Does Reward Increase or Decrease Creativity?

Robert Eisenberger and Michael Selby

Two studies involving 504 school children investigated why behaviorists and cognitively oriented investigators have come to opposite conclusions about reward’s effects on creativity. A monetary reward for a high degree of divergent thought in a task (word construction) increased children’s subsequent originality in a different task (picture drawing). The same reward, made contingent on a low degree of divergent thought, reduced this generalized originality. These effects were eliminated by using a large reward and were restored by keeping the large reward out of the children’s sight. The results suggest that reward training increases generalized creativity when (a) a high degree of divergent thought is required and (b) the reward is presented in not too salient a fashion. The findings are consistent with a 2-factor interpretation of rewarded creativity effects that incorporates learned industriousness and selective attention.

Creative performance, involving novel behavior that meets a standard of quality or utility (e.g., Guilford, 1968; Maltzman, 1960; Shalley, 1991; Wallach & Kogan, 1965; Winston & Baker, 1985), is conducive to success in various endeavors. For example, developing the habit of approaching academic tasks innovatively helps students to become self-directed, active learners (Torrance, 1965). The continual application of creative thought to new problems contributes to notable scientists’ multiple discoveries, as illustrated by the careers of Einstein, Feynman, von Neumann, and Szilard (Clark, 1972; Gleick, 1992; Lanouette, 1992; Macrae, 1992). And an innovative approach to the daily mix of unforeseen business problems and opportunities enables employees to contribute more substantially to the success of organizations (George & Brief, 1992).

Divergent thinking, an important component of creative performance, involves the production of varied responses to a problem or a question that has multiple alternative solutions (Guilford, 1968; Runco, 1991; Winston & Baker, 1985). According to general behavior theory, divergent thinking, as any discriminable response class, should be enhanced by systematic reward (cf. Maltzman, 1960; Pyor, Haag, & O’Reilly, 1969; Skinner, 1953; Torrance, 1970; Winston & Baker, 1985). Consistent with this view, a review of 20 behaviorally oriented studies concluded there was compelling evidence that reward effectively enhances divergent thought (Winston & Baker, 1985). For example, when Goetz and Baer (1973) gave preschool children verbal approval for each new pattern they created with a set of blocks, novel patterns were continually produced. When approval was next made contingent on repetition of previously constructed patterns, novelty decreased, only to be restored when new patterns were again rewarded. When Glover and Gary (1976) asked fourth- and fifth-grade students to suggest a variety of uses for common items, and used a token economy to reward the children for doing so, the novelty of stated uses increased.

The development of a generalized orientation toward divergent thinking has been regarded by behaviorists as an important possible consequence of rewarding such behavior. In a series of studies, Maltzman (1960) gave college students repeated presentations of a list of words and instructed the students to give a free association to each stimulus word. The students received verbal approval for generating a new word every time they received a repeated presentation of a stimulus word. This procedure increased the subsequent originality of uses that the students gave for common physical objects. Funderbunk (1977) reported that giving children verbal approval for constructing novel drawings similarly increased the originality of uses the children later gave for common objects. Glover (1980) found that the originality of written essays produced by college students was increased by preliminary training in which the students received points toward their course grade for generating multiple solutions to everyday life problems and for supplying unusual uses for common objects. As with other response classes, the generalized effects of reward for divergent thought have been found to increase with the similarity between the training task and the transfer task (Goetz, 1982, 1989).

On the basis of behavior-analytic approaches and expectancy theories, and empirical evidence such as that reported above, the use of rewards to promote creativity has been advocated for business (e.g., Edwards, 1989; Farr & Ford, 1990) and education (e.g., Funderbunk, 1977; Goetz, 1989). The strongly held view by many researchers and practitioners that reward is a useful tool for increasing creativity in applied settings is illustrated by Torrance’s comment that he had seen “excitingly original thinking when the conditions had rewarded such achievement” (Torrance, 1965, p. 131) and by Davis’ recommendation that “a creative atmosphere rewards creativity and helps it become habitual” (Davis, 1986, p. 208).
In contrast to the seemingly well-established incremental effects of reward on divergent thinking, considerable evidence gathered by cognitively oriented researchers suggests precisely the opposite conclusion, that reward inhibits divergent thinking. For example, Kruglanski, Friedman, and Zeevi (1971) required college students to list possible titles for a paragraph. The titles produced by students promised reward were judged to be less creative than titles given by unrewarded students. Loveland and Olley (1979) found that the promise of reward for completing a drawing task reduced the diversity of forms incorporated into the drawings. Amabile, Hennessey, & Grossman (1986) reversed the usual temporal order of instrumental behavior and reward by allowing school children the use of a camera to take photographs (the reward) on condition that the students agree to subsequently construct collages and stories. The creativity of the collages and stories was inferior, as rated by judges, to that of other children engaged in the same activities without the stated contingency.

Cognitively oriented researchers, as behaviorists, have argued that reward in one task has generalized effects on the performance of subsequent tasks, but with the difference that reward is predicted to reduce creativity. Reward in one task would create a generalized reward expectancy that would inhibit creative performance in later tasks (Hennessey & Amabile, 1988). Amabile and her colleagues gave preadolescent children a painting task followed by a collage-construction task. Half the children received a positive evaluation of their painting performance before they began the collages, and half the children received no evaluation. The positive evaluation for painting was intended to establish an expectancy of evaluation during subsequent collage construction and to thereby reduce the creativity of the collages. As predicted, the children rewarded for painting subsequently produced collages judged to be less creative (Hennessey & Amabile, 1988).

