Effects of Reward on Intrinsic Motivation—Negative, Neutral, and Positive: Comment on Deci, Koestner, and Ryan (1999)

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Meta-analyses indicated that rewards increase perceived self-determination and that rewards’ effects on intrinsic motivation depend on the performance requirement. 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 standards 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. The findings suggest that reward procedures requiring ill-defined or minimal performance convey task triviality, thereby decreasing intrinsic motivation. Reward procedures requiring specific high task performance convey a task’s personal or social significance, increasing intrinsic motivation.

A primary school teacher offers students prizes for scoring 80% or higher on math tests. A city council establishes a “learning to earn” program in which economically disadvantaged high school students receive college scholarships for maintaining grade point averages of B or higher. A credit card provider offers telesales representatives financial bonuses for increasing their rates of enrollment of new cardholders. These uses of incentives to achieve superior performance assume that rewards for specified high performance are an effective way to alter behavior.

In contrast to the preceding examples, reward’s practicality has been challenged by suggestions that reward reduces interest in tasks for their own sake (intrinsic motivation or interest). Deci, Koestner, and Ryan (1999) presented a meta-analysis concluding that expected tangible rewards, such as pay, awards, and prizes, decrease intrinsic motivation. Deci et al. reported that rewarded individuals chose a task less often following elimination of the reward than did other individuals not receiving the reward. Besides the findings with this free-choice measure, Deci et al. reported that some methods of reward presentation caused recipients to respond on attitude questionnaires with self-reports of lessened interest. However, reward based on meeting a performance objective (performance-contingent reward) was not found to reduce self-reported task interest. Dismissing the self-report measure of intrinsic motivation as less valid than free choice, Deci et al. concluded that expected tangible reward reduces intrinsic motivation.

Deci et al. (1999) argued that these findings supported Deci and Ryan’s (1985) cognitive evaluation theory, which assumes that events leading to greater perceived self-determination or perceived competence increase intrinsic motivation, whereas events that decrease perceived self-determination or competence lessen intrinsic motivation. Based on cognitive evaluation theory, Deci et al. argued that reward lessens perceived autonomy, leading to reduced intrinsic motivation. Reward for intrinsically motivating activities in everyday life, warned Deci et al., reduces intrinsic motivation.

In contrast to Deci et al.’s (1999) review, we argue here that (a) reward can decrease, have no effect, or increase intrinsic motivation depending on its method of presentation; (b) reward increases perceived self-determination; (c) applied studies, containing features characteristic of everyday life, usually find either positive or null reward effects on intrinsic motivation; and (d) these results contradict cognitive evaluation theory, suggesting instead that reward procedures conveying a task’s triviality decrease intrinsic motivation whereas reward procedures conveying a task’s personal or social significance increase intrinsic motivation.

General Interest Theory

Beliefs that reward reduces intrinsic motivation are related to conceptions of human nature stressing the motivational primacy of individual self-fulfillment. This emphasis on the individual over the collective (e.g., family, community, or church) gained widespread acceptance in Western civilization only during the last few centuries (Sampson, 1988). Jean-Jacques Rousseau (1712–1778), a commanding figure in the development of European romanticism, reviled in self-discovery and creative expression; Rousseau (1762/1974; 1782/1995) claimed that social constraints on whether, when, or how people pursue short-term whims and long-term objectives are highly aversive. Romanticism’s assumptions that people are motivated toward self-actualization and that they are distressed by impingements on self-determination have profoundly shaped the Western worldview (Geller, 1982; Hogan, 1975). Combining European romanticism’s stress on self-actualization with American pragmatism’s concern with achievement, theorists such as deCharms (1968), Deci and Ryan (1985), Csikszentmihalyi (1990), and Harackiewicz and Sansone (1991) have assumed that
the pursuits of autonomy and/or competence are fundamental motives leading to human satisfaction and fulfillment.

Some theorists and researchers agree with cognitive evaluation theory’s assumptions that perceived self-determination and competence make important contributions to intrinsic motivation but disagree with cognitive evaluation theory’s claim that reward reduces perceived self-determination and does not affect perceived competence. Pryor (1985) argued that,

If we have information about how to get the environment to reinforce us, then we control our environment; we are no longer at its mercy. . . . So subjects like to learn through reinforcement not for the obvious reason—to get food or other rewards—but because they actually get some control over what is happening (p. 172)

Eisenberger and Cameron (1996) similarly suggested that reward contingent on reaching a specific criterion of performance increases perceived self-determination. Eisenberger, Rhoades, and Cameron (in press) maintained that the promise or repeated use of reward conveys that (a) the individual giving the reward lacks control over the performance of the potential reward recipient, and (b) the potential reward recipient has the option of declining the reward and not acting as requested. Therefore, reward should increase, rather than decrease, perceived autonomy.

Eisenberger et al. (in press) gave college students the objective of distinguishing subtle differences between pairs of cartoon drawings. Students were asked to reach specific performance standards based either on a particular number of correct identifications or on surpassing the performance of 80% of those previously performing the task. Half the participants were promised a monetary reward for reaching their performance objective. Reward increased the participants’ perceived self-determination, free time spent on the task after the reward’s withdrawal, and self-expressed task interest. Perceived self-determination, resulting from performance-contingent reward, was positively related to self-expressed task interest. In another study, Eisenberger et al. reported a positive relationship between employees’ expectation of reward for high performance and their perceived self-determination.

Eisenberger et al. (in press) concluded that people understand reward’s use in everyday life to be utilitarian, involving the reward giver’s lack of control over the recipient: The person, group, or institution providing the reward usually does so based on the belief that favorable consequences are needed to obtain the cooperation of the potential reward recipient. To enable cognitive evaluation theory to explain the findings, Eisenberger et al. suggested that the assumption of a decremental effect of reward on perceived autonomy be replaced by the assumption of an incremental effect.

Cognitive evaluation theory’s presumption that reward has no effect on the motivation to be competent or on perceived competence has also been challenged. Harackiewicz & Sansone (1991) argued that performance-contingent reward increases intrinsic motivation by causing individuals to care about doing the task well (competence valuation). Such competence valuation was found to mediate the effects of contextual factors (e.g., competition, reward) on intrinsic motivation (see, e.g., Harackiewicz, Abrahams, & Wageman, 1987; Harackiewicz & Manderlink, 1984). Other theorists have suggested that performance-contingent reward might increase intrinsic motivation by leading individuals to believe they are competent or self-efficacious (Bandura, 1997; Rosenfield, Folger, & Adelman, 1980). Accordingly, Eisenberger et al. (in press) reported that perceived competence partially mediated the positive relationship found between performance-contingent reward and intrinsic motivation.

The exclusivity of perceived self-determination and competence as determinants of intrinsic motivation has been questioned by Sethi, Lepper, and Ross’s (in press) recent finding that Asian American children were more influenced than Anglo-American children in their preference for tasks that they believed their mothers valued highly. Sethi et al. suggested that opinions of one’s in-group may be a stronger source of intrinsic motivation in collectivist than in individualistic cultures. More generally, Reiss and Havercamp (1998) argued that motives such as self-determination and competence are part of a larger array of human wants and desires that influence intrinsic motivation. People may enjoy tasks because they provide novel stimulation, afford aggressive or sexual fantasies, provide feelings of greater self-determination or competence, allow one to identify more strongly with one’s in-group, etc. Thus, the sources of intrinsic motivation may be more diverse than simply competence and self-determination.

