Effects of Direct and Vicariously Administered Reinforcement Schedules on the Level of Creative Responding of Pre-School Children and their Effects in Building a Resistance to Extinction

Charles V. Carson

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Charles Vincent Carson
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INTRODUCTION

Creativity is an area which has long fascinated both researchers and educators both because of the difficulty in arriving at an objective observable definition and because of its implications as an application of well developed learning skills. While most researchers agree that creativity involves an interaction of hereditary and learning skills, many such as Guilford (1952) feel that it is the learning process which extends and develops the creative process. The idea that learning enhances creativity benefits both the researcher and the educator since within a learning framework one can speak of what is creative in terms of what is newly learned. This allows for a more objective definition of creativity which can be converted into some observable measurable response. Once this definition is achieved the educator can then get to the business of applying it to a productive teaching procedure.

In arriving at a working definition of creativity the concept of a newly-learned response came to be repeatedly referred to by researchers as a "novel" or "original" response (Maltzman, 1960; Kagan, 1967; Jackson and Messick, 196; Hallman, 1967; Pryor, Haag and O'Reilly, 1969; Maloney and Hopkins, 1973; Goetz and Baer, 1971; and Goetz and Salmonson, 1972). In the studies cited creativity or novel response was defined as behavior not previously displayed in a specific setting or session.

Once a working definition of creativity was established,
efforts were turned to the task of training creative responses. Novel movements in porpoises were trained by Pryor, Haag and O'Reilly (1969). Maltzman (1960) successfully increased novel word associations in college students, and in recent years rather successful attempts have been made (Goetz and Baer, 1971; Goetz and Salmonson, 1972; and Maloney and Hopkins, 1973) to train creative responses in young children in the areas of blockbuilding, art, and sentence structure in writing. The results of these latter studies are of particular interest to teachers who have traditionally placed a great emphasis on the desire to learn (1) what constitutes "creativity" and (2) how is creativity best instilled in young children. What they are asking is, of course, "How do you most effectively train creativity?" Teachers are concerned with how to train responses that are both creative and durable. It is with this question that the present study was concerned.

In the study by Maloney and Hopkins (1973) creative responses were rewarded immediately with praise plus points which could later be exchanged for candy and extra recess time. In the studies by Goetz and Baer (1971) and Goetz and Salmonson (1972) creative responses were rewarded immediately with praise. All of these studies had the common elements of praise being (1) immediate and (2) given on an individual basis. The effects of immediate reinforcement on increasing desirable behaviors is well documented in numerous studies (Harris, Wolf, and Baer, 1964; Brackbill and Lipsit, 1962; Madsen, Becker, and Thomas, 1968; Becker, Thomas, Neilsen and Kuy-
and most results show immediate reinforcement for novel responses to be most effective. However, laboratory studies by Renner (1964) seem to indicate that delay of reward is associated with stronger response strength and that when immediate reward and constant delay groups are similar, constant delay training increases resistance to extinction. However, in dealing with constant delay, the results pertaining to increased resistance to extinction are rather inconclusive and the question remains as to whether delay alone produces resistance to extinction. More comparisons between immediate reinforcement and constant delay groups are needed.

Schwarz and Hawkins (1970) applied delayed reinforcement techniques to a subject in a classroom and demonstrated effective modification of undesirable behaviors. This is also another successful attempt at applying reinforcement techniques on an individual subject. Since most classrooms contain more than one subject to be instructed and since there are some responses that a teacher would desire from all the students, there is a need to test the effects of delayed and immediate reinforcement techniques on a group as well as an individual basis.

When working with groups of children a teacher cannot always reinforce each child individually and as a result one child will be loudly reinforced in hopes that other children who have made a similar response will be vicariously reinforced.

Many studies have shown that subjects will exhibit vicarious reinforcement through the imitation of a reinforced model's response.
(Levy, McClinton, Rabinowitz, and Walkin, 1974; Kaplan, 1972; Jeffrey, Hartmann, and Gilfand, 1972; Smeets, Striefel, and Gast, 1974; Geshuri, 1972; Mendelson, 1972; Peed and Forehand, 1973). Most of these studies chose to measure imitation by first having the model complete a response and then asking the observer to emit the same response and then measuring the degree to which the observer "copied" or imitated the model's response. They never had the model continue responding while the observer was imitating the response. An important consideration neglected by these studies was the durability of imitative responses under a schedule of continuous vicarious reinforcement. Many authors postulate that the initial high level of imitation will quickly extinguish under a continued schedule of vicarious reinforcement (Bandura, 1969). This has yet to be tested.

