

The Differential Effects of Tangible Rewards and Praise on Intrinsic Motivation: A Comparison of Cognitive Evaluation Theory and Operant Theory

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Substantial research indicates that tangible rewards, such as money, prizes, and tokens, decrease response rates by undermining intrinsic motivation. In contrast, praise appears to increase response rates by enhancing intrinsic motivation. Based on their interpretation of available evidence, many social-cognitive researchers warn not to use tangible rewards in applied settings and to use praise instead. Furthermore, they suggest that the differential effects of the two types of rewards on intrinsic motivation cannot be explained using principles of operant psychology. Cognitive evaluation theory provides one of the most recent and widely cited social-cognitive explanations for the different effects of the two types of rewards on intrinsic motivation (Deci & Ryan, 1985). However, a review of existing research found little support for the explanations based on this theory and revealed three potential confounding effects: (a) temporal contiguity, (b) the number of reward administrations, and (c) discriminative stimuli associated with reward availability. These three confounding factors provide explanations for the effects of tangible rewards and praise on intrinsic motivation that are consistent with principles of operant psychology.

Key words: intrinsic motivation, tangible rewards, praise

Many social-cognitive researchers who study human motivation assert that a clear distinction can be made between intrinsically and extrinsically motivated behavior (e.g., Boggiano & Pittman, 1992; Deci, 1992; Deci & Ryan, 1991, 1992; Kohn, 1993). As summarized by Deci,

It is possible to distinguish between two broad classes of motivation to perform an activity: intrinsic motivation and extrinsic motivation. A person is intrinsically motivated if he (she) performs an activity for no apparent reward except the activity itself. Extrinsic motivation, on the other hand, refers to the performance of an activity because it leads to external rewards. (1972b, p. 113)

Social-cognitive theorists propose that important differences exist between the two types of motivation. For example, intrinsic motivation has been associated with relatively highly valued constructs, such as competence (e.g., White, 1959), personal causation (e.g., deCharms, 1968), and self-deter-

mination and autonomy (e.g., Deci, 1992; Deci & Ryan, 1985, 1987, 1992). In contrast, extrinsic motivation is assumed simply to reflect performing an activity to gain an external consequence. Indeed, based on proposed differences between the two forms of motivation, Fair and Silvestri concluded that intrinsic motivation "is universally considered to be superior to extrinsic motivation" (1992, p. 4).

Given the relative importance ascribed to intrinsic motivation, social-cognitive researchers have conducted nearly 100 studies to identify the effects of external consequences, particularly rewards,¹ on intrinsically motivated behavior (see reviews by Cameron & Pierce, 1994; Deci & Ryan,

¹ The distinction between *reward* and *reinforcer* has often been overlooked in research that has examined the effects of external consequences on intrinsic motivation. Whereas a reinforcer refers to a stimulus that has been demonstrated to increase a response rate on which it is contingent, a reward can be defined as a stimulus that is assumed to have reinforcing properties but that has not been shown experimentally to increase response rates.

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1985; Dickinson, 1989; Morgan, 1984; Wiersma, 1992). The studies typically have consisted of (a) a treatment session, in which participants in the experimental group were informed that performance of an activity assumed to be intrinsically motivated (e.g., puzzles and games) would be rewarded, and participants in the control group received no mention or payment of a reward; followed by (b) a posttreatment session, in which no rewards were available and one or more dependent measures of intrinsic motivation were assessed (e.g., rate or duration of responding on the target activity). If rewarded participants responded less frequently or for shorter periods of time than participants in the control group during the posttreatment session, then the reward was interpreted to have decreased intrinsic motivation. In contrast, if rewarded participants responded more frequently or with longer duration than participants in the control group, the reward was interpreted to have increased intrinsic motivation. In addition to treatment and posttreatment sessions, some studies included a baseline session that was identical to the posttreatment session to permit within-group comparisons.

Using this methodology, researchers appear to have repeatedly demonstrated that tangible rewards (e.g., money, awards, prizes, and tokens) decrease intrinsic motivation, whereas praise increases it (see reviews by Deci, 1975; Deci & Ryan, 1980, 1985). Cameron and Pierce (1994) recently conducted a meta-analysis of 96 studies examining the effects of different types of rewards on intrinsic motivation. They found that tangible rewards tended either to decrease or have no effect on intrinsic motivation. In contrast, they found that praise increased intrinsic motivation in almost every situation tested.

The finding that tangible rewards decrease intrinsic motivation has led to warnings regarding their use in behavior therapy (e.g., Deci, 1978; Deci & Ryan, 1985), business settings (e.g., Caldwell, O'Reilly, & Morris, 1983;

Kohn, 1993), classrooms (e.g., Condry, 1978; Edwards, 1994; Kohn, 1993) sports (e.g., Deci & Ryan, 1985; Weinberg & Jackson, 1979), token economies (e.g., Deci & Ryan, 1985; Kopel & Arkowitz, 1975; Levine & Fasnacht, 1974), and society in general (e.g., Csikszentmihalyi, 1978; Deci, 1978; Kohn, 1993) for fear that their use will result in undermining the very behavior that they were meant to enhance. As Kohn (1993) recently warned, "What rewards do, and what they do with devastating effectiveness, is smother people's enthusiasm for activities they might otherwise enjoy" (p. 74).