Integrating these analyses, an emerging view we term general interest theory suggests that intrinsic motives are more diverse than solely competence and self-determination and that reward can have incremental as well as decremental effects on intrinsic motivation. According to general interest theory, the content of tasks and the context in which they are presented, including reward, increase intrinsic motivation when they convey that task performance helps satisfy needs, wants, or desires. Conversely, task content and context, including reward, reduce intrinsic motivation when they communicate that the task is irrelevant or antibetical to needs, wants, or desires. Rewards would then influence intrinsic motivation primarily by their symbolic function; depending on how a task must be performed to obtain reward, reward would decrease or increase the importance of being competent, the perception of competence, and the identification with the task giver’s judgment of the task as important.

General interest theory implies that personality and culture influence needs and desires and thereby affect intrinsic motivation. Harackiewicz and Manderlink (1984) and Harackiewicz et al. (1987) found that high-achievement orientation increased students’ interest in tasks involving performance standards. Eisenberger et al. (in press) found a positive relationship between employees’ expectations of reward for high performance and their interest in their daily job activities, this relationship being greater for those having a high desire for control. Sethi et al.’s (in press) findings on cross-cultural differences in intrinsic motivation have already been noted.

Importantly, general interest theory avoids cognitive evaluation theory’s restrictive assumption that the effects of perceived self-determination and perceived competence on intrinsic motivation are limited to tasks having high initial interest. Deci et al. (1999) stated that cognitive evaluation theory is inapplicable to “uninteresting tasks,” which they operationally defined as tasks receiving participants’ average interest rating of less than the midpoint on a Likert scale or which the experimenter judged to be the less interesting of two tasks used in the study. This limitation of cognitive evaluation theory’s domain renders the theory incapable of dealing with one of the most basic issues concerning intrinsic motivation. Interest in tasks that require considerable skill (e.g.,
learning to read or use a personal computer) is often initially aversive because individuals can accomplish little. A fundamental question beyond the scope of cognitive evaluation theory concerns how initially uninteresting tasks can become more interesting. General interest theory, in contrast to cognitive evaluation theory, argues that ways of presenting tasks that convey their relevance or irrelevance to need satisfaction, including the use of reward, should influence intrinsic interest in initially less interesting as well as more interesting tasks.

General interest theory implies that some ways of offering and presenting reward convey the task’s importance for satisfying needs and wants, whereas other reward procedures impart the irrelevance of the task to personal motives or the undermining of goals related to these motives. Reward for meeting a specific performance standard would convey competence, the importance of doing well, and the task giver’s positive valuation of the activity. Conversely, reward offered simply for engaging in a task, for trivial task performance, or for meeting a vaguely stated performance standard would convey the task’s irrelevance to personal competence and the task giver’s low valuation of the task. Therefore, reward for high performance ought to increase intrinsic interest, whereas reward for trivial performance ought to decrease intrinsic interest.

Eisenberger and Armeli (1997) reported that reward for trivial performance in an initial task (giving usual uses for common objects) reduced children’s subsequent free choice of a different task requiring creative effort (drawing novel pictures). Thus, reward for trivial performance can create the impression that tasks in a given setting are inconsequential, reducing intrinsic motivation. Conversely, reward for a high level of creativity in the initial task (giving unusual uses for common objects) increased children’s subsequent free choice of another creative task. Rewarding high performance, therefore, can increase intrinsic motivation by imparting a positive evaluation of tasks administered in a given context.

In sum, according to general interest theory, intrinsic motivation is reduced when reward conveys the perceived irrelevance of the task to competence or when reward affords the impression that the task is unimportant. In contrast, reward for meeting a performance standard imparts a greater importance of achievement, greater personal competence, and a favorable attitude toward the task by the task giver. Because persons often derive beliefs about their own competence by comparing their performance with that of others (Suls & Wills, 1991), reward for surpassing others would be the performance contingency type most likely to increase intrinsic motivation.

General interest theory’s predictions that (a) reward increases perceived self-determination and (b) specific performance requirements have more positive reward effects than do vague performance requirements contrast sharply with CET. According to Deci and Ryan (1985, p. 77), the requirement of meeting a specific performance standard should be experienced as more controlling than reward contingencies that interfere less with the individual’s freely chosen behavior. The greater the specificity of the performance requirement, according to Deci and Ryan, the greater should be the loss of perceived self-determination and intrinsic motivation. We now use meta-analysis to review differing predictions of cognitive evaluation theory and general interest theory concerning the effects of reward on perceived self-determination and intrinsic motivation.

Examination of the Empirical Evidence

We carried out two meta-analyses of laboratory studies and a narrative review of applied studies on reward and intrinsic motivation. One meta-analysis concerned the effects of tangible reward on perceived self-determination, the mechanism assumed by cognitive evaluation theory to account for decremental reward effects. Because Deci et al.’s (1999) meta-analysis and our own previous meta-analyses (Cameron & Pierce, 1994; Eisenberger & Cameron, 1996) agreed that reward for simply carrying out a task reduces intrinsic motivation, our second meta-analysis distinguishes the predictions of cognitive evaluation theory and general interest theory concerning how performance-contingent reward affects intrinsic motivation. Because Deci et al. suggested that reward used in everyday life decreases intrinsic motivation, we provide a subsequent examination of studies having features typical of reward’s applied use.

Identification of Relevant Studies

We incorporated both published and unpublished data to reduce the bias toward publication of statistically reliable findings. We used Deci et al.’s (1999) definitions for the free-choice and self-report measures of intrinsic motivation. To identify relevant studies, we reviewed the meta-analyses and supplemental narrative reviews reported by Deci et al., Cameron and Pierce (1994), and Eisenberger and Cameron (1996, 1998). We also examined abstracts of unpublished doctoral dissertations in the computer database PsycINFO, and we included our own research findings.

For our meta-analysis of reward’s effects on self-determination, we included studies in which participants rated their freedom to decide whether or how to carry out the task. To review research on performance-contingent reward, we started with the full set of studies classified as performance contingent by Deci et al. (1999). We added or deleted studies based on Deci and Ryan’s (1985) classification criteria for performance-contingent reward plus additional criteria to be subsequently described. According to Deci and Ryan:

[The term performance-contingent rewards is used to mean that the reward is given for a specified level of effective performance. The focus here is on the quality of one’s performance, relative to some type of information or standard, so that the rewards convey competence information. . . . Of course, task-contingent rewards can also convey competence information; for example, when rewards are administered for each unit of production, more rewards mean that one is performing better. However, without specific reference to the quality of performance or to normative levels of performance, they would not be considered performance contingent. If a person were offered $1 for each task completed, it would be a task-contingent reward; if he or she were offered $1 for each task that was completed faster than 70% of the people who had done it, it would be performance contingent. (p. 74)]

The appendix gives the full set of studies designated performance contingent by Deci et al. (1999), together with studies we added and explanations for changes made from their classifications. We eliminated experimental conditions from 6 studies cat-
categorized as performance contingent by Deci et al. that were more appropriately classified as piece-rate contingent, involving reward for each unit of production. Piece-rate reward is a subcategory of completion-dependent reward in which completing a task yields reward; here, the task is carried out repeatedly and rewarded on each occasion. Deci and Ryan (1985) explicitly differentiated piece-rate reward from performance-contingent reward. According to general interest theory, piece-rate reward's repetitiveness and lack of a performance standard often communicate a task's triviality, reducing intrinsic motivation.