Many textbooks and literature reviews in the fields of animal learning, social psychology, business, and education have concluded, on the basis of the cognitively oriented studies, that reward has an inherent debilitating effect on human creativity. For example, an extensively cited review published in this journal stated that individuals who are provided rewards “seem to work harder and produce more activity, but the activity is of a lower quality, contains more errors, and is more stereotyped and less creative than the work of comparable nonrewar ded subjects working on the same problems” (Condry, 1977, pp. 470-471). The use of rewards to promote generalized creativity is not possible, we are informed by another investigator, because “reinforcement seems ineffective at producing anything but stereotyped repetition of what works” (Schwartz, 1982, p. 57). A primer on practical techniques for enhancing student’s creativity warns of serious decremental consequences of reward (Tegano, Moran, & Sawyers, 1991).

A thoughtful eclectic researcher, reviewer, or practitioner might be excused for expressing bewildermnet at the differing conclusions reached by behaviorists and cognitively oriented investigators. Most empirical studies report strong effects of reward on creativity, but the direction of effects seems to vary for no well-understood reason other than the behavioral-versus-cognitive conceptual framework of the researchers. Each group of researchers seldom comments on the other's findings except to point out methodological deficiencies. The present research investigates why behaviorists and cognitively oriented investigators have come to opposite conclusions concerning the effects of reward on creativity by (a) addressing the concerns raised by the behaviorally oriented investigators and the cognitively oriented investigators concerning the others' methodology, (b) elaborating the processes suggested by the two groups of investigators, and (c) evaluating the possibility that the effects of reward on divergent thinking result from a combination of processes suggested by the two groups. We begin with methodological issues.

Simply asking individuals to concentrate on generating multiple possible solutions enhances performance on divergent-thinking tasks (e.g., Torrance, 1988). Because the great majority of behavioral studies of divergent thinking have been concerned with developing practical, effective training procedures, researchers have often included spoken directions or descriptive comments that explicitly inform the participants of the desirability of creative performance (cf. Goetz, 1989). The acknowledged cost of this strategy is the inability to separate the effects of reward from instructions (Winston & Baker, 1985).

Thus, one explanation of the differing findings of the behavioral and cognitive studies, suggested by Amabile (1983, p. 127), is that the incremental effects reported by the behaviorists are due to instructions rather than reward. More generally, the incentive value of reward is usefully distinguished not only from the effects of explicit instructions and informative comments, but also from implicit information about required performance conveyed by the reward contingency itself (Zimmerman, 1985). That is, the contingency between performance and reward informs individuals about appropriate behavior in addition to supplying an incentive for carrying out the behavior. In the behavioral studies, the participants may have increased their divergent thinking simply because of the informational properties of the reward contingency. The present research examines the incentive effects of reward on generalized divergent thinking while controlling for these informational factors.

Because the cognitively oriented investigators hypothesized that the decremental effects of reward on creativity stem from cognitively manipulable reward expectancies, the repeated presentation of a reward contingency is usually omitted in favor of the simple promise of reward, the single pairing of performance with reward, or the provision of reward before the required performance (cf. Malouf, 1983). Behaviorists have argued that such abbreviated techniques increase the participant's use of implicit, previously learned cues for performance that may evoke behavior different from the actual repeated presentation of a reward contingency. Many of the cognitive experiments might have failed to obtain a positive effect of reward on creativity because of their abbreviated procedures (cf. Dickinson, 1989; Flora, 1990; Malouf, 1983; Reiss & Sushinsky, 1975, 1976; Skinner, 1953; Workman & Williams, 1980). Therefore, the present studies incorporate the repeated presentation of contingent reward.

A few studies by cognitively oriented investigators did repeatedly reward performance and nevertheless obtained decrements of creativity. In most of these studies, the reward could be ob-
tained with a low degree of divergent thinking. For example, McGraw and McCullers (1979) had college students solve a series of problems in which a specified quantity of water was to be measured out using three jars of differing size. Although the size of the individual jars was varied from problem to problem, as was the total amount of water to be measured out, all the problems could be solved by the same simple rule for combining the contents of the three jars. Unknown to the students, the final problem required the discovery of a new rule. The students who had been promised monetary payment for correct solutions of the problems required more time to solve the new problem than was taken by an unrewarded control group. The results were interpreted to indicate that all use of reward induces a set for simple cognitive performance.

However, these and related findings might indicate not that reward inherently reduces generalized creativity, but that rewarding a low degree of divergent thinking produces a reduced generalized orientation toward divergent thought (cf. Reiss & Sushinsky, 1975, 1976). Such an interpretation would be consistent with findings that reward for low cognitive effort reduces the quality of performance in subsequent tasks (Eisenberger, Kaplan, & Singer, 1974; Eisenberger, Leonard, Carlson, & Park, 1979). Note that in studies involving the repeated use of a reward contingency, cognitively oriented investigators generally reward a low degree of divergent thought, whereas behaviorists generally reward a high degree of divergent thought. The present research examines whether reward for high-versus-low degrees of divergent thought have different generalized effects.

In sum, on the basis of the critiques by the behaviorists and cognitively oriented investigators concerning the others' methodologies, the present research (a) controls for the informational properties of reward contingencies, (b) uses repeated experience with reward-contingent performance, and (c) compares the generalized effects of reward for high-versus-low degrees of divergent thinking.

We now examine in more detail processes that may underlie the effects of reward on divergent thinking. The willingness to exert high cognitive effort could contribute to individual differences in creative performance (Sternberg & Lubart, 1991). The possible manner in which a generalized orientation toward high or low degrees of divergent thinking develops from reward contingencies can be derived from learned industriousness theory (Eisenberger, 1992). According to this approach, effort is a fundamental response-produced experience, the aversiveness of which is highly sensitive to secondary reward effects. The theory states that if an individual is rewarded for putting a large amount of cognitive or physical effort into a task, the sensation of high effort acquires secondary reward properties, and the aversiveness of high effort is thereby decreased. This reduced aversiveness of high effort should increase the individual's readiness to expend effort in subsequent goal-directed tasks. An individual can also learn that a small amount of effort has a high payoff. Reward for low effort should contribute to low effort's secondary reward properties while extinguishing some of the previously conditioned secondary reward value of high effort. The result would be to make low effort less unpleasant relative to high effort. The individual would then be less willing to expend high effort in subsequent tasks.

