Psychological Bulletin
1999, Vol. 125, No. 6, 692–700

0033-2909/99/$3.00

The Undermining Effect Is a Reality After All—Extrinsic Rewards, Task Interest, and Self-Determination: Reply to Eisenberger, Pierce, and Cameron (1999) and Lepper, Henderlong, and Gingras (1999)

Edward L. Deci
University of Rochester

Richard Koestner
McGill University

Richard M. Ryan
University of Rochester

In their commentaries, M. R. Lepper, J. Henderlong, and I. Gingras (1999) rightly stressed various pitfalls in using meta-analysis and R. Eisenberger, W. D. Pierce, and J. Cameron (1999) rescinded or failed to defend many of their earlier claims, instead presenting 2 new meta-analyses said to discredit cognitive evaluation theory (CET). The 1st, concerning reward effects on self-determination, is invalid because they confused locus of control with locus of causality, and the 2nd, concerning performance-contingent rewards, is flawed in ways similar to their 3 previous meta-analyses. Their only new reliable finding, based on 6 studies, is that if people are told their performance will be evaluated by high standards, they are less intrinsically motivated when they do not get rewards than when they do. This article discusses conceptual and methodological issues, concluding that CET remains the best supported and most comprehensive theory of reward effects on intrinsic motivation.

The two commentaries on our article (Deci, Koestner, & Ryan, 1999) present very different perspectives. In one, Lepper, Henderlong, and Gingras (1999) argued that using meta-analyses to synthesize theoretically complex literatures, such as the intrinsic motivation literature, is subject to various methodological problems and is thus questionable. Perhaps their most important point is that researchers, intent on examining theoretical underpinnings of interesting phenomena, often design experiments intended to yield interactions that, unless there are several such studies, cannot be disaggregated in meta-analyses. Typically, meta-analytic researchers collapse across such conditions, which can result in a misleading picture. We agree with this and similar points made by Lepper et al., but we believe that narrative reviews of complex literatures are also vulnerable to missing nuanced complexities. Thus, the important point is not so much that the use of meta-analysis is questionable but that people must exercise great care when performing a meta-analysis. We attempted to do that in ours, although we recognize that there were several cases, most of which we noted in the text, where we collapsed across moderator variables and could not pull them apart meta-analytically because of the small number of studies that had examined the relevant moderator.

In the other commentary, Eisenberger, Pierce, and Cameron (1999) presented two new meta-analyses intended to refute some of our conclusions (Deci, Koestner, & Ryan, 1999) and outlined a new theory to integrate the literature on rewards and intrinsic motivation. In their commentary, Eisenberger et al. implicitly retracted many of their earlier claims, acknowledging some of their earlier errors and granting that completion-contingent rewards do undermine intrinsic motivation, and abandoned the implausible helplessness interpretation of reward effects that had been suggested by Overmier (personal communication cited in Eisenberger & Cameron, 1996, p. 1156) and formed a central element in Eisenberger and Cameron's argument.

Eisenberger et al. (1999) greatly narrowed their focus to argue only about performance-contingent rewards. They concluded that when performance-contingent rewards are given for beating others, they enhance intrinsic motivation and that rewards enhance rather than undermine perceived self-determination. Unfortunately, both meta-analyses were characterized by the same types of problems, as pointed out by Lepper et al. (1999), that had made their three earlier meta-analyses inaccurate reflections of the literature. These included collapsing across conditions with different meanings and misclassifying studies in terms of contingency categories. Furthermore, their post hoc general interest theory turns out not to provide a satisfactory account of findings in this field.

Because we are to a large extent in agreement with Lepper et al.'s (1999) comments, most of our response addresses issues raised by Eisenberger et al. (1999). The comments are organized into seven sections. The first concerns the fact that Eisenberger et

Edward L. Deci and Richard M. Ryan, Department of Clinical and Social Sciences in Psychology, University of Rochester; Richard Koestner, Department of Psychology, McGill University, Montreal, Quebec, Canada.

This work was supported by research grants from the National Institute of Mental Health (MH-53385) and the Social Science and Humanities Research Council of Canada.

Correspondence concerning this article should be addressed to Edward L. Deci, Department of Clinical and Social Sciences in Psychology, University of Rochester, Rochester, New York 14627. Electronic mail may be sent to deci@psych.rochester.edu.

al. misportrayed cognitive evaluation theory (CET), made several claims about the theory that are wrong, and disregarded results and discussions in our article (Deci et al., 1999) that are contrary to their claims. In the second section, we discuss the concept of self-determination, pointing out that Eisenberger et al. confused self-determination (i.e., locus of causality) with locus of control, so their meta-analysis that purports to examine reward effects on self-determination (Eisenberger et al., 1999, Table 1) is actually irrelevant to reward effects on self-determination.

In the third section, we comment on Eisenberger et al.'s (1999) general interest theory, and in the fourth section, we discuss organismic integration theory (OIT; Deci & Ryan, 1985), which we had omitted from our article (Deci et al., 1999) for the sake of space but briefly discuss here because of Eisenberger et al.'s persistently inaccurate account of our position on task interest, rewards, and autonomy. The fifth section deals with Eisenberger et al.'s new meta-analysis of performance-contingent rewards and the implications of their advocating rewards for beating the performance of others. The sixth section addresses the application of this work to real-world situations, and in the seventh, we discuss some difficulties in doing meta-analyses of this sort, returning to themes addressed by Lepper et al. (1999).

CET: What It Really Proposes

One of the most puzzling aspects of the Eisenberger et al. (1999) commentary is that they seem to have been very selective in reading our article, overlooking major sections of it and ignoring important aspects of CET that we repeatedly emphasized. Consequently, continuing a trend from their earlier articles (Cameron & Pierce, 1994; Eisenberger & Cameron, 1996), they misportrayed CET and, in the process, confused empirical findings with theoretical propositions.

The following three quotes from the Eisenberger et al. (1999) commentary illustrate how they misrepresented our article and theory: "cognitive evaluation theory's view of tangible reward as having only decremental effects on intrinsic motivation. . ." (p. 686), "Cognitive evaluation theory's presumption that reward has no effect on the motivation to be competent or on perceived competence. . ." (p. 678), and "In contrast to Deci et al.s (1999) review, we argue here that . . . reward can decrease, have no effect, or increase intrinsic motivation" (p. 677).