Deci et al. (1999) categorized as performance contingent those studies in which participants received less than the maximum reward. We similarly included studies in which participants earned an amount of performance-contingent reward less than maximum but within their likely range of expectations (see, e.g., Daniel & Esser, 1980). When expectations concerning reward are realistic, intermediate reward amounts may be satisfying. However, Deci et al. also included studies in which most or all participants promised reward experienced a high degree of failure. We analyzed these studies separately because they concern failure rather than performance-contingent reward.

Categories of Performance-Contingent Reward

We divided performance-contingent reward studies into three categories based on theoretical considerations. First is normatively based reward, involving the objective of exceeding the performance of others (e.g., exceeding the performance of 80% of those previously performing the task). The second category involves meeting an absolute performance standard (e.g., solving a specified number of puzzles). The third category involves the vague, unspecified performance objective of "doing well" or "doing a good job."

According to cognitive evaluation theory, reward for meeting either a normative or absolute performance standard should be experienced as more restrictive than would reward for meeting a vague performance standard and therefore should produce a greater loss of perceived self-determination and intrinsic motivation. In contrast, general interest theory assumes that reward for meeting more restrictive performance standards should produce greater intrinsic motivation than would reward for meeting vague standards. Reward for meeting vague performance standards should convey the triviality of the task and its unimportance to the task giver, reducing intrinsic motivation; reward for exceeding criterion or exceeding others would more effectively convey that competence is important, that the performer is competent, and that an authority figure (the task giver or the group or organization he or she represents) believes high task performance to be important. Because people compare their performance against that of others as the most direct indication of competence (Suls & Wills, 1991), reward for meeting normative performance standards should produce greater intrinsic motivation than would reward for meeting absolute performance standards. Therefore, general interest theory predicts that the effects of reward on intrinsic motivation change progressively from negative to positive when comparing vague, absolute, and normative performance contingencies.

Control Conditions for Performance-Contingent Reward

Performance-contingent reward involves the assignment of a performance objective and performance feedback. Often, the rewarded group's intrinsic motivation is compared with an unrewarded control group that lacks the rewarded group's assigned performance objective and performance feedback. This partial control condition fails to differentiate performance-contingent reward from the assignment of a performance objective and delivery of performance feedback without reward (Eisenberger & Cameron, 1998).

Use of a control group providing a performance objective plus feedback (hereafter termed the complete control condition) is important for testing the differential predictions of cognitive evaluation theory and general interest theory. Cognitive evaluation theory assumes that perceived autonomy can be reduced simply by setting performance objectives for participants, and Harackiewicz, Manderlink, and Sansone (1984) suggested that performance objectives can reduce intrinsic motivation by generating evaluation apprehension. Differentiating the effects of performance-contingent reward from a performance standard requires that both the rewarded group and the control group receive the performance standard. Further, Deci and Ryan (1985, p. 63) argued that positive performance feedback increases intrinsic motivation through perceived competence. Therefore, differentiating the effects of performance-contingent reward from performance objectives and feedback requires the use of the complete control condition.

The complete control condition has value both for testing theories and for generalizing findings to everyday life. Receipt of task assignments and performance feedback are integral components of the social, educational, and economic organization of routine living. Care must be taken not to confuse the effects of standards or feedback with the supplemental effects of performance-contingent reward.

Deci et al. (1999), like many previous reviewers, often combined the partial and complete control condition. Further, they simply omitted some positive effects of normative performance requirements related to complete control conditions (Harackiewicz et al., 1984, Exp. 1 & 3; 1987). We rectified these omissions and distinguished the control conditions in studies using normative and absolute performance standards. This was not done for vague performance standards because almost all the studies used partial control conditions.

Effect-Size Computations

We used the same statistical methodology for computing and accumulating effect sizes as used in meta-analyses by Eisenberger and Cameron (1996) and Deci et al. (1999). Individual effect sizes were calculated as the difference between the rewarded group and the control group, divided by the pooled standard deviation, this result being corrected for small sample size (Cohen's $d$ estimate). Effect sizes were accumulated across individual studies, weighted by the number of participants in each group (Hedges & Olkin, 1985). The homogeneity statistic was calculated for each group of studies examined; when this statistic was statistically significant, the most extreme outliers were removed progressively until homogeneity was achieved. The data are reported with outliers both
included and excluded. Findings reported as not significant in a source article, with incomplete effect size information, were assigned an effect size of zero. Confidence intervals (CIs) were determined within which the cumulative effect size could not be attributed to chance. The meta-analytic software program DSTAT 1.10 (Johnson, 1993) was used for computations. Positive effect sizes designate incremental effects of reward whereas negative effect sizes designate decremental effects.

**Effects of Reward on Perceived Self-Determination**

Cognitive evaluation theory's explanation of the decremental effects of reward on intrinsic motivation invokes a loss of perceived self-determination as the underlying mechanism. In contrast, Eisenberger et al. (in press) suggested that the offer of reward increases perceived self-determination by conveying the task giver's lack of control over the task performer. The conclusion by Deci et al. (1999) that reward undermines perceived self-determination is an inference based on the free-choice and self-report measures of intrinsic motivation rather than being based on perceived autonomy's direct assessment. Therefore, we examined studies of reward's effect on perceived self-determination.

A search of the empirical literature revealed five relevant experiments, containing a total of eight comparisons between rewarded and control groups. When computing composite effect sizes, we combined the data of two or more rewarded groups if they were compared with the same control group, thereby meeting the statistical assumption of independence of sampling. As shown in Table 1, the effect of reward on perceived self-determination was positive for all eight comparisons of rewarded groups with unrewarded control groups. The composite effect-size estimate was substantial, $d = .37$, CI = .22 to .51, $p < .0001$; none of the effect sizes differed reliably from the others, $Q(5) = 3.72, p = .59$. These results suggest that reward increases perceived autonomy, rather than decreasing perceived autonomy, as supposed by cognitive evaluation theory.

Deci et al. (1999) rejected the findings of three of these studies on the basis that they used "intrinsically uninteresting" tasks, the data of which were irrelevant to cognitive evaluation theory. In contrast, general interest theory has the advantage of applying both to high- and low-interest tasks. Consistent with general interest theory, reward increased self-determination with tasks of both low and high initial interest. Freedman and Phillips (1985) used less interesting and more interesting versions of the same task to produce reliable differences in self-reports of intrinsic motivation. The incremental effect of pay on perceived self-determination was equally great for both versions of the task.

Evidence is available from two additional studies (Eisenberger et al., in press, Study 1; Shiffman-Kaufman, 1990), given in Table 1, that were not reviewed by Deci et al. (1999); these tasks meet Deci et al.'s stated criteria for being interesting. The two experiments show a highly reliable combined positive effect of reward on perceived self-determination, $d = .32, p < .001$, similar in magnitude to the results of the other studies. Thus, the incremental effects of reward on perceived self-determination occurred for both less interesting and more interesting tasks.