There is considerable evidence that rewarded high effort does produce a generalized increase in industriousness. Increasing the degree of required performance involving one or more tasks raised the subsequent vigor and persistence of various other activities, including rats' lever pressing and runway traversal (Eisenberger, Carlson, & Frank, 1979; Eisenberger, Carlson, Guile, & Shapiro, 1979; Eisenberger & Masterson, 1986), depressed mental patients' card sorting (Eisenberger, Heerdt, Hamdi, Zimet, & Bruckmeier, 1979), learning-disabled and typical preadolescent students' handwriting, drawing, and mathematics performance (Eisenberger & Adornetto, 1986; Eisenberger, Heerdt, et al., 1979; Eisenberger, Mitchell, & Masterson, 1985; Eisenberger, Mitchell, McDermitt, & Masterson, 1984), and college students' manipulatory behavior (Nation, Cooney, & Gartrell, 1979; Pittenger & Pavlik, 1988), perceptual identifications (Eisenberger & Leonard, 1980), essay writing (Eisenberger, Masterson, & McDermitt, 1982; Eisenberger, McDermitt, Masterson, & Over, 1983), anagram solving (Boyajian & Nation, 1981), and resistance to cheating (Eisenberger & Masterson, 1983; Eisenberger & Shank, 1985). Extended effort training produced long-term effects with both rats (Eisenberger, Weier, Masterson, & Theis, 1989) and humans (Eisenberger et al., 1984).

Learned industriousness theory assumes that individuals learn which dimensions of performance are rewarded and generalize high or low effort more to these performance dimensions than to other dimensions in subsequent tasks. Preadolescent learning-disabled students who received points for reading with high accuracy subsequently produced more accurate drawings and stories than did those who had been rewarded for reading with high speed or for the mere completion of the reading task. In comparison, students who were rewarded for high reading speed subsequently constructed stories more quickly than did children who had been rewarded for high reading accuracy or for the mere completion of the reading task (Eisenberger et al., 1984). Such dimensional learning would also apply to creative performance. Reward for a high degree of divergent thought would increase the secondary reward value of divergent thinking, resulting in an increased generalized tendency to think divergently. Reward for a low degree of divergent thought would lessen the secondary reward value of divergent thinking, resulting in a reduced generalized tendency to think divergently.

A different possible mechanism, suggested by cognitive investigators to explain decremental effects of reward on creativity, centers on reward's attention-eliciting properties. Reward is assumed to orient the individual toward goal-relevant stimuli, thereby "diverting attention from the task itself and nonobvious aspects of the environment that might be used in achieving a creative solution" (Amabile, 1983, p. 120; see also Amabile et al., 1986; Balsam & Bondy, 1983; McGraw, 1978; Reiss & Sushinsky, 1975, 1976; Sternberg & Lubart, 1991). This narrowing of attention would reduce the spontaneity and flexibility of performance that results from high task involvement and contributes to creative performance (McGrath, 1978; Sternberg & Lubart, 1991). In support of this view, Amabile and McGraw cited findings that reward lessens the incidental learning of information that appears to the learner to be unrelated to the task.

Although widely accepted as a general explanation of the decremental effects of reward on creativity, the preceding attention-elicitaton hypothesis has not yet been used to derive and test distinctive predictions. A central, untested implication of the attention-elicitaton hypothesis is that reward should have a greater decremental effect on divergent thinking if presented in a way that attracts increased attention. Increased reward salience, resulting from a greater reward size, proximity, quality, and so forth, would reduce the task attention that contributes to creative thinking and thereby produce a greater reduction in creativity. Salient rewards would create a strong generalized expectancy of future reward, draw attention away from the intrinsic task properties, and thereby reduce creativity in subsequent task performance (cf. Hennessey & Amabile, 1988).

More generally, it is possible that the seemingly inconsistent effects of reward on divergent thinking result from the combined action of industriousness-learning and attention-elicitaton processes. According to this two-factor interpretation, whether reward produced an increase or a decrease in divergent thinking would depend on the combination of the degrees of rewarded divergent thought and reward salience. Rewarding a high degree of divergent thought would have a generalized incremental effect on creativity by increasing the secondary reward value of divergent thinking, whereas rewarding a low degree of divergent thought would have a generalized decremental effect on creativity by extinguishing some of the previously established secondary reward value of divergent thought. Salient rewards would reduce these effects by creating a generalized expectancy of large reward that would attract attention away from the task itself. A pair of experiments tested these predictions.

Experiment 1

Study 1 examined the effects of the degrees of rewarded divergent thought and reward salience on the development of generalized divergent thought by fifth- and sixth-grade school children. There were six groups of children produced by the factorial combination of two levels of rewarded divergent thought crossed with three levels of reward salience. In the high-divergent-thought condition, the children were asked to construct six new words from letters contained in a target word. In the low-divergent-thought condition, the children were asked to construct a single new word from the target word. These procedures were repeated with four additional target words, making a total of five training trials.

The children received one of three magnitudes of monetary reward (zero, 1¢, or 10¢ per trial). To increase the salience of the large monetary reward, the pennies awarded at the end of each trial in the 1¢ and 10¢ conditions were stacked in plain sight next to the participant. To equate across the groups the information concerning appropriate performance, all participants received verbal instructions concerning required task performance and were told "correct" each time they fulfilled the reward contingency.