The purpose of this study has both theoretical and practical implications. It was an attempt to (1) compare the effects of immediate and delayed social reinforcement on the number of "creative" responses exhibited by pre-school children and (2) to test the effects of immediate and delayed reinforcement on the performance of subjects who received no direct reinforcement while they observed other subjects exhibiting the same response being reinforced, and (3) the effects of delayed and immediate schedules of reinforcement on the building of a resistance to response extinction in both direct and vicariously reinforced subjects.

The practical implications of this study are many but would, hopefully, provide teachers with some information as to how social reinforcement may be used most effectively to "motivate" (increase
both probability and rate of response) young children to be "creative," and to insure that a high rate of responding is not inadvertently extinguished.

METHOD

Subjects

Ten subjects, six females and four males, ranging in age from 2 1/2 to 5 years participated in the study. All ten children attended Judson Baptist Church Day Care Center in Kalamazoo, Michigan. These subjects were chosen because of the relatively simple structure of their felt pen drawings as reflected in the very small number of art forms depicted. None of the children exhibited any physical impairments which might have interfered with their performance in this study. All subjects were verbal enough to describe their drawings if asked to do so. None of the children exhibited behavior problems of a severity that would interfere with their effective functioning in pairs. The ten subjects were divided into five groups (pairs) based upon pre-experiment drawing scores. Each pair contained subjects of approximately the same pre-experiment score level. All ten subjects were chosen because of their low average art form scores which was 2.

Settings and Materials

The experimenter met with each of five pairs of subjects for
two daily seven-minute sessions five days per week. One pair was seen at a time so that there were five seven-minute sessions in the morning and five seven-minute sessions in the afternoon totalling ten seven-minute sessions per day. The sessions were conducted from 8:40 - 10:00 a.m. each morning and 1:30 - 3:00 p.m. each afternoon in the arts and crafts room of the Day Care Center. The Room was devoid of people during the drawing sessions except for the experimenter and the subjects. The room contained three rectangular tables, several chairs, and various arts and crafts supplies (paints, puzzles, paper, etc.). One table was used and two chairs were positioned so that both subjects in a pair sat on the same side of the table, approximately one and one-half feet apart. The experimenter sat on the opposite side of the table from the subjects so that they could more easily observe his hand gestures and facial expressions, as well as attend to his verbalizations. Before beginning the study the experimenter practiced observing drawings upside-down so that he could easily pick out and describe certain aspects of the drawings from across the table without interfering with the subjects' angle of perspective. Although reliability on the number and type of forms per drawing was not assessed during the sessions but rather afterwards due to the nature of the independent variable, an observer did sit in on sessions during each phase of the study as a check on how the experiment was being carried out. When an observer was present, he sat behind and off to the side of the subjects so that he could hear the experimenter's verbalizations and watch his gestures with-
out distracting the subjects.

The experimental materials were placed upon the table within easy reach of the subjects. The materials consisted of broad felt markers approximately 4 3/4" in length. The colors offered were blue, red, pink, green, yellow, and purple. A piece of white paper measuring 11" by 17" was placed directly in front of each subject.

Response Definitions

**Subject behaviors.** The behaviors of the subjects during the sessions were defined according to their products, the number of drawing forms produced. A list of twenty-two drawing forms constructed by Elizabeth Goetz (1974) was used in defining the products and deriving scores for each drawing. The list used is contained in Appendix A. A *forms per drawing* score was defined as the number of forms present at least once in any drawing. A *similar drawing form* score was defined as the percentage of forms in the drawing of the unreinforced subject that also appeared in the drawing of his reinforced partner during the same session. While a similar form did not have to be the same color or the exact same size as that appearing in the drawing of the reinforced subject, it did have to meet the criteria set down in the Goetz list for that particular form category. It was felt that this would be the most sensitive measure of the effects of vicarious reinforcement since by definition vicariously reinforced responses should be the same as those being directly reinforced whether on an immediate or delayed schedule.

A particular form category was scored only once for each drawing.
Thus, if a child drew two circles he received a score in the duplicate form category and in the circular form category but the circular form category was not scored twice. This pertained to each individual drawing. A circle made on a new drawing was of course scored in the circular category. The number of different forms per drawing was scored for each subject. By "different" is meant that, once a form was scored in a particular category, repetitions of that form could not be scored again for that particular drawing. However, that same form on a new drawing was scored the first time it appeared.

Data were collected on the forms per drawing (number of forms appearing at least once in a single drawing) and the similar drawing forms (percentage of forms in a drawing by the unreinforced subject that also appeared in the drawing of his reinforced partner in the same session).

