; (b) to examine whether the reinforcing value of the reward influences the size of post-reward performance changes; and (c) to examine how long post-reward performance changes last when they occur. These research objectives will be discussed first and will be followed by a discussion of the considerable day-to-day variability of task performance shown by all seven subjects. Discussion of the three major research objectives will focus on the data from two subjects, 1 and 2. These subjects completed at least two of the three post-reward phases, unlike Subjects 4, 5, 6, and 7. Subject 3 also completed two of the three post-reward phases. However, his data will be excluded because, as indicated in the previous section, it is highly likely that his performance was affected by social interaction with the experimenter. This section will end with a discussion of the
methodological weaknesses of the study and suggestions for future research.

Reward Versus Reinforcement

Rewards that did not increase task performance and rewards that did increase task performance (reinforcers) did not affect post-reward performance differently for either Subject 1 or 2. Both subjects responded in a consistent manner to the termination of both reward and reinforcement although Subject 1 exhibited temporary performance decrements while Subject 2 did not exhibit performance decrements. These results do not support Williams' contention (1980) that rewards that are not reinforcers will result in post-reward decrements and rewards that are reinforcers will not result in post-reward decrements.

Individual differences similar to the ones observed in the present study have been observed in several multiple-trial studies that examined the effects of reinforcement on post-reinforcement task performance. Davidson and Bucher (1978), Feingold and Mahoney (1975), Horn and Maxwell (1980) and Vasta and Stirpe (1979) reported that while the majority of their subjects did not exhibit post-reinforcement decrements some of their subjects did exhibit decrements.
The studies mentioned in the preceding paragraph employed within-subject comparisons that enabled the detection of individual differences. Individual differences may be obscured by between-group statistical analyses. For example, Williams employed a between-group statistical comparison to analyze his data. In a personal communication with the author, Williams (March 4, 1985) stated that four of the twelve subjects who received reinforcement for task performance did show post-reinforcement decrements in comparison to control group subjects while four of the twelve subjects who received unattractive rewards for task performance did not show post-reward decrements. The results of the present study, thus, do not necessarily conflict with the results obtained by Williams. Rather, the between-group statistical comparisons obscured individual differences in Williams' study; individual differences that were similar to the ones observed in the present study.

Individual differences may have been obscured in other studies as well. Mawhinney (1979) examined the individual data from Deci's 1971 study. In that study, Deci reported that subjects who received rewards exhibited post-reward decrements in comparison to control subjects who did not receive rewards for task performance. Yet, Mawhinney's analysis revealed that, "fully 58% (N=7) of the experimental [rewarded] subjects failed to behave as
Deci predicted" (p. 428). In other words, 58% of the subjects who were rewarded for task performance failed to display performance decrements following reward termination. Because of these observations Mawhinney urged researchers to adopt within-subject comparisons as opposed to between-group statistical comparisons when analyzing the data from investigations of this phenomenon.

Use of the group mean, for example, is appropriate where concern is for estimating the general effect of a treatment population. It may obscure as much as it reveals, however, when concern is for evaluation of a theory of individual work motivation. (p. 437)

Both reinforcement and reward termination have been shown to affect the performance of different subjects differently. The present study was the first study to examine both post-reward and post-reinforcement performance using within-subject comparisons. It may be that due to different reinforcement histories, subjects who exhibit decrements following reward termination are also likely to exhibit decrements following reinforcement termination while subjects who do not exhibit decrements following reward termination are also not likely to exhibit performance decrements following reinforcement termination. As suggested by Lepper (1981), the likelihood that individuals will decrease their interest in or performance of tasks that are extrinsically rewarded may depend upon the extent to which rewards have, in the individuals' past,
been frequently and uniquely associated with attempts to coerce them into performing tasks of minimal interest.

Lepper (1981) maintains that it is the coercive aspects of external contingencies, not rewards per se, that cause decreases in task interest and performance.

More generally, this view suggested that the use of unnecessarily powerful or salient techniques of social control - even of a seemingly benign sort, such as the addition of attractive rewards contingent upon engagement in a task of inherent interest - in order to induce an individual to engage in an activity of initial interest may, in effect, undermine that individual's later interest in the activity per se, when extrinsic rewards and constraints are no longer salient. (p. 168)

Williams (1980) also contends that it is not reward or reinforcement that causes performance decrements but the constraining aspects of contingencies.