To assess the generalized effects of the degrees of rewarded divergent thought and reward magnitude, we next presented the children with pages that contained printed rows of unfilled circles and asked them to draw pictures using the circles as basic elements in the drawings and to inform the experimenter when they were finished. This task, adapted from the Torrance Test of Creative Thinking (Torrance, 1965; Yamamoto, 1964), was selected to allow (a) an extremely broad range of originality in the subject matter of the children's drawings, and (b) the objective measurement of originality based on the infrequency of occurrence of the drawings' subject matter in the population of drawings constructed by the large sample of children (cf. Chris-tensen, Guilford, & Wilson, 1957; Eisenman, 1987; Funderbunk, 1977; Milgram & Rabkin, 1980; Runco, 1986; Wallach & Kogan, 1963; Ward, 1969).

According to learned industriousness theory, reward for divergent thinking on the word-construction task should increase the originality of performance on the subsequent circle task, whereas reward for a low degree of divergent thinking should decrease subsequent originality. In contrast, the reward salience hypothesis would predict that the receipt of a large reward on the word-construction task, regardless of the degree of rewarded divergent thinking, would reduce subsequent originality. According to the two-factor interpretation that incorporates both processes, a small reward for a high degree of divergent thought on the word-construction task should increase subsequent originality. A small reward for a low degree of divergent thought should reduce subsequent originality. Both these effects should be reduced by the use of a large reward in the word-construction task.

Method

Subjects and materials. Participants were 192 fifth- and sixth-grade students (83 boys and 109 girls) of varied socioeconomic background attending the Bayard elementary school in Wilmington, Delaware. To help ensure that every student would be able to successfully complete the training task, participants were required to have a reading level, determined by standardized tests, to be no lower than 1 year behind their current grade level. Participants were given a sheet of 20.3-in. × 27.9-cm blank loose-leaf paper and a pencil so they could work on the training task. The training task required the students to construct new words using any number of the letters contained in the target words shown to them. Children in Grades 3–7 have been found to be able to carry out this task successfully without extensive instruction (Stevenson, Klein, Hale, & Miller, 1968). The five target words (broniosaurus, desperation, instrument, mechanical, and refrigerator) were selected from a list found by Hillerich (1978) to be generally recognizable and pronounceable by children in the age range of the participants and to have an approximately equivalent length (10–12 letters). All words were printed in capital letters on index cards.

For the transfer task, all children received sheets of 20.3-cm × 27.9-cm paper with 30 circles (five rows × six columns). Each circle had a diameter of 3.8 cm. To make clear to the children the need to incorporate the circles into their drawings, the first circle was filled in to create a simple "happy face" (i.e., two dots represented the eyes, one dot represented the mouth, and an arc represented the smile).

Training task. The children were assigned randomly in equal numbers to the six conditions. Throughout the experiment, each child was seated facing the experimenter on the opposite side of a desk. At the beginning of the low-divergent-thinking task, the experimenter stated the following directions to the child:

1119
I am going to show you a word [the experimenter showed the example word \textit{furniture} to the child]. When I show you the word, read it out loud. Then, on your paper, make one new word using as many letters as you want from the word on the card. When you are finished, tell me the word you have made. Remember, the words were read over again verbatim, but the example word was not shown again. Do you have any questions? Here is an example [the experimenter showed the word \textit{furniture} to the child again]. If the word were \textit{furniture}, you could make the word \textit{turn} [the experimenter said this last sentence while writing down the word \textit{turn} on the child's blank loose-leaf paper]. Do you understand? [The experimenter waited for the child to say yes and then proceeded.] OK, here's the first word.

The directions for the high-divergent-thinking task were the same except that the children were asked to make six new words from each target word, and in the example, they were told they would make five additional new words in addition to the word \textit{turn}.

After answering any questions, the experimenter placed the first word in front of the child. To control for possible differences in task difficulty for the five target words, half the students in each group received the reverse order of the target words. After the child wrote the required number of new words on each trial, she or he was asked to read the words aloud. Children in the zero-reward condition were told, "That's correct." Children in the 1¢ condition were told, "That's correct. Here's a penny," and the coin was placed to the side of the paper on which they were writing their responses. Children in the 10¢ condition were told, "That's correct. Here's ten cents," and the 10 pennies were placed next to the page of responses. On subsequent trials, the monetary rewards were placed next to the monetary rewards achieved on the previous trials.

\textbf{Transfer task.} After a child completed the training task, the experimenter placed the circle sheet with a happy face on it directly in front of the child and placed an additional set of circle sheets next to the first sheet. The following directions were stated to every child:

Make pictures from these circles. A circle should be the main part of whatever you make. When you can't think of any more pictures, then just put your pencil down. There are more circle sheets here if you need them [experimenter pointed to the extra sheets]. Remember [tell the child the directions verbatim to the child]. Here is an example of a picture you might make [experimenter pointed to happy face picture on the child's sheet]. Do you understand?

After answering any questions, the experimenter stared at a book in her lap. After the child indicated he or she had finished drawing, the experimenter asked the child to state the subject of each picture and wrote down the child's answers. So that all children would experience reward for taking part in the study, children in the zero-reward and 1¢ conditions were then given a simple word-construction task that allowed them to earn a total of 15¢.

\textbf{Results.} To decrease the probability of falsely accepting null hypotheses, the following strategy was used in this and the following study: (a) analysis of covariance (ANCOVA) was used to reduce error variance in the test data due to individual differences among participants that were extraneous to the purposes of the research (Huitema, 1980; Kirk, 1982), (b) one-tailed statistical tests were used to evaluate directional hypotheses (Rosenthal \& Rosnow, 1985; Toothaker, 1993), and (c) any predicted effect that failed to reach a conventional level of statistical significance was replicated, using an independent sample of children, and the results of the original study and the replication were combined by meta-analysis (Winer, 1971; Wolf, 1986). Whereas in accord with our research strategy, we report ANCOVAs, it turned out that the major findings of this and the following study were statistically significant even without the use of covariates to reduce error variance.