From our earliest studies of reward effects (Deci, 1971, 1972a, 1972b) through our more recent studies aimed at differentiating reward contingencies (Ryan, Mims, & Koestner, 1983), we have predicted and found negative, neutral, and positive effects of rewards. And from the earliest formal statements of CET (Deci, 1975; Deci & Ryan, 1980), we have emphasized that the informational aspect of rewards (even expected tangible rewards) can enhance intrinsic motivation by enhancing perceived competence. Thus, CET has never viewed tangible rewards as having "only decremental effects" and we have been very specific in proposing and demonstrating that rewards can enhance intrinsic motivation by increasing perceived competence (Ryan et al., 1983). Accordingly, Eisenberger et al.'s (1999) statement that rewards "can decrease, have no effect, or increase intrinsic motivation" (p. 677) is simply an echoing of statements we have made many times over the past 25 years, including in our meta-analysis article.

It is particularly noteworthy that a supplemental meta-analysis summarized in Table 9 of our article (Deci et al., 1999) highlighted the differential impact of informational versus controlling verbal rewards, and the accompanying text presented the results of a study of informational versus controlling performance-contingent rewards (Ryan et al., 1983), with informational, relative to controlling, tangible rewards enhancing intrinsic motivation; however, this was overlooked by Eisenberger et al. (1999).

Our statements in the article about expected, tangible, contingent rewards being detrimental were not, as Eisenberger et al. (1999) suggested "presumption" (p. 678) but instead were straightforward summaries of the meta-analytic results. We reported that the meta-analysis showed evidence of undermining by engagement-contingent, completion-contingent, and performance-contingent rewards, with the evidence for engagement contingent and completion contingent being stronger than for performance contingent. We also noted instances in which rewards were not detrimental (e.g., unexpected, task noncontingent) and in which moderator variables modified the findings (e.g., salient vs. nonsalient rewards). These were all reliable findings, not presumptions.

Perceived Self-Determination: Control or Causality?

Eisenberger et al. (1999) argued that "reward increases perceived self-determination" (p. 677). However, they confused the concepts of "perceived control" and "perceived self-determination" and they presented a flawed meta-analysis that does not support their argument.

The concept of "locus of control" (perceived control) was introduced by Rotter (1954, 1966) and refers to whether people believe they can reliably attain desired outcomes. An internal locus of control signifies that people believe they can obtain desired outcomes. However, internal control does not mean that people's behavior will be self-determined. The concept of "locus of causality" (perceived self-determination) concerns the degree to which people experience their behavior to be volitional and freely chosen rather than coerced or seduced by desired outcomes. As explained 3 decades ago by deCharms (1968), a person could easily have an internal locus of control and an external locus of causality with respect to a particular behavior. That is, a person could feel able to obtain a desired outcome (i.e., have an *internal* locus of *control*) and also feel pressured and controlled by that desired outcome to behave in a specific way (i.e., have an *external* locus of *causality*). Accordingly, finding that contingent rewards lead to a more internal locus of *control* (which they probably do) would be fully consistent with the fact that rewards can also lead to a more external locus of *causality* (i.e., to less perceived self-determination).

Eisenberger et al. (1999) confused these concepts and in most of their discussion focused on locus of control rather than locus of causality. For example, quoting Pryor (1985) to argue that rewards enhance self-determination, Eisenberger et al. stated that knowing how to get the environment to reinforce you means that you are in control of your environment. That is indeed a reasonable description of an internal locus of control, but it does not imply self-determination. Similarly, in one of only four articles included in Eisenberger et al.'s new meta-analysis said to be about self-determination, Freedman and Phillips (1985) assessed perceived control (rather than perceived self-determination) with items such

as "My performance was under my own control." Although this implies an internal locus of control, it does not address the issue of whether participants felt free or volitional in doing the activity—that is, whether the behavior had an internal perceived locus of causality and thus emanated from their integrated sense of self (Deci & Ryan, 1991).

In fact, the meta-analysis said to concern reward effects on self-determination was defective for several reasons. As noted, Freedman and Phillips (1985) did not assess self-determination. Further, their study, like that of Overskeid and Svartdal (1998), involved uninteresting tasks, and as shown in Table 8 of our article (Deci et al., 1999), the experience of being rewarded for doing dull tasks is quite different from the experience of being rewarded for interesting tasks (a point to which we return later).

A third study in that meta-analysis was a doctoral dissertation by Shiffman-Kaufman (1990) that examined the effects of both direct and vicarious rewards relative to no rewards. Children had three puzzles to work on in a 15-min period, but there was no manipulation of choice and the rewards were independent of which puzzles were worked on. Still, Shiffman-Kaufman assessed what she called *perceived self-determination*, using the single item "How free were you or the player to choose the puzzle that was played with?" Because none of the participants were given choices, the question was not aligned with the manipulation and did not assess the critical issue of whether the children felt volitional or self-determined about doing the activity.

In sum, because Eisenberger et al. (1999) confused perceived control and perceived self-determination, and because of various methodological peculiarities, the meta-analysis presented in their Table 1 provides no support for their contention that rewards enhance self-determination.

We noted in our article (Deci et al., 1999) that little attention has been given to mediation of the undermining effect by the diminution of perceived self-determination, although such work is warranted. It is thus understandable that Eisenberger et al. (1999) would take interest in this issue. However, although there were three studies that examined perceived causality (and are thus more pertinent to self-determination than are the studies on perceived control that they did use), and although Cameron and Pierce (1994) included all three studies in their meta-analysis, Eisenberger et al. did not mention them as being relevant to the issue they were claiming to examine in their new meta-analysis.

