The Effects of Extrinsic Reinforcement on Previously Non-Reinforced "Preferred" Play Activities

Tanea Calou
Western Michigan University

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THE EFFECTS OF EXTRINSIC REINFORCEMENT ON PREVIOUSLY NON-REINFORCED "PREFERRED" PLAY ACTIVITIES

by

Tanea Calou

A Thesis
Submitted to the
Faculty of The Graduate College
in partial fulfillment
of the
Degree of Master of Arts

Western Michigan University
Kalamazoo, Michigan
December 1976
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Tanea Calou
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<table>
<thead>
<tr>
<th>CHAPTER</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>I INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>II METHOD</td>
<td>12</td>
</tr>
<tr>
<td>Subjects and Setting</td>
<td>12</td>
</tr>
<tr>
<td>Baseline</td>
<td>13</td>
</tr>
<tr>
<td>Experimental Condition</td>
<td>13</td>
</tr>
<tr>
<td>Baseline Two</td>
<td>15</td>
</tr>
<tr>
<td>Reliability</td>
<td>15</td>
</tr>
<tr>
<td>III RESULTS</td>
<td>17</td>
</tr>
<tr>
<td>IV DISCUSSION</td>
<td>26</td>
</tr>
<tr>
<td>V REFERENCES</td>
<td>29</td>
</tr>
<tr>
<td>VI APPENDICES</td>
<td>31</td>
</tr>
</tbody>
</table>
INTRODUCTION

Reinforcement procedures have repeatedly been shown to be effective in increasing and maintaining human behavior (Brigham, Graubard, and Stan, 1972; Everett, Hayward, and Meyers, 1974; Glynn, 1971; O'Leary, O'Leary, and Becker, 1967; Patterson and Brodsky, 1966; Powers, Osborne, and Anderson, 1973; Verplank, 1955). However, the use of incentives has been criticized on the grounds that reinforcement may ultimately result in a decrease in the frequency of the very behaviors one wants to increase, and that token programs have failed to demonstrate generalization effects after contingencies are withdrawn (Levine and Fasnacht, 1974).

Recent findings have shown that when reinforcement contingencies are applied to behaviors that already exist at a moderate baseline level, the behaviors drop below the previous baseline level after reinforcement is withdrawn (Calder and Staw, 1975; Deci, 1971, 1972a, 1972b, Kruglanski, Alan, and Lewis, 1972; Kruglanski and Zeevi, 1971; Lepper, Greene, and Nisbett, 1973; Greene and Lepper, 1974; Lepper and Greene, 1975). These studies refer to this effect as an "undermining of intrinsic motivation", and propose that when external contingencies cannot immediately be identified as the variable maintaining a behavior, intrinsic motivation must be the factor responsible for its maintenance; when external contingencies are programmed to increase this same behavior, the intrinsic motivation decreases and thereby leads to the later response decrement when reinforcement is withdrawn. In all cases, the authors select a target behavior which they assume to be of intrinsic interest
to the subject. However, the basis for making this assumption varies from the author's opinion to the pre-experimental measures which show the subject engaging in the behavior at some high rate with no external contingencies apparent. These studies are conceptualized in terms of DeCharms' theory of personal causation and in terms of attribution theory. Both models propose that a person can attribute his behavior either to external contingencies (in the case in which these are easily identifiable), or to intrinsic variables in cases where the external contingencies are difficult to identify. One of the implications derived from this assumption is that there is an undermining in intrinsic interest when a person is induced to perform an activity through external justification. This undermining effect occurs because the person comes to infer that his behavior is controlled by the external contingencies of the situation rather than by his intrinsic interest in the activity itself.