Researchers have also challenged the validity of operant psychology based on the apparent findings that tangible rewards decrease response rates by undermining intrinsic motivation. For example, Lepper and Gilovich stated that the effect of tangible rewards on intrinsic motivation is "inconsistent with the well-established finding that contingent reinforcement will increase the probability of the response it follows—the fundamental law of effect" (1981, p. 6). More recently, Kohn asserted that "Skinnerian dogma belongs at the top of any list of what needs careful reexamination. The bad news is that we have paid an enormous price for having accepted it so long. The good news is that we can do better" (1993, p. 256).

To explain the differential effects of tangible rewards and praise on intrinsic motivation, social-cognitive researchers typically refer to cognitive evaluation theory (CET; Deci, 1975, 1976a, 1976b; Deci, Cascio, & Krusell, 1975; Deci & Porac, 1978; Deci & Ryan, 1980, 1985). In addition to providing an explanation that is consistent with empirical findings, the proponents of CET suggest that operant psychologists are unable to account for why tangible rewards and praise have differential effects on intrinsic motivation because operant psychologists study "responses" rather than "human psy

chological processes" (Deci & Ryan, 1985, p. 188).

Several operant psychologists have reviewed the literature on the effects of rewards on intrinsic motivation (e.g., Bernstein, 1990; Dickinson, 1989; Flora, 1990; Mawhinney, 1979, 1990; Scott, 1975). Among many important points they have raised are the following. One, social-cognitive researchers have often drawn conclusions regarding the use of reinforcement in applied settings, yet in most cases the rewards used in their studies were not demonstrated to increase response rates (Bernstein, 1990; Dickinson, 1989) (for exceptions, see Davidson & Bucher, 1978; Feingold & Mahoney, 1975; Greene, Sternberg, & Lepper, 1976; Loveland & Olley, 1979; B. W. Williams, 1980). Two, the detrimental effects of certain rewards on intrinsic motivation may be a function of many factors other than the rewards, such as aversive control procedures (Dickinson, 1989) and discriminative stimuli associated with reward availability (Flora, 1990). Three, behavioral observations were often relatively brief (Dickinson, 1989), response rates typically were not assessed for stability (Bernstein, 1990), details of response rates during the treatment sessions often were not reported (Scott, 1975), and follow-up observations were infrequent (Bernstein, 1990; Dickinson, 1989).

Nevertheless, no one has described from an operant perspective why tangible rewards and praise have produced different effects on intrinsic motivation. An explanation based on operant principles would be an important step toward answering the challenges that have been directed toward operant psychology and the criticisms of operant-based interventions in applied settings.

Therefore, the purpose of the present article is to extend the work of other operant psychologists by (a) critically reviewing the evidence in support of the CET explanation for the different effects of tangible rewards and praise

on intrinsic motivation; (b) offering operant explanations for the differential effects of the two types of rewards based on three confounding variables identified in the literature; and (c) discussing relative advantages of the operant versus social-cognitive accounts of the different effects of the two types of rewards on intrinsic motivation. Throughout the review, the term *reward* will be used to represent the external consequences (tangible items and praise) used in the studies, because in most cases researchers either did not include baseline observations or they failed to report details of treatment session response rates, making it impossible to determine whether the reward actually increased response rates (see Dickinson, 1989, for further discussion on the distinction between reward and reinforcement in studies examining the effects of external consequences on intrinsic motivation).

THE EFFECTS OF EXTERNAL CONSEQUENCES ON INTRINSIC MOTIVATION: TANGIBLE REWARDS VERSUS PRAISE

Deci (1971) conducted the first study to evaluate the effects of external consequences on people's intrinsic motivation. In a series of three experiments, he examined the effects of money and praise on college students' intrinsic motivation for solving puzzles and writing headlines for their school newspaper. Intrinsic motivation was defined as the amount of time students spent solving puzzles or writing headlines when no obvious external rewards existed for performing either activity. He found that, compared to non-rewarded students, students who were paid for the activities exhibited a decrease in intrinsic motivation, whereas students who received praise exhibited an increase in intrinsic motivation.

Deci's (1971) investigation was followed by a series of studies that examined the effects of different types of rewards on intrinsic motivation. Many

of the studies replicated the finding that monetary rewards decrease intrinsic motivation (where intrinsic motivation typically was defined as the rate or duration of responding on a target activity when no rewards were available) (e.g., Crano & Sivacek, 1984; Feehan & Enzle, 1991; Margolis & Mynatt, 1986; Porac & Meindl, 1982).

In addition to monetary rewards, the following tangible rewards have also been found to decrease intrinsic motivation: awards (e.g., Danner & Lonky, 1981; Ransen, 1980), candy (e.g., Fazio, 1981; Morgan, 1981, 1983), class credits (e.g., Folger, Rosenfield, & Hays, 1978), grades or evaluations (e.g., Butler, 1988; Harackiewicz, Manderlink, & Sansone, 1984), prizes (e.g., Fabes, Eisenberg, Fultz, & Miller, 1988; B. W. Williams, 1980), and tokens (e.g., Greene et al., 1976).