Data from studies that have examined a variety of social control techniques support this view. Performance decrements have been found following the termination of experimenter requests to perform a task (Williams, 1980), deadlines (Amabile, DeJong & Lepper, 1976), competition with others (Deci, Betley, Kohle, Abrams & Porac, 1981), experimenter surveillance of performance (Lepper & Greene, 1975; Pittman, Davey, Alafat, Wetherill & Kramer, 1980), experimenter-selection versus self-selection of the task to be performed (Swann & Pittman, 1977), and the requirement that subjects perform one task in order to gain...
access to a task of equivalent initial interest (Lepper, Sagotsky, Dafos & Greene, 1982).

Performance decrements in response to social constraints may represent what Skinner (1953) calls countercontrol. Skinner maintains that control is frequently aversive to an individual when the control techniques are ones that have, in the individual’s past, been correlated with punishment or threats of punishment and "when, as is usually the case, the ultimate advantage to the controller is opposed to the interest of the controllee" (p. 321). Countercontrolling behavior may be evoked by the controlling contingencies and reinforced by either withdrawal of those contingencies or by signs of irritation or anger on the part of the individual who imposed the contingencies. According to Skinner countercontrolling behaviors are more likely to be evoked by social constraints than by nonsocial constraints. To quote Skinner:

One effect upon the controllee is to induce him to engage in countercontrol. He may show an emotional reaction of anger or frustration including operant behavior which injures or is otherwise aversive to the controller. Such behavior may have been reinforced by the reduction in similar aversive consequences. The importance of reinforcement is seen in the fact that we are much more likely to respond in this way to social than to nonsocial control. If we are forced to step off the sidewalk by a large branch blown down by the wind, we shall probably not exhibit a strong emotional reaction, but if we are forced to step off in the same way by a group of idle people, aggressive behavior - verbal and nonverbal - may be generated. The aggressive behavior has probably alleviated similar social conditions but has had little or no effect upon
branches of trees. It is not necessarily more "natural" to react emotionally to social than to nonsocial restraint....The opposition to control is likely to be directed toward the most objectionable forms - the use of force and conspicuous instances of exploitation, undue influence, or gross misrepresentation - but it may extend to any control which is "deliberately" exerted because of the consequences to the controller. (p. 321)

One countercontrolling strategy may be to refrain from engaging in the task. Such behavior may be reinforced by signs of anger or irritation on the part of the individual imposing the control techniques. In the present study the performance of Subject 1 may reflect such a history. Not only were decrements observed following termination of reward and reinforcement but performance decrements were also observed during the first three sessions in which unattractive rewards were promised for task performance. In addition, during the unattractive reward sessions immediately after the experimenter explained to the subject that he would rewarded for playing with the task, the subject responded "I know, I know, I know" in what could be called a hostile or aggressive tone of voice. As indicated by Skinner in the previous quote, such verbal behavior may be generated by social control techniques when it has, in the past, been successful in alleviating the aversive conditions.

The subject's performance decrement lasted three sessions. In the fourth session of the unattractive reward phase, task performance returned to baseline
levels. In the present situation, the reward contingency was not correlated with punishment or threats of punishment nor did the experimenter gain any advantage at the expense of the subject. While the reward contingency may have evoked countercontrolling behavior initially due to the subject’s history, the contingency, since it did not contain these coercive elements, may have failed to evoke the behavior after the subject had been repeatedly exposed to it. It may also be that the countercontrolling behavior extinguished due to nonreinforcement since the contingency was neither withdrawn nor did the experimenter show any signs of irritation or anger.

The performance decrements that occurred during the post-reward and post-reinforcement phases may also be analyzed as countercontrolling behavior even though there were no reward contingencies in effect. At the beginning of each session during the unattractive and attractive reward phases, the experimenter told the subject that he was not going to receive any pieces of wood (the unattractive reward) or stickers (the attractive reward), respectively, for playing with the tinker toys. That statement may have carried with it a subtle social constraint or performance request and as such evoked countercontrolling behavior due to the subject’s history. The decrements during these phases were very transient. The contingency may have not continued to evoke the countercontrolling
behavior because it was not correlated with punishment or disadvantages to the subject or because the decrements were not reinforced.