Specifically, Pittman, Cooper, and Smith (1977) used a false-physiological-feedback paradigm to give external causality cues to one group of rewarded participants and internal causality cues to another rewarded group. There were also a rewarded group with no cues and a no-rewards group. All three rewarded groups showed undermining. Further, the group with no cues had the same low level of intrinsic motivation as the group with external-causality cues, whereas the group with internal-causality cues had significantly higher intrinsic motivation. This suggests, therefore, that the undermining effect of contingent rewards is mediated by participants' attribution of external, as opposed to internal, causality. Using a cognitive priming manipulation, Porac and Meindl (1982) showed comparable results. Finally, Brockner and Vasta (1981) used a process analysis to show that rewarded participants were more likely to attribute their behavior to external, as opposed to internal, causes and that external attributions were related to lower levels of intrinsic motivation. Together, these three studies provide evidence that the impact of rewards on intrinsic motivation is mediated, as proposed in CET, by perceived causality.

General Interest Theory

In their commentary, Eisenberger et al. (1999) presented a new theory, general interest theory, to account for reward effects on intrinsic motivation, which was apparently intended to replace the various theoretical stands that they have taken in their three previous meta-analysis articles. Simply stated, general interest theory suggests that events increase intrinsic motivation when they convey that task performance will help satisfy needs, wants, or desires and will reduce intrinsic motivation when they convey that the task is irrelevant or antithetical to needs, wants, or desires. Expected tangible rewards, according to Eisenberger et al., increase perceived self-determination and intrinsic motivation by conveying to the recipients that the rewarder cannot control them. However, rewards that do not have a clearly stated high-performance standard (e.g., do not require beating other people's performance) signify that the task is not relevant for gaining competence affirmation and that the rewarder does not value the task; thus, they decrease intrinsic motivation.

Take, as an example, the Deci (1971) study, in which participants were offered $1 for each of four challenging puzzles that they were able to solve in the allotted time. The results showed decreased intrinsic motivation for rewarded participants. Using general interest theory to explain this result (and its many replications) would suggest, first, that the offer of reward increased perceived self-determination and tended to enhance intrinsic motivation. However, because the rewarder said only that participants had to solve the challenging puzzles (rather than that they had to solve them faster than previous participants), solving the puzzles was irrelevant to competence affirmation and conveyed that the rewarder did not value the task. That, in turn, would have been so dysphoric as to overwhelm the positive feelings associated with the affirmation of self-determination, resulting in decreased intrinsic motivation. To us, that reasoning is simply illogical.

There are other noteworthy issues associated with general interest theory. For example, Eisenberger et al. (1999) suggested that tasks that afford sexual and aggressive fantasies would enhance intrinsic motivation. Indeed, people may enjoy this type of drive-related activity, yet no current account of intrinsic motivation considers drive satisfaction to be pertinent to intrinsic motivation. Thus, to accept this aspect of general interest theory would require a whole new formulation of intrinsic motivation.

Further, general interest theory, like other expectancy-valence perspectives, does not distinguish among goal contents. Attaining any goal is expected to result in positive consequences for intrinsic motivation. However, recent research had made it clear that the content of goals does indeed make a difference. Ryan et al. (in press) found that, whereas perceived attainment of intrinsic goals (such as personal growth and community involvement) contributed to well-being, perceived attainment of extrinsic goals (such as wealth and fame) did not. Also, Sheldon and Kasser (1998) found, in a longitudinal study, that well-being was enhanced by actual attainment of intrinsic goals, but attainment of extrinsic goals provided little benefit. To explain such results, general interest theory would have to consider the content of goals as well as whether people desire them.

Finally, Eisenberger et al. (1999) argued that general interest theory is preferable to CET because it does not make a distinction between interesting and dull tasks. However, our meta-analysis showed definitively that rewards have a different effect on intrinsic motivation for interesting and uninteresting tasks (Deci et al., 1999, Table 8), so the theory should make a distinction to account for these effects. In our article, we said that CET was formulated to explain the effects of events on intrinsic motivation for interesting activities and that the issue of reward effects on uninteresting tasks is considered with the concept of internalization. Eisenberger et al. were critical of CET for not explaining the effects of events on motivation for dull tasks, but they ignored our research that has gone under the rubric of OIT and that has focused on motivation for uninteresting activities.

OIT

According to this approach, extrinsic motivation is necessary to prompt an activity if people do not find it intrinsically interesting. And although extrinsic contingencies are often antagonistic to self-determination and intrinsic motivation, OIT proposes that extrinsically motivated activities can become self-determined through the processes of internalization and integration (Ryan, Connell, & Deci, 1985; Ryan & Deci, in press). Internalization involves taking in a regulation, and integration involves fully transforming it into one's own. Thus, extrinsic motivation can take the form of (a) external regulation, in which case people's behavior is controlled by contingencies external to the person; (b) introjected regulation, in which case the behavior is controlled by contingencies that have been internalized but not integrated; and (c) fully integrated regulation, in which case the person has identified with and integrated the regulations, thereby forming the basis for self-determined extrinsic motivation. Thus, intrinsic motivation and fully integrated extrinsic motivation are the types of motivated behavior that are self-determined, whereas external regulations and introjected regulations (i.e., ego involvements) underlie the types of motivated behavior that are controlled and, thus, are antithetical to self-determination.

An experiment by Deci, Eghrari, Patrick, and Leone (1994) showed that conveying the value of an uninteresting activity, acknowledging the person's feelings about it, and using a style that emphasizes choice rather than control led to greater internalization than not providing these supports. In addition, the results showed that when internalization occurred in the supportive conditions, it was integrated, as reflected by positive correlations between subsequent behavior and self-reports of perceived choice, personal importance, and enjoyment, whereas when internalization occurred in the controlling conditions, it was introjected, as reflected by negative correlations between subsequent behavior and the self-report variables. In other words, when people internalized regulations in supportive contexts, their extrinsically motivated behavior became self-determined, whereas when they internalized regulations in controlling contexts, their behavior was controlled by introjected contingencies. They behaved because they felt pressured to do so.

Although we have conducted numerous studies that support OIT (see Ryan, 1993; Ryan & Deci, in press; and Vallerand, 1997, for reviews), we have not specifically examined reward effects on *internalization* and *integration*, although it is an important issue that remains to be explored. Our interpretation of the findings that rewarding uninteresting activities did not reliably affect either free-choice behavior or interest (Deci et al., 1999, Table 8) is that offering rewards for an uninteresting activity may help to convey that the dull or boring activity has value, which would facilitate internalization and which could counterbalance the controlling aspect of the rewards, which would hinder internalization.