Whereas tangible rewards appear to decrease intrinsic motivation, a significant amount of research has shown that praise increases it (e.g., Blanck, Reis, & Jackson, 1984; Koestner, Zuckerman, & Koestner, 1987; Ryan, 1982; Sansone, Sachau, & Weir, 1989). Thus, substantial evidence has been accumulated since Deci's (1971) seminal investigation that suggests that the two types of rewards have different effects on intrinsic motivation (see reviews by Cameron & Pierce, 1994; Deci, 1975; Deci & Ryan, 1985).

COGNITIVE EVALUATION THEORY

Deci and his colleagues developed CET to explain the effects of external consequences on intrinsic motivation (e.g., Deci, 1975, 1976b; Deci & Porac, 1978; Deci & Ryan, 1980, 1985). In particular, they offered three propositions to describe how consequences affect intrinsic motivation. The first proposition makes use of the concept of *locus of causality*, which refers to people's perception of whether they engaged in an activity for internal (e.g., because they liked the activity) or external (e.g., because they were paid)

reasons. According to Deci and Ryan (1985), consequences that promote a more internal locus of causality will increase intrinsic motivation, whereas those that promote a more external locus of causality will decrease it (p. 62).

Deci and his colleagues also proposed that external consequences will affect intrinsic motivation to the extent that they influence perceptions of competence (i.e., people's perception of whether or not they can interact successfully with their environment). Specifically, the second proposition of CET states that consequences that promote perceived competence will increase intrinsic motivation, whereas those that promote perceived incompetence will decrease intrinsic motivation (Deci & Ryan, 1985, p. 63).

In addition to changes in perceived locus of causality, competence, or both, Deci and Ryan (1985) proposed that in order to understand how a particular consequence will affect intrinsic motivation, it is necessary to consider three aspects of a consequence that may be more or less salient to an individual: informational, controlling, and amotivating aspects. Informational aspects of a consequence are those that provide details that help people to interact effectively with their environment. Controlling aspects of a consequence are those that pressure people to think, feel, or behave in a given manner. Finally, amotivating aspects are those that signal people's inability to master a particular task and often can be associated with feelings of self-deprecation or hopelessness.

According to CET, any consequence may have one or more of these three aspects. It is the relative saliency of the three aspects that determines the effect of the consequence. Deci and Ryan (1985) described the following rules for how the three perceived aspects of a consequence will affect intrinsic motivation:

The informational aspect facilitates an internal perceived locus of causality and perceived competence, thus enhancing intrinsic motivation. The controlling aspect facilitates an external perceived locus of causality and perceived incompetence, thus decreasing intrinsic motivation. The amotivating aspect facilitates a perceived locus of causality that is neither internal nor external, thus having no effect on intrinsic motivation.

ceived locus of causality, thus undermining intrinsic motivation and promoting extrinsic compliance or defiance. The amotivating aspect facilitates perceived incompetence, thus undermining intrinsic motivation and promoting amotivation. (p. 64)

Deci and Ryan (1985) proposed that when tangible rewards are used to motivate people, the controlling or amotivating aspects of the reward are the most salient characteristics. Therefore, tangible rewards decrease intrinsic motivation by inducing a shift in perceived locus of causality from internal to external, promoting perceived incompetence, or both. In contrast, when praise is used to motivate people, the informational aspect of the reward is the most salient characteristic. Therefore, praise increases intrinsic motivation by facilitating an internal locus of causality and perceived competence.

EVIDENCE FOR THE CET PROPOSITIONS

Although a significant amount of research has been directed toward identifying the effects of different rewards on intrinsic motivation, the majority of studies did not include tests of the CET propositions. Of studies that included tests of the propositions, Vallerand and Reid (1984) reported some support for CET. They found that college students' perceived competence and intrinsic motivation were increased by positive feedback and decreased by negative feedback. Further, a path analysis suggested that the effects of feedback on the students' intrinsic motivation were mediated by perceived competence.

In a related study, Kruglanski, Alon, and Lewis (1972) found that tangible rewards decreased fifth grade children's intrinsic motivation for playing various games. The authors also attempted to measure whether or not children who received the rewards had an external locus of causality. They asked rewarded and nonrewarded children 1 week after the treatment session for their reasons for playing the games. Of the 36 rewarded children, only 2 mentioned the reward as their reason.

No children in the nonrewarded group mentioned the reward as their reason. The same children then were administered a forced-choice question with three possible answers as to why they played with the games: (a) because I like to compete, (b) because I wanted to win the prize, and (c) because I generally find group games interesting. Of the 36 rewarded children, 7 selected the second choice, whereas no children from the nonrewarded group did so. The difference between the number of rewarded and nonrewarded children who selected the second choice was significant with a χ^2 test, leading Kruglanski et al. to conclude that the tangible rewards caused external perceptions of causality that, in turn, decreased the children's intrinsic motivation for playing the games.

