

Extrinsic and Intrinsic Motivation at 30: Unresolved Scientific Issues

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The undermining effect of extrinsic reward on intrinsic motivation remains unproven. The key unresolved issues are construct invalidity (all four definitions are unproved and two are illogical); measurement unreliability (the free-choice measure requires unreliable, subjective judgments to infer intrinsic motivation); inadequate experimental controls (negative affect and novelty, not cognitive evaluation, may explain “undermining” effects); and biased metareviews (studies with possible floor effects excluded, but those with possible ceiling effects included). Perhaps the greatest error with the undermining theory, however, is that it does not adequately recognize the multifaceted nature of intrinsic motivation (Reiss, 2004a). Advice to limit the use of applied behavior analysis based on “hidden” undermining effects is ideologically inspired and is unsupported by credible scientific evidence.

Key words: intrinsic motivation, cognitive evaluation theory

Thirty years have passed since Reiss and Sushinsky (1975, 1976) raised scientific questions about the then newly reported undermining effect of extrinsic reward on intrinsic motivation. We argued that claims of undermining were premature. We questioned whether undermining effects were attribution phenomena or previously demonstrated negative effects of novel rewards, such as distraction, performance anxiety, frustrating delay, and so on. We suggested that greater attention needs to be paid to how rewards are used in undermining studies and to what behavior is actually rewarded. We specifically questioned the significance of undermining studies using only a single trial of reward. We also questioned the relevance of studies that provided reward contingent on time in activity regardless of what the person does with that time. We suggested that the usual symbolic effects of reinforcement, as commonly used in applied behavior analysis, are positive feedback, not cognitive reevaluation of intrinsic interest.

Scores of new studies have been published in the 30 years since Sush-

insky and I published our comments on undermining theory. Today, some scholars say that undermining is a proven phenomenon with practical implications for applied behavior analysis, education, sports, and labor practices (Kohn, 1993). Lepper and Henderlong (2000), for example, asserted that research unambiguously shows that intrinsic and extrinsic motivation can be in conflict. Deci, Ryan, and Koestner (2001) referred to the “pervasive negative effects of rewards on intrinsic motivation” (p. 43). I shall review the scientific status of these claims. I will evaluate the construct validity, measurement reliability, and experimental controls of the undermining research. I will cite an alternative, multifaceted theory of intrinsic motivation (Reiss, 2004a) that does not imply undermining effects.

THE FOUR DEFINITIONS OF INTRINSIC MOTIVATION

An initial step in scientific inquiry is to put forth a conceptually coherent theory and then show construct validity for the central ideas. Undermining theorists¹ have not accomplished this in

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¹ In this article, the phrase *undermining theorists* refers primarily to cognitive evaluation theorists (e.g., Deci, 1975; Deci & Ryan, 1985)

the study of intrinsic motivation. They have not proven construct validity (Reiss, 2004a; Reiss & Sushinsky, 1976). Instead, four definitions have been put forth, three of which are invalid; and the fourth (means–ends) does not predict undermining effects when applied validly. I shall consider all four definitions.

White (1959) put forth the competence motivation definition of intrinsic motivation. He sought to reverse the influence of Hull–Spence behaviorism by striking at Hull’s (1943) motivational construct of drive. Hull recognized four drives: hunger, thirst, sex, and escape from pain. White argued that Hull–Spence behaviorists were focused on too narrow a range of human motives. He reasserted the significance of the neo-Freudian (e.g., Erikson, 1950; Sullivan, 1953) “ego motives” such as competence, play, and curiosity.

White (1959) held that competence motivation is the common root of the neo-Freudian ego motives, but he presented no scientific evidence to support this hypothesis. White did not develop a measure of competence motivation, and he made no predictions. He acknowledged that his hypothesis is implausible because ego motives seem so diverse they may have no common property. Curiosity, self-determination, and play, for example, are very different motives that may have little or nothing in common.

Deci and Ryan’s (1985) cognitive evaluation theory draws heavily on White’s (1959) construct of competence motivation and, thus, has some of the same limitations. Their theory holds that people engage in intrinsically motivated behavior to feel competent and self-determining. Deci and Ryan presented no direct evidence that competence and autonomy give the neo-Freudian ego motives (now called intrinsic motives) their reinforcing

(motivating) properties. If Common Property A (competence) motivates both B (curiosity) and C (play), then the stronger Property A is (the more an individual values and is motivated by competence), the stronger should be Motives B (curiosity) and C (play). In other words, if people were motivated to learn and to play to feel competent and self-determining, as Deci and Ryan have argued, then individuals who place an above-average value on competence or self-determination also should show above-average intrinsic interest in learning and playing. Elsewhere I have reported evidence that these predictions of the competence motivation hypothesis are invalid (Reiss, 2000, 2004a). Although achievement-motivated people place above-average intrinsic value on feeling competent, they are not necessarily curious or playful people (Reiss, 2000, 2004a; Reiss & Havercamp, 1998). Although independent-minded people place above-average value on self-determination, they are not necessarily curious, playful, or achievement motivated (Reiss, 2000, 2004a, in press; Reiss & Havercamp, 1998). This suggests that people do not become intrinsically motivated (e.g., curious or playful) to experience competence and self-determination.