Because of the different types of reinforcement used by the experimenter, (delayed as well as immediate), each drawing was scored at the end of the session. Each drawing was scored individually and a total numerical score for the number of forms in a drawing as well as a list of all the particular forms in the drawing was recorded daily. The percent of similar drawing forms per group was derived by counting the number of forms contained in the drawing of the unreinforced subject which were also present in the drawing of the reinforced member of the group and dividing the latter by the former. All data were graphed by the experimenter.

Reliability was taken twice during baseline, four times during
the reinforcement phase and twice during the extinction phase. Reliability was assessed on total number of forms per drawing and on particular forms contained in the drawing. Since the percentage of similar drawing forms was computed by merely adding and dividing the data on particular forms per drawing, it was felt that reliability on this measurement was not necessary. The drawings were scored independently by another scorer and the data sheets of the experimenter and the second scorer were compared. Reliability scores were calculated by computing the total number of agreements (forms scored by both scorers) and dividing by the total number of agreements plus disagreements and converting this number to a percent.

To assess reliability a session from the appropriate experimental phase was chosen for each reliability check. One subject from each pair was randomly chosen and his drawing for that session was scored by both the experimenter and the independent reliability checker. Scoring was done independently (i.e. the scorers were never together when scoring was done). The reliability checker usually scored the drawings in his home, and the results of the two scores were then compared. Both scorers had identical copies of Goetz's list of Form Definitions For Felt Pen Drawings for use in scoring the forms for each drawing. Reliability was calculated for both individual drawings and for the session overall. The results are presented in Table I on page 10.

Procedure and Experimental Design

This study employed a simple reversal design since the effects
TABLE I
Reliability Results

<table>
<thead>
<tr>
<th>Subject</th>
<th>Session 1 Baseline</th>
<th>Session 2 Baseline</th>
<th>Session 3 Reinf.</th>
<th>Session 4 Reinf.</th>
<th>Session 5 Reinf.</th>
<th>Session 6 Reinf.</th>
<th>Session 7 Reversal</th>
<th>Session 8 Reversal</th>
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<tbody>
<tr>
<td>Subject 1</td>
<td>83%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>80%</td>
<td>75%</td>
</tr>
<tr>
<td>Subject 2</td>
<td>100%</td>
<td>90%</td>
<td>85%</td>
<td>100%</td>
<td>76%</td>
<td>80%</td>
<td>78%</td>
<td>92%</td>
</tr>
<tr>
<td>Subject 3</td>
<td>80%</td>
<td>80%</td>
<td>76%</td>
<td>96%</td>
<td>100%</td>
<td>82%</td>
<td>100%</td>
<td>80%</td>
</tr>
<tr>
<td>Subject 4</td>
<td>100%</td>
<td>100%</td>
<td>90%</td>
<td>100%</td>
<td>90%</td>
<td>100%</td>
<td>92%</td>
<td>86%</td>
</tr>
<tr>
<td>Subject 5</td>
<td>70%</td>
<td>90%</td>
<td>100%</td>
<td>90%</td>
<td>80%</td>
<td>90%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Overall Reliability</td>
<td>86.6%</td>
<td>92%</td>
<td>90.2%</td>
<td>97.2%</td>
<td>89.2%</td>
<td>90.4%</td>
<td>90%</td>
<td>86.6%</td>
</tr>
</tbody>
</table>
of extinction upon previously reinforced responses was one of the primary concerns along with the strength of vicariously reinforced responses.

The experiment was divided into the following three phases: a Baseline Phase; a Control, or Reinforcement Phase; and an Extinction, or Reversal Phase. The experimenter conducted the drawing sessions so as to eliminate any personal bias the teacher might have towards a particular child and any other related variable which might inadvertently influence a child's performance and the results of the experiment.

**Baseline.** During Baseline each group was invited to "come in and draw a picture." The subjects were told, "You may draw whatever you want to until I tell you that time is up." The bottom of the paper was pointed out to each child because all scoring was done in relation to the bottom of the paper. All five groups were given the same instructions. The experimenter sat on the other side of the table from the subjects and displayed neither verbal nor facial approval or disapproval towards any forms drawn by any of the subjects. If a subject finished drawing before time was up he was encouraged to continue although he could leave if he wanted to. When time expired the experimenter said, "Time's up!", collected the drawings and thanked the children for coming saying, "Thanks for coming, and I'll see you tomorrow." No other verbal statement was made. Each of the daily drawing sessions was handled in this manner during the
baseline period. Baseline sessions continued until each child's forms per drawing score had stabilized enough to allow experimental manipulation.