However, this conclusion has several limitations. For example, with respect to demonstrating that rewards decreased the children's intrinsic motivation, the study lacked baseline data and the results differed depending on which of several dependent variables were used to represent intrinsic motivation. Thus, it is unclear how the rewards actually changed the children's intrinsic motivation. Further, with respect to demonstrating that the reward caused an external locus of causality, the use of a χ^2 test was questionable because two of the four cells in their analysis contained expected frequencies less than five, with less than five categories (Lewis & Burke, 1949). In addition, even after forcing the rewarded children to pick one of three choices for participating in the experiment, only 7 of the 36 children selected the reward. However, rather than comparing this proportion to chance expectation, the authors compared it to the proportion of nonrewarded children that selected the reward as their reason for participating in the task. Given that the nonrewarded children never received or heard mention of a reward, it is not surprising that none of them selected the reward as their reason for participating in the task. The fact that

the authors used the nonrewarded children as the comparison, instead of chance expectation, significantly weakens their conclusion.

Whereas the results from only a few studies offer evidence in support of CET propositions, the results of other studies fail to support the theory. For example, researchers have found changes in intrinsic motivation without changes in perceived locus of causality or competence (e.g., Boal & Cummings, 1981; Farr, Vance, & McIntyre, 1977; Harackiewicz & Manderlink, 1984; Pinder, 1976; Shanab, Peterson, Dargahi, & Deroian, 1981; Smith & Pittman, 1978; Weiner & Mander, 1978). Conversely, Phillips and Lord (1980) found changes in perceived competence following the receipt of rewards, but no changes in intrinsic motivation. In addition, Salancik (1975) found that college students rewarded with money reported internal attributions of control.

Given the inconsistent findings, it appears that more research is needed on the CET propositions. However, it is unclear whether or not future research will be able to resolve conclusively the validity of the propositions. Consider the following example. After Smith and Pittman (1978) found that money decreased intrinsic motivation but obtained no evidence in support of the CET propositions from participants' self-report data, the authors reconciled the self-report data with CET predictions by suggesting that "subjects do not have conscious access to the processes that actually mediate their free-choice behavior" (p. 571). The notion that evidence of the CET propositions may be inaccessible to conscious awareness (and, therefore, inaccessible to verbal report) has received substantial consideration (e.g., Nisbett & Wilson, 1977; Wilson, Hull, & Johnson, 1981). Although this may be true, it renders it very difficult to reach conclusive answers regarding the validity of the propositions.

METHODOLOGICAL CONFOUNDING EFFECTS

Future research may provide more conclusive support for CET propositions, but it is also possible that the differential effects of tangible rewards and praise on intrinsic motivation are due to reasons other than those described in CET. More specifically, three variables that may have caused the different effects of tangible rewards and praise on intrinsic motivation have not been controlled in previous research: (a) temporal contiguity, (b) the number of reward administrations, and (c) discriminative stimuli associated with reward availability. These three variables are consistent with explanations based on principles of operant psychology for why tangible rewards and praise have had different effects on intrinsic motivation. (See the Appendix for a listing of methodological confounding effects associated with studies that have examined the effects of rewards on intrinsic motivation.)

Temporal Contiguity

Temporal contiguity, which refers to the interval between the occurrence of a target behavior and the delivery of a reward, is an important factor in determining the likelihood that a reward will increase the rate of a behavior. Specifically, research has demonstrated that rewards are more likely to increase the frequency of a target behavior the more closely they follow the behavior's occurrence (e.g., Rachlin & Greene, 1972; Reynolds, 1968; Skinner, 1938; Sulzer-Azaroff & Mayer, 1991; Thomas, 1981, 1983; B. A. Williams, 1976). Interestingly, temporal contiguity was not controlled in studies that examined the effects of rewards on intrinsic motivation.

Recall that the studies typically have involved two sessions: (a) a treatment session in which the experimental group was informed that performance of the target activity would be rewarded and the control group received no mention or payment of a reward, fol-

lowed by (b) a posttreatment session in which no rewards were available and participants were free to engage in the target activity or alternative activities. Participants' level of intrinsic motivation was assumed to be represented by their rate or duration of responding on the target activity during the posttreatment session.

Careful examination of the literature reveals that tangible rewards and praise were delivered differently in studies examining their effects on intrinsic motivation. Tangible rewards typically were delivered after the treatment session (e.g., Boal & Cummings, 1981; Danner & Lonky, 1981; McGraw & Fiala, 1982; Morgan, 1981, 1983; Ransen, 1980) or after the posttreatment session (e.g., Benware & Deci, 1975; Phillips & Lord, 1980; Rummel & Feinberg, 1990; B. W. Williams, 1980). In fact, several researchers did not deliver the rewards until weeks after the posttreatment session (e.g., Harackiewicz, 1979; Harackiewicz & Manderlink, 1984; McLoyd, 1979). For example, Harackiewicz (1979) concluded that contingent tangible rewards (two pens and a notebook) decreased high school students' intrinsic motivation despite not administering the rewards until 1 month after the posttreatment session was completed.