The second definition of intrinsic motivation, herein called the internal–external definition, can be viewed as a modern version of mind–body dualism. Plato (375 BCE/1966) distinguished between motives of the body, such as hunger and sex, and those of the mind and soul, such as curiosity and honor. Because the body is regrettably mortal but ideas are immortal, Plato considered intellectual motives metaphysically superior to biological survival needs. Plato also suggested that the needs of the body and mind can compete, as shown when his students’ interest in sex undermined their interest in philosophy. For centuries priests, monks, and even professors took vows of celibacy to keep their souls and

and to self-perception theorists (e.g., Lepper et al., 1973). Kohn (1993) and others cited these influential social-psychological works to call for limitations on the use of extrinsic rewards.

minds pure from undermining temptations.

Deci's (1975) distinction between intrinsic and extrinsic motivation and Plato's (375 BCE/1966) distinction between mind and body have a number of similarities. Both Deci and Plato classified motives similarly into mind-intrinsic and body-extrinsic categories. Both held that the motives of the body (extrinsic motives) can interfere with those of the mind (intrinsic motives). Both held that the motives of the mind (intrinsic motives) are superior to those of the body (extrinsic motives).

The internal-external definition states that the environment instigates extrinsic motivation, but internal factors instigate intrinsic motivation. Deprivation of food or water, for example, instigates the extrinsic motives of hunger and thirst (Deci, 1975); optimal arousal or cognition instigates the intrinsic motives of curiosity and self-determination (Condry & Stokker, 1992; Deci, 1975; Deci & Ryan, 1985). The following quotations are typical of how undermining theorists have expressed the internal-external hypothesis. Deci and Ryan (1985) wrote that intrinsic motives are "clearly . . . different from drives" (p. 17) because drives "involve a deficit or need in body tissues outside the nervous system" (p. 61). Deci (1975) wrote that "the primary effects [of intrinsically motivated behaviors] are in the tissues of the central nervous system rather than in the non-nervous system tissues" (p. 61). Deci also wrote that, "White, like Berlyne, asserted that the energy for intrinsically motivated behavior comes from the central nervous system, rather than from tissue needs" (p. 75). White (1959) asserted that intrinsic motives are not "visceral needs comparable to hunger, thirst, or sex" (p. 301). Greene and Lepper (1974) referred to extrinsic motivation as "consisting of whatever the body is obliged to do," whereas intrinsic motivation "consists of whatever the body is not obliged to do" (p. 49).

The internal-external hypothesis is a

neurophysiological theory put forth on the basis of anecdotal observations. Nobody has proven a neurophysiological distinction between intrinsic and extrinsic motivation. Although undermining theorists say that the environment does not instigate curiosity and self-determination, they overlook examples of how deprivation of novel stimuli instigates curiosity (exploring environments) and how tyranny instigates motivation for self-determination. Further, the idea that cognition does not instigate extrinsic motivation has been disputed by modern neuropsychology (see Berntson & Cacioppo, 2000, for one of many examples). As more has become known about the physiological basis of motivation, undermining theorists have stopped citing the internal-external definition.

Weiner (1995) put forth a third definition of intrinsic motivation, which I call the hedonistic definition. Under this analysis, people engage in behavior to experience enjoyment. When behavior is "inherently" enjoyable, intrinsic motivation is imputed. When the enjoyment of a behavior requires an incentive or reward, extrinsic motivation is imputed.

Logicians have refuted positions similar to Weiner's. For example, Russell (1945), the cofounder of formal logic and the scholar credited with elucidating the logical foundations of mathematics, argued that enjoyment is the consequence, not the motivating antecedent cause, of satiation (pp. 778-779). Because enjoyment occurs primarily when a psychological or biological "desire or need" is satiated, the behavior was already motivated by the desire or need before the enjoyment was anticipated. According to Russell, the logical sequence is as follows: (a) motivating need or desire (e.g., need for food, need for cognition), (b) anticipation of enjoyment at time of satiation of need (e.g., eating, learning), (c) performance of behavior aimed at satiating need, (d) satiation (goal attainment), (e) enjoyment. The sequence is not, as psychological hedonists such as

Weiner (1995) and Csikszentmihalyi (2000) have held, as follows: (a) stimulus signaling opportunity to engage in behavior, (b) anticipation of enjoyment on performance of behavior, (c) intrinsic motivation or energy, (d) performance of behavior, (e) enjoyment. Russell's view implies that the satiating goal of curiosity is knowledge, not pleasure; that the satiating goal of hunger is food, not pleasure; and that the satiating goal of honor is sound character, not pleasure. In contrast, Weiner's and Csikszentmihalyi's hedonistic definitions of intrinsic and extrinsic motivation imply no satiating goals.