To determine the originality of the words that the children constructed in training, each word was assigned a score equal to the total number of times it appeared in the population of words produced by all the participants. The children produced a total of 415 different words. In the high-divergent-thought condition, originality increased from the first to the sixth word per trial, as indicated by a $3 \times 6$ repeated measures analysis of variance (ANOVA) on reward condition (zero, 1¢, or 10¢) and Words 1–6. The only significant effect was the increasing originality from the first to the sixth word, $F(5, 465) = 16.20, p < .001$. The mean frequency scores for the first to the sixth words were as follows: 57.7, 44.7, 40.9, 41.9, 35.3, and 35.0. This increase of originality across the sequence of responses is frequently reported in research on divergent thinking (Christensen et al., 1957; Milgram \& Rabkin, 1980; Runco, 1986; Ward, 1969). The result may reflect a tendency to initially produce responses with high associative strength, as elicited by the task, before the individual produces more-novel responses (Christensen et al., 1957). As Wallach (1988, p. 117) put it, "unusualness seems to ride the back, as it were, of the tendency to produce longer ideational strings...".

The major data of interest concerned the originality of the children's circle drawings. Two judges' examination of the subject matter of all the children's drawings produced a total of 373 different topics. Examples of frequently used topics were faces and decorative buttons, whereas examples of infrequently used topics were eyeglasses (involving the connection of two adjacent circles) and tires. The judges next tabulated the number of times each topic was represented in the population of drawings. To determine the originality of a given child's drawings, the two judges, working independently, assigned each drawing a score equal to the total number of times the same topic appeared in the population of drawings. In the rare cases in which the two judges disagreed in their assignment of a child's drawing to a particular subject, the judges' scores for that drawing were averaged. Finally, each child's average originality score was obtained by adding the originality scores for all of the child's drawings and dividing by the total number of drawings that the child produced.

The correlation between the average originality scores given to the children by the two judges was .998. The average frequency of occurrence of each group's drawings in the population of drawings is given in Figure 1. Low scores signify use of less frequently used topics and, therefore, greater originality. It was possible for these scores to exceed the number of participants in the study because the scores reflect the number of times a drawing appeared in the total population of drawings. In our analysis of the drawings' originality, we used as covariates the children's gender, grade level, and left-versus-right handedness. The ANCOVA assumption of homogeneity of the regression slopes (Huitema, 1980; Kirk, 1982) was readily met (all $p$s > .30). The $2 \times 3$ ANCOVA examined the effects of the degree of
REWARD AND CREATIVITY

Figure 1. The mean commonality of children’s drawings as a function of the previous degrees of rewarded divergent thought (low [L] or high [H]) and level of monetary reward (zero, low, or high) in a prior word-construction task. (The commonality scores represent the average frequency of occurrence of each group’s drawings in the total population of drawings. Therefore, low scores signify high originality).

rewarded divergent thought (low vs. high) and the three levels of monetary reward (zero, 1¢, and 10¢) on generalized originality. The two-factor interpretation of the effects of reward on generalized creativity predicted that reward for a high degree of divergent thought would have an incremental effect on generalized creativity, that reward for a low degree of divergent thought would have a decremental effect on generalized creativity, and that these effects would be lessened by the use of a large reward.

A focused test for the existence of an interaction between the degree of rewarded divergent thought and the amount of reward revealed, as predicted, that the small monetary reward produced the greatest difference in the originality of the drawings between children in the high-divergent-thought condition and the low-divergent-thought condition, t(183) = 2.97, p < .002. Simple-effects tests were used to break down this interaction. As predicted, a small reward for a low degree of divergent thought produced a decrement in children’s generalized creativity. Specifically, among children who received the low-divergent-thought task, the 1¢ reward produced less generalized originality than did the zero reward, t(183) = 2.52, p < .006. The conclusion was less clear concerning the prediction that a small reward for a high degree of divergent thought would produce an increment in generalized creativity. Among children who received the high-divergent-thought task, the 1¢ reward produced considerably greater generalized creativity than the zero reward. However, this difference did not reach a conventional level of statistical significance, t(183) = 1.11, p < .15. Finally, in accord with the attention-elicitation hypothesis, the use of a large reward eliminated the difference in creativity found between the groups receiving the high-divergent-thought task and the low-divergent-thought task, t(183) = 20.

Most of the preceding results were consistent with the view that the effects of reward on generalized divergent thought result from the combined action of industriousness-learning and attention-elicitation processes. However, the use of a small reward for a high degree of divergent thinking did not produce a statistically reliable generalized increase in creativity. This effect, involving the difference in creativity between the high-divergent-thought, small-reward group and the high-divergent-thought, zero-reward group, only approached statistical significance despite the large numerical difference in creativity scores. A replication study comprising the same two conditions was therefore carried out with a somewhat larger group size. Then the results for the two conditions were combined across the studies by meta-analysis.

In the replication study, 80 fifth-grade students (27 boys and 53 girls) attending the Bancroft elementary school in Wilmington, Delaware, were randomly assigned in equal numbers to the high-divergent-thought, zero-reward condition and the high-divergent-thought, small-reward condition. All procedures were precisely the same as in the preceding study, with information concerning gender available for use as a covariate. Because the total sample of children in the original study was larger than in the replication study, the frequency counts of drawings in the main study were used to score the originality of students’ scores in the replication study.

The correlation between the average originality ratings assigned by the judges to the children in the replication study was 1.0. As predicted, the high-divergent-thought, small-reward group demonstrated a greater generalized creativity than the high-divergent-thought, zero-reward group. The ANCOVA revealed that the difference between the means of the two groups (178 and 268, respectively) was statistically significant, t(77) = 1.80, p < .05. Moreover, the combination of the results of the original study and the replication study, examined with a conventional meta-analytic technique, produced a statistically reliable difference between the two groups (Winer’s combined test [1971; Wolf, 1986], Z = 2.05, p < .025).