**Control phase - reinforcement phase.** During the control phase the experimenter initiated a program of descriptive social reinforcement for drawing forms on both a delayed and immediate schedule. The subjects were then instructed that they were to remain for the entire session. Two groups now received immediate descriptive social reinforcement and two groups received descriptive reinforcement on a delayed schedule. The fifth group acted as a control group and they maintained baseline conditions throughout the entire study.

**Groups 1 and 2 (immediate social reinforcement).** At the beginning of this phase the experimenter chose one member of each of these two groups and delivered descriptive reinforcement contingent on each new form as it was drawn by the subject. The experimenter observed the other group member but delivered no reinforcement for his drawing forms. Since all pairs were matched according to pre-experiment drawing scores, the method for choosing which subject would receive the reinforcement was a simple toss of the coin - performed by the experimenter before the experimental phase began. Descriptive social praise, whether immediate or delayed, consisted of descriptive praise pertaining to a particular drawing form such as, "That is a very nice round circle you have painted," etc. The experimenter also traced the form with his finger on the child's drawing as he delivered
the praise so that both children knew exactly what he was being reinforced for. The only difference in reinforcement procedures for the delayed and immediate groups was that the subjects in the immediate reinforcement groups received praise contingent on each new form as it was produced while the subjects in the delayed reinforcement groups who were directly reinforced received their praise at the end of the session. The control group received no praise at all during the entire study so as to control for both "normal" rate of responding and any practice effect which might influence their scores.

When a subject drew a new form (i.e. one that he had never produced before in the experiment), the experimenter would note this saying, "That's a very nice triangle you have made there and that's the first time you've ever made that shape. That's very pretty." No other verbal statements were made by the experimenter during the drawing sessions other than to occasionally urge the subjects to continue drawing.

Groups 3 and 4 (delayed social reinforcement). The procedure for these groups was the same as for the immediate reinforcement groups. The vicariously reinforced subjects received no direct reinforcement for their drawing forms.

Control group. This group received no descriptive reinforcement of any kind for their drawings but rather maintained baseline conditions throughout the study. They were invited to come in and draw whatever they wished until time was up. They were urged to continue...
drawing if necessary but no other verbal statements were made to this group by the experimenter. The scores of this group were used to test whether or not simple practice effect produced a noticeable increase in drawing forms and whether this increase, (if any), would be exhibited by both subjects thus giving some indication as to whether similarity of drawing forms occurred to any noticeable degree in the absence of any form of direct descriptive reinforcement.

**Extinction phase (reversal).** During this phase all groups previously receiving either delayed or immediate reinforcement were returned to baseline conditions. (The control group never left this phase). Subjects were again asked to come and draw but no descriptive reinforcement of any kind was given to any of the subjects for their drawing forms. The experimenter merely observed the subjects as they drew and made no verbal statements except to urge them to continue drawing when necessary. This phase was used to test the effects of extinction on subjects who had been directly reinforced on either a delayed or immediate schedule and to compare the results, and also to test the extinction effects on subjects who had been vicariously reinforced on either a delayed or immediate schedule and to compare the results. From this it was hoped that some indication of the effects of these conditions, in the building of a resistance to the extinction of responding, would be learned.
RESULTS

Forms Per Drawing

The number of Forms Per Drawing for each subject is presented in Figures 1-5 on pages 16, 18, 20, 22, and 23.

Group I (Chris and Bryan) - immediate social reinforcement.
As can be seen in Figure 1, during baseline Chris' mean number of forms per drawing was 1.8 while Bryan's was 1.2. During the reinforcement phase when Chris received immediate descriptive social reinforcement for his drawings while Bryan received no performance feedback at all from the experimenter, Chris' mean number of drawing forms was 3 with a range of 1 form per drawing at the beginning of the phase to 4 forms at the end of the phase. Bryan's mean number of forms per drawing during this phase was 1.4 with only minor fluctuations. During the extinction phase (reversal) Chris' mean number of forms was 1.5 with a range of 3 forms at the beginning of the phase to 1 form per drawing at the end of the phase. Bryan's mean number of forms per drawing during this phase was 1.2 with no noticeable fluctuations. Figure 1 can be found on page 16.