Russell (1945) provided this analysis to explain why, as a matter of logic, enjoyment or pleasure is a consequence of satiating a desire, not what is desired: "When I am hungry, I desire food, and so long as my hunger persists food will give me pleasure. But the hunger, which is the desire, comes first; the pleasure is the consequence of the desire" (p. 779). Enjoyment cannot motivate much behavior because behavior is often not enjoyable unless it was already motivated by a desire, need, or setting condition. When a period of social isolation causes me to anticipate enjoyment when I visit friends, the period of social isolation (setting condition) causes the anticipation that socializing will be enjoyable. The enjoyment or motivation is not intrinsic to socializing. After a period of socializing, my "need" to socialize is satiated, and further socializing is burdensome.

If it were otherwise—if enjoyment were intrinsic to the behavior itself rather than a consequence of satiation of a motivating need or desire—then the mere performance of the behavior would be reinforcing. I submit that the concept of an inherently enjoyable behavior implies a self-reinforcing behavior. As seen in the example of self-stimulatory behaviors in autism, self-reinforcing behaviors are extremely repetitive and do not satiate easily (Carr, 1977). If intrinsic motives such as curiosity and play were self-pleasuring,

they would not satiate as quickly as they do.

Enjoyment is rarely intrinsic to behavior; rather, enjoyment almost always depends on the satiation of a desire, need, or motive of the individual. When I am well rested, for example, I desire exercise and I enjoy hiking; when I am tired, I desire rest and I dislike hiking. If hiking were intrinsically pleasurable and behavior were motivated by the anticipation of intrinsic pleasure, hiking would be self-reinforcing, and I would hike until I collapsed from exhaustion. When I am tired, I would want to experience the joy of hiking even more than when I am rested, because enjoyment or pleasure is more valuable to me when I am tired. Getting tired, then, would be a setting condition to hike more, making hiking insatiable. Because I stop hiking when I am tired, hiking must not possess intrinsic pleasures (self-reinforcing properties) that are automatically experienced on performance. In conclusion, intrinsic motivation is an invalid construct when defined as the pursuit of enjoyment.

Suppose I know that Mary has been working on a mindless task all day and that Bill has been isolated in a remote area for weeks. I can predict that Mary is motivated by the need or desire for cognition (read a book, converse, etc.) and that Bill is motivated by the need or desire to socialize. It adds nothing to say they are both motivated by the anticipation of enjoyment. The nature of the antecedent motive (curiosity, socializing) predicts and explains the behavior that is likely to occur, not the "anticipation of enjoyment." The same antecedent psychological need or desire that motivates participation in the behavior also motivates the anticipation of enjoyment at the time of satiation.

Greene and Lepper (1974) expressed a fourth definition of intrinsic motivation, herein called the means-ends definition. This definition holds that intrinsic motivation is doing what we want, whereas extrinsic motivation is

doing something to get something else. When a child plays stickball for fun, undermining theorists say that the child's playing is intrinsically motivated. When a professional baseball player takes the field for pay, however, undermining theorists say that the player's participation in baseball is extrinsically motivated.

Although means–ends analyses have been around since antiquity (Aristotle, 330 BCE/1953), undermining theorists have misidentified means and ends. When a child plays stickball, for example, the child's play is a means of satisfying the need for physical exercise. When a professional baseball player takes the field, the individual's play may be a means of raising a family and meeting their needs (“parenting” instinct). In these examples, playing ball is an instrumental goal (means) but for different ends. Undermining theorists have committed a significant error in logic in misidentifying a child's play as an Aristotelian end goal.

Consider the example of a high school tennis coach asking a student who plays tennis for exercise to try out for the school team; the aim is to win a championship trophy. According to the means–ends distinction (see, e.g., Aristotle, 330 BCE/1953), the trophy is a common means to the end of achievement or glory, and tennis is a common means to the end of muscle exercise or physical activity. When a tennis enthusiast plays for a championship trophy, we need to consider the motivating influences of two different needs or ends (needs for exercise and achievement), not as undermining theorists have held, the interaction of instrumental and end goals.