DeCharms' assumptions were tested by Deci in 1971 in a series of three studies. In the first study, Deci examined the effects of money on puzzle solving, a task thought to be intrinsically interesting to college students. A group design using three one-hour experimental conditions was employed. The dependent variable was the amount of time spent solving puzzles during an eight-minute free-choice situation that occurred in the middle of each of the three sessions. For the pre- and post-conditions, both the experimental and control groups were asked to reproduce puzzle configurations. In the second session, the experimental condition, the experimental group was paid one dollar
contingent upon each puzzle solved within thirteen minutes, whereas
the control group received no money. During the free-choice period,
the experimenter left the experimental room and the subjects were told
that they could do whatever they wanted to do: continue to work on
the puzzles, read magazines, or walk around. There were no consequences
for any behavior performed during this free-choice period. The depen-
dent measure was taken unobtrusively behind a one-way mirror. The mean
number of seconds spent working on the puzzle during the free-choice
periods is summarized below:

<table>
<thead>
<tr>
<th>GROUPS</th>
<th>PRE</th>
<th>EXPERIMENTAL</th>
<th>POST</th>
<th>POST MINUS PRE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>248.2</td>
<td>313.9</td>
<td>198.5</td>
<td>-49.7</td>
</tr>
<tr>
<td>Control</td>
<td>213.9</td>
<td>205.7</td>
<td>241.8</td>
<td>27.9</td>
</tr>
</tbody>
</table>

These results show that the experimental group spent less time
on the puzzles during the post-experimental condition after the rein-
forcement session than in the pre-experimental condition, while the
control group spent more time on the puzzles.

Deci's (1971) second study was a field replication of the first
study. The same experimental design used in the original study was
employed to investigate the effects of money on writing headlines for
a college newspaper. A twelve week experiment was divided into four
experimental conditions. Time spent writing headlines was the re-
corded dependent measure; it was assumed that the faster a subject com-
pleted a headline, the higher was his intrinsic motivation. Pre-
measures were taken during the first experimental condition, and post-
measures during the third and fourth conditions. The experimental
group was paid fifty cents for each headline written during the second condition only; the control group never received any money. The mean number of minutes spent writing each headline during the four periods are shown below:

<table>
<thead>
<tr>
<th>GROUP</th>
<th>PERIOD 1</th>
<th>PERIOD 2</th>
<th>PERIOD 3</th>
<th>PERIOD 4</th>
<th>PERIOD 4 MINUS PERIOD 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>22.39</td>
<td>20.34</td>
<td>21.35</td>
<td>20.05</td>
<td>-2.34</td>
</tr>
<tr>
<td>Control</td>
<td>22.19</td>
<td>20.97</td>
<td>12.60</td>
<td>13.79</td>
<td>-8.40</td>
</tr>
</tbody>
</table>

Since the lower the score the higher the intrinsic motivation, the table above shows that for the experimental group, intrinsic motivation increased before the experimental session, decreased immediately after the reinforcement session, and increased again from Period 3 to Period 4. The control group showed an increase in motivation from Period 1 to Period 3 and a decrease from Period 3 to Period 4. For Deci, these data indicate that "...the decrease in intrinsic motivation in the experimental group relative to the control group is more than just a temporary phenomenon." (p. 112)

Deci's third study was similar to the two above, the only change being that the independent variables were verbal reinforcement and positive feedback. During the first and the second sessions, both groups were asked to solve puzzles and there were no consequences for any behavior performed for either group. During the second session the subjects received verbal reinforcement and positive feedback contingent upon each puzzle solved. In cases where the subjects were unable to complete the puzzles, they were told that they had not performed badly because these puzzles were difficult. Results below show the mean
number of seconds spent on puzzles during the free-choice periods:

<table>
<thead>
<tr>
<th>GROUP</th>
<th>PRE</th>
<th>EXPERIMENTAL</th>
<th>POST</th>
<th>POST MINUS PRE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>134.0</td>
<td>146.7</td>
<td>129.3</td>
<td>-4.7</td>
</tr>
<tr>
<td>Control</td>
<td>246.8</td>
<td>146.7</td>
<td>64.7</td>
<td>-182.1</td>
</tr>
</tbody>
</table>

The experimental group spent less time on puzzles in the post-reinforcement session than in the pre-reinforcement session. The control group showed a constant decrease in time spent with puzzles over the three periods. For Deci, the data "...suggested that when verbal reinforcement and positive feedback are used as external rewards, the subjects' intrinsic motivation seems to increase relative to the non-reward subjects." (p. 114)