Performance-Contingent Rewards: Their Meaning and Their Effects

The primary focus of Eisenberger et al.'s (1999) commentary was a reanalysis of some of the performance-contingent rewards studies in an attempt to show enhancement of intrinsic motivation in some performance-contingent subcategories. Thus, they have greatly narrowed the portion of the research field with which they have taken exception.

Ryan et al. (1983) defined *performance-contingent rewards* as those given specifically for performing an activity well, for matching a standard of excellence, or for surpassing a specified criterion (e.g., better than 80% of the other participants), with all participants receiving the rewards, indicating that they had all done well or surpassed the criterion. Subsequently, however, researchers examined rewards given as a direct function of the quality of people's performance, meaning that people who performed better got larger rewards than those who performed less well. These rewards were also considered performance contingent, so their inclusion broadened the definition in a way that made this reward-contingency category more ecologically valid. That is, in the real world, everyone in a classroom or work group cannot get a reward for being in the top 20%; so when performance-contingent rewards are used, people typically get them as a function of the quality of their performance.

In Eisenberger et al.'s (1999) new meta-analysis (see their Figures 1 and 2), their results suggested that performance-contingent rewards are less detrimental than our results had indicated. There were several reasons for these different results, but the biggest single factor yielding their more positive picture was that they excluded from their analyses 11 out of the 40 performance-contingent studies that we had used in ours. The other major differences were that, in some studies, they used the wrong control groups and they collapsed across conditions that were intended by the experimenters to have different psychological meanings.

Eisenberger et al.'s (1999) Exclusion of Studies

It is quite telling that Eisenberger et al. (1999) excluded from their primary analyses more than one fourth of the studies included in our meta-analysis of performance-contingent rewards. The studies were as follows: Boggiano, Harackiewicz, Bessette, and Main (1985); Chung (1995); Dollinger and Thelen (1978); Efron (1976); Kruglanski et al. (1975); Lee (1982); Luyten and Lens (1981); Picek (1976); Pittman et al. (1977); T. W. Smith and Pittman (1976); and Weiner and Mander (1978).

Combining these 11 studies meta-analytically revealed the following results. For free-choice behavior, the composite effect size for 9 studies was $d = -0.70$ (CI = -0.90 to -0.50), and for self-reported interest, the composite effect size for 9 studies was

$d = -0.08$ (CI = -0.26 to 0.11). By comparing these effects sizes for the studies they excluded with the effect sizes for the studies they included, namely, $d = 0.03$ (CI = -0.05 to 0.12) for free choice and $d = 0.16$ (CI = 0.08 to 0.24) for self-report, one can readily see why their results for performance-contingent rewards look quite different from ours. Let us take a careful look at some of their exclusions.

First, in Table 6 of our article (Deci et al., 1999), one finds seven studies that we coded as Type 2 performance-contingent rewards. These were the studies in which people who performed well got larger rewards than those who performed less well, so not all participants received the maximum rewards. Our Figure 1 (Deci et al., 1999) shows that these seven studies yielded an undermining for free choice of $d = -0.88$ (CI = -1.12 to -0.65), and although we did not report it in the article, the composite effect size for six studies with self-reports was $d = -0.11$ (CI = -0.34 to 0.12). We believe this is the most ecologically valid type of performance-contingent rewards, yet Eisenberger et al. (1999) excluded five of the seven studies and excluded half the participants from a sixth (Karniol & Ross, 1977) because they included such studies only if the reward was "within their likely range of expectations" (p. 680). By doing so, they effectively restricted the performance-contingency category to cases in which everyone got maximum rewards.

Second, Eisenberger et al. (1999) excluded studies they said used "piece-rate rewards" rather than performance-contingent rewards. As an example, in Boggiano et al.'s (1985) study, children were offered what the researchers labeled *performance-contingent rewards* for working on mazes. The children were told they would get rewards for successfully completing the mazes, and the experimenter then asked them why they would be rewarded. If they did not say something like "for getting the mazes right," the experimenter repeated the contingency. Although Boggiano et al. reasoned that rewarding children for "successfully" completing mazes met the performance-contingency criterion of signifying that the children had "performed well," Eisenberger et al. considered it a piece-rate contingency and excluded it from the performance-contingency meta-analysis. The other five studies excluded for having so-called piece-rate contingencies had similar reward administrations; so by excluding these studies, Eisenberger et al. further restricted the performance-contingent category to cases in which, if the performance standard was not quantified, it had to be stated in terms of the task being "done well" rather than done successfully.

Performance Standards

The Eisenberger et al. (1999) meta-analysis distinguished between studies with performance standards that were "vague" versus "explicit," hypothesizing that the explicit standards (accompanied by maximum rewards) would lead to greater intrinsic motivation than the vague standards, and their results showed support for the hypothesis. However, their definition of *explicit* was actually quite vague, stating only that it involved meeting an objective or normative performance standard. Furthermore, in their analysis of vague versus explicit standards, they made many of the same types of errors (e.g., collapsing across conditions with different psychological meanings) for which Lepper et al. (1999) have criticized their earlier meta-analyses. Consider these points in turn.

Think, for a moment, about what information people would need in order to have the psychological experience of working toward an explicit standard. There are two types. The first is some type of "cutoff," whether stated in absolute terms (earn 100 points) or normative terms (beat 85% of your peers), and the second concerns what it would take to reach the cutoff ("solve five puzzles worth 20 points each to earn 100 points" or "complete 14 mazes to reach the 85th percentile"). Both types of information may be important for guiding performance, but from the participants' perspective, it is the second type of information that would be more relevant for knowing what they are working toward and how well they are proceeding.

In Harackiewicz, Manderlink, and Sansone's (1984) Study 3, some participants who played pinball were told they would be rewarded if they surpassed the 80th percentile and were then informed of the score that would be necessary to reach that standard. Because they knew the cutoff (the 80th percentile) and what it took to reach it (the specific score), the standard was quite explicit. In contrast, other participants were simply told they would be rewarded for reaching the 80th percentile. Thus, these latter participants did not really know in any concrete sense how well they had to perform. From their perspective, while working on the task, the standard was just as vague as if they had been told that they had to "perform well" to receive a reward. However, both conditions were classified as explicit. From this, one would infer that, for Eisenberger et al. (1999), a quantitative statement (the 80th percentile) is sufficient to make a standard explicit, even if the quantitative standard has no palpable meaning to the participants for organizing and guiding their behavior. Nevertheless, Eisenberger et al.'s classification of experimental conditions as vague versus explicit failed to follow even this quantitative guideline.