Conflicts among ends have been discussed since antiquity. Money, for example, is a common means of experiencing status (Reiss, 2004a). Reading a book is a common means of satisfying the need to think. When circumstances force us to choose between being knowledgeable (Do I become a scholar?) or gaining status (Instead, do I take a higher paying job in indus-

try?), we may experience competing interests. We might even reevaluate our interests. This is a conflict between one end (need for cognition) and another end (need for status or social standing), not a conflict between means and ends. It is about ranking reinforcements and setting priorities.

In conclusion, the hypothesis that means undermine or compete with ends is illogical. By definition, means facilitate ends. Because it is illogical to say that means interfere with that which they facilitate, means do not compete with ends. Doing one's duty is a common means for experiencing honor; doing one's duty does not compete with the pursuit of honor. Raising a family is a common means of satisfying the “parenting instinct” (McDougall, 1936/2003; Reiss, 2000); raising a family does not compete with the “parenting instinct.” Because means and ends do not compete, a valid means–ends analysis does not lend itself to the prediction of undermining effects.

CONSTRUCT VALIDITY

To evaluate the implications of the four definitions for construct validity, we will consider a list of eight reinforcements²: knowledge, play, autonomy, cooperation, sex, food, anxiety reduction, and competition. According to undermining theory, these eight reinforcements divide into two global categories, called intrinsic and extrinsic motivation. Undermining theorists say that knowledge, play, autonomy, and cooperation are intrinsically motivated reinforcements (IMs), whereas sex, food, anxiety reduction, and competition are extrinsically motivated reinforcements (EMs).

The central conceptual issue in undermining theory is to validate the classification of the eight reinforce-

² Reiss's (2004a) theory of motivation recognizes 16 fundamentally distinct categories of reinforcement. Here I consider only eight to shorten the argument; it is the same argument whether we assume 8, 10, 12, or 16 reinforcements.

TABLE 1

The four definitions of intrinsic and extrinsic motivation often confused as one definition

Definition	Hypothesis	Shortcomings
Competence motivation	Competence is the common root of neo-Freudian ego motives (e.g., curiosity, play) but not biological survival needs (drives).	<ol style="list-style-type: none"> 1. No direct evidence to support hypothesis. 2. Implausible. 3. Overlooks individual differences: Competent people are not necessarily curious and vice versa.
Internal-external	Environmental factors (e.g., deprivation of food or water) instigate extrinsic motivation, whereas internal factors (e.g., cognition, optimal arousal) instigate intrinsic motivation.	<ol style="list-style-type: none"> 1. No direct scientific evidence supporting hypothesis. 2. External factors (absence of stimulus novelty, tyranny) can instigate intrinsic motives (e.g., curiosity and self-determination). 3. Internal factors (cognition) can instigate extrinsic motives (hunger, pain avoidance).
Hedonism	Intrinsic motivation, but not extrinsic motivation, is inherently pleasurable.	<ol style="list-style-type: none"> 1. No direct scientific evidence supporting hypothesis. 2. Same formal error in logic as those made since antiquity by philosophical hedonists. 3. Does not handle well the phenomenon of satiation.
Means-ends	Extrinsic rewards are motivating because they produce something else; intrinsic behaviors are motivating as ends in themselves.	<ol style="list-style-type: none"> 1. Misapplied in undermining theory; reading is a common means for learning, not an end in itself. 2. Logically, means facilitate ends and, thus, do not compete with them.

ments into intrinsic versus extrinsic categories. Why are knowledge, play, autonomy, and cooperation considered to be intrinsic motives? Why are sex, food, anxiety reduction, and competition considered to be extrinsic motives? What criteria are used to group reinforcements in this manner, and what evidence supports the construct validity of these criteria? What are the essential differences between intrinsic and extrinsic reinforcements?

As shown in Table 1, undermining theorists have put forth four criteria for dividing our list of eight reinforcements into two global categories of IMs and EMs, but each fails to do so.

1. The competence motivation hy-

pothesis asserts that IMs, but not EMs, are motivated by a need for competence. There is no credible scientific evidence that competence is a valid criterion for dividing our list of eight reinforcements into IM and EM categories. Why is play about competence and sex is not? I have met people who take as much pride in how competent they are at sex as they take in how competent they are at play activities.

2. The internal-external definition does not divide our list of eight reinforcements into intrinsic and extrinsic motives. The environment can instigate curiosity, for example, and internal cognitions can instigate hunger or pain or anxiety.

TABLE 2

Reliability of measures of intrinsic motivation

Measure	Status ^a
Free-choice measure	Reliability of choices is not demonstrated. Requires subjective inferences. Reliability of inferences is not demonstrated.
Self-report measure	Usually only one or two questions. Reliability not demonstrated. Factorial validity not demonstrated.

^a Lack of covariance is another significant shortcoming.

3. The hedonistic definition holds that IMs are motivated by expectations of enjoyment intrinsic to the activity, whereas EMs are motivated by expectations of enjoyment extrinsic to the activity. There is no credible scientific evidence that expectations of enjoyment play different motivational roles in IMs versus EMs.