Subject 1 did not exhibit a performance decrement during the final post-reward phase. There are three possible reasons for that. First, he had been repeatedly exposed to the noncoercive reward contingencies for a sufficient period of time so that they failed to evoke countercontrolling behavior. Second, the countercontrol- ling behavior may have extinguished in that setting due to nonreinforcement. The third reason relates to variables outside of the experimental setting. The post-reward phase was introduced when the subject only had four days remaining at the day care center. During these days, he received a lot of attention from the day care center staff, his peers and the experimenters. Each day he arrived wearing a new article of clothing that was purchased for him to wear at his new school. He would point these out to the experimenter and observer who both provided him with a great deal of social attention. These extraneous variables may have reduced the general aversiveness of the control situation.

Subject 2 did not exhibit any post-reward or post-reinforcement performance decrements. In keeping with the preceding discussion, it may be that rewards and reinforcers have not been used to coerce him into performing
tasks that he would not otherwise perform nor correlated with punishment for noncompliance. Given such a history and given that the reward contingency did not contain coercive elements, the reward contingency would not be expected to evoke countercontrolling behavior.

In Williams' study (1980) the majority of the subjects who received unattractive rewards for task performance exhibited post-reward decrements. While the decrements may have been due to the reinforcement history of those subjects, they may also have been due to the coercive nature of the reward contingency. The reward contingency used by Williams was more coercive than the reward contingency in the present study. The subjects consisted of fourth and fifth grade students who were asked to participate in a math skills improvement project. Subjects were presented with four "math-related" tasks and were informed that they would be given a math test at the end of the session. The subjects were then informed that if they played with the target activity while the experimenter went to get the test they would be given a reward which consisted of two comic books that they had previously rated as uninteresting. Tests are frequently correlated with punishment or adult disapproval when students perform poorly. Thus, this coercive element may have contributed to the evocation of countercontrolling behavior. This coercive element cannot be solely
responsible for the post-reward performance decrements, however, since the majority of subjects who received attractive rewards under the same conditions did not exhibit post-reward decrements.

Performance decrements are likely to occur when (1) individuals have been exposed to a history in which control techniques have been correlated with punishment for noncompliance and with disadvantages to them and (2) when the current control technique contains these coercive elements. The present study with its within-subject comparison design was the first study that enabled the detection of consistent performance patterns of subjects following both reward and reinforcement termination. One subject exhibited decrements following reward and reinforcement termination while the other subject did not exhibit such decrements. These data emphasize the importance of an individual's history of reinforcement with respect to rewards and reinforcement, a factor that has been overlooked in attempts to discover the variables that influence when post-reward decrements will or will not occur.

The Size of Post-reward Performance Changes

This study did not successfully address the relation between the reinforcing value of the reward and the size of post-reward performance changes. The reinforcing value
of the reward was manipulated by providing one scratch and
sniff sticker on a VI 90" schedule in one attractive
reward phase and two scratch and sniff stickers on a VI
90" schedule in the other attractive reward phase. Three
of the seven subjects, 1, 2, and 3, completed both of the
attractive reward phases. However, for all three subjects
the stickers lost their reinforcing value during the se­
cond attractive reward phase, eliminating the opportunity
to compare the effects of rewards having two different
reinforcement values on post-reward performance.

 Transience of Post-reward Performance Changes

Subject 1 was the only subject who displayed any
reliable performance changes during the post-reward
phases. When performance decrements occurred, they were
very transient. These results are consistent with the
results of other studies that have continued to me­sure
subject performance for several sessions following reward
termination (Colvin, 1971; Davidson & Bucher, 1978; Deal &
Madsen, 1980; Feingold & Mahoney, 1975; Hom & Maxwell,

Caution should be exercised when extrapolating these
results to a situation in which intrinsically interesting
tasks have been rewarded for extended periods of time.
The reward phases of research studies have been relatively
short. The transience of the decrements may depend upon
the length of the time that rewards are provided for task performance.