For example, in a study by Greene and Lepper (1974), young children drew pictures with Magic Markers and were told that a couple of rewards were available for the 2 children who draw the very best pictures. Hence, the standard was quantified and thus explicit in the same sense that the Harackiewicz et al. (1984) standard of beating the 80th percentile was explicit; however, Eisenberger et al. (1999) classified the study as vague, stating that "setting extremely high performance standards may produce the anticipation of failure" (p. 690). We agree that it may, and indeed the study showed substantial undermining for free-choice behavior ($d = -0.57$), but it was undermining with an explicit standard rather than a vague one.

An even more noteworthy example of misclassifying conditions as vague versus explicit can be found in the "other-reward conditions" of a study by Enzle, Roggeveen, and Look (1991). These researchers (as Eisenberger et al., 1999, did subsequently) suggested that the effects of performance-contingent rewards might be different if the performance standards were vague versus explicit, so they included both a vague-standards condition and an explicit-standards condition in their study. The experimental task was a crossword game, and participants in both the vague and explicit conditions were told that they could earn $3 by making "complex patterns of words" (Enzle et al., 1991, p. 473). In the vague-standards condition, nothing was said about what constituted complex patterns, whereas in the explicit-standards condition, participants were provided with three specific examples of what

constituted complex word patterns. Thus, in the explicit-standards condition, participants had a basis for guiding their behavior, but in the vague-standards condition, they did not. Nonetheless, Eisenberger et al. collapsed across the two conditions and classified the study as using vague standards.

In fact, this experiment is the only one included in the meta-analysis that provided a direct test of Eisenberger et al.'s (1999) hypothesis within a single study, and the results were exactly opposite to their hypothesis. Participants who were rewarded by the experimenter for meeting explicit standards showed very strong undermining for free-choice behavior, $d = -1.32$ (CI = -2.29 to -0.36), whereas those who were rewarded for meeting vague standards showed a nonsignificant effect, $d = -0.13$ (CI = -1.01 to 0.74). Thus, both the Greene and Lepper (1974) study and the explicit-standard condition of the Enzle et al. study were misclassified, and contrary to Eisenberger et al.'s (1991) hypothesis, both showed strong undermining for rewards with explicit standards.

A Control Group or an Evaluation Manipulation?

Eisenberger et al. (1999) argued that, when examining the effects of performance-contingent rewards given for meeting explicit standards (e.g., beating 85% of the other participants), there are two possible control groups, which they labeled *partial control* and *complete control*. Partial-control participants are *not* told that they have to exceed a criterion, but subsequently they are given positive feedback comparable with that given to the rewarded participants. The so-called partial-control group is the standard control group that has been used in studies examining the effect of performance-contingent rewards independent of the information they convey (e.g., Ryan et al., 1983). In contrast, complete-control participants are told that their performance will be evaluated on the basis of whether they exceed a criterion, which is the same criterion that the rewarded participants are trying to exceed.

In our article (Deci et al., 1999), we argued that the so-called complete-control group really involves an evaluation manipulation, and various studies (e.g., W. E. Smith, 1975) have shown that evaluation tends to undermine intrinsic motivation relative to a no-evaluation control group (what Eisenberger et al., 1999, termed a *partial-control group*). Thus, we did not use the evaluation conditions as a control group in our meta-analysis, except in two studies that had not included a standard control group (Rosenfield, Folger, & Adelman, 1980; Salancik, 1975).

In Eisenberger et al.'s (1999) meta-analysis, they compared reward conditions with explicit standards to evaluation conditions that used the same standards. For five studies with the free-choice measure, they found significant enhancement ($d = 0.28$), and for six studies with self-reports, they also found significant enhancement ($d = 0.20$). In fact, when looking at the most differentiated categories in the two figures, we see that the one reliable finding of enhancement of intrinsic motivation by performance-contingent rewards was for rewards given for explicit, competitive standards (e.g., beating 85% of the other participants) relative to a control group in which participants were told they would be evaluated by the same standards. (The other significant findings for self-reports were not replicated for free-choice and are also suspect because various of the excluded studies that showed substantial undermining would have been in those categories.)

In short, the one meaningful new finding from Eisenberger et al.'s (1999) meta-analysis, which was based on six studies, is that people who are told they will be evaluated on the basis of outperforming their peers tend to be less intrinsically motivated if they do not receive a reward for their performance than if they do.

However, there are four important points to note about this conclusion. First, it was based on six studies that tended to use a relatively high standard, such as beating 80% or 85% of others; but, as we noted earlier, Eisenberger et al. (1999) stated that if the performance standard is "extremely high," it will induce fear of failure that will undermine intrinsic motivation. Apparently, the performance-criterion window that is likely to work effectively is pretty narrow.

Second, in real-life settings, as we already noted, it is not possible to reward everyone for being in the top 15% or 20%, so if this reward contingency were actually introduced into, say, a classroom or a work group, 80% or 85% would not get a reward. Thus, individuals would experience both pressure to earn the reward and the unpleasant experience of receiving evidence that the teacher or manager considered them incompetent. Eisenberger et al. (1999) suggested that these people would probably not expect the high rewards, implying that the failure to get a reward would not be problematic for them. However, a study by Pritchard, Campbell, and Campbell (1977), which has not been used in any of the meta-analyses because participants who did not do well did not get rewards, provides an excellent test of what would happen in applied settings if this type of performance contingency were implemented. The Pritchard et al. study considered both the people who got the competitive rewards and those who did not and found very large undermining on both free-choice behavior ($d = -0.95$) and self-reported interest ($d = -0.76$).

Third, the rewards category with an explicit, exceeding-others standard is essentially a competition-for-rewards condition, and studies have shown that explicit competition (even without rewards) tends to undermine intrinsic motivation. For example, Reeve and Deci (1996) found that trying to beat others undermined intrinsic motivation, and a process analysis indicated that this was due in part to a decrement in perceived self-determination caused by the competition.