In contrast to the delivery of tangible rewards, praise was delivered during the treatment session, immediately following occurrences of the target behavior (e.g., Blanck et al., 1984; Danner & Lonky, 1981; Koestner et al., 1987; Rummel & Feinberg, 1990; Ryan, Mims, & Koestner, 1983; Vallerand & Reid, 1984). Thus, the different effects of the two types of rewards on intrinsic motivation may be due, in part, to differences in temporal contiguity. Specifically, because praise was delivered during the treatment sessions, immediately following occurrences of the target behavior, it may have been more likely to increase response rates (intrinsic motivation) than the tangible rewards.

Number of Reward Administrations

The number of times a reward is administered has also been demonstrated to influence the probability of a behavior's occurrence. Specifically, repeated administrations of rewards are more likely than a single reward administration to increase the frequency of a target behavior (e.g., Reynolds, 1968; Skinner, 1953; Sulzer-Azaroff & Mayer, 1991). As with temporal contiguity, the number of reward administrations has not been controlled in studies that examined the effects of rewards on intrinsic motivation. Researchers who used tangible rewards typically administered the reward only once (e.g., Boal & Cummings, 1981; Harackiewicz & Manderlink, 1984; Morgan, 1981, 1983; Rummel & Feinberg, 1990; Vallerand, Gauvin, & Halliwell, 1986). In contrast, researchers typically have administered praise multiple times (e.g., Blanck et al., 1984; Koestner et al., 1987; Rummel & Feinberg, 1990; Ryan et al., 1983; Vallerand & Reid, 1984).

Thus, in addition to temporal contiguity, the number of reward administrations may have contributed to the different effects of tangible rewards and praise on intrinsic motivation. Lending further support to the importance of these two variables is the observation that when tangible rewards have been administered during the treatment session in a temporally contiguous multiple-trial manner, they increased intrinsic motivation (e.g., Davidson & Bucher, 1978; Feingold & Mahoney, 1975; Jeffrey, 1974; Lopez, 1981; Reiss & Sushinsky, 1975, Experiment 2; Vasta, Andrews, McLaughlin, Stirpe, & Comfort, 1978; Vasta & Stirpe, 1979).

Discriminative Stimuli Associated with Reward Availability

In addition to temporal contiguity and the number of reward administrations, the presence of discriminative stimuli associated with reward availability is a third uncontrolled variable

in studies that have examined the effects of rewards on intrinsic motivation. To appreciate the potential importance of these stimuli, it will be necessary to further describe the methodology used to study the effects of rewards on intrinsic motivation.

As previously mentioned, researchers typically informed participants in the experimental group that performance of the target activity during the treatment session would be rewarded. However, it was crucial that participants not receive, or even expect to receive, a reward during the posttreatment session; otherwise, their behavior would be extrinsically motivated and would not reflect their level of intrinsic motivation (Deci & Ryan, 1985; Lepper & Greene, 1976). Therefore, to decrease the possibility of participants being extrinsically motivated during the posttreatment session, researchers specifically told rewarded participants after the treatment session that performance of the target activity would not be rewarded during the posttreatment session.

The significance of this methodological procedure has been validated empirically. As noted by Cameron and Pierce (1994), researchers have shown that only when rewards were expected (i.e., participants were informed regarding their availability) were they associated with decreases in intrinsic motivation (e.g., Greene & Lepper, 1974; Harackiewicz et al., 1984; Lepper, Greene, & Nisbett, 1973). In fact, Deci and Ryan (1985) modified CET to state that only expected rewards are likely to be perceived as controlling, amotivating, or both, thereby decreasing intrinsic motivation.

Close examination of the literature reveals that the presence of stimuli that signal reward availability has varied depending on the type of reward administered. As described above, researchers utilizing tangible rewards consistently told participants when performance of the target activity would, and would not, be rewarded (e.g., Butler, 1988; Crano & Sivacek, 1984;

Daniel & Esser, 1980; Fabes et al., 1988; Gomide & Ades, 1989; Wilson et al., 1981).

In addition to verbal discriminative stimuli, several researchers using tangible rewards conducted the treatment and posttreatment sessions in different rooms (e.g., Daniel & Esser, 1980; Greene & Lepper, 1974; Lepper & Greene, 1975; Lepper et al., 1973; Loveland & Olley, 1979; Margolis & Mynatt, 1986). Thus, rewarded participants had both verbal and contextual stimuli associated with reward availability.

In contrast, when praise was used as the reward, participants were not told prior to the treatment session that performance of the target activity would be rewarded. Moreover, they were not informed prior to the posttreatment session that performance of the target activity no longer would be rewarded (e.g., Blanck et al., 1984; Koestner et al., 1987; Ryan, 1982; Shanab et al., 1981; Zuckerman, Larrance, Porac, & Blanck, 1980).

Thus, a third alternative explanation for the different effects of the two types of rewards on intrinsic motivation is based on the fact that tangible rewards were associated with clear stimuli that signaled their availability. The presence of these stimuli most likely decreased the probability that performance of the target activity would generalize from the treatment to the posttreatment session. Conversely, praise was not associated with clear stimuli that signaled its availability. Therefore, there was an increased likelihood that performance of the target activity would generalize from the treatment to the posttreatment session (e.g., Skinner, 1953; Stokes & Osnes, 1989; Sulzer-Azaroff & Mayer, 1991). As noted by Sulzer-Azaroff and Mayer, "Indiscriminable contingencies promote generalization; clear, situation specific stimuli promote discrimination" (1991, p. 511).