Both behavioral and cognitive theories would predict performance recoveries after a period of time. From a behavioral perspective, since the individuals are no longer exposed to the variables responsible for the performance decrements, the decrements would eventually disappear, and task performance would be brought under the control of the variables that originally maintained it. From a cognitive perspective, in the absence of reward contingencies, individuals would eventually perceive that their task performance was a function of their own interest, not a function of the rewards. This shift in perception would be accompanied by increases in task performance.

As Williams (1980) suggested, from a practical standpoint, the most important implication of studies that have investigated post-reward performance changes is that extrinsic rewards may have long-term deleterious effects. The advice from cognitive psychologists (Crandy, 1977; Deci, 1975; Levine & Fasnacht, 1974) that performance-contingent reward systems be abandoned in favor of more "intrinsically-oriented" systems is based on the assumption that performance decrements will be relatively stable. Results from the present study as well as the results from other studies that have repeatedly measured
performance following reward termination do not support that assumption. Rather, results from these studies suggest that when decrements occur, they are very transient.

Cognitivists are also concerned, however, that intrinsic interest will decrease while the rewards are being provided for task performance. Because the rewards maintain task performance, the decreased interest cannot be measured by examining the subject's task performance. Subjective measures (verbal reports) of task interest during and following reward have been inconsistent (for example: Boal & Cummings, 1981; Calder & Staw, 1975; Enzle & Ross, 1978; Farr, 1976; Harackiewicz, 1979; Jones, 1981; Kruglanski, Friedman & Zeevi, 1971). Thus, there is no evidence to substantiate the claim that extrinsic rewards decrease task interest while they are being provided for task performance.

Within-subject Variability

For all seven subjects, performance of the task varied considerably from day-to-day except when performance was under the control of the extrinsic rewards. Such variability suggests that task performance was being controlled by variables that were not under experimental control.
This day-to-day variability in performance is not unique to the present study. Similar variability has been observed in all of the multiple-trial studies that have reported individual data (Colvin, 1971; Davidson & Bucher, 1978; Ham & Maxwell, 1980; Feingold & Mahoney, 1975; Vasta & Stirpe, 1979).

Three factors may have contributed to the variability observed in the present study: social interaction with the experimenter; social interaction with other subjects; and the reinforcing value of the preferred task in comparison to the reinforcing value of the other two tasks.

Social Interaction with the Experimenter

During the study, the experimenter and the observer remained behind a partition to minimize social contact with the subjects while they were performing the tasks. When subjects initiated social contact, the experimenter attempted to remain neutral with respect to the performance of any particular task. Subjects initiated relatively few social contacts with the experimenters during the first part of the study. However, as the children became more familiar with the experimenters and the observers they initiated contacts more frequently. Several subjects would not only request that the experimenter "come and look" at what they had done but would also approach the experimenter behind the partition.
This social contact could very well have functioned as reinforcement for task performance. Such reinforcement would be expected to maintain or increase the performance of the preferred task and thus reduce the day-to-day variability of performance. However, subjects would occasionally engage in other activities that resulted in more frequent contact with the experimenter. For example, during the first four sessions of the second attractive reward phase (Sessions 35-38), Subject 2 played almost exclusively with the tinker toys. During Session 39, he asked for but was not given a black dinosaur during the reward selection. He then drew a black dinosaur with the markers. When he finished the drawing he carried it to the experimenter. This was the first time during the study that he had approached the experimenter behind the partition. He continued to draw pictures of dinosaurs for the remainder of the session. After he completed each picture he took it to the experimenter and gave it to her. This pattern continued for four sessions. After these sessions he would say things like, "I forgot to play with the tinker toys", "Tomorrow I'm going to play with the tinker toys so I can get some stickers", "I did not get any stickers today, darn", etc. The increase in drawing with the markers and the accompanying decrease in playing with the rewarded task (the tinker toys) may have been due to this increased social contact with the experimenter.
rather than to a decrease in the reinforcing value of the stickers.