Fourth, there are important ramifications, unacknowledged by Eisenberger et al. (1999), of orienting people toward comparing their competence with that of others. Specifically, the regular use of explicit competitive standards (with or without rewards) is likely to promote "performance goals," as opposed to "mastery goals," and one of the dominant themes in the field of motivation during the past 15 years has concerned the motivational impact of performance versus mastery goals. Two recent meta-analyses showed the potentially detrimental effects of performance goals (i.e., a focus on demonstrating competence) relative to mastery goals (i.e., a focus on acquiring competence). Rawsthorne and Elliot (in press) did a meta-analysis of goal orientations on intrinsic motivation and concluded that (a) the pursuit of performance goals led to significantly less free-choice task persistence than the pursuit of mastery goals and (b) the undermining effect of performance goals was especially evident when the normative-comparison focus was made highly salient and feedback was given that explicitly confirmed successfully matching the standard. The second recent meta-analysis (Utman, 1997) concluded that (a) performance goals led to poorer performance than mastery goals

and (b) the performance-hampering effects of performance goals was especially evident for relatively complex (i.e., interesting) tasks. Together, these two comprehensive meta-analyses highlight the motivational dangers associated with orienting children and adults toward comparing their performance with others. It may be right, as Eisenberger et al.'s finding suggests, that if people are oriented toward beating others, they will be worse off if they do not get rewards than if they do; but the real issue in terms of application to real life concerns the consequences of emphasizing the explicit, exceeding-others standards.

Use of Rewards in Everyday Life

Eisenberger et al. (1999) said that the theoretical and empirical bases of recommending against use of rewards in real-world settings are questionable and suggested that there really is no problem with reward use in the real world. Their position was partly based on arguments that we have shown in this reply to be problematic and partly based on their suggestion that the well-controlled experiments reviewed in our meta-analysis are not very relevant to real life.

The issue of the relevance of laboratory research to applied settings has been discussed for decades and is much too big an issue to be addressed in this reply. Instead, we note that Eisenberger et al. (1999) bolstered their point that there is little to worry about when using rewards by citing two field studies in which expected rewards did not seem to undermine intrinsic motivation. However, they failed to take note of several other field studies (many done in classrooms) that were specifically designed to test aspects of CET's propositions about reward use.

For example, Deci, Schwartz, Sheinman, and Ryan (1981) showed that teachers' endorsement of controlling strategies, such as the use of rewards and punishments to motivate good behavior, was negatively related to intrinsic motivation and self-esteem in their elementary school students. Subsequent studies confirmed the negative impact of teachers' and parents' uses of controlling rewards on intrinsic motivation. For example, an observational study by Turner et al. (1998) found that elementary students' involvement in math was significantly lower when teachers emphasized evaluation and rewards; a longitudinal study by Gottfried, Fleming, and Gottfried (1994) showed that children's academic intrinsic motivation over time was negatively related to their parents' provision of task-extrinsic incentives; and a field study by Ginsburg and Bronstein (1993) indicated that higher parental surveillance and external reward use to promote higher grades was significantly associated with an extrinsic motivational orientation (as judged by teachers) and poorer academic performance. These and other field studies provide meaningful evidence in favor of CET's warning that teachers' and parents' use of controlling, rather than autonomy-supportive, motivational strategies will negatively impinge on students' intrinsic motivation (see Ryan & La Guardia, in press, for a review).

It is worth recalling that our meta-analysis revealed important age-related findings. Namely, the negative impact of tangible rewards on intrinsic motivation was especially strong for children relative to college students, and the positive effect of praise was muted for children relative to college students. Together with the field studies described above, these age-related findings suggest that the use of rewards to promote motivation is particularly questionable when applied to children. Certainly, on the basis of the evidence, Cameron and Pierce's (1994) advocacy of widespread use of incentive systems by teachers and parents appears to be misguided.

The Objectivity and Precision of Meta-Analysis?

There were a few other differences between ours (Deci et al., 1999) and Eisenberger et al.'s (1999) meta-analyses of performance-contingent rewards. For example, Eisenberger et al. caught one calculation error we had made (notably, our error favored their position rather than ours), they located one unpublished doctoral dissertation that we had missed, they included two of their own new studies, they reported slightly different effect sizes for some studies, and they differed from us about whether or not to include various conditions within a few studies. With the exception of our small calculation error and the three studies they added, we stand by our position on each difference. However, all of these differences (beyond the ones already discussed) are relatively inconsequential when performing meta-analyses of a literature this large.

Nonetheless, the fact that there were such differences provides support for one of the main points made by Lepper et al. (1999) in their commentary. Namely, use of the meta-analytic procedure does not provide assurance of objectivity and precision in summarizing complex research literatures. In part, this is because many published studies do not provide sufficient information (a) to definitively classify studies by type (e.g., as completion contingent vs. performance contingent) and (b) to calculate effect sizes. Consider each point.

Often the theoretically dynamic categories of experimental manipulations emerge after several studies have been published. For example, the Ryan et al. (1983) typology of reward contingencies that has guided the literature for many years did not emerge until 12 years after the initial studies of reward effects had been published. Researchers doing studies before these differentiations had been emphasized did not necessarily include the precise information in their write-ups that would allow people, at a later time, to make an absolute differentiation between contingency types that the researchers may not even have thought about. Moreover, in this literature, some categories emerged as a function of the meta-analyses themselves. The concept of task-contingent rewards guided studies for 2 decades and was not differentiated into engagement contingent and completion contingent until researchers began doing meta-analyses of this field. Consequently, many articles referred to rewards as being task contingent, so judgment was required when placing such studies into the engagement-contingent versus completion-contingent categories.

As for calculating effect sizes, there were many instances in which cell sizes and standard deviations were not reported and thus had to be estimated from the available information. Such estimations can result in some differences in effects sizes in different meta-analyses of the same literature, although, typically, differences due to estimation are relatively minor. Nonetheless, these are important points to keep in mind in reviewing any meta-analysis.

Fortunately, the intrinsic motivation literature is now very large, and the findings are very robust. A thoughtful consideration of all the meta-analyses that have now been done makes it clear that engagement-contingent and completion-contingent rewards have a substantial and reliable undermining effect on intrinsic motivation.