4. A means–ends analysis does not work because each of the eight reinforcements is an end that can be sought for its own sake.

I suggest that these eight reinforcements (knowledge, play, autonomy, cooperation, sex, food, anxiety reduction, and competition) do not divide into two categories that can be called IM ego motives and EM drives. Instead, they represent eight different reinforcements, not two. In fact, Reiss (2004a, 2004b, 2004c) has suggested 16 different categories of motivation, but the exact number is not important here. The important point is that motivation is fundamentally multifaceted and cannot be reduced to just two sources (Haverkamp & Reiss, 2003; Reiss, 2004a; Reiss & Haverkamp, 1998). Pleasures differ in kind and are fundamentally multifaceted. Undermining theory is based on the invalid assumption of a unitary theory of pleasure common to IMs. Weiner (1995) mistakenly defined intrinsic motivation as engaging in behavior out of expectation of pleasure, when he should have said that people engage in intrinsic motives out of expectations of pleasures. None of the four definitions of intrinsic

and extrinsic motivation works, because we cannot validly squeeze 8 or 10 or 16 fundamentally different reinforcements into just two categories (Reiss & Haverkamp, 1998).

When debating these issues, we must be careful to focus on one definition at a time. We do not want to unwittingly defend the shortcomings of one of the definitions by changing our focus to a different definition. Each definition should be evaluated for construct validity on its own merit.

MEASUREMENT ISSUES

In addition to the conceptual issues just discussed, the measurement issues shown in Table 2 need to be addressed. Undermining theorists use a free-choice measure that requires inferences to interpret intrinsic versus extrinsic motivation. The measure has been used most often in a two-phase study. In Phase 1, the subjects engage in an intrinsically interesting activity under conditions of expected reward, unexpected reward, or no reward, depending on their random group assignment. In Phase 2, researchers observe whether or not the subject freely chooses to engage in the rewarded activity. If he or she does, undermining theorists then examine the circumstances of the choice to infer if the subject persisted in the target behavior because of extrinsic motivation (expectation of reward) or intrinsic motivation (no expectation of reward). An undermining effect is interpreted when expected-re-

ward subjects show less posttest interest in the target behavior than do subjects in the control conditions, provided the expected-reward participants are judged to be no longer expecting reward (Lepper, Greene, & Nisbett, 1973; Lepper, Henderlong, & Gingras, 1999). Many studies that did not find undermining effects were dismissed on the grounds that the extrinsic motivation manipulated in the experimental phase might have persisted into the free-choice posttest, so that some free-choice behavior might be a reflection of extrinsic rather than intrinsic motivation (e.g., Lepper & Greene, 1976). Unfortunately, the only way to know this for sure is to read the minds of the subjects to learn what their expectations were.

In undermining theory, the process of inferring expectations in children and adults is almost always poorly tied to objective indicators. Reiss and Sushinsky (1975), for example, used "extrinsic" reinforcement to teach young schoolchildren to listen to an experimental song. When the children were posttested 2 days later in a different room with different people—the objective criteria Lepper et al. (1973) stated were needed for inferring that posttest behavior is intrinsically motivated—the children listened to the previously rewarded song and, thus, showed an enhancement effect of reward rather than an undermining effect. Lepper and Greene (1976), however, asserted that the real reason the children listened to the previously rewarded song during posttesting was because they expected to be rewarded, not because the reward had increased intrinsic interest in the music itself.

Reiss and Sushinsky (1976) argued that without independent measures of expectation, the free-choice measure of intrinsic motivation permitted a mind-reading game. When children engage in the target behavior during no-reward posttesting, undermining theorists say the children are doing so out of expectation of reward. This, they say, is enhanced extrinsic motivation and is not

a disconfirmation of undermining theory. When the children do not engage in the target behavior during posttesting, undermining theorists say the children are showing decreased intrinsic motivation, which supports undermining theory. Whatever the children do, undermining theory is arguably supported or not disconfirmed. Based on this logic, scores of studies that have shown null results, or enhancement effect studies, were considered to be irrelevant to undermining theory (e.g., Lepper & Greene, 1976; Lepper et al., 1999).

Reiss and Sushinsky (1976) published a table (p. 237) that showed the procedures of three experiments on undermining effects. The table provided evidence that Lepper and Greene's (1976) inferences of expectations of reward during free-choice posttesting were based on the outcome of the study, not the procedure. When the results of the study showed an undermining effect, undermining theorists concluded that the study was relevant because the participants did not expect to be rewarded during the posttest. When the results of the study showed no undermining effect, undermining theorists concluded post hoc that the study was irrelevant because the subjects expected to be rewarded during the posttest (e.g., Lepper & Greene; Lepper et al., 1999).