Group II (Sarah and Becky) - immediate social reinforcement.
During baseline Becky's mean number of forms per drawing was 2 while Sarah's was 2.75 (see Figure 2, page 18). During the reinforcement phase when Becky received immediate descriptive social reinforcement, her mean number of forms per drawing rose to 5 with a range of 4
FIGURE 1 - IMMEDIATE REINFORCEMENT

Baseline | Reinforcement | Extinction

CHRISS

BRYAN

Sessions

Number of Forms Per Drawing
forms per drawing at the beginning of the phase to 5 forms at the end with some drawings containing 6 forms and one containing 7 forms. Sarah averaged 4.1 forms per drawing with a range of 5 forms per drawing at the beginning of the phase to a low of 3 forms and a return to 5 forms at the end of the phase. This represented an average increase of 3 forms per drawing over baseline level for Becky and an increase of 1.35 forms for Sarah. During the extinction phase (reversal) Becky's mean number of forms fell to 3 with a range of 5 forms per drawing at the beginning of the phase to 2 forms at the end of the phase. This represented a decrease of 2 forms from the reinforcement phase and 1 form higher than the baseline level. Sarah's mean number of forms during this phase was 2.9, a decrease of 1.2 forms from the reinforcement phase and an increase of .15 over the baseline level.

**Group III (Darcy and Kim) - delayed social reinforcement.** Figure 3 on page 20 shows that Darcy's mean number of forms per drawing during baseline was 2.8 while Kim's was 5 forms. During the reinforcement phase in which Darcy received delayed descriptive social reinforcement on her drawing forms while Kim received no direct feedback Darcy's mean number of forms per drawing was 4.3 with a range of 3 forms at the beginning of the phase to 5 forms at the end of the phase. Kim's mean number of forms was 4.4 with a range of 5 forms at the beginning of the phase to 6 forms at the end. Fluctuations were as high as 7 forms and as low as 2 forms. Darcy increased her average to 1.5 forms over baseline level while Kim experienced a de-
FIGURE 2 - IMMEDIATE REINFORCEMENT

Reinforcement

Baseline

Extinction

Sessions

Number of Forms per Drawing

Becky

Sarah

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crease of .6 forms. During the extinction phase (reversal) Darcy's mean number of drawing forms was 3.4 with a range of 5 forms at the beginning of the phase to 3 forms at the end. Fluctuations were as high as 6 forms and as low as 1. This represented a decrease of .9 forms from the reinforcement phase and an increase of .6 forms over the baseline level. Kim's mean number of forms per drawing during this phase was 4.4 with a range of 6 forms at the beginning of the phase to 5 forms at the end. Fluctuations were as high as 8 forms and as low as 4.

Group IV (Tammy and Jenny) - delayed social reinforcement.

As can be seen in Figure 4 on page 22, during baseline Jenny's mean number of forms per drawing was 2.2 while Tammy's was 2.5 forms. During the reinforcement phase in which Jenny received delayed descriptive social reinforcement, her mean number of forms was 4 with a range of 2 forms per drawing at the beginning of the phase to 6 forms at the end of the phase. Tammy's mean number of forms was 3.36 with a range of 3 forms at the beginning of the phase to 4 forms at the end of the phase with some drawings containing 5 forms. Jenny increased 1.8 forms over baseline level while Tammy increased .86 forms. During the extinction phase (reversal) Jenny's mean number of forms was 2.9 with a range of 6 forms at the beginning of the phase to 3 forms per drawing at the end. This represented an average decrease of 1.1 forms from the reinforcement phase level and an increase of .7 forms over the baseline level. Tammy's mean number of forms during reversal was 3.4. She increased an average of .04
FIGURE 3 - DELAYED REINFORCEMENT

Reinforcement
Extinction
Baseline

Number of Forms Per Drawing

Sessions

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forms from the reinforcement phase level and .9 forms over baseline level.

Group V (Andy and Jonny) - control group. This group maintained baseline conditions throughout the study and acted as a check on the possibility of a practice and/or chance effect having any influence on the number of forms per drawing that were produced. As can be seen in Figure 5 on page 23, during the entire study Andy's mean number of forms per drawing fluctuated from 1 form to 1.6 to 1.4 forms, an increase of only .4 over the beginning level. The range was 1 form at the beginning of the study and 1 form at the end with only minor fluctuations. Jonny's mean number of forms per drawing fluctuated from 1.8 forms to 1.9 to 1.8 forms, the same number as in the beginning with only a .1 variance.

Percent of Similar Drawing Forms

The results of measuring the percent of forms contained in the drawings of the reinforced subject that also appeared in the drawings of his/her non-reinforced partner are contained in Figures 6-10. As mentioned earlier, this was felt to be the most sensitive measure of the effect of vicarious reinforcement upon the non-reinforced subject's responses and also a good measure of the strength of a vicariously reinforced response.

Group I (Chris and Bryan) - immediate social reinforcement.