Further, performance-contingent rewards tend to undermine intrinsic motivation, although this effect depends on moderator variables such as what control group was used and whether the rewards were administered with an informational or controlling style (Ryan et al., 1983). The only reliable enhancement effect seems to be for a condition in which performance-contingent rewards are given for matching an explicit competitive standard, the reward condition is compared with a condition in which people are told they will be evaluated by the same competitive standard, the standard is quite high but not too high, and all participants in both conditions are told they reached the standard (Eisenberger et al., 1999).

Meta-analyses of complex literatures, such as this rewards literature, gain credibility when the results make sense within a network of theoretically related findings. Such is the case for the results of our meta-analysis. As noted in our article (Deci et al., 1999), reward effects on intrinsic motivation are part of a much broader field of research that has examined the effects of social and personality factors related to self-determination and motivation. External factors, such as surveillance, threats, and deadlines, have been found to decrease intrinsic motivation, and providing choice has been found to enhance it (see Deci & Ryan, 1985, for a review). These studies, like the reward studies, have been well explained by CET. Other studies have shown that individuals who are highly self-determined in regulating their behavior display greater well-being than those who are orientated toward external controls (Deci & Ryan, 1985). Furthermore, as already noted in this reply, research organized by OIT complements and is congruent with research organized by CET, and the results of our meta-analysis and of the research guided by OIT are fully consistent with the results of meta-analyses of the literature on mastery versus performance goals. Thus, this network of well-integrated research results gives further credence to the outcomes of our meta-analysis.

Conclusion

In their 1996 *American Psychologist* article, Eisenberger and Cameron argued that the undermining of intrinsic motivation by expected, contingent, tangible extrinsic rewards, which they said had become accepted as reality within both academic and popular psychology, was largely a myth. In spite of their protestations, it is finally clear that the "accepted reality" of the undermining effect is in fact a reality after all and that CET remains the most viable account yet offered for the complex set of results.

References

Boggiano, A. K., Harackiewicz, J. M., Bessette, J. M., & Main, D. S. (1985). Increasing children's interest through performance-contingent reward. *Social Cognition, 3,* 400–411.

Brockner, J., & Vasta, R. (1981). Do causal attributions mediate the effects of extrinsic rewards on intrinsic interest? *Journal of Research in Personality, 15,* 201–209.

Cameron, J., & Pierce, W. D. (1994). Reinforcement, reward, and intrinsic motivation: A meta-analysis. *Review of Educational Research, 64,* 363–423.

Chung, K. T. (1995). The effects of extrinsic reinforcement on intrinsic motivation amongst mildly mentally handicapped children. *Curriculum Forum, 4*(2), 98–114.

deCharms, R. (1968). *Personal causation: The internal affective determinants of behavior.* New York: Academic Press.

Deci, E. L. (1971). Effects of externally mediated rewards on intrinsic motivation. *Journal of Personality and Social Psychology, 18,* 105–115.

Deci, E. L. (1972a). Effects of contingent and non-contingent rewards and controls on intrinsic motivation. *Organizational Behavior and Human Performance, 8,* 217–229.

Deci, E. L. (1972b). Intrinsic motivation, extrinsic reinforcement, and inequity. *Journal of Personality and Social Psychology, 22,* 113–120.

Deci, E. L. (1975). *Intrinsic motivation.* New York: Plenum.

Deci, E. L., Eghrari, H., Patrick, B. C., & Leone, D. R. (1994). Facilitating internalization: The self-determination theory perspective. *Journal of Personality, 62,* 119–142.

Deci, E. L., Koestner, R., & Ryan, R. M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin, 125,* 627–668.

Deci, E. L., & Ryan, R. M. (1980). The empirical exploration of intrinsic motivational processes. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 13, pp. 39–80). New York: Academic Press

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior.* New York: Plenum.

Deci, E. L., & Ryan, R. M. (1991). A motivational approach to self: Integration in personality. In R. Dienstbier (Ed.), *Nebraska Symposium on Motivation: Vol. 38. Perspectives on motivation* (pp. 237–288). Lincoln: University of Nebraska Press.

Deci, E. L., Schwartz, A. J., Sheinman, L., & Ryan, R. M. (1981). An instrument to assess adults' orientations toward control versus autonomy with children: Reflections on intrinsic motivation and perceived competence. *Journal of Educational Psychology, 73,* 642–650.

Dollinger, S. J., & Thelen, M. H. (1978). Overjustification and children's intrinsic motivation: Comparative effects of four rewards. *Journal of Personality and Social Psychology, 36,* 1259–1269.

Efron, B. (1976). *Effects of self-mediated competency feedback and external incentives on intrinsic motivation and quality of task performance.* Unpublished doctoral dissertation, University of Pittsburgh, Pittsburgh, PA.

Eisenberger, R., & Cameron, J. (1996). Detrimental effects of reward: Reality or myth? *American Psychologist, 51,* 1153–1166.

Eisenberger, R., Pierce, W. D., & Cameron, J. (1999). Effects of reward on intrinsic motivation—Negative, neutral, and positive: Comment on Deci, Koestner, and Ryan (1999). *Psychological Bulletin, 125,* 677–691.

Enzle, M. E., Roggeveen, J. P., & Look, S. C. (1991). Self- versus other-reward administration and intrinsic motivation. *Journal of Experimental Social Psychology, 27,* 468–479.

Freedman, S. M., & Phillips, J. S. (1985). The effects of situational performance constraints on intrinsic motivation and satisfaction: The role of perceived competence and self-determination. *Organizational Behavior and Human Decision Processes, 35,* 397–416.

Ginsburg, G. S., & Bronstein, P. (1993). Family factors related to children's intrinsic/extrinsic motivational orientation and academic motivational orientation and academic performance. *Child Development, 64,* 1461–1474.

Gottfried, A. E., Fleming, J. S., & Gottfried, A. W. (1994). Role of parental motivational practices in children's academic intrinsic motivation and achievement. *Journal of Educational Psychology, 86,* 104–113.

Greene, D., & Lepper, M. R. (1974). Effects of extrinsic rewards on children's subsequent intrinsic interest. *Child Development, 45,* 1141–1145.