The free-choice posttest requires the prior development of a valid measure of whether individuals expect to be rewarded or do not expect to be rewarded. No measure of expectation has been developed, which calls into question the scientific underpinnings of large portions of the undermining literature.

Unfortunately, subjectivity and "halo" inferences are not the only significant problems with free-choice posttests of intrinsic motivation. The reliability of observations of free choice is in question regardless of whether or not reward is expected. Because almost all undermining studies are only one or a few sessions in

length, undermining theorists do not follow the practice of establishing a baseline over a period of sessions to show reliability of measurement. As behavior analysts have shown, until one has a stable baseline, one does not know if one has a reliable set of observations.

Another problem with undermining theory concerns self-report measures of intrinsic motivation. These measures basically ask people how much they like an activity. In many studies, undermining theorists asked only one or two makeshift questions ("Do you like X?"); the questions had unknown psychometric properties. No psychometrically sound self-report measure of intrinsic motivation is widely used, suggesting that the problem has yet to be solved.

Usually a variety of different measures of the same process are developed to show convergence of results. This has not been done for undermining theory. Both free-choice and self-report measures have been used, but these measures often produce different results when used in the same experiment (Deci, Koestner, & Ryan, 1999; Eisenberger, Pierce, & Cameron, 1999).

To overcome the measurement problems summarized in Table 2, Deci et al. (1999) advised that we limit our interest to those studies in which the results of both free-choice and self-report measures are in agreement. The suggested remedy, however, is invalid. If one clock is advancing 3 hr wrong and another is advancing 6 hr wrong, the clocks are not more valid at the moments when they agree on what time it is. Undermining theorists need to develop multiple, reliable, and valid measures. Although divergent results on different measures of the same process are not uncommon in science, this is usually regarded as a basis for doubting the validity of the underlying theory or phenomenon.

EXPERIMENTAL CONTROLS

By definition, undermining effects are thought to result from cognitive at-

tribution or evaluation processes (Lepper et al., 1973). We can demonstrate undermining effects, therefore, only in studies with no possibility of arousal of negative affect. Only when rewards arouse no negative affect can we conclude with confidence that any loss of interest in the target behavior occurred, not because of Pavlovian association of behavior and negative affect, but rather because the subjects reevaluated their interest in the target behavior or activity.

Self-perception theorists have underestimated the potential for negative affect to occur when rewards are given for high-interest activities. They reasoned that because people like rewards, receiving them for something one would have done anyway is a matter of adding the fun of the reward to the fun of an intrinsically motivated target behavior (Nisbett & Valins, 1971). When fun is added to fun, they reasoned, no negative affect is aroused. Any negative consequence of rewarding an intrinsically interesting activity, therefore, cannot be a result of Pavlovian association of behavior and negative affect. Believing they excluded the possibility of Pavlovian association of negative affect, undermining theorists argued that cognitive evaluation theory should be accepted because it is the only possibility left standing (Lepper et al., 1973).

Reiss and Sushinsky (1976) disputed the analysis that extrinsic reward for intrinsically motivated activity cannot arouse negative affect. We noted that rewards can produce negative affect associated with "performance anxiety, frustrative delay of reward, embarrassment or guilt if reward is perceived as socially inappropriate, hurried rates of performance (subject rushing to finish in order to receive reward as soon as possible), and visual or cognitive distraction" (p. 235). We suggested that aversive Pavlovian conditioning provides an alternative explanation of the undermining effects that had been published prior to 1976 (the date of our article). Thus, the conclusion that the

undermining paradigm is necessarily a matter of adding fun to fun is invalid.

Reiss and Sushinsky (1975, 1976) advised that the use of multiple trials of reward, coupled with the demonstration of learning effects, might minimize most known negative effects of reward. A number of studies using multiple trials of reward produced findings of null effects regarding undermining effects (e.g., Feingold & Mahoney, 1975). Because almost all studies that have shown undermining effects have used only one or a few trials of reward, the undermining literature has lacked the scientifically required experimental controls that are necessary to demonstrate undermining effects.

Smith and Pittman (1978) addressed the issue of experimental controls in a study that varied both the number of trials of reward and the presence versus absence of additional distraction. Compared with a no-reward control condition, the subjects in the distraction condition showed an undermining effect, as was suggested by Reiss and Sushinsky (1975, 1976). The magnitude of the distraction-induced undermining effect declined with additional multiple trials of reward. In comparison, the group who performed the experimental task for money showed an undermining effect at both 10 and 50 trials of reward. Smith and Pittman interpreted these results as showing that distraction can produce undermining effects over 10 trials but not 50. They also argued that, having eliminated distraction as the cause of undermining at 50 trials of reward, cognitive evaluation theory is the only plausible explanation left standing for the undermining effect at 50 trials.