Subject 3 also engaged in a variety of different behaviors, the result of which was increased social contact with the experimenter. For example, during the reward phase, each time he completed a picture on the Etch A Sketch, he would ask the experimenter to come and see it. During Session 13 when the experimenter discouraged such social contact by ignoring the subject's requests he began playing with the tinker toys.

As the examples in the previous paragraphs illustrate some of the day-to-day variability observed may have been due to social contacts with the experimenter.

Social Interactions with Other Subjects

Subjects frequently interacted with one another outside of the experimental setting. Experimental sessions were conducted before and after the "school day" so that the regularly scheduled activities of the children would not be disrupted. During these times, the children were all in one location, typically on the playground or in the gym. Subjects would often talk to each other between sessions, telling each other what they had played with that day. During experimental sessions subjects would also frequently express an interest in the activities of other subjects by asking the experimenter what another
subject had played with. In addition, after completing an activity, subjects would sometimes comment that another subject was really going to like what they had done. On occasion a tinker toy creation constructed by one subject would not be completely disassembled before another subject was escorted to the experimental room. When this occurred, subjects would almost always ask who had made the creation and would either add pieces to it or take it apart. It is highly likely that these types of social interactions between the subjects contributed to the day-to-day variability of task performance.

**Reinforcing Value of the Tasks**

Some day-to-day variability may have resulted from momentary fluctuations in task interest due to repetition. If one task has a much higher reinforcing value than the other tasks that are available, then one would expect the performance of that task to be consistently high. However, if the available tasks have approximately the same reinforcing value, more performance variability would be expected. In the present study, tasks that were of initially low interest were substituted with other tasks. The tasks may have had similar reinforcing values and as a result contributed to day-to-day performance variability.

The day-to-day variability may also reflect the low reinforcement value of the tasks in general. The stimuli
produced by task performance may not be sufficiently reinforcing to maintain responding for long periods of time. If performance of the tasks result in other sources of reinforcement, such as interaction with the experimenter, then such variables may control performance. The stimuli produced by task performance may have acquired their reinforcing value due to pairing with other reinforcers such as adult praise and peer attention. When adult praise and peer attention are directly available for task performance, task performance may be more controlled by these variables than by the response-produced stimuli.

Methodological Problems

It was difficult to determine whether performance changes during the post-reward phases were due to the manipulation of the independent variable or to task exposure. Typically when within-subject designs are employed changes that occur during intervention phases can be compared to performance during baseline and reversal conditions. While the post-reward phases in the present study represent a return to baseline conditions they also represent an intervention phase - the termination of reward or reinforcement. Performance changes during these phases could either be due to the termination of reward or reinforcement or to task exposure. The use of a control
group would have increased the possibility of detecting performance changes due to task exposure. It would be difficult, however, to arrange for control subjects to have the same amount of task exposure as experimental subjects. The task performance of experimental subjects would be periodically rewarded which would increase task exposure in comparison to control subjects whose task performance would not be rewarded. In spite of that problem, the task performance of a control group would have provided data with respect to the susceptibility of the tasks used in the study to task exposure effects.

Another problem was the social interaction that occurred between the experimenters and the subjects. The experimenter and the observer sat behind the partition so that subjects would not know their behavior was being observed and in order to reduce social contact. As indicated earlier, this procedure was not entirely successful in eliminating social contact.

Social interaction has been shown to affect post-intervention performance. Praising task performance has consistently been shown to increase post-praise performance (Anderson, Manoogian & Reznick, 1976; Deci, 1971, 1972a; Deci, Cascio & Krusell, 1973; Harackiewicz, 1979; Shanab, Peterson, Darghai & Deroian, 1981; Swann & Pittman, 1977; Zinser, Young & King, 1982) while ignoring task performance has been shown to decrease
post-intervention task performance [Anderson et al., 1976]. It is difficult to interact with a child while neither praising nor ignoring task performance as noted by Anderson et al. (1976):

While the experimenter was [rather painfully] striving to avoid eye contact, conversation, or attending to the child's drawings, the child was striving equally hard to elicit some recognition or validation from the experimenter for what he was doing. (p. 917)

This type of social interaction has not been reported to be a problem in any previous multiple-trial study even though in every study but one (Davidson & Bucher, 1978) the experimenter remained in the room with subjects while they performed the tasks. In the present study, five of the seven subjects initiated considerable social contact with the experimenter. The only way to completely control for such social interaction would be to have the experimenter located in a different room and to dispense rewards with some type of mechanical dispenser during the reward phases. From a practical standpoint, however, the procedure used in the present study more nearly approximates a real world setting.