Deci (1972a) examined the effects of money, verbal reinforcement and sex of subjects using a 3x2x2 analysis of variance design and the same dependent variable used in the above studies, time spent in engaging in the target activity. Money and verbal reinforcement were delivered contingently upon puzzles solved within the allotted time. Each of the subjects performed the experimental task in one of the following conditions shown in the table below:

<table>
<thead>
<tr>
<th>Condition</th>
<th>No Verbal Reinforcement</th>
<th>Verbal Reinforcement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Females</td>
<td>Males</td>
</tr>
<tr>
<td>Money After</td>
<td>151.6</td>
<td>65.6</td>
</tr>
<tr>
<td>No Money</td>
<td>292.4</td>
<td>124.4</td>
</tr>
<tr>
<td>Money Before</td>
<td>346.0</td>
<td>248.0</td>
</tr>
</tbody>
</table>

The results showed that all subjects in the "Money After" condition spent less time on the puzzles than the subjects in the "No Money" and "Money Before" conditions. Deci interpreted this result as evidence that
money decreases intrinsic motivation when it is given contingently upon task performance. The subjects in the "Money Before" condition spent the most amount of time on the target task. Deci interpreted this data as evidence that when a person who is performing an intrinsically motivated task feels inequitably overpaid, he will make additional inputs to restore equity.

It was also predicted that verbally reinforced subjects would be more intrinsically motivated to perform the task than those who were not verbally reinforced. For females, the "No Money - Verbal Reinforcement" cell should have been greater than the "No Money - No Verbal Reinforcement" cell. Verbal reinforcement increased motivation for male subjects only.

Deci (1972b) attempted to answer the question of whether it was money per se or its contingent administration that caused response decrements after reinforcement removal. The same dependent variable that was used in previous studies was again employed. In a group design, the experimental group received two dollars at the end of the session regardless of their performance while the control group did not receive any money. A single one-hour experimental session was used. The experimental group spent 192.8 seconds working on puzzles during the eight-minute free-choice period, while the control group spent 190.2 seconds. Although there was no difference in the amount of free time spent on the puzzles between the two groups, Deci interpreted this finding as evidence that non-contingent extrinsic rewards do not change intrinsic interest.
Lepper, Greene and Nisbett (1973) investigated whether or not an extrinsic reinforcer must be expected by the subject if it is to produce behavior decrements after its removal. Baseline measures were obtained on pre-school children performing a novel activity, drawing, for an hour on three different days. The children whose total playing time during baseline exceeded four minutes with the target activity were divided by degree of interest, and randomly assigned to one of the three conditions: a) expected reward, b) non-expected reward, and c) no reward. Subjects in conditions a and b received a certificate of "good player" while subjects in the $c$ condition did not receive any award. Subjects in the expected condition were told about the award before the experimental session, which was conducted with each child individually and lasted six minutes. The post-experimental condition was conducted for four days (the authors did not disclose the number of hours); the dependent measure of intrinsic motivation was mean percentage of free-choice time spent on the target activity during the last condition. Totals were 8.59 percent for the expected award group, 16.73 percent for the no-award, and 19.09 percent for the unexpected group.

In 1974, Greene and Lepper replicated the above study and also manipulated the demand characteristics of the situation (high and low performance demand). Subjects in the high performance demand group were told that only the children who drew the best pictures would receive the reinforcer. Subjects in the low performance demand condition were told that everyone who drew would receive the award. A 2x2 design was
employed. The only measurement was a post-measure obtained for a one hour period on three successive days. The results showed that the expected award group spent less time drawing than the unexpected award group.

In 1975, Lepper and Greene attempted to replicate their previous studies by using a different novel activity, puzzle solving, and by using the Premack principle (the opportunity to play with attractive toys) as the reinforcer.

Subjects in the expected award conditions were told that the amount of time they would be able to play with the toys would be determined by how fast and hard they worked the puzzles. However, all children played the same amount of time with the toys. The results again showed that the expected award group spent less time with the puzzles than the unexpected award group during the follow-up observations.