Additional evidence of reward's relationship to perceived autonomy is available from an applied study (Eisenberger et al., in press, Study 2) not included in our meta-analysis because, unlike the other studies, it was correlational. According to cognitive evaluation theory, employees' expectancy of increased pay for high performance should be experienced as more controlling than pay determined by factors independent of performance (e.g., job title or length of organizational tenure). Employees' expectancies of greater pay for high performance were positively related to perceived self-determination in daily job activities. This finding, like the experimental findings, indicates that offers of pay for task performance increase perceived self-determination.

These data support the view that people interpret the offer of reward as implying greater freedom of action because the individual, group, or organization supplying the reward must resort to incentives in an attempt to influence performance (Eisenberger et al., in press). Rather than decreasing perceived self-determination, as supposed by cognitive evaluation theory, tangible reward has strong incremental effects on perceived self-determination. These findings suggest that cognitive evaluation theory's explanation of reward's decremental effects on intrinsic motivation is simply incorrect.

<table>
<thead>
<tr>
<th>Study</th>
<th>Contingency type</th>
<th>$N_{E}$</th>
<th>$N_{C}$</th>
<th>Perceived self-determination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eisenberger, Rhoades, &amp; Cameron</td>
<td>Exceed criterion</td>
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<td>110</td>
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<td>0.26</td>
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<tr>
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<td>47</td>
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<tr>
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<td>0.24</td>
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<td>Task participation</td>
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<td>10</td>
<td>1.20</td>
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<tr>
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<td>Task participation</td>
<td>64</td>
<td>32</td>
<td>0.37</td>
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<tr>
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<td>Exceed others</td>
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<td>20</td>
<td>0.23</td>
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<tr>
<td>Overskold &amp; Svartdal (1996), Exp. 2</td>
<td>Task participation</td>
<td>20</td>
<td>20</td>
<td>0.47</td>
</tr>
<tr>
<td>Shiffman-Kaufman (1990)</td>
<td></td>
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</table>

Note. Exceed criterion refers to reward for meeting an absolute performance standard. Exceed others refers to reward for exceeding the performance of others. Piece-rate refers to reward for each occasion of completing a repeatedly carried-out task. Task participation refers to reward for simply performing the task. $N_{E}$ designates the reward condition, and $N_{C}$ designates the control condition.
Effects of Performance-Contingent Reward on Intrinsic Motivation

Cognitive evaluation theory predicts reward’s increasingly strong negative effects on intrinsic motivation when comparing vague, absolute, and normative performance standards. General interest theory, in contrast, predicts that the effects should change progressively from negative to positive for these same comparisons. We performed meta-analyses on free choice and self-reported interest to examine these predictions. We used the hierarchical meta-analytic method to systematically examine potential effects of different performance-contingency categories (vague, absolute, and normative) and control conditions (partial and complete), proceeding from the most general comparison (collapsing across performance category and type of control condition) to more fine-grain analyses involving specific contingency categories and control conditions.

Many studies compared two or more categories of reward with the same control condition. Other studies compared a single performance-contingent reward category with a single control condition, and a few studies compared a single performance-contingent reward category with both partial and complete control conditions. When several rewarded conditions were compared with the same control condition or when both control conditions were compared with the same rewarded condition, the multiple conditions were combined to satisfy the statistical assumption of independent sampling. Outliers removed at one level of analysis in the hierarchical design were included for initial statistical tests conducted at other levels of analysis.

Table 2 gives effect sizes of the individual studies. Figures 1 and 2 present the cumulative findings. The 27 free-choice studies contained 35 effects, and the 23 self-reported interest studies contained 36 effects.

Free-choice behavior. Analyses of performance-contingent reward’s effects on free-choice behavior are arranged hierarchically in Figure 1, with the more general procedural categories closer to the diagram’s top. For each level of analysis, the number of studies, effect size, CI, and homogeneity statistic are given. No outliers were found for any grouping of free-choice studies in the hierarchical analysis.

Performance-contingent reward’s overall effect on free choice was nonsignificant. This result may be contrasted with Deci et al.’s (1999) finding of a negative overall effect. The difference in findings is due to (a) our exclusion of piece-rate studies because they are not a type of performance-contingent reward, (b) our exclusion of studies in which most or all participants promised reward experienced failure, (c) our supplementation of Deci et al.’s database with additional performance-contingent reward studies, and (d) our inclusion of data involving complete control groups that had been omitted by Deci et al.

The next level of analysis distinguished vague versus explicit performance standards. Vague performance standards had a reliable negative effect on free choice whereas explicit performance standards had a reliable positive effect. For subsequent levels of analysis, the explicit studies were divided into those involving normative performance standards (exceeding others) and absolute performance standards (exceeding criterion). Normative performance standards had a reliable positive effect on free choice whereas absolute performance standards did not. These categories, in turn, were divided depending on whether the control group received the same performance objective and performance feedback as the rewarded group (complete control condition) or lacked either of these elements (partial control condition). Reward for exceeding others increased free-choice behavior relative to the complete control condition. Other effects of normative and absolute performance contingencies were not reliable.

This pattern of findings is inconsistent with cognitive evaluation theory, which assumes that the more explicit the performance requirement for obtaining reward, the greater should be the loss of perceived self-determination and intrinsic motivation. According to cognitive evaluation theory, both vague and explicit performance-contingent reward should reduce free choice, with the explicit performance contingency producing the greater decrement. Our findings indicate, however, that a vague performance objective provides the only type of performance-contingent reward that reduces free choice. Particularly difficult for cognitive evaluation theory to explain is the positive effect of normatively based reward on free choice; here, the decremental effect should have been strongest.

The findings are consistent with the implications of general interest theory that (a) vague performance-contingent reward reduces intrinsic motivation by conveying the task’s triviality and irrelevance to the recipient’s needs and motives, and (b) normatively based reward increases intrinsic motivation by conveying the importance of competence, high competence, and the importance of the task to the task giver or the group or organization that the task giver represents.

Self-reported task interest. Figure 2 gives the meta-analytic results for self-reported interest, arranged hierarchically in the same manner as the free-choice data, with outliers excluded. Performance-contingent reward had an overall positive effect on self-reported interest, $k = 23, d = .15, CI = .07, .23$. However, the effect sizes were heterogeneous, $Q(22) = 60.5, p < .001$. When the two most extreme outliers (Dafoe, 1985; Harackiewicz, 1979) were excluded, homogeneity was obtained, and the overall positive effect remained statistically significant, $d = .16, CI = .08, .24$. The difference between this positive effect of performance-contingent reward and Deci et al.’s (1999) nonsignificant overall effect is due to the factors described for the free-choice analysis.

The next level of analysis indicated a reliable positive effect of explicit performance contingencies on self-reported interest, $k = 18, d = .20, CI = .11, .29$; effect sizes were heterogeneous, $Q(17) = 44.8, p < .001$. Removal of the most extreme outlier (Harackiewicz, 1979) resulted in homogeneity of effect sizes and the stronger reliable positive effect shown in Figure 2, $d = .24, CI = .15, .33$. Vague performance-contingent reward did not have a significant effect on self-reported interest.

At the next level of analysis, reward for exceeding others had a reliable positive effect on self-reported interest, $k = 13, d = .15, CI = .01, .29$; effect sizes were heterogeneous, $Q(12) = 39.8, p < .0001$. Removing the most extreme outlier (Harackiewicz, 1979) produced the stronger positive effect shown in Figure 2, with homogeneous effect sizes, $d = .22, CI = .08, .36$. Reward for exceeding criterion also had a reliable positive effect on self-reported interest.