Because the Smith and Pittman (1978) study showed that the first 10 trials of extrinsic reward might produce undermining effects caused by distraction, and because Reiss and Sushinsky (1975) also showed distraction effects, undermining studies with fewer than 10 trials of reward should control for distraction. Undermining

effects observed in studies with a single trial of reward may be distraction effects that have nothing to do with cognitive evaluation. Many of the so-called undermining effects in the social-psychological literature may be demonstrations that people do not like to be distracted.

The Smith and Pittman (1978) finding of undermining after 50 trials in the no-distraction reward condition is subject to reinterpretation. The rewarded subjects consistently earned the lowest possible amount of reward on a task on which amount of reward was an indicator of quality of performance. In this experiment, then, the reward may have provided negative feedback because it symbolized low-quality performance. The procedure was a little like grading a student with a passing D or C- in 50 courses in a row, claiming the student received 50 positive rewards (passing grades), and then arguing that cognitive evaluation theory is the only plausible explanation for why the student lost interest in school. This analysis, of course, overlooks the apparent possibility that the student might have been discouraged by the low grades even though they were passing grades.

The Smith and Pittman (1978) study, therefore, demonstrated that undermining effects can be produced by distraction and perhaps by symbolic negative feedback. Undermining theorists need to control for such effects in order to claim scientific evidence that any particular undermining effect was produced by reevaluation of interest from intrinsic to extrinsic sources. Because undermining theorists have not embraced such controls, they may have unwittingly confused distraction effects for undermining effects.

After the publication of the Smith and Pittman (1978) study, undermining theorists continued to study the effects of novel rewards rather than multiple trials of reward, even though both Reiss and Sushinsky (1975) and Smith and Pittman showed distraction effects. Even if Smith and Pittman had demonstrated a valid undermining effect in

the 50-trial reward condition—and had eliminated the possibility that symbolic negative feedback played a role—subsequent studies that used only one or two trials of reward still would have needed to control for distraction.

Undermining theorists need to control for the arousal of negative affect and other negative effects of reward (e.g., distraction). Undermining theorists need to control for *all* such effects in the *same* experiment; otherwise, any negative effects they show may be the result of Pavlovian associations and not cognitive evaluation. It is insufficient to control for distraction in a study that leaves performance anxiety uncontrolled, or to control for performance anxiety in a study that leaves distraction uncontrolled. As Reiss and Sushinsky (1976) observed, “it is possible to control for the arousal of any one competing response (e.g., frustration) and still produce the [undermining] effect by arousing some other competing response (e.g., performance anxiety)” (p. 240).

METAREVIEWS

Reiss and Sushinsky (1975, 1976) noted that rewards have significant positive or negative effects depending on how they are used. About 25 to 30 years later, both Akin-Little, Eckert, Lovett, and Little (2004) and Eisenberger et al. (1999) reviewed literature on undermining effects and reached similar conclusions. Eisenberger et al., for example, concluded that

Reward for meeting vague performance standards reduced the subsequent choice to carry out the task and did not affect self-reported interest. Reward for meeting absolute performance did not affect free choice but increased self-reported interest. Reward for exceeding others increased both free choice and self-reported interest. Applied studies commonly found positive or null relationships between reward and intrinsic motivation. (p. 677)

Undermining theorists responded to Eisenberger et al.’s metareview much like they had responded to Reiss and Sushinsky’s research 25 years earlier: They argued that studies showing no

undermining effects have methodological shortcomings. They went from dismissing their early critics as “operant partisans” (Greene, 1974, p. 10) to calling their new ones “overly simplistic” investigators who lack nuance (Lepper, Keavney, & Drake, 1996, p. 5). They sought higher methodological standards for studies that did not show undermining effects than for those that did not. As an example, Deci et al. (1999) asserted that metareviews should include only studies with initially high-interest activities, because of the possibility of floor effects with activities of initially low interest. Deci et al. did not realize that potential ceiling effects could be misinterpreted as undermining effects when half the participants in an experiment randomly experienced increased interest and the other half randomly experienced decreased interest. If we exclude studies that may have been biased by floor effects, as Deci et al. suggested, we also should exclude studies that may have been biased by ceiling effects. Reiss and Sushinsky’s (1975) Experiment 2 was among the few studies in this literature in which the methods successfully avoided both ceiling and floor effects. As noted already, the results of this experiment showed an enhancement effect.

Undermining theorists reject data against their viewpoint for a variety of questionable reasons, and they have been doing this for 30 years (e.g., Lepper et al., 1999). Because undermining theorists have excluded from metareviews all studies they say did not properly control for expectations during posttesting (e.g., Deci et al., 1999), consistency would demand us to disregard all studies that did not control for distraction and other noncognitive negative effects of reward. If all questionable data were excluded, few studies will be left for a metareview.