We previously noted that in divergent-thinking problems, responses occurring later in sequence are usually found to be more original than those that occur earlier. Therefore, the reward for a high degree of divergent thought in the word-construction task might have increased originality during the usual-length response sequence or might have evoked additional drawings of greater originality after the usual-length response. Considering first the main study, a 2 × 3 ANCOVA examined the effects of the two degrees of rewarded divergent thought and the three levels of monetary reward on the number of drawings produced in the circles task. The ANCOVA assumption of homogeneity of the regression slopes was met (all ps > .15). The only reliable result was that a required high degree of divergent thought produced a greater number of subsequent drawings than a required low degree of divergent thought, F(2, 183) = 5.05, p < .03. Of greater interest was the failure of the degree of required divergent thinking to interact with the conditions of reward, F(2, 183) = .53. Thus, the reward conditions affected the originality of the drawings throughout performance and not the number of drawings produced. The replication study suggests a similar conclusion in that the high-divergent-thought, small-reward group produced unreliably fewer drawings than the high-divergent-thought, zero-reward group, k(75) = -.86. In sum, a small reward for different degrees of
required divergent thought affected the originality of subsequent performance and not the number of responses.

These results indicate that, depending on the degree of rewarded divergent thought and the salience of reward, reward can increase or decrease generalized creativity. Consistent with two-factor theory, a small reward for a high degree of divergent thought enhanced generalized creativity, and a small reward for a low degree of divergent thought reduced creativity. Furthermore, the use of a large, highly salient reward eliminated these effects.

Experiment 2

In the first study, a large reward for a high degree of divergent thought produced no greater generalized creativity than the same reward for a low degree of divergent thought. One possible conclusion is that generalized effects of reward for high-versus-low degrees of divergent thought can be obtained only with rewards having a small size. However, other research suggests that reward size is only one of a number of parameters that combine to determine the attention-eliciting properties of reward. Mischel (1981) found that conditions designed to increase the anticipation of a preferred reward's consummatory properties reduced how long children were willing to wait before they settled for the less-preferred reward. For example, the children spent less time waiting if the preferred reward was physically present (Mischel & Ebbesen, 1970) or if they were asked to form a mental image of the reward's attractive consummatory qualities (e.g., the chewy, sweet, soft taste of marshmallows; Mischel & Baker, 1975). Conversely, children were more willing to wait for a preferred reward when the reward was not physically present or when their attention was directed toward the reward's less appealing qualities or to a symbolic representation of the reward.

According to the two-factor interpretation, it should be possible to obtain effects of a large reward on generalized creativity if the attention-eliciting properties of reward size were countered by some other means of altering reward salience. Mischel's research, reviewed above, suggests that the physical proximity of reward is salient for children. Recall that in the first study, the monetary rewards were piled next to the participants. It follows from the two-factor interpretation that reducing the salience of the large reward by eliminating its close physical presence should make it possible to obtain generalized effects of rewarding different degrees of divergent thought. In the present study, we examined whether generalized effects of a large monetary reward for high-versus-low degrees of divergent thought could be established by placing the reward out of the children's sight. Out of view, the large reward should elicit less attention and therefore be more likely to produce effects similar to those obtained in the prior study with a small reward. All children in the second study received the same monetary reward that was used in the large-reward condition of the prior study (10¢ per trial). There were four groups produced by the factorial cross between two levels of rewarded divergent thinking and two levels of reward proximity.

Method

Participants were 232 fifth- and sixth-grade students (120 boys and 112 girls) of varied socioeconomic background attending the Bancroft elementary school in Wilmington, Delaware. As in the prior study, no participant's reading level was more than 1 year behind his or her current grade level, on the basis of standardized tests. The participants were randomly assigned to the four groups. As in the preceding study, children in the proximal-reward condition were told each time they met the reward contingency in the word-construction training, "That's correct. Here's 10¢." Children in the distal-reward condition were told, "That's correct. Here's 10¢. I am going to put it away for you until we are all done." All children were shown the monetary reward on each training trial, and depending on the condition, the money was either accumulated on the table to the side of the training materials or was accumulated in a cup out of the child's view. Information concerning grade level and gender were available for use as covariates to reduce error variance. Other details of the training task and the circles task were the same as in the preceding study.

Results

The correlation between the average originality scores given the children by the two judges was 1.0. The norms for word frequencies in training and for drawing frequencies in test, developed in the first study, were used to evaluate originality in the second study. Similar to the training results of the first study, in the high-divergent-thought condition, originality increased from the first to the sixth word per trial, as indicated by a 2 × 6 repeated measures ANOVA on reward location (proximal vs. distal) and Words 1–6. As in the first study, the only significant effect was the increasing originality from the first to the sixth word, F(5, 570) = 43.7, p < .001. The mean frequency scores for the first to the sixth word were as follows: 67.3, 52.7, 46.6, 43.9, 35.0, and 33.6.

The major data of interest concerned the originality of the children's drawings. The average frequency of occurrence of each group's drawings in the total population of drawings is given in Figure 2. The ANCOVA assumption of homogeneity of the regression slopes was readily met (p > .20). The 2 × 2 ANCOVA examined the effects of the degree of rewarded divergent thought (low vs. high) and the reward location (proximal vs. distal) on generalized originality. A focused test was carried out on the possible interaction between the degree of rewarded divergent thought and the proximity of the reward. As predicted, the physical absence of the reward produced the greater difference in the originality of the drawings between children in the high-divergent-thought condition and the low-divergent-thought condition, t(226) = 1.74, p < .05. Simple-effects tests indicated that, among children receiving the large, distal reward, requiring a high degree of divergent thought produced greater average generalized creativity than requiring a low degree of divergent thought, t(226) = 2.52, p < .01. As in the first study, among children receiving the large, proximal reward, the difference in average creativity resulting from a high-versus-low degree of required divergent thought did not approach statistical significance, t(226) = .04.