At the most fine-grain level of analysis, reward for exceeding others and exceeding criterion had reliable positive effects, compared with their complete control conditions, on self-reported
<table>
<thead>
<tr>
<th>Study</th>
<th>Contingency type</th>
<th>Performance-contingent control group</th>
<th>N_E</th>
<th>N_C</th>
<th>Free-choice d</th>
<th>Self-report d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adomey (1983)</td>
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<td>Partial</td>
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<td>14</td>
<td>-0.54</td>
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<tr>
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<td>Complete</td>
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<td>Complete</td>
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<td>0.06</td>
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<td>20</td>
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<td>0.38</td>
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<tr>
<td>T. W. Smith &amp; Pittman (1978)</td>
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<td>Partial</td>
<td>66</td>
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<td>Tripathi &amp; Agarwal (1988)</td>
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<td>30</td>
<td>-0.60</td>
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</table>

Note. Studies listed by Deci et al. (1999) as performance contingent that we categorized as other contingencies are included. N_E designates the reward condition, and N_C designates the control condition. Individual studies were divided based on contingency types and control conditions. For example, for Harackiewicz, Mandelink, & Sansone’s (1984) Experiment 3, we make four comparisons based on the factorial combination of two kinds of contingency (exceed others and exceed criterion) with two types of control condition (partial and complete). Dashes indicate that the data for that category were not reported.

* Indicates assignment of a zero effect size for studies reporting nonsignificant findings without enough detail to calculate an effect size.
Free-Choice Behavior

All Expected Performance Contingent Rewards

\[ k = 27 \]
\[ d = .03 \]
\[ (-.05, .12) \]
\[ Q(26) = 39.3 \]

Vague

\[ k = 13 \]
\[ d = -.29^* \]
\[ (-.47, -.12) \]
\[ Q(12) = 9.45 \]

Explicit

\[ k = 14 \]
\[ d = .13^* \]
\[ (.03, .23) \]
\[ Q(13) = 12.7 \]

Exceeding Criterion

\[ k = 8 \]
\[ d = .08 \]
\[ (-.04, .20) \]
\[ Q(7) = 3.35 \]

Exceeding Others

\[ k = 9 \]
\[ d = .23^* \]
\[ (.07, .39) \]
\[ Q(8) = 12.8 \]

Partial Control

\[ k = 6 \]
\[ d = .06 \]
\[ (-.11, .22) \]
\[ Q(5) = 3.53 \]

Complete Control

\[ k = 5 \]
\[ d = .09 \]
\[ (.04, .24) \]
\[ Q(4) = .85 \]

Partial Control

\[ k = 6 \]
\[ d = .17 \]
\[ (-.09, .43) \]
\[ Q(5) = 6.42 \]

Complete Control

\[ k = 5 \]
\[ d = .28^* \]
\[ (.09, .48) \]
\[ Q(4) = 8.19 \]

Figure 1. Summary of the hierarchical meta-analysis comparing a performance-contingent tangible-reward condition with a control condition on the free-choice measure of intrinsic motivation. No outliers were found at any level of analysis. Values of \( d \) were corrected for sample size. Numbers in parentheses represent 95% confidence intervals. Vague performance requirements are not subdivided into partial and complete control conditions because almost all the studies used partial control conditions. \( k \) = total number of studies. * \( p < .05 \).

Interest. Reward for exceeding criterion also had a reliable positive effect on self-reported interest relative to the partial control condition. Reward for exceeding others, relative to the partial control condition, did not have a reliable effect, \( k = 10, d = .11, CI = -.08, .30 \); this also showed heterogeneous effect sizes, \( Q(9) = 38.8, p < .0001 \). As illustrated in Figure 2, removal of the most extreme outlier (Harackiewicz, 1979) produced a homogeneous incremental effect of reward for exceeding others, relative to the partial control condition, \( d = .24, CI = .05, .44 \). In sum, reward for meeting vague performance standards had no effect on self-reported interest, whereas reward for meeting explicit performance standards increased self-reported interest. These results, like the findings for free-choice behavior, accord well with general interest theory’s predictions of greater positive effects of specific over vague performance-contingent reward.

Deci et al. (1999) dealt with the failure to find negative effects of performance-contingent reward on self-reported task interest by questioning the validity of the self-report measure. Deci et al. stated that the primary problem associated with the self-report measure is that “people may confuse their enjoyment of the reward with their interest in the task” (p. 655). This suggestion that people generalize reward enjoyment to task interest seems no different from stating that reward makes tasks intrinsically interesting. Further, it may be asked why
Self-Reported Interest

All Expected Performance Contingent Rewards

\[
\begin{align*}
  k &= 21 \\
  \delta &= .16^* \\
  (.08, .24) \\
  Q(20) &= 29.8 
\end{align*}
\]

Vague

\[
\begin{align*}
  k &= 9 \\
  \delta &= .00 \\
  (-.16, .15) \\
  Q(8) &= 13.4 
\end{align*}
\]

Explicit

\[
\begin{align*}
  k &= 17 \\
  \delta &= .24^* \\
  (.15, .33) \\
  Q(16) &= 20.0 
\end{align*}
\]

Exceeding Criterion

\[
\begin{align*}
  k &= 11 \\
  \delta &= .26^* \\
  (17, .35) \\
  Q(10) &= 17.1 
\end{align*}
\]

Exceeding Others

\[
\begin{align*}
  k &= 12 \\
  \delta &= .22^* \\
  (.08, .36) \\
  Q(11) &= 12.1 
\end{align*}
\]

Partial Control Condition

\[
\begin{align*}
  k &= 8 \\
  \delta &= .25^* \\
  (.09, .40) \\
  Q(7) &= 13.9 
\end{align*}
\]

Complete Control Condition

\[
\begin{align*}
  k &= 4 \\
  \delta &= .25^* \\
  (.10, .40) \\
  Q(3) &= 5.63 
\end{align*}
\]

Partial Control Condition

\[
\begin{align*}
  k &= 9 \\
  \delta &= .24^* \\
  (.05, .44) \\
  Q(8) &= 11.4 
\end{align*}
\]

Complete Control Condition

\[
\begin{align*}
  k &= 6 \\
  \delta &= .20^* \\
  (.01, .39) \\
  Q(5) &= 3.44 
\end{align*}
\]

\textit{Figure 2.} Summary of the meta-analysis comparing a performance-contingent tangible-reward condition with a control condition on the self-report measure of intrinsic motivation. Outliers are excluded. Values of \( \delta \) were corrected for sample size. Numbers in parentheses represent 95\% confidence intervals. Vague performance requirements are not subdivided into partial and complete control conditions because almost all the studies used partial control conditions. \( k \) = total number of studies. * \( p < .05 \).

such "confusion" would apply to self-reported interest but not to free-choice behavior.

The more positive effects of reward found with explicit performance requirements than with vague performance requirements were obtained with both free-choice and self-report measures. The similar findings suggest that related processes affect free choice and self-reported intrinsic interest. These results are consistent with general interest theory and inconsistent with cognitive evaluation theory.