Future Research

The present study was the first multiple-trial study to examine the effects of reward and reinforcement on post-reward and post-reinforcement performance. Only two
Subjects whose performance was not confounded by social interaction with the experimenter completed the study. Both subjects exhibited consistent performance patterns following reward and reinforcement termination. Additional studies need to be conducted to determine whether these results can be reproduced with other subjects.

Social interaction with the experimenter may have influenced subject performance in the present study. In order to separate the effects of social interaction from the effects of reward and reinforcement termination, future research should be conducted in which rewards and reinforcers are provided by a mechanical dispenser.

The results of the present study suggest that the reinforcement history of subjects with respect to reward and reinforcement is an important determinant of post-reward and post-reinforcement performance changes. It would be interesting to conduct a study in which subjects are provided with an immediate reinforcement history. Subjects could be exposed to reward and reinforcement contingencies in which rewards are used to coerce them into performing tasks of minimal interest, to coerce them into performing tasks that had advantages for the experimenter, and in which rewards are correlated with threats of punishment for noncompliance. Other subjects could be exposed to reward and reinforcement contingencies that did not contain these coercive elements. By experimentally
manipulating subjects' histories of reinforcement, the importance of this variable could be ascertained.

Several researchers have maintained that it is the coercive elements of reward contingencies that cause post-reward decrements, not the rewards themselves. To date, no one has systematically investigated those coercive elements. Skinner (1953) suggested that control techniques are particularly aversive when they are correlated with punishment or threats of punishment for noncompliance and when the controller gains some advantage at the expense of the controlled. Williams (1980) suggested that the constraining nature of contingencies increase with the degree to which task performance is specified and the degree to which rewards are correlated with threats of punishment. Lepper (1981) suggested that post-reward decrements are likely if rewards are uniquely associated with attempts to coerce individuals into performing tasks of minimal interest. Research also indicates that close monitoring of performance may result in performance decrements (Deal & Madsen, 1980; Lepper & Greene, 1975; Pittman et al., 1980). Future research should be conducted to determine the elements of reward contingencies that are coercive and are likely to evoke countercontrol behaviors so that these elements can be avoided when designing performance-contingent reward systems.
Finally, the present study did not successfully address the issue of whether the size of post-reward performance changes is a function of the reinforcing value of the reward. Future research should be conducted to determine whether the size of post-reward decrements is a function of the reinforcing value of the reward as proposed by Williams (1980), a function of the initial level of task interest as proposed by Calder and Staw (1975) or a function of the reinforcing value of the reward in comparison to the reinforcing value of the task as suggested by the behavioral contrast literature.

Conclusions

It is clear that rewarding individuals for performing a task that they find interesting may, under certain circumstances, decrease their task performance when the rewards are no longer available. The present study examined one variable that may increase or decrease post-reward task performance: the extent to which the reward is reinforcing. The results suggest that an individual's reinforcement history may determine to a large degree whether post-intervention decreases will be observed following both reward and reinforcement termination. Individuals who have been exposed to a history in which rewards and reinforcers have been primarily correlated with threats of punishment for noncompliance or with some
type of disadvantage to themselves may be highly likely to exhibit post-reward and post-reinforcement performance decrements. Post-reward performance decrements may be a form of countercontrol and may in the individual's past have been reinforced by withdrawal of the control technique or by signs of irritation or anger on the part of the controller.

As in previous multiple-trial studies, when post-reward or post-reinforcement decrements did occur, they were very transient. There were no permanent decreases in task performance as a result of reward or reinforcement termination.