A 2 × 2 ANCOVA examined the effects of the degree of rewarded divergent thought and the reward proximity on the number of drawings produced. The assumption of homogeneity
of the regression slopes was met \((p > .40)\). There was a reliable main effect for reward location, with the distal reward producing more drawings than the proximal reward, \(F(1, 226) = 5.92, p < .02\). The interaction between the degree of divergent thought and reward location was not statistically significant, \(F(1, 226) = 2.40\). Simple-effects tests indicated that requiring a high degree of divergent thought did not produce a significantly greater number of drawings than requiring a low degree of divergent thought either among children who received a proximal reward, \(t(226) = .44\), or a distal reward, \(t(226) = -1.00\). Note that with the distal reward, a required high degree of divergent thought produced a statistically nonsignificant lesser number of drawings than did a required low degree of divergent thought. In sum, a large, distal reward for different degrees of required divergent thought affected the originality of subsequent performance and not the number of responses.

In both the first and the second study, the use of a large, proximal reward eliminated the generalized effects of rewarding different degrees of divergent thought. In the second study, these effects were restored by moving the large reward out of sight. Thus, two aspects of reward salience, size and proximity, contributed to eliminating the generalized effects of rewarding different degrees of divergent thought.

**General Discussion**

The present findings increased our understanding of why behaviorists and cognitively oriented investigators have come to opposite conclusions about reward's effects on creativity. The results suggest that reward influences creativity through the combined effects of two processes involving learned industriousness and directed attention. A monetary reward for a high degree of divergent thought in one task (word construction) increased children's subsequent originality in an entirely different task (picture drawing). The same reward, made contingent on a low degree of divergent thought, reduced generalized creativity. These effects were eliminated by using a large reward and were restored by keeping the large reward out of the children's sight.

The increase of generalized creativity produced by reward for a high degree of divergent thought supports behavior theory's assumption that performance in any discriminable response class, including divergent thought, can be effectively strengthened by reward (Maltzman, 1960; Pryor et al., 1969; Skinner, 1953; Torrance, 1970; Winston & Baker, 1985). The present findings indicate that the increased creativity found in many behaviorally oriented studies was not due solely to the informational properties of the reward contingencies, but additionally involved the incentive properties of the reward. The results are also consistent with cognitive approaches that emphasize the importance of task-focused motivation for producing creative performance (Csikszentmihalyi, 1990; Sternberg & Lubart, 1991).

In divergent-thinking tasks, the responses occurring later in sequence are generally found to be more original than those occurring earlier (Christensen et al., 1957; Milgram & Rabkin, 1980; Runco, 1986; Ward, 1969). Therefore, reward for a high degree of divergent thought could either increase originality during the usual-length response sequence or add additional responses of increased originality after the usual-length sequence. Both kinds of effects would be assumed to be influenced by motivation and effort (Runco, 1986; Ward, 1969) and would contradict suggestions that reward generally increases an individual's amount of activity at a cost to overall flexibility and creativity (Condy, 1977, pp. 470–471).

In the present studies, reward for a high degree of divergent thinking influenced the average originality of generalized performance without having a measurable effect on the frequency of responding. Thus, repeated reward for divergent thought increased originality during the usual-length response sequence rather than adding responses of increased originality after the sequence. These findings follow from learned industriousness theory (Eisenberger, 1992), according to which individuals learn the dimensions of performance that are rewarded and generalize high or low performance more to those dimensions than to others. To the extent that individuals discriminate that reward depends on the originality of their performance rather than the frequency of responses, reward should influence originality during the usual-length response sequence. The results are consistent with prior findings indicating that rewarded high speed or accuracy in one task generalized more to the same dimension of performance in subsequent tasks than to the alternative dimension (Eisenberger et al., 1984).

The decrease of generalized creativity, obtained by rewarding a low degree of divergent thought, is similar to previous findings that reward for low cognitive effort reduces the quality of performance in subsequent tasks (Eisenberger et al., 1974; Eisenberger, Leonard, Carlson, & Park, 1979). As suggested by Reiss and Sushinsky (1975, 1976), providing reward for a low degree of creativity may produce a type of "learned laziness" that lessens creative performance. According to learned industriousness theory, rewarding a low level of effort in a given performance...
dimension increases the secondary reward value of low effort in that dimension and extinguishes some of the secondary reward of high effort. Thus, reward for a low degree of divergent thought would increase the unpleasantness of divergent thinking in subsequent tasks.

The generalized decremental effect of rewarding a low degree of divergent thought is consistent with related results in cognitively oriented studies (e.g., McGraw & McCullers, 1979; Schwartz, 1982). The conclusion drawn by those researchers, that reward has an inherent decremental effect on generalized creative performance, is supplemented by the present findings concerning the degree of rewarded divergent thought. Depending on whether a high degree or low degree of divergent thought is rewarded, generalized creativity will increase or decrease.

The elimination of the generalized effects of different degrees of rewarded divergent thought that resulted from increasing the size and proximity of reward follows from the attention-elicitation hypothesis (Amabile, 1983; Amabile et al., 1986; McGraw, 1978; Reiss & Sushinsky, 1975, 1976; Sternberg & Lubart, 1991), as incorporated into the present two-factor interpretation. Salient reward would attract attention away from the task and thereby interfere with the learning of high or low generalized divergent thought. Furthermore, salient rewards would create a strong generalized expectancy of future rewards and thereby draw attention, during subsequent tasks, to the reward itself (cf. Hennessey & Amabile, 1988). The reduced attention to the intrinsic properties of the tasks would reduce the flexibility and spontaneity of performance (McGraw, 1978; Sternberg & Lubart, 1991).

We found that the combination of two different features of reward salience, large size and high proximity, were required to eliminate the generalized effects of industriousness training. Neither of these features alone was sufficient to fully counteract the reward contingency. The results indicate that no single aspect of a reward's salience prevents its effective use as a motivator of creative performance. Rather, it is the summation of a reward's attention-inducing properties, in combination with the degree of rewarded divergent thought, that determine whether a reward will enhance or interfere with the development of divergent thought.