From the standpoint of Bem’s (1967) self-perception theory, metareviewers should not disregard studies based on the initial level of interest in the target behavior. Self-perception theory holds

that salient extrinsic reward undermines intrinsic interest in target behavior whenever a person engages in the behavior to be rewarded. The individual is predicted to reason that because reward is required to motivate him or her to perform the behavior, the behavior must be of little intrinsic interest. The theory makes the same prediction, for the same reasons, whether the initial level of interest is low, medium, or high, even though the term *overjustification* applies only to situations in which the initial level of interest is high. If self-perception theory is taken as a guide, Deci et al. (1999) erred in arguing that metareviews should be focused only on studies with initially high interest.

The metareviews were flawed because they evaluated single-trial reward studies. In real life, many extrinsic rewards are given over multiple trials. The child who is extrinsically motivated by grades, for example, will receive many grades over the course of his or her academic career. The college athlete competes weekly or more; the professional athlete is paid 12 to 52 times each year. Because we know that single-trial rewards often do not have the same effects as when the same rewards are given repeatedly over a significant period of time (Reiss & Sushinsky, 1975; Smith & Pittman, 1978), Deci and Ryan (1985) and Kohn (1993) made a leap in reasoning when they implied that the results of single-trial reward studies have practical implications for education and athletics.

Reiss and Sushinsky (1975, 1976) repeatedly criticized the use of single-trial reward procedures to demonstrate undermining. We wrote, "Recent criticisms that token economies undermine intrinsic interest were based on a failure to appreciate differences between single-trial, non-contingent reward and multiple-trial, contingent reinforcement procedures" (1975, p. 1116). We made it clear that our criticisms were not directed at an attempt to study cognitive processes but rather at the single-trial reward paradigm.

Our concern was that distraction and novelty effects are stronger when only a few trials of reward are given.

FUTURE DIRECTIONS

The typical undermining experiment has too many important uncontrolled variables for the paradigm to be profitable in future scientific work. Nothing consistent should be expected with so much going on at once. Important variables include individual differences, different rewards, different activities, different motives or needs, intensity of reward, intensity of interest in the target behavior, measurement, and details of the reward procedure, including number of trials of reward and reward contingency. Uncontrolled variables typically include distraction, performance anxiety, negative feedback on quality of performance, and frustration. It may be impossible to draw firm conclusions from a literature with so many poorly controlled variables and so many conflicting and inconsistent results.

Future researchers should abandon the indirect approach of making the case for undermining theory by attacking alternatives rather than showing direct evidence for the hypothesis at hand. How much more persuasive would be the case for undermining theory if significant numbers of participants in these studies had said, "That reward really got me to rethink things. I now realize I don't like puzzles as much as I used to." How interesting it is that almost nobody participating in these studies actually said they reevaluated their interest in the target behavior. Perhaps this is because they did not reevaluate their interest in the target behavior.

Instead of studying intrinsic and extrinsic rewards, we might more profitably study questions such as these. How many primary reinforcements are there? Which fundamental pursuits are interconnected and in what ways? How many genetically distinct categories of reinforcement become functionally re-

lated to behavior? What are the connections between individual differences in motivation (or reinforcement preferences) and “personality” (or individual differences in habits)? What is the role of values in the reinforcement process?

Research on these questions is proving to be exciting and profitable, but it requires a systematic approach in which each scientific step is secured before moving on to the next one. In studying our multifaceted theory of intrinsic motives (see Reiss, 2004a), we spent the first 5 years proving construct validity and the first 8 years developing valid measures. Thus far, we have shown construct validity for 16 different fundamental (end) motives (or categories of primary reinforcement). We have speculated that these different motives are genetically distinct. We think all 16 basic motives are seen in all adults and many animals but sometimes not in children, but we do not know why motivation seems to be so different in children. Competence motivation and autonomy fall under two of the 16 fundamental motives on our list (Reiss & Havercamp, 1998). Competence motivation is highly correlated with willful behaviors and traits, whereas autonomy is correlated with individuality and perhaps not being a team player (Havercamp & Reiss, 2003; Reiss, 2004a, 2004b, 2004c; Reiss & Havercamp, 1998). We have begun to show practical implications in diverse areas of psychology such as media psychology (Reiss, 2004c), sports psychology (Reiss, Wiltz, & Sherman, 2001), romantic relationships (Engel, Olson, & Patrick, 2002), and mental retardation and developmental disabilities (Lecavlier & Tasse, 2002; Wiltz & Reiss, 2003). We invite those frustrated with their lack of progress in studying undermining to study our multifaceted model of intrinsic reinforcement.

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