Three other studies have also investigated the effects of extrinsic incentives on intrinsic interest (Calder and Staw, 1975, Kruglanski, Alan and Lewis, 1972; Kruglanski, Friedman and Zeevi, 1971). The dependent variable in all three studies was the subject's subjective evaluation of the reinforcing value (enjoyment) of the task. All studies showed that the subjects said they enjoyed the target activity less when they were reinforced for performing it than when they were not reinforced for engaging in it.

Feingold and Mahoney (1975) attempted to examine the effects of reinforcement on intrinsic motivation, defined by these authors as pre-experimental performance levels, using an operant framework.
Second grade children were introduced to a novel activity and their baseline performance was recorded for two weeks. A four session reinforcement phase was then introduced during which subjects earned points that were exchanged for prizes when their daily performances exceeded that observed during baseline. A baseline phase was then instituted for six weeks. All five subjects showed increases in mean performance from first to final baseline, although two subjects showed decrement trends at the end of the follow-up period.

Except for the Feingold and Mahoney study, all the studies mentioned above support the idea that reinforcement applied to behaviors which apparently are not maintained by external contingencies can have a detrimental effect. However, methodological faults exist in each of these supportive studies which call into question the results:

All studies have very short experimental conditions, (e.g., in two of Deci's (1971) studies, the three experimental sessions lasted one hour each and in his 1972 studies, he used a single one-hour experimental session. All the Lepper et al. studies used a three hour baseline, one single six-minute experimental session, and three hours of post-measurement).

The demonstration of reinforcement effects is usually absent or unreported, (e.g., In Deci's 1972 studies no baseline measurement was taken, which made it impossible to demonstrate any reinforcement effect. None of the Lepper et al. studies reported whether or not the subjects had drawn during the whole six minutes of the experimental session).

Reliability measures were typically not taken in Deci's studies and in Lepper and Greene's 1972 and 1975 studies there seemed to be no independence of observation: the observers sat side-by-side without separating partitions.

All Lepper's studies used a novel activity without waiting for its novel effects to habitate.

Some of Deci's studies employed unmatched groups and some of his data were significant at the .10 level only.
Intrinsic motivation was not defined operationally in most of these studies.

Feingold and Mahoney (1975) argued that the behavior decreases shown by the expected award groups in the studies where the expectancy of the reward was manipulated was due to the lack of control for discrimination learning. Feingold and Mahoney proposed that the subjects in that condition anticipated that reinforcement would not be delivered after the reinforcement sessions, since no announcement had been made. These same authors also pointed out that the studies on overjustification neglected the findings of the current literature on "reinforcement contrast", which demonstrate that the immediate reinforcing power of a stimulus is affected by previous response-consequence experiences. Thus, "if behavior that has been weakly reinforced briefly receives more generous rewarding consequences, a return to the previous weak reinforcer produces a performance suppression. That is, a formerly reinforcing stimulus can become a punisher through relative contrast." (Feingold and Mahoney, 1975, p. 369).

In all of Deci's studies as well as those of Lepper and Greene, decreases were reported without, however, reporting data during sessions before and after the reinforcement sessions.

In the Lepper and Greene 1975 study, the subjects in the expected award condition were asked to work "hard and fast". In some of Deci's studies there was a time limit to perform the experimental task. One could argue that each of the above situations could contain aversive properties and so the subjects would not perform the task unless a contingency was present.

Feingold and Mahoney (1975) also used a novel activity and did not wait for its novelty effects to habituate. In addition, the subjects were required to remain seated for fifteen minutes and they were taken to another room by a person unknown by the subjects. These two last features of their study may have imposed some external contingency for the subjects to engage in the activities provided, including the target activity; consequently, the situation does not qualify as one in which intrinsically motivated behavior is occurring.