Finally, the within-subject variability exhibited by all of the subjects suggests that task interest was a very weak controlling variable in comparison to other uncontrolled variables. Previous multiple-trial studies have also reported such day-to-day variability in the task performance of their subjects. While many cognitive psychologists have argued that extrinsic rewards may destroy intrinsic interest, these data suggest that there may not be much intrinsic interest to destroy.
<table>
<thead>
<tr>
<th>Subject</th>
<th>Task 1</th>
<th>Task 2</th>
<th>Task 3</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Etch A Sketch</td>
<td>Tinker Toys</td>
<td>Markers</td>
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<tr>
<td>2</td>
<td>Stick N Lift</td>
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<td>Stick N Lift</td>
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<td>6</td>
<td>Puzzle Blocks</td>
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<tr>
<td>7</td>
<td>Stick N Lift</td>
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### Appendix B

**The Number and Percent of Sessions Rescored for Each Subject**

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<th>Subject</th>
<th>Total number of sessions</th>
<th>Number of sessions rescored</th>
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### Appendix C

The Number of Seconds Subjects Spent Performing Each Task as Recorded by Two Observers and the Absolute Differences Between Observations

<table>
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<p>| 2       | 6/18         | 69     | 70     | 1       | 280  | 275  | 5       | 551  | 549  | 2       |
|         | 6/21         | 0      | 0      | 0       | 348  | 347  | 1       | 426  | 431  | 5       |
|         | 6/27         | 46     | 43     | 3       | 626  | 627  | 1       | 190  | 193  | 3       |
|         | 6/29         | 505    | 509    | 4       | 376  | 379  | 3       | 0    | 0    | 0       |
|         | 7/05         | 0      | 7      | 7       | 382  | 390  | 8       | 438  | 436  | 2       |
|         | 7/06         | 0      | 0      | 0       | 898  | 890  | 8       | 0    | 0    | 0       |
| Subject | Session Date | Table 1 | | Table 2 | | Table 3 |
|---------|--------------|---------| |---------| |---------|
|         |              | OB  1  | OB 2 | ABS | DIF | OB 1 | OB 2 | ABS | DIF |
| 2       | 7/12         | 291    | 285 | 6  | 573 | 575 | 2    | 0    | 0    | 0   |
|         | 7/17         | 0      | 0   | 0  | 752 | 737 | 15   | 142  | 152  | 10  |
|         | 7/25         | 0      | 0   | 0  | 895 | 851 | 44   | 0    | 0    | 0   |
|         | 7/31         | 0      | 0   | 0  | 11  | 12  | 1    | 876  | 882  | 6   |
|         | 8/06         | 0      | 0   | 0  | 818 | 801 | 17   | 0    | 0    | 0   |
|         | 8/16         | 0      | 0   | 0  | 149 | 168 | 19   | 624  | 624  | 0   |
|         | 8/20         | 0      | 0   | 0  | 368 | 374 | 6    | 362  | 364  | 4   |
| 3       | 6/21         | 365    | 359 | 6  | 90  | 88  | 2    | 416  | 420  | 4   |
|         | 6/22         | 681    | 678 | 3  | 213 | 214 | 1    | 0    | 0    | 0   |
|         | 6/25         | 319    | 320 | 1  | 416 | 426 | 8    | 0    | 0    | 0   |
|         | 6/28         | 472    | 470 | 2  | 192 | 193 | 1    | 0    | 0    | 0   |
|         | 7/03         | 564    | 569 | 5  | 203 | 205 | 2    | 71   | 61   | 10  |
|         | 7/11         | 239    | 235 | 4  | 647 | 640 | 7    | 0    | 0    | 0   |
|         | 7/16         | 442    | 438 | 4  | 0   | 0   | 0    | 457  | 439  | 18  |
|         | 7/26         | 0      | 0   | 0  | 625 | 634 | 9    | 0    | 0    | 0   |
|         | 7/30         | 0      | 0   | 0  | 743 | 698 | 45   | 0    | 0    | 0   |
|         | 8/07         | 75     | 77  | 2  | 660 | 628 | 32   | 0    | 0    | 0   |
|         | 8/13         | 0      | 0   | 0  | 723 | 711 | 12   | 0    | 0    | 0   |
|         | 8/14         | 295    | 307 | 12 | 358 | 344 | 14   | 0    | 0    | 0   |
|         | 8/21         | 0      | 0   | 0  | 471 | 455 | 16   | 0    | 0    | 0   |</p>
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