Effects of Failure on Intrinsic Motivation

Deci et al.’s (1999) analysis of performance-contingent studies incorporated data from experiments in which most or all participants failed to achieve their performance objectives. We analyzed this data separately because reward’s sudden diminution from an expected level produces negative contrast (Dunham, 1968; Williams, 1983), involving an aversive emotional reaction (Daly, 1969a, 1969b). An apparent decrement of intrinsic interest following the failure to receive expected reward might actually be a negative contrast effect (Balsam & Bondy, 1983; Bandura, 1986; Feingold & Mahoney, 1975; Flora, 1990). Further, according to general interest theory, the lack of expected reward lessens intrinsic motivation by symbolizing incompetence.

We reclassified, as \textit{fail–low reward}, conditions from four studies categorized as performance contingent by Deci et al. (1999);
these studies involved high levels of failure feedback paired with less than expected reward (see Table 2 and the appendix). For example, participants in Pittman, Cooper, and Smith’s (1977) study were told they would be paid on a graduated scale according to their motor-task performance. Participants averaged less than $6 per trial out of a possible range of 5–25$. A meta-analysis of the fail–low reward studies indicated a large and reliable decrement in free choice, \( d = -1.02, CI = -1.35, -.70 \); however, this did not occur with self-reported interest, \( d = .04, CI = -.23, .35 \). Therefore, some evidence indicates that failure reduces intrinsic motivation.

The effects of fail–low reward on intrinsic interest may be compared with the effects of high reward following failure. Three studies, which we designated as fail–high reward, included conditions in which participants received failure feedback but nevertheless obtained the initially anticipated reward. With the caveat that these studies contained small numbers of participants, it is notable that fail–high reward did not reliably reduce free choice, \( d = .29, CI = -.18, .77 \); this result was statistically different from the decrement found with fail–low reward, \( \chi^2(1, k = 7) = 20.1, p < .001 \). Evidently, decremental effects of failure on intrinsic motivation can be ameliorated by reward. This finding is inconsistent with cognitive evaluation theory’s view of tangible reward as having only decremental effects on intrinsic motivation.

**Practical Applications**

Based on cognitive evaluation theory and the conclusion that tangible reward reduces intrinsic motivation, Deci et al. (1999) warned against reward’s use in everyday life. The conceptual and empirical bases for this recommendation are questionable. Our meta-analysis found that reward increased perceived autonomy; that reward ameliorated the effects of failure on intrinsic motivation; that reward contingent on meeting an absolute performance standard either increased or did not affect intrinsic motivation, depending on the intrinsic motivation measure used; and that reward contingent on surpassing the performance of others increased intrinsic motivation. Deci et al. further reported a supplemental meta-analysis showing no overall effect of reward on intrinsic motivation for low-interest tasks. Our findings suggest no problem with rewarding low-interest tasks or rewarding the attainment of specific performance standards in high-interest tasks.

Deci et al.’s (1999) review and our prior reviews (Cameron & Pierce, 1994; Eisenberger & Cameron, 1996) agreed that reward simply for task participation reduces intrinsic motivation. Further, our present analysis finds that reward for meeting a vague performance objective reduces intrinsic motivation as measured by the free-choice measure although not the self-reported interest measure. One might be tempted to conclude that reward for highly interesting tasks should be avoided in everyday life when dependent simply on task engagement or vague performance objectives. Conversely, everyday use of reward for meeting normative performance standards (outperforming others) would have the benefit of increasing intrinsic motivation.

Such conclusions would be premature. Recommendations concerning the application of research findings presume that (a) the conditions under which the effects occur in circumscribed experimental settings are relevant to everyday life and (b) the real-world effects are sufficiently strong and durable as to be of practical interest. Deci et al. (1999) stressed that decremental reward effects can last for days or weeks between reward’s administration and the test of intrinsic motivation. These findings are theoretically but not practically relevant. Important tasks at home, work, or school are usually performed repeatedly. What matters practically is whether reward’s effects persist with repeated task performance, not whether effects are retained over an interval during which the task is never carried out. The pragmatic issue for parents, teachers, and employers is whether effects of reward on intrinsic motivation persist when the task is performed on repeated occasions.

Six studies employed multiple sessions of baseline free-choice behavior followed by repeated tangible-reward sessions and then multiple free-choice test sessions. These studies were based on an operant experimental orientation emphasizing reward’s effects in the individual organism and using baseline performance as a control condition. Five studies, using various types of reward contingencies, reported incremental effects of reward on free-choice performance (Davidson & Bucher, 1978; Feingold & Mahoney, 1975; Skaggs, Dickinson, & O’Connor, 1992; Vasta, Andrews, McLaughlin, Stirpe, & Comfort, 1978, Experiments 1 and 2), and one study reported no overall effect (Mawhinney, Dickinson, & Taylor, 1989). These studies included a combined total of only 31 participants and lacked independent control groups. Despite these limitations, the observed incremental effects are evidence against Deci et al.’s (1999) view that reward strongly reduces intrinsic motivation in a variety of practical situations.

Three other multiple-session studies used control groups. One study (Vasta and Stirpe, 1979), which failed to find a reliable effect, had rewarded and control groups with very different baseline free-choice levels. Greene, Sternberg, and Lepper (1976) found that children rewarded for their least preferred activities subsequently spent less time on these tasks than did a control group rewarded for all activities; no effect was found for high-interest tasks. Mynatt, Oakley, Piccione, Margolis, and Arkkelin (1978) noted the interpretative problem produced by Greene et al.’s use of reward for the control group. In a systematic replication using unrewarded control groups, Mynatt et al. found an incremental effect of reward on intrinsic motivation with low-interest tasks and no effect with high-interest tasks.

Flora and Flora (1999) recently examined college students’ self-reported interest in reading as a function of the presence or absence of childhood participation in the “Book it!” reading program. Here, schoolchildren in Grades K–6 received certificates for pizza when they reached reading goals set by their teachers. During the 1995–1996 school year, reported Flora and Flora, 22 million schoolchildren were enrolled. Previous participation during childhood did not reliably affect the college students’ expressed interest in reading.

A large-scale study of employees found that expected pay for high performance was positively related to self-expressed interest in daily job activities (Eisenberger et al., in press). Using another large employee sample, Eisenberger et al. reported that expected pay for high performance was positively related to perceived self-determination in daily job activities. Perceived self-determination, in turn, was associated with (a) perceptions that the organization valued the employees’ contributions and cared about their well-being, (b) positive mood, and (c) job performance. This evidence suggests that employees find reward for high perfor-
mance an indication of their autonomy, leading to a more favorably perceived quality of work life.

As one argument against the use of reward in everyday life, Deci et al. (1999) noted that the receipt of less than the maximum possible reward can be aversive. However, most students and employees develop realistic expectations concerning rewards. A student’s receipt of a grade of B on an exam or an employee’s receipt of two thirds of the maximum possible pay increase may be satisfying or aversive depending on what the individual believes is deserved. Further, when reward is based on achievable performance standards, people understand they can improve their outcomes in the future. We know very little about how these typical uses of reward in everyday life affect intrinsic motivation.

The data from the limited number of applied studies are inconsistent with warnings by Deci et al. (1999) and others against the use of reward in everyday life. Positive relationships and null relationships between reward and intrinsic motivation are commonly found in applied studies; negative relationships are rare. We need more applied research to delineate the kinds of reward procedures that may decrease, have no effect, or increase intrinsic motivation in applied settings. For the present, speculative warnings unsupported by applied studies should be weighed against the hundreds of studies showing the effective use of reward to alter behavior in everyday life.