In sum, the procedural inconsistencies regarding temporal contiguity, the number of reward administrations, and

the presence of stimuli associated with reward availability potentially confounded the effects of tangible rewards and praise on intrinsic motivation. All three variables provide explanations for the different effects of the two types of rewards on intrinsic motivation that are consistent with principles of operant psychology. Thus, the difference in the effects of the two types of rewards on intrinsic motivation may not be the result of some informational, controlling, or amotivating aspect inherent to the rewards, but instead to the manner in which the rewards were administered.

RELATIVE ADVANTAGES OF OPERANT VERSUS CET ACCOUNTS OF INTRINSIC MOTIVATION

Are there any advantages to interpreting the effects of different types of rewards on intrinsic motivation from an operant perspective? The answer may be yes. First, the operant explanations appear to be more parsimonious than the explanations based on CET. Specifically, each operant explanation is based on one primary variable: differences in reward delivery. In contrast, proponents of CET have developed several variables (e.g., perceived locus of causality; perceived competence; and controlling, amotivating, and informational aspects of consequences) to account for the effects of different rewards on intrinsic motivation. As a result, the operant explanations involve relatively more risk than explanations based on CET because there are fewer variables with which to reconcile potentially damaging findings.

Second, the operant explanations are more readily falsifiable than the explanations based on CET because the proposed variables can be subjected to experimental manipulation. In contrast, it is unclear how one might experimentally manipulate and observe the inferred variables proposed by social-cognitive researchers to account for

changes in observed behavior. As discussed earlier, several social-cognitive researchers have even suggested that the CET mechanisms may not be accessible to conscious awareness.

Third, the operant explanations are consistent with the principles followed by behavior therapists when implementing reward programs in applied settings. The same cannot be said of the explanations based on CET. For example, a behavior therapist would not deliver tangible rewards as they were administered in studies that demonstrated that the rewards decrease intrinsic motivation (i.e., a single administration, not contiguous with the target behavior, and with clear discriminative stimuli associated with reward availability). In fact, the differences between the social-cognitive paradigm and how rewards actually are administered in operant interventions call into question the external validity of the warnings against the use of tangible rewards in applied settings.

In addition to advantages based on parsimony, falsifiability, and external validity, the operant explanations do not depend on the ability to distinguish clearly between intrinsically and extrinsically motivated behavior. In contrast, the CET explanation depends on the ability to make such a distinction. However, making a distinction between intrinsically and extrinsically motivated behavior may prove to be a difficult task in many situations.

For example, social-cognitive researchers assumed that the behavior of control group participants in the studies currently reviewed was intrinsically motivated because no external consequences were present for engaging in the target activity (otherwise the behavior would have been extrinsically motivated). The behavior of participants in the experimental group during baseline and posttreatment sessions was also assumed to be intrinsically motivated for the same reason. However, it may be problematic to conclude that no external consequences were present for engaging in the target ac-

tivity at those times. Specifically, college students were the participants in the majority of these studies. Researchers typically reported that the students received credit toward their grade in introductory psychology for their participation in the study. Thus, is it accurate to conclude that the participants were ever intrinsically motivated, given that a relatively salient external consequence existed for participating in the studies?

Further, in many studies the response rates (intrinsic motivation) of control group participants changed significantly over the course of the treatment sessions despite the participants not having received any experimental manipulation that should have altered their level of intrinsic motivation (e.g., Anderson, Manoogian, & Reznick, 1976; Deci, 1971; Greene et al., 1976; Turnage & Muchinsky, 1976; B. W. Williams, 1980). Under such circumstances, changes in the behavior of control group participants raise serious questions regarding the construct of intrinsic motivation that remain to be addressed.

Another issue that needs further clarification is the distinction between intrinsic and extrinsic motivation and intrinsic and extrinsic rewards (not to overlook the confusion often found between the terms *reward* and *reinforcement*). In many instances it appears that an extrinsic reward refers to a reward that is external to an organism (e.g., praise and tangible rewards), whereas intrinsic rewards exist within an organism (e.g., a feeling of pleasure). Yet if this is the case, how is one to clearly distinguish between intrinsic motivation and rewards and between extrinsic motivation and rewards? And how would one study the effects of intrinsic rewards on intrinsic and extrinsic motivation? Until constructs are clearly defined conceptually and operationally, it will be difficult to evaluate the utility of the intrinsic-extrinsic distinction.

Given the shortcomings associated with the construct of intrinsic motiva-

tion as currently defined in CET, it may be beneficial to consider alternative conceptualizations of the construct. For example, Michael (1982, 1993, 1995) has described motivation from an operant perspective by distinguishing between unconditioned and conditioned establishing operations. Establishing operations are environmental events, operations, or stimulus conditions that affect organisms by momentarily altering the reinforcing effectiveness of other events (an establishing property) and the frequency of behavior relevant to those events (an evocative property). According to Michael (1993, p. 196), intrinsic motivation may best be conceptualized as a form of unconditioned reinforcement that is not related to any particular unconditioned establishing operation (i.e., perceptions of autonomy and self-determination may always function as effective forms of unconditioned reinforcement that are difficult to associate with any obvious establishing operation).