The present findings suggest that disagreements concerning whether reward increases or decreases creativity might usefully be replaced by further investigation of the conditions that maximize such increases or decreases. The use of a large, proximal reward eliminated the generalized effects of rewarding a high degree of divergent thought but did not reduce generalized creativity to a level less than that of the unrewarded control condition. This suggests that the decremental effect of high reward salience roughly balanced the incremental effect of a high level of rewarded divergent thought. The two-factor interpretation indicates conditions under which the decremental effect of reward salience might outweigh the incremental effect of rewarding a high level of divergent thought.

If the reward were made even more salient than the large, proximal monetary reward used in the present study, individuals' attention to the task and their discrimination of the requirement of high divergent thought might be more effectively inhibited. Mischel's (1981) findings on self-control suggest that participation of the consummatory properties of potent rewards, such as favored snacks and action-filled video games, may generate considerable anticipatory excitement that could more fully dominate attention and interfere more effectively with children's attention to creative tasks. Asking children to think about possible purchases with a proffered monetary reward might similarly draw attention away from the task and reduce creativity (cf. Balsam & Bondy, 1983).

Future progress in understanding the incremental and decremental effects of reward on creativity requires addressing the methodological critiques by the behaviorists and cognitively oriented investigators concerning the other group's research. We previously noted that the contingency between performance and reward informs individuals about appropriate behavior in addition to supplying an incentive for carrying out the behavior (Zimmerman, 1985). Therefore, unless one controls for the informational properties of the reward contingency, it is difficult to distinguish these informational effects from the incentive effects of reward.

For many behaviorally oriented studies concerned with developing practical, effective training procedures, the confounding of the informational and incentive features of reward contingencies is a useful strategy (cf. Winston & Baker, 1985). However, when one is concerned with teasing apart the incentive and attentional effects of reward on creativity, the control of informational effects is important. One useful technique for eliminating this confound, used in the present studies, involves supplying all participants with feedback concerning the correctness of their performance. This baseline of information for all participants allows evaluation of the incentive and attention-inducing properties of reward.

Another basic methodological issue concerns the use of instructions as a substitute for repeated presentation of a reward contingency. Such procedures provide valuable information concerning verbally induced expectancies (e.g., Kruglanski et al., 1971; Loveland & Olley, 1979). However, the results of instructions cannot be assumed to necessarily mimic the effects of repeated presentation of a reward contingency (Dickinson, 1989; Flora, 1990; Malouf, 1983; Reiss & Sushinsky, 1975, 1976; Skinner, 1953; Workman & Williams, 1980). Only by careful attention to these methodological issues can a meaningful dialogue be established between behaviorists and cognitive investigators concerning the effects of reward on creativity.

How creativity is affected by other features of reward contingencies, besides the required degree of divergent thought and reward salience, needs to be investigated with the kinds of methodological controls previously discussed. It has been argued that highly creative people tend to strongly value their intrinsic interests and their independence and that they may respond to extrinsic rewards rebelliously by reducing the quality and creativity of their performance (Barron, 1963; Eisenman, 1991). More generally, because Western culture inculcates the value of individualism and self-expression, overbearing attempts to restrict alternative courses of action, such as the accompaniment of reward by implied threats of punishment for noncompliance, may produce psychological reactance and a lessening of the quality of performance (cf. Deci & Ryan, 1985; Hennessey & Amabile, 1988; Skinner, 1953).
REWARD AND CREATIVITY

However, it is also the case in everyday life that the recipients of rewards deemed socially appropriate and deserved usually report feeling encouraged and valued. For example, most students whose parents provided them with financial support for their college education interpreted such support as an indication of love and caring (Brinberg & Castell, 1982). Also, perceived organizational support has been found to increase employee innovation (Eisenberger, Fasolo, & Davis-LaMastro, 1990). The withholding of rewards that the individual believes are deserved and appropriate, rather than their provision, may be more likely to be perceived as coercive.

The present findings have practical implications for the classroom. High reward salience appears to counter the effects of reward for divergent thought (cf. Amabile, 1983; Amabile et al., 1986; Balsam & Bondy, 1983; McGraw, 1978; Reiss & Susinsky, 1975, 1976; Sternberg & Lubart, 1991). The teacher who continually draws attention to valued rewards faces the possibility of undermining creative performance (Tegano et al., 1991). Furthermore, the present research and previous findings (e.g., McGraw & McCullers, 1979; Schwartz, 1982) suggest that providing rewards for a low level of divergent thought reduces generalized creativity. To meet pressures by students, parents, and administrators, many teachers award verbal approval and high grades for low-quality performance on tasks that could be used to promote creativity (Eisenberger, 1989). The present results support suggestions that allowing self-indulgent task performance, with little consideration of performance quality or skill enhancement, has decremental effects on creativity (Csikszentmihalyi, 1990; Sternberg & Lubart, 1991).

On the other hand, contrary to the conclusion of many reviews, texts, and primers that reward inherently reduces creativity, the judicious reward of divergent thought seems to promote generalized creativity (cf. Funderbunk, 1977; Goetz, 1989). In the present studies, the combination of both the reward's large size and close proximity was required to eliminate the incremental effect of rewarded divergent thought. Reward training would appear to have incremental effects on generalized creativity when (a) a high degree of divergent thought is required, and (b) the reward is presented in not too salient a fashion. Procedures that draw children's attention to the less-appealing qualities of consumable rewards or to rewards' symbolic representation (Mischel, 1981), or that use small amounts of money or tokens that must be accumulated to obtain desirable rewards (Chance, 1993), show continued promise as effective motivators of creative performance.

References


Schwartz, B. (1982). Reinforcement-induced behavioral stereotypy:


Received August 25, 1993
Revision received November 18, 1993
Accepted January 8, 1994