The present study attempted to provide a behavioral definition for "an activity motivated by intrinsic interest," and to test the effects of reinforcement upon a subject's performance of such an activity after reinforcement was terminated. The study attempted to
correct other methodological questions raised concerning many of the studies in this area. For example, the study was conducted during a free-choice period in which each subject could choose to engage in any of the activities available. This permitted selection of a target behavior based upon its actual duration of occurrence; the assumption was made that a highly intrinsically motivated behavior would be frequently chosen and engaged in by the subject. Measures were obtained over several days for each experimental condition to substantiate the baseline level of performance to detect any effect when reinforcement was programmed, and to permit transient effects to wear off after reinforcement was terminated.
METHOD

Subjects and Setting

Subjects were three white middle class children, two girls and one boy, ages five to six years. They were selected after five days of observation during which ten children were observed. Two groups of five children were observed for one hour each. A time sampling procedure with fifteen seconds between each sample was used to determine the activities in which the students were engaging so that the subjects who showed preference for any activity could be selected. Preference was defined as engaging in one play activity for between 40 - 70% of the total observation period. Each child was observed forty-eight times. Daily order of observation was randomized. At the end of this period four subjects had met the preference criterion. One of these quickly stopped engaging in his preferred activity for 10 days when the school purchased new toys, and was, therefore, dropped from the study. The preferred activity of each child was chosen for observation for the remainder of the study.

The study was conducted in a university-based preschool which contained seven play rooms, a backyard with swings and a slide, and a garage with tricycles. Some of the play materials were: a sandbox, blocks, puzzles, games, water colors, modeling clay, glue, paste, and paper and crayons for drawing. There were two "free play" periods in the morning and two in the afternoon, each of about ninety minutes in duration. During this time children were free to engage in any activities
they desired. This study was conducted during these free play periods.

Baseline

The baseline condition lasted for ten days for Subjects 1 and 3 and 12 days for Subject 2. All subjects were observed at the same time everyday.

Response Measurement

Duration of the preferred activity, which was drawing for all subjects, was continuously recorded by the observer with a stopwatch during a 20-minute session. The watch was started when the subject began to engage in the target behavior and was stopped when the subject stopped engaging in it. Drawing was defined as: kneeling on one or both knees, or being seated in a chair or on an instructor's lap, and holding in one or both hands one of the following objects: magic marker, pen, pencil, brush, crayon or a sheet of drawing paper on which one of the above objects had been used.

The experimenter attempted not to provide antecedent or consequent stimuli to the subjects with respect to the target behavior; verbal and non-verbal behavior were standardized as much as possible across all phases of the experiment. Baseline measures were taken until the subject's target behavior was considered stable by three examiners.

Experimental Condition

A multielement design was employed; reinforcement and extinction conditions were alternated from session to session. Ullman and Sulzer (1975) have stated that "the multielement design has been found to be
quite useful in dealing with unstable baselines." (p. 383). Nine days of reinforcement were alternated with nine days of baseline.

Before the first reinforcement session, the experimenter said to each subject: "I am studying what kind of pictures children like to draw. There will be some days that I am going to ask you to draw a picture for me. I am going to ask you to draw for a certain amount of time. Do you see this chart here? [The experimenter showed the subject the chart.] I am going to color these blocks as you draw your pictures. When I color this last block you can stop drawing. Then, you can play with some very interesting things that I will bring in this box for you." [The experimenter showed him (her) a box.]

For the next reinforcement sessions, the experimenter, with box in hand, approached one subject at a time and asked him (her): "Would you like to draw a picture for me today? After you are finished you can play with a surprise that I have for you in this box." The experimenter sat next to the child so that he (she) could see the experimenter coloring the chart. The box was placed on the floor beside the subject. Each time the experimenter colored a two-minute block, she said to the subject, "You are getting closer and closer to finishing and to playing with the surprise." If the subject drew pictures for the required time, the experimenter simply thanked him (her) for the picture and opened the box for the subject. Some of the reinforcers were: posters and pictures to paint, guess and show booklets, card games, and sticker books. Each subject was required to draw for an amount of time equal to his mean performance plus two percent.
During the baseline days, the experimenter did not take the reinforcement box to the classroom. The children were neither asked to draw nor were they reinforced. The extinction sessions also lasted for twenty minutes. Subjects were informed about the date of the next reinforcement sessions whenever they asked about it. During this phase as well as the subsequent ones, S1 and S2 were not observed at the same time everyday because they did not arrive at school at the same time. S3 was observed at the same time everyday except for two days.