Intrinsically motivated behavior can also be interpreted in terms of Skinner's concept of generalized reinforcers (Skinner, 1953, pp. 77–81). For example, effective manipulation of the physical environment often precedes the delivery of a primary reinforcer. Manipulation of the physical environment may become a generalized reinforcer via its prior association with primary reinforcers. Then, as noted by Skinner, "We are automatically reinforced, apart from any particular deprivation, when we successfully control the physical world. This may explain our tendency to engage in skilled crafts, in artistic creation, and in such sports as bowling, billiards, and tennis" (p. 77).

CONCLUSION

The present review found little evidence to support Deci and Ryan's (1985) propositions to explain the effects of different rewards on intrinsic motivation. In addition, three variables were identified that were not controlled in previous research and that may have

caused the different effects of tangible rewards and praise on intrinsic motivation: temporal contiguity, the number of reward administrations, and stimuli associated with reward availability. Specifically, tangible rewards were delivered only once, after the treatment or posttreatment sessions, and participants were told precisely when rewards were available for performance of the target activity. In contrast, praise was delivered multiple times, immediately following the target behavior, and participants were not informed of its availability.

Thus, contrary to the claims of several social-cognitive theorists, explanations consistent with principles of operant psychology appear to exist for the differential effects of tangible rewards and praise on intrinsic motivation. The results of the present review suggest that the recommendations for the use of praise instead of tangible rewards in applied settings are premature.

Although the current review focused on temporal contiguity, frequency of reward delivery, and discriminative stimuli, other variables remain to be addressed in future research. For example, when rewards have been administered multiple times during a treatment session, the schedule of reward delivery has not been controlled. Thus, the possibility that posttreatment response deficits may partially be a function of the prior schedule (e.g., a postreinforcement pause) has not been considered. Likewise, the value of different rewards has rarely been controlled (for an exception, see B. W. Williams, 1980).

In addition to reward schedules and values, social-cognitive researchers rarely have considered the literature on behavioral contrast when interpreting their results. As noted by Flora (1990), effects of negative contrast may be similar to the effects of tangible rewards on intrinsic motivation: If behavior that has been on a relatively weak reinforcement schedule (the baseline session) receives a period of

more generous reinforcement (the treatment session), a return to the previous schedule (the posttreatment session) often produces a temporary response decrement below the initial response rate (see reviews by Rachlin, 1973; Reynolds, 1961; B. A. Williams, 1983). Identification of the conditions that produce contrast effects and that control the duration of the effects is an area of research that both social-cognitive and operant psychologists might find to be directly relevant to research on the effects of rewards on intrinsic motivation.

In sum, researchers and clinicians often find themselves attempting to identify the causes of a behavior. When environmental variables that maintain the behavior are not readily identifiable, many researchers have used the construct of intrinsic motivation to account for the behavior. However, as the present review demonstrated, choosing between an explanation based on intrinsic motivation versus one based on environmental variables is a decision that can lead to very different conclusions. Specifically, attributing changes in response rates to changes in intrinsic motivation has led many researchers to conclude that tangible rewards are to be avoided due to their effect on people's innate need for autonomy and self-determination. Interpreting the same response rates in terms of environmental factors, such as the frequency and delay of reward delivery, as well as stimulus control, leads one to conclude that tangible rewards are not to be avoided, but that attention must be paid to how they are administered.

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APPENDIX

Study	Reward type	When administered ^a	Number administered	Discriminative stimuli
Anderson et al. (1976)	award, money, or praise	award: AT money and praise: DT	money and praise: multiple award: 1	money and award: verbal and contextual praise: none
Arnold (1976)	money	AT	1	verbal
Benware and Deci (1975)	money	AP	1	verbal
Blanck et al. (1984)	praise	DT	multiple	none
Boal and Cummings (1981)	money	AT	1	verbal
Butler (1988)	grades	AT	2	verbal
Calder and Straw (1975)	money	AP	1	verbal
Chadwick and Day (1971)	tokens or praise	tokens and praise: DT	multiple	unclear
Crano and Sivacek (1984)	money	Study 1: never paid Study 2: BT AT	Study 1: none Study 2: 1	Studies 1 and 2: verbal
Daniel and Esser (1980)	money	AT	1	verbal and contextual
Danner and Lonky (1981)	award or praise	award: AT praise: DT	award: 1 praise: multiple	award: verbal and contextual praise: none
Davidson and Bucher (1978)	tokens	DT	multiple	verbal
Deci (1971)	money or praise	money: AT praise: DT	money and praise: multiple	money: verbal praise: none
Deci (1972a)	money	AT	1	verbal
Deci (1972b)	money or praise	money: AT or AP praise: DT	money: 1 praise: multiple	money: verbal praise: none
Fabes et al. (1988)	prize	AT	1	verbal
Fabes et al. (1989)	prize	AT	1	verbal
Fallon and Goetz (1975)	praise	DT	multiple	none
Farr (1976)	money	AT	1	verbal
Farr et al. (1977)	money	AP	1	verbal
Fazio (1981)	candy	AT	1	verbal
Feehan and Enzle (1991)	money	DT	multiple	verbal
Feingold and Mahoney (1975)	tokens	DT	multiple	verbal
Fisher (1978)	money	AP	1	verbal
Folger et al. (1978)	class credits	AP	1 or 3	verbal
Garbarino (1975)	prize	AT	1	verbal
Gomide and Ades (1989)	candy	AT	1	verbal
Greene and Lepper (1974)	award	AT	1	verbal and contextual
Greene et al. (1976)	tokens	DT	multiple	verbal
Hamner and Foster (1975)	money	AT	1	verbal
Harackiewicz (1979)	prize	AP	1	verbal
Harackiewicz and Manderlink (1984)	prize	AT	1	verbal
Harackiewicz et al. (1984)	prize	AT	1	verbal
Jeffrey (1974)	money	DT	multiple	verbal
Karniol and Ross (1977)	candy	AT	1	verbal
Kiesler and Sakumura (1966)	money	unclear	1	verbal
Koestner et al. (1987)	praise	DT	multiple	none
Kruglanski et al. (1972)	prize	AT	1	none
Kruglanski et al. (1971)	tour	AP	1	verbal
Kruglanski et al. (1975)	money	DT	multiple	none