Harackiewicz, J., Manderlink, G., & Sansone, C. (1984). Rewarding pinball wizardry: The effects of evaluation on intrinsic interest. *Journal of Personality and Social Psychology, 47,* 287–300.

Karniol, R., & Ross, M. (1977). The effect of performance-relevant and performance-irrelevant rewards on children's intrinsic motivation. *Child Development, 48,* 482–487.

Kruglanski, A. W., Riter, A., Amitai, A., Margolin, B., Shabtai, L., & Zaksh, D. (1975). Can money enhance intrinsic motivation? A test of the content consequences hypothesis. *Journal of Personality and Social Psychology, 31,* 744–750.

Lee, J. (1982). *Effects of absolute and normative feedback and reward on performance and affect.* Unpublished doctoral dissertation, University of Iowa, Iowa City.

Lepper, M. R., Henderlong, J., & Gingras, I. (1999). Understanding the effects of extrinsic rewards on intrinsic motivation—Uses and abuses of meta-analysis: Comment on Deci, Koestner, and Ryan (1999). *Psychological Bulletin, 125,* 669–676.

Luyten, H., & Lens, W. (1981). The effect of earlier experience and reward contingencies on intrinsic motivation. *Motivation and Emotion, 5,* 25–36.

Overskeid, G., & Svartdal, F. (1998). Effect of reward on subjective autonomy and interest when initial interest is low. *Psychological Record, 46,* 319–331.

Picek, J. S. (1976). *Effects of reward uncertainty and ability information on attributions of intrinsic motivation.* Unpublished doctoral dissertation, Indiana University, Bloomington.

Pittman, T. S., Cooper, E. E., & Smith, T. W. (1977). Attribution of causality and the overjustification effect. *Personality and Social Psychology Bulletin, 3,* 280–283.

Porac, J. F., & Meindl, J. (1982). Undermining overjustification: Inducing intrinsic and extrinsic task representations. *Organizational Behavior and Human Performance, 29,* 208–226.

Pritchard, R. D., Campbell, K. M., & Campbell, D. J. (1977). Effects of extrinsic financial rewards on intrinsic motivation. *Journal of Applied Psychology, 62,* 9–15.

Pryor, K. (1985). *Don't shoot the dog! The new art of teaching and training.* New York: Bantam Books.

Rawsthorne, L. J., & Elliot, A. J. (in press). Achievement goals and intrinsic motivation: A meta-analytic review. *Personality and Social Psychology Review.*

Reeve, J., & Deci, E. L. (1996). Elements within the competitive situation that affect intrinsic motivation. *Personality and Social Psychology Bulletin, 22,* 24–33.

Rosenfield, D., Folger, R., & Adelman, H. (1980). When rewards reflect competence: A qualification of the overjustification effect. *Journal of Personality and Social Psychology, 39,* 368–376.

Rotter, J. B. (1954). *Social learning and clinical psychology.* Englewood Cliffs, NJ: Prentice Hall.

Rotter, J. B. (1966). General expectancies for internal versus external control of reinforcement. *Psychological Monographs, 80*(1, Whole No. 609).

Ryan, R. M. (1993). Agency and organization: Intrinsic motivation, autonomy and the self in psychological development. In J. Jacobs (Ed.), *Nebraska Symposium on Motivation: Developmental perspectives on motivation* (Vol. 40, pp. 1–56). Lincoln: University of Nebraska Press.

Ryan, R. M., Chirkov, V. I., Little, T. D., Sheldon, K. M., Timoshina, E., & Deci, E. L. (in press). The American dream in Russia: Extrinsic aspirations and well-being in two cultures. *Personality and Social Psychology Bulletin.*

Ryan, R. M., Connell, J. P., & Deci, E. L. (1985). A motivational analysis of self-determination and self-regulation in education. In C. Ames & R. E. Ames (Eds.), *Research on motivation in education: The classroom milieu* (pp. 13–51). New York: Academic Press.

Ryan, R. M., & Deci, E. L. (in press). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist.*

Ryan, R. M., & La Guardia, J. G. (in press). Achievement motivation within a pressured society: Intrinsic and extrinsic motivations to learn and the politics of school reform. In T. Urdan (Ed.), *Advances in motivation and achievement.* Greenwich, CT: JAI Press.

Ryan, R. M., Mims, V., & Koestner, R. (1983). Relation of reward contingency and interpersonal context to intrinsic motivation: A review and test using cognitive evaluation theory. *Journal of Personality and Social Psychology, 45,* 736–750.

Salancik, G. R. (1975). Interaction effects of performance and money on self-perception of intrinsic motivation. *Organizational Behavior and Human Performance, 13,* 339–351.

Sheldon, K. M., & Kasser, T. (1998). Pursuing personal goals: Skills enable progress but not all progress is beneficial. *Personality and Social Psychology Bulletin, 24,* 1319–1331.

Shiffman-Kaufman, S E. (1990). *The effects of reward contingency and type of learning experience on intrinsic motivation.* Unpublished doctoral dissertation, City University of New York, New York, NY.

Smith, T. W., & Pittman, T. S. (1976). Reward, distraction, and the overjustification effect. *Journal of Personality and Social Psychology, 36,* 565–572.

Smith, W. E. (1975). *The effect of anticipated vs. unanticipated social reward on subsequent intrinsic motivation.* Unpublished doctoral dissertation, Cornell University, Ithaca, NY.

Turner, J. C., Meyer, D. K., Cox, K. E., Logan, C., DiCintio, M., & Thomas, C. T. (1998). Creating contexts for involvement in math. *Journal of Educational Psychology, 90,* 730–745.

Utman, C. H. (1997). Performance effects of motivational state: A meta-analysis. *Personality and Social Psychology Review, 1,* 170–182.

Vallerand, R. J. (1997). Toward a hierarchical model of intrinsic and extrinsic motivation. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 29, pp. 271–360). San Diego, CA: Academic Press.

Weiner, M. J., & Mander, A. M. (1978). The effects of reward and perception of competency upon intrinsic motivation. *Motivation and Emotion, 2,* 67–73.

Received June 28, 1999
Accepted June 30, 1999 ■