The next phase of the experiment was introduced when it was agreed by the three examiners that a subject's behavior demonstrated discriminative responding on reinforcement and non-reinforcement days.

**Baseline Two**

This condition was conducted for 17 days for S1, 18 days for S2, and 19 days for S3 to assess the effects of a continuing period of non-reinforcement. The amount of time each subject spent drawing was recorded during a twenty-minute observation period.

**Reliability**

Reliability checks were taken by an independent observer. Each of the two observers used a silent stopwatch. The observers held their watches in such a way that neither could see the other's watch. No record sheet was used. After each session in which reliability checks were taken, the independent observer reported his time in seconds to the experimenter.

Reliability scores were calculated by dividing the smaller amount
of elapsed time in seconds by the larger and multiplying by 100. For the first baseline, the inter-observer reliability for three complete sessions was 95%, 98%, and 97%. During the experimental phase, four checks were taken during four complete experimental sessions. The scores were 99%, 99%, 100%, and 100%. No checks were taken during the extinction sessions.

The inter-observer reliability for five complete post-reinforcement sessions was 98%, 97%, 99%, 100%, and 100%. These last two scores were obtained from sessions during which the observed subject did not draw.
RESULTS

Figures 1, 2, and 3 show the data for S1, S2, and S3 respectively. (For further clarification of the figures, see Appendices A and B.)

The filled circles represent the percent of time each subject spent engaging in the target activity when reinforcement was not available. This includes all the data points in baseline conditions one and two, and alternating days during the experimental condition. The open circles in the experimental condition show target behavior on days when reinforcement was available to the subject if he engaged in drawing for the required amount of time. The opportunity to play outside as one play activity which the children could select if they wished was never available during the first baseline. As spring approached, weather conditions made playing outside available more frequently during the last two conditions. S1 played outside every time the opportunity was available. S2 chose to play outside all but once when the opportunity was available. S3, except for two days, was observed in a period in which play outside was never allowed. During the two days that S3 was observed in a period different from her regular observation period, playing outside was possible and she went outside. Because playing outside was not available during baseline one, observations made at times when a subject went outside were not included in this study. Days in which the subjects played outside are indicated on the graph with a star.

S1's mean percent of sessions spent drawing during the first baseline was 53.4%. On the eighth session, the subject did not draw. For
Figure 1: Percent of time spent drawing per session.
Figure 2: Percent of time spent drawing per session.
Figure 3: Percent of time spent drawing per session.
the other nine days in this condition, the subject spent between 24% and 88% of his time drawing. During reinforcement sessions, he was required to engage in drawing 55% of the session; that equalled 11 minutes. In six out of the nine reinforcement sessions, he drew for more than 11 minutes because he said that he wanted to complete the picture.

For all but one session in which reinforcement was not available, S1 did not draw. A time series change detection statistical test evaluated the difference between baseline performance and performance on non-reinforcement days of the experimental phase. For this subject, the difference was significant at the \( p < .025 \) level. The average percent of sessions spent drawing during the second baseline condition was 47.4% as compared to 53.4% during the first baseline.

S2's mean percent of sessions spent drawing during the first baseline was 50.6%. In two days of this condition, the behavior was zero. For the other days, the subject spent between 5 and 100 percent of his time drawing. During reinforcement sessions, she was required to draw for 52% of the session which equalled 10 minutes and 30 seconds. In all reinforcement days she performed to criterion. For three extinction sessions, the behavior was at or above the behavior on reinforcement days. However, the following six extinction days were characterized by little or no drawing activity.

The same statistical test which was performed for S1 was also performed for S2 and S3. The difference between baseline performance and performance during extinction days was not significant for either
subject.

The average duration of drawing in the second baseline did not appear different from that of baseline one. The variation from day to day during these two conditions was also similar. The mean percent of sessions spent drawing in baseline two was 53.6% as compared to 50.6% in baseline one. In addition, the number of days in which little or no drawing took place was almost the same, three in baseline one and four in the second baseline.