Mean percent of similar drawing forms during baseline was 46.4% (see
FIGURE 4 - DELAYED REINFORCEMENT

Baseline Reinforcement

Extinction

JENNY

TAMMY

Number of Forms Per Drawing

Sessions
FIGURE 5 - CONTROL GROUP

Number of Forms Per Drawing

Sessions

Baseline

Andy

Baseline

Johnny

10 5

10 5

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During the reinforcement phase mean percent of similar drawing forms rose to 87.8%, an increase of 41.4 percentage points over baseline. During the extinction phase (reversal) mean percent of similarity fell to 55.2%, a decrease of 32.6 percentage points from the reinforcement phase level. It should be noted that while the mean percent of similar drawing forms is higher during extinction than during baseline, actual level of similarity at the end of the extinction phase (40%) was lower than the baseline level. This group showed an increase in similarity during the reinforcement phase and a decrease when reinforcement was withdrawn.

**Group II (Sarah and Becky) - immediate social reinforcement.**

With this group the mean percent of similar drawing forms during baseline was 39.4% (see Figure 7, page 26). Similarity rose to 84.2%, an increase of 44.8 percentage points over baseline during the reinforcement phase. During the extinction phase (reversal) similarity fell to 41.4%, a decrease of 42.8 percentage points from the reinforcement phase level. It should be noted that while the mean percent of similar drawing forms was almost identical with the baseline level, the actual level of similarity at the end of the extinction phase (25%) was lower than the baseline level. This group also showed an increase in similar drawing forms during the reinforcement phase and a decrease when reinforcement was withdrawn.

**Group III (Darcy and Kim) - delayed social reinforcement.**

As can be seen in Figure 8 on page 28, the mean percent of similar
FIGURE 6 - IMMEDIATE REINFORCEMENT

Baseline Reinforcement Extinction

Percent of Similar Drawing Forms

Sessions

CHRIS & BRYAN
FIGURE 7 - IMMEDIATE REINFORCEMENT

Baseline

Reinforcement

Extinction

SARAH & BECKY

Percent of Similar Drawing Forms

100

90

80

70

60

50

40

30

20

10

0

5

10

15

20
drawing forms during baseline was 54.1%. During the reinforcement phase the mean percent of similarity rose to 70.2%, an increase of 16.1 percentage points over baseline. At the beginning of this phase percent of similar drawing forms was 50%, and by the end of the phase this percent had reached 80%. During the extinction phase (reversal) the mean percent of similarity was 56.1%, a decrease of 14.1 percentage points from the reinforcement phase level. While the mean percent of similarity was almost the same as the baseline level, the actual level at the end of the extinction phase (66.7%) was higher than the baseline level and almost at reinforcement level. This group also showed an increase in similar drawing forms during the reinforcement phase though not as great an increase. However, this group, unlike both immediate reinforcement groups, showed a final level of similarity higher than baseline and almost at the same mean percent level as the reinforcement phase.

**Group IV (Tammy and Jenny) - delayed social reinforcement.**

Mean percent of similar drawing forms during baseline for this pair was 48.1% (see Figure 9, page 30). During the reinforcement phase the mean percent of similarity rose to 62.9%, an increase of 14.8 percentage points over baseline. It should be noted that while at the beginning of the reinforcement phase percent of similarity was 45%, by the end of the phase this percent had reached 70%. During the extinction phase (reversal) the mean percentage of similar drawing forms was 64.3%, an increase of 1.4 percentage points over the reinforcement level and an increase of 16.2 percentage points over
FIGURE 8 - DELAYED REINFORCEMENT

Baseline  Reinforcement  Extinction

DARCY & KIM

Percent of Similar Drawing Forms

Sessions

10

5

20
baseline. This group followed the performance level of Group 3 except that their final performance level was slightly higher than the reinforcement phase performance.

Group V (Andy and Jonny) - control group. As Figure 10, page 31 shows, the mean percent of similar drawing forms during the entire study seldom reached higher than 50%. The results of this group were divided into three comparable phases of duration similar to the other groups for the sake of comparison. During baseline the control group achieved a mean percent of similar drawing forms of 42.5%. During what would be the reinforcement phase they achieved a mean percent of similarity of 48.3%, an increase of 4.8 percentage points over baseline. During what would be the extinction phase the mean percent of similar drawing forms was 43.6%, a decrease of 4.7 percentage points from the reinforcement phase level and an increase of 1.1 percentage points over baseline level.