APPENDIX

Continued

Study	Reward type	When administered ^a	Number administered	Discriminative stimuli
Lepper and Greene (1975)	play with toy	AT	1	verbal and contextual
Lepper et al. (1973)	award	AT	1	verbal and contextual
Leventhal and Fischer (1970)	praise	DT	multiple	none
Lopez (1981)	prize	DT	multiple	none
Loveland and Olley (1979)	award	AT	1	verbal and contextual
Luyten and Lens (1981)	money	DT	unclear	verbal
Margolis and Mynatt (1986)	money	DT	1	verbal and contextual
Martin (1977)	praise	DT	multiple	none
Mawhinney et al. (1989)	money	DT	multiple	verbal
McGraw and Fiala (1982)	money	AT	1	verbal
McGraw and McCullers (1979)	money	AT	multiple	verbal
McLoyd (1979)	prize	AP	1	verbal
Meddock et al. (1971)	praise	DT	multiple	none
Morgan (1981)	candy	AT	1	verbal
Morgan (1983)	candy	AT	1	verbal
Mynatt et al. (1978)	candy	DT	multiple	verbal
Orlick and Mosher (1978)	award	AT	1	verbal
Phillips and Lord (1980)	money	AP	2	verbal
Pinder (1976)	money	DT	multiple	verbal
Pittman et al. (1977)	money	AP	unclear	verbal
Pittman et al. (1980)	praise	DT and AT	2	none
Porac and Meindl (1982)	money	AP	1	verbal
Pritchard et al. (1977)	money	AT	1	verbal
Ransen (1980)	award	AT	1	verbal
Reiss and Sushinsky (1975)	play with doll or tokens	doll: AT tokens: DT	doll: 1 tokens: multiple	Study 1: verbal Study 2: verbal and contextual
Rosenfield et al. (1980)	money	AT	1	verbal
Ross (1975)	candy	AT	1	verbal
Ross et al. (1976)	candy	AT	1	verbal
Rummel and Feinberg (1990)	money and praise	money: AP praise: DT	money: 1 praise: multiple	money and praise: verbal
Ryan (1982)	praise	DT	3	none
Ryan et al. (1983)	money and praise	money: AP praise: DT	money: 1 praise: multiple	money and praise: verbal
Salancik (1975)	money	AP	1	verbal
Salili et al. (1976)	teacher evaluation	not administered	not administered	verbal
Sansone et al. (1989)	praise	DT	1	none
Sarafino and DiMattia (1978)	grades	not administered	not administered	verbal
Scott and Erskine (1980)	money	AP	1	none
Shanab et al. (1981)	verbal feedback	DT	multiple	none
Smith and Pittman (1978)	money	DT	multiple	verbal
Straw et al. (1980)	money	AT	1	verbal
Swann and Pittman (1977)	award	AT	1	verbal
Tripathi and Agarwal (1988)	prize	AP	1	verbal
Turnage and Muchinsky (1976)	extra credit or money	extra credit and money: AP	extra credit and money: 1	extra credit and money: verbal
Vallerand et al. (1986)	money	AT	1	verbal

APPENDIX

Continued

Study	Reward type	When administered ^a	Number administered	Discriminative stimuli
Vallerand and Reid (1984)	praise	DT	multiple	verbal
Vasta et al. (1978)	gold star and praise	gold star and praise: DT	gold star and praise: multiple	gold star and praise: unclear
Vasta and Stirpe (1979)	tokens	DT	multiple	verbal
Weinberg and Jackson (1979)	feedback and money	feedback and money: AT	feedback and money: 1	verbal
Weiner (1980)	tokens	AP	multiple	verbal
Weiner and Mander (1978)	money	AP	1	verbal
B. W. Williams (1980)	comic books	AP	1	verbal
Wilson et al. (1981)	money	AT	1	verbal
Zuckerman et al. (1980)	praise	AT	1	none

^a AT = after treatment; AP = after posttreatment; BT = before treatment; DT = during treatment.