The mean percent of sessions spent drawing during the first baseline for S3 was 49%. On three days of this condition, the subject did not draw. For the other days during this condition, the subject spent between 5% and 100% of her time drawing. The subject was required to play for 51% of the session; that is, for 10 minutes and 20 seconds. In all reinforcement days, the subject performed to criterion. During the extinction days, she continued to engage in the target behavior until the sixth extinction session. After this session, the behavior dropped on the last three days until it reached zero on the last day. After the extinction condition was terminated, time spent drawing slowly increased. In the last 14 days, the behavior never was below 19%, as compared to four days in baseline one which were at or near zero. The mean percent of sessions spent drawing during this condition was 40.5% as compared to 49% during baseline one. However, the mean percentage of sessions spent drawing during the last seven days of the second baseline was 59.7% as compared to the seven final days of baseline one which was 56.2%.
DISCUSSION

The studies supporting the overjustification hypothesis employed one reinforcement session and very short pre- and post-experimental conditions, thereby making it difficult to separate transient effects from any long term effects of reinforcement.

This study measured the target behavior over a number of observation sessions extending over several days in each of the three conditions. In addition, the multielement reinforcement condition procedure permitted a replication of previous studies by alternating one reinforcement session with one baseline session; it highlighted the short term effects of the reinforcement contingency. The second baseline permitted an analysis of the long term nature of these effects.

For S1, during the reinforcement condition, the reinforcer seemed to gain control over drawing in the sense that on days in which it was not present, no drawing occurred except on one day. Neither punishment nor satiation seemed to account for this decrease in drawing on non-reinforcement days. No aversive stimulus was offered and no stimulus was removed following drawing behavior. A satiation argument seems unlikely since the criterion for reinforcement on reinforcement days was only slightly above the mean percent of sessions spent drawing during baseline one. It is unlikely that after 24 hours, the subject would be satiated. If satiation were a reasonable explanation one would expect to see the subject not drawing on days which followed high drawing behavior. This is not the case in either of the two baseline conditions.
When reinforcement and non-reinforcement were alternated, the presence or absence of extrinsic reinforcement controlled responding. Once the contrast between reinforcement and non-reinforcement was terminated, it appeared that the control over responding by the extrinsic reinforcers was no longer present. Responding again seemed to come under the control of the same reinforcers which were present in the initial baseline condition, although mean responding was slightly lower in baseline two.

The discriminated extinction explanation seems also to account for the decrease in responding during extinction days of the experimental condition for S2 and S3. Although the decrease required some time to develop, the last few days of reinforcement was characterized for both subjects by high rates of responding only on reinforcement days. In days in which the experimenter did not bring the reinforcement box to the classroom, drawing eventually dropped to zero. The mean percent of time spent drawing in baseline two slightly exceeded that of baseline one for both subjects. In summary, all subjects showed some decrease in behavior during extinction days in the experimental condition, though for S2 and S3 this decline developed slowly. All subjects showed a resumption of baseline one drawing during baseline two.

It seems then that in the short run extrinsic reinforcement interfered with behavior that was being emitted frequently in the sense that a temporary decrease occurred. The reinforcement condition of this study replicated the findings of Deci and Lepper, et al. However, there was no evidence of detrimental long term effects of the extrinsic
reinforcement on the preferred play activity.

The procedure employed to deliver the reinforcer during the experimental condition tended to prevent the subjects from drawing any more that session. Usually they quickly opened the reinforcement box and played with the object provided. This ceiling effect could be eliminated by providing the reinforcer at the end of the session if performance met criterion.

Further studies with different subjects and different behaviors are needed to test the generality of this finding. All future studies should make use of a design which permits extended observations so that temporary effects can be separated from long term effects.
REFERENCES


Deci, E. L. The effects of contingent and non-contingent rewards and controls on intrinsic motivation. Organizational Behavior and Human Performance, 1972, 8, 217-229. (b)


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Time series change detection, Western Michigan University Computer Center, June 18, 1974. (Computer Program)


## APPENDIX A

### PERCENT OF TIME SPENT DRAWING

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**APPENDIX B**

**MEAN PERCENT OF SESSIONS SPENT DRAWING**

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### APPENDIX A

#### PERCENT OF TIME SPENT DRAWING

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