DISCUSSION

The results of the present study seem to suggest that: (1) Both delayed and immediate reinforcement increase responding when applied directly to the subject. (2) There appears to be little difference in magnitude of response under either schedule of reinforcement when applied directly to the subject. (3) In general, both delayed and immediate reinforcement produced a slight increase in responding in a vicariously reinforced subject. (4) Delayed reinforcement built up
FIGURE 9 - DELAYED REINFORCEMENT

Baseline Reinforcement

Extinction

TAMMY & JENNY
some degree of resistance to extinction for directly reinforced subjects since both directly reinforced subjects finished with response levels above baseline while the subjects receiving direct immediate reinforcement finished at or below baseline level. (5) Immediate reinforcement produced a higher level of vicarious reinforcement as measured by similar drawing forms than did delayed reinforcement but delayed reinforcement maintained the level of similarity and built a greater resistance to extinction once reinforcement was withdrawn than did immediate reinforcement. The fact that delayed reinforcement did seem to build a resistance to extinction on both a direct reinforcement and vicariously reinforced basis supports previous findings that suggest that delayed reinforcement is superior to immediate reinforcement in building a resistance to extinction. This seems to support the results of Renner (1964) that when immediate and delay groups are similar, training involving constant delay of reinforcement increases resistance to extinction.

One fact of interest is that the vicariously reinforced subjects did not exhibit extinction curves during the experimental phase but rather maintained their rate of responding. This is contrary to Bandura's\(^1\) theory that "observers who witness others being rewarded for a period of time may temporarily increase similar responding but if consistently ignored they are apt to discontinue the modelled behavior." One possible explanation for this maintenance

of behavior is the concept of self reward or self-reinforcement.

Studies by Bandura and Kupers\textsuperscript{2} indicated that "people generally adopt the standards for self-reinforcement exhibited by exemplary models, they evaluate their own performances relative to that standard and then they serve as their own reinforcing agents." This tendency may be of greater durability than most studies to date have anticipated.

Kaplan (1972) has found that subjects have a strong tendency to imitate a model whether or not the model is reinforced or is successfully learning the task. Perhaps a combination of a tendency to imitate coupled with self-rated performance according to the standards of a reinforced model might explain a similar response rate of such durability. The fact that patterns of responding were similar for the members of each pair seems to give some weight to this assumption.

The results tend to disagree with the findings of Habley, Gipson, and Hause (1972) which stated that greater emphasis in increased resistance to extinction was to be given to the magnitude of the reward and that in extinction, delay has no effect. Since the reward given was of the same magnitude for all subjects the only variable to be considered is the amount of delay.

An explanation for the effectiveness of delayed over immediate reinforcement in producing resistance to extinction is offered by

\textsuperscript{2} loc cit., p. 33.
Habley, Gipson, and Hause (1972) who postulate that resistance to extinction increases as reward gets smaller and delay gets longer because the associated stimuli become more like nonreward at small magnitudes and long delays. This would seem to coincide with Bandura who states that "vicariously aroused emotional responses can readily become conditioned either to the modelled responses themselves or to environmental stimuli that are regularly correlated with the performer's affective reactions. Subsequent imitation of matching responses by the observer or the presence of the correlated environmental stimuli is likely to generate some degree of emotional arousal." Thus frequent and immediate reward would magnify greatly the emotive potential of the correlated environmental stimuli while periods of delay would tend to wash them out. This would guard against the confusion and response frustration that would follow a nonreward of a previously high-reward response. In view of the supportive evidence presented it would be expected that delayed reinforcement would build a resistance to extinction on both a direct and a vicarious level.

Practically speaking, since most human responding is not consistently reinforced on a regular schedule across environments, the question of building up a resistance to extinction (especially of creative responses) should be of prime concern to teachers. It may

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3 loc. cit., p. 31.
mean they may have to alter their initial method of reinforcing in order to maintain results. Many teachers cannot attend to every child in a classroom individually so that many original responses could not be reinforced immediately but rather on a delayed schedule. Many teachers will loudly praise one child for a particular response hoping that all the other children in the room who have made that same response will be vicariously reinforced. If because of classroom conditions this is necessary, a program of praise given on a delayed schedule would seem to provide more resistance to extinction.

The results of this study were obtained using groups of two. More research is needed using larger groups in order to test whether or not the results obtained in this study can be applied to larger numbers of subjects. The solutions to problems encountered using larger groups where the chance of competing responses by the subjects might negate the effect of vicarious reinforcement would be noteworthy. When the experimenter originally began this study each group contained 3 subjects and poster paints were used. The children enjoyed painting so much that the end product was a completely un-scorable painting usually consisting of one hue which covered the entire paper. The children would paint a drawing form and then completely obliterate it in their attempt to cover the entire paper. Since scoring for some subjects was on a delayed schedule, this type of response had to be eliminated. The answer to this problem proved to be felt markers since they seem to be more conducive to drawing forms and since the amount of effort needed to cover the entire
paper would make it an aversive task.