Theoretical Implications of the Research Evidence

Cognitive evaluation theory’s explanation of decremental effects of reward on intrinsic motivation, involving the loss of perceived self-determination, is inconsistent with empirical evidence indicating that reward increases perceived self-determination. People believe they have more control over their behavior when offered reward, not less control as supposed by cognitive evaluation theory. Cognitive evaluation theory’s claim that reward generally reduces intrinsic motivation by means of lessened self-determination is no longer tenable.

Cognitive evaluation theory is also inconsistent with the findings concerning the effects of performance-contingent reward on intrinsic motivation. According to cognitive evaluation theory, the more intrusive a performance contingency, the greater should be the loss of perceived self-determination and intrinsic motivation. Explicit performance-contingent reward interferes more with unrestricted behavior than does reward contingent on a vague performance requirement and thus should produce the greater reduction of intrinsic motivation. Contrary to cognitive evaluation theory, rewards for meeting more restrictive performance standards produce more positive effects on intrinsic motivation than do rewards for meeting vague standards: (a) Reward for meeting vague performance standards reduces the subsequent choice to carry out the task and does not affect self-reported interest; (b) reward for meeting absolute performance standards does not affect free choice but increases self-reported interest; and (c) reward for exceeding the past performance of others (normative performance standards) increases both free choice and self-reported interest.

Cognitive evaluation theory presumes that tangible reward has no incremental effects on intrinsic motivation. However, reward for surpassing the performance of others increases intrinsic motivation as assessed by both free choice and self-reported interest. Additionally, reward ameliorates the decremental effect of failure on intrinsic interest. Also, the limited number of available applied studies commonly found incremental or null relationships between reward and intrinsic interest, suggesting that incremental effects of reward on intrinsic interest are more widespread in everyday life than has previously been supposed and that decremental effects may be more limited.

To help explain these results, cognitive evaluation theory could be altered to assume positive effects of reward on perceived autonomy and competence. This would be consistent with previously reviewed findings that positive relationships between performance-contingent reward and intrinsic interest were mediated by perceived self-determination and competence (Eisenberger et al., in press). Such a realignment of cognitive evaluation theory would help explain incremental effects of reward on intrinsic motivation. At the same time, because reward increases perceived self-determination, cognitive evaluation theory is left without a mechanism to explain why reward simply for engaging in a task or for meeting vague performance standards reduces intrinsic motivation.

General interest theory, in contrast, explains both negative and positive effects of reward on intrinsic motivation. General interest theory holds that task content and context, including rewards, (a) decrease intrinsic motivation when they convey the task’s irrelevance or inconsistency with the satisfaction of needs, wants, or desires; and (b) increase intrinsic motivation when they indicate that task performance helps satisfy needs, wants, or desires. In this view, reward’s symbolic value influences intrinsic motivation: Reward procedures requiring minimal, repetitive, or ill-defined performance convey a task’s triviality, thereby decreasing intrinsic motivation. Reward procedures requiring specific high task-performance convey a task’s personal or social significance and thus increase intrinsic motivation. Offers of reward also increase perceived self-determination, contributing positively to intrinsic motivation. People understand that reward’s use in everyday life is utilitarian, involving the reward giver’s lack of control over the potential reward recipient; the person, group, or institution offering the reward believes that favorable consequences are needed to obtain the cooperation of the person asked to perform the task. Therefore, people feel freer to decline a task when they are offered reward as opposed to simply being asked to perform the task.

Deci et al. (1999) stated that low-interest tasks are beyond cognitive evaluation theory’s domain. Therefore, cognitive evaluation theory has nothing to say about the fundamental issue of how low-interest tasks become more interesting. General interest theory, in contrast, applies to both high-interest tasks and low-interest tasks. General interest theory helps explain how tasks initially perceived as uninteresting capture interest based on such factors as skill development, personal and social need satisfaction, and reward’s symbolic value.

References

References marked with an asterisk indicate studies included in the meta-analyses.


*Karniol, R., & Ross, M. (1977). The effect of performance-relevant and


(Appendix follows)
Appendix

Performance-Contingent Reward Studies

A list of each study used in Deci, Koestner, and Ryan’s (1999) meta-analysis plus our additions. Consequential differences of contingency classifications, sample sizes, and effect sizes between our analysis and Deci et al.’s are explained.

Table A1

Studies Used in the Meta-Analyses

<table>
<thead>
<tr>
<th>Study</th>
<th>Differences Between Our and Deci, Koestner, and Ryan’s (1999) Analyses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adornay (1983)</td>
<td>Study not included by Deci et al. We categorized this study as absolute-standard performance contingency.</td>
</tr>
<tr>
<td>Bartelme (1983)</td>
<td>We distinguished absolute-standard performance contingency (exceed criterion) from vague-standard performance contingency, the two of which Deci et al. combined. Also, we corrected Deci et al.’s inflated sample sizes, which did not take into account Bartelme’s omission from the data analysis of the 24 male participants.</td>
</tr>
<tr>
<td>Boggiano, Harackiewicz, Bessette, &amp; Main (1985)</td>
<td>Reclassified as piece-rate contingency.</td>
</tr>
<tr>
<td>Chung (1995)</td>
<td>Chung’s description of the reward contingency was, in its entirety, “a reward dependent on their performance of the target activity.” We excluded this study, included by Deci et al., because of insufficient information to code the contingency. The study had few participants per group (N = 5), having no practical effect on the meta-analysis.</td>
</tr>
<tr>
<td>Dafoe (1985)</td>
<td>We distinguished groups, combined by Deci et al., receiving vague, absolute (exceed criterion), and normative (exceed others) performance requirements. Numbers of children receiving the free-choice and self-report procedures differed. Absolute criterion involved telling children they would be rewarded for performance “better than you did before.”</td>
</tr>
<tr>
<td>Dollinger &amp; Thelen (1978)</td>
<td>We excluded self-reward condition, included by Deci et al., in which participants evaluated their own performance and decided on their own reward. The remaining condition was reclassified as piece-rate.</td>
</tr>
<tr>
<td>Efron (1976)</td>
<td>Reclassified as a piece-rate contingency. Following Deci et al., we divided participants into two samples depending on whether they received competency feedback.</td>
</tr>
<tr>
<td>Eisenberger (1999)</td>
<td>Recent study not included by Deci et al. We included these data.</td>
</tr>
<tr>
<td>Eisenberger, Rholes, &amp; Cameron (in press), Study 1</td>
<td>Recent study not included by Deci et al. We included these data.</td>
</tr>
<tr>
<td>Enzie, Roggeveen, &amp; Look (1991)</td>
<td>We excluded self-reward condition, included by Deci et al., in which participants evaluated their own performance and decided on their own reward. Remaining condition was placed in subcategory of vague-standard performance contingency.</td>
</tr>
<tr>
<td>Fabes (1987), Study 1</td>
<td>Placed in subcategory of vague-standard performance contingency.</td>
</tr>
<tr>
<td>Goldstein (1977)</td>
<td>Placed in subcategory of vague-standard performance contingency, with separate partial and complete control conditions.</td>
</tr>
<tr>
<td>Greene &amp; Lepper (1974)</td>
<td>Placed in subcategory of vague-standard performance contingency. Unlike most vague-standard performance contingencies that promised reward for “doing well” or “doing a good job,” children here were told that only “a couple” of rewards were available for the entire group and that “the very best” performance would be rewarded. We suggest that setting extremely high performance standards may produce the anticipation of failure, the aversiveness of which reduces intrinsic motivation. Use of a complete control condition, not included in this study, is important to distinguish the effects of the performance standard and performance feedback from the supplemental effects of reward.</td>
</tr>
<tr>
<td>Harackiewicz (1979)</td>
<td>We distinguished normative-standard and absolute-standard performance contingencies whose findings were compared with combined performance of two partial control groups. Deci et al. combined the two rewarded groups and examined each group’s effect on an individual partial control group.</td>
</tr>
<tr>
<td>Harackiewicz, Abrahams, &amp; Wageman (1987)</td>
<td>The study comprised four categories of performance-contingent reward, involving absolute versus normative performance standards crossed factorially with complete versus partial control conditions. We separated the four treatment combinations. Deci et al. collapsed across the type of performance standard (absolute and normative). As in the case of Harackiewicz et al.’s (1984) Exp. 1 and 3, Deci et al. analyzed only the data involving the incomplete control condition. Thus, their findings omit the positive effect of reward for exceeding others on self-reported interest, relative to a complete compete control group (d = .35).</td>
</tr>
<tr>
<td>Harackiewicz, Manderlink, &amp; Sansone (1984), Exp. 1</td>
<td>Placed in subcategory of normative-standard performance contingency. We report data separately for the incomplete and complete control groups. Deci et al. reported only data for the incomplete control group. Thus, their analysis failed to include Harackiewicz’s positive effect of performance-contingent reward for exceeding others (normatively contingent reward) on free-choice performance (d = .46) and self-reported interest (d = .21), as assessed with a complete control group.</td>
</tr>
<tr>
<td>Harackiewicz, Manderlink, &amp; Sansone (1984), Exp. 2</td>
<td>Placed in subcategory of normative-standard performance contingency.</td>
</tr>
</tbody>
</table>
Table A1 (continued)