Another problem was competing responses from the children during the vicarious reinforcement phase. With 3 children in the group, the two children who were not being directly reinforced would entertain each other while the experimenter attended to the subject being directly reinforced. This tended to completely negate any possibility of vicarious reinforcement becoming established. To offset this interference the groups were reduced to 2 subjects so that the probability of the vicariously reinforced subject attending to the experimenter was greatly increased. In a large classroom with older children where talking to one another is generally prohibited during class time, interference might not be so great a problem. With small groups of pre-school children there exists a problem of interfering responses. Studies using other types of reinforcers with other types of behaviors are also needed to test the generality of the present results.
APPENDIX A

Form Definitions for Felt Pen Drawings

*Circular Enclosure: Any nearly enclosed or enclosed curve, including circles, ovals, ellipses, etc. The diameter must be at least 1.5" at the widest point. There may be one point on the curve.

*Cross: Two lines which intersect each other making a cross-like formation, and meeting the following requirements:
  a) Lines must be the same length within 1".
  b) 2 angles must be a minimum of 20 degrees.
  c) Lines must intersect each other at a point dividing each into equal linear proportions OR linear proportions no greater than 2 to 1.

Curve: A line, or any part of a line at least 3" long that is continuously bent so that no portion of it is straight. All circulars get credit for a curve.

Diagonal line: A relatively straight line at least 3" long forming an angle between 10 and 80 degrees.

Duplicate: A relatively exact pair of forms. Only the (*) forms may be duplicates. Color and size may vary, but not structure. When duplicates are not close to being identical in size, the smaller form must be at least 1/2 the size of the larger one. A "layer of colors" may be
scored as a duplicate only if the 2 layers contain the same colors in the same pattern and are separated by at least 3" of space.

**Horizontal line:**
A relatively straight line, at least 3" long, and forming an angle of 0 to 10 degrees.

**Irregular enclosure:**
Any enclosed or nearly enclosed unsymmetric line formation, leaving a center area with a diameter no smaller than 1.5" at its widest point.

**Layer of colors:**
3 or more lines, using 2 or more colors which lie side by side. Each line must be at least 1" in length. Each line should be a different color than the one beside it - and no farther from the line beside it than 1/4".

**Mass:**
Any combination of lines in a manner that results in a solid colored area, at least 1" square. No uncolored area may be larger than .1" at its widest point.

**Overlapping same form:**
A duplicate with one form overlapping the other at any point.

**Pattern:**
3 or more duplicate forms.

**Rectangular:**
Any nearly enclosed form with 4 relatively straight lines (sides) and four 90-degree angles, approximate to within 10 degrees. Opposite sides must be relatively parallel. 2 sides must be no smaller than 1" long.
*Simulation: A configuration which resembles a real-life object. Symbols are excluded. One other person must agree that the design resembles a real-life object OR the child must label it as a real-life object, and the experimenter must agree.

Staccatto: 3 or more dash-like particles, all within a 3" area of each other. Can or cannot be overlapping. May not be larger than 1/4" x 1/4".

Spiral: A winding, or coiled line. Must be at least 2 complete revolutions, and these revolutions must be consecutive.

*Symbol Any configuration which represents anything other than a simulation - includes numbers, letters, signs, etc.

*Tinker toy line: Circular forms with one or more straight lines connecting them. The circular forms do not have to be the same size and the line may not bisect it.

Train of colors: A series of 2 or more colors forming a line of procession. The colors need not be touching, but must be within 1/4" of each other. The "train" need not consist only of lines, but can include areas of colors, providing they are arranged in the train formation.

*Triangular: Any enclosed form with only 3 relatively straight sides, and 3 clear-cut angles. At least 2 sides must be 1.5" long, with the third side at least .5" long.
Undulating line: A line or part of a line with 3 or more consecutive curves at least 1/4" deep. No part of the line may overlap or touch itself at any point. All of the curves must go in one direction.

Vertical line: Any relatively straight line, at least 3" long and forming an angle of 80 to 100 degrees.

Zig zag: A line or any part of a line with 3 or more consecutive angles formed by turning the magic marker first one way, then the other. No part of the zig zag may overlap or touch itself at any point.

Note: All angles measured in analyzing the pictures were measured as they lay relative to the bottom of the page.
REFERENCES


Campbell, Patrick E. and Fixsen, Dean L., "Contingent and Noncontingent Schedules of Continuous and Partial Reward in Rats." Psychological Reports, XXX (June 1972), 975-82.