<table>
<thead>
<tr>
<th>Study</th>
<th>Differences Between Our and Deci, Koestner, and Ryan’s (1999) Analyses</th>
</tr>
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<tr>
<td>Harackiewicz, Manderlink, &amp; Sansone (1984), Exp. 3</td>
<td>The study comprised four categories of performance-contingent reward, involving absolute versus normative performance standard crossed factorially with complete versus partial control conditions. We separated these four treatment combinations. Deci et al. collapsed across the type of performance standard (absolute and normative). Further, Deci et al. analyzed only the data involving the incomplete control condition, failing to include the complete control condition. Therefore, their analysis omits a free-choice d of .81 and a self-report d of .80 found when the rewarded normative group was compared with complete control group. As in the case of Harackiewicz et al’s (1984) Exp. 1, Deci et al.’s findings omit the positive effect of reward for exceeding others on intrinsic motivation, relative to a compete control group. We distinguished these conditions. Deci et al. combined groups receiving absolute-standard and vague-standard performance contingencies. We distinguished these conditions. Deci et al.'s first sample as an absolute performance contingency. Deci et al.’s mistakenly reversed sign of the effect's direction was corrected. Deci et al.’s second sample was reclassified as fail-high reward: participants were informed they had performed much more poorly than average performance, yet they received their initially expected reward.</td>
</tr>
<tr>
<td>Hyman (1985)</td>
<td>Reclassified as luck-based reward. Participants played a game in which they received points or pay based on luck, there being no indication that participants were led to believe anything except luck was responsible for their scores. We therefore omitted this study. (Deci et al. eliminated participants in one of the two tasks, a stock market game, the purpose of which was to amass financial gains. Deci et al. found the control condition problematic because participants were told in advance they would have to return the money they received for it to be used with future participants. We see no problem with this, as no expectation of reward was established for the control condition.)</td>
</tr>
<tr>
<td>Karniol &amp; Ross (1977)</td>
<td>Deci et al.’s first sample was reclassified as a piece-rate contingency. We divided their second sample into fail-high reward and fail-low reward; these participants received failure feedback but were rewarded on either 85% of their trials (fail-high reward) or 50% of their trials (fail-low reward), respectively.</td>
</tr>
<tr>
<td>Kruglanski (1975), Exp. 2</td>
<td>Reclassified as fail-low reward because the study was designed so that all participants would fail on their final trial, making failure salient.</td>
</tr>
<tr>
<td>Lee (1982)</td>
<td>Placed in subcategory of vague-standard performance contingency. Deci et al. excluded one rewarded group and its associated control group because control subjects were told in advance that they would not keep the money they would be receiving in the game they played. We see no problem with this, as no expectation of reward was established for the control condition, so we included these groups.</td>
</tr>
<tr>
<td>Luyten &amp; Lens (1981)</td>
<td>Placed in subcategory of vague-standard performance contingency. The study used an inappropriate control condition; the rewarded group but not the control group performed the task prior to the free-time period. Therefore, the data were eliminated from our analysis.</td>
</tr>
<tr>
<td>Orlick &amp; Mosher (1978)</td>
<td>Deci et al.’s first sample was placed in subcategory of absolute-standard performance contingency. Deci et al.’s second sample was reclassified as fail-high reward because participants received feedback indicating much poorer than average performance but also received the initially expected reward.</td>
</tr>
<tr>
<td>Pallak, Costomiris, Sroka, &amp; Pittman (1982)</td>
<td>Placed in subcategory of vague-standard performance contingency. Following Deci et al., we distinguished two control conditions depending on whether participants received performance feedback.</td>
</tr>
<tr>
<td>Patrick (1985)</td>
<td>Placed in subcategory of vague-standard performance contingency. The study used an inappropriate control condition; the rewarded group but not the control group performed the task prior to the free-time period. Therefore, the data were eliminated from our analysis.</td>
</tr>
<tr>
<td>Picek (1976)</td>
<td>Deci et al.’s first sample was placed in subcategory of absolute-standard performance contingency. Deci et al.’s second sample was reclassified as fail-high reward because participants received feedback indicating much poorer than average performance but also received the initially expected reward.</td>
</tr>
<tr>
<td>Pittman, Cooper, &amp; Smith (1977)</td>
<td>Placed in subcategory of vague-standard performance contingency. Following Deci et al., we distinguished two control conditions depending on whether participants received performance feedback.</td>
</tr>
<tr>
<td>Rosenfield, Folger, &amp; Adelman (1980)</td>
<td>Placed in subcategory of normative-standard performance contingency. This toy road-racing task was rigged so that the car would leave the track few times for some participants and many times for others. Deci et al. characterized participants with many car accidents as receiving failure feedback and examined their data separately. However, participants in both conditions were told their objective was to outdo the average of those previously taking the task and were informed they had met this criterion. Therefore, we combined the two conditions.</td>
</tr>
<tr>
<td>Ryan, Mims, &amp; Koestner (1983)</td>
<td>Placed in subcategory of vague-standard performance contingency. Participants were told they would be paid for “some signs of learning.” Deci et al.’s d value is inflated because they used the overall error term instead of reconstituting the error term to include variation attributable to other independent variables and their interactions.</td>
</tr>
<tr>
<td>Salancik (1975)</td>
<td>Placed in subcategory of normative-standard performance contingency. Placed in subcategory of vague-standard performance contingency. Participating subjects were told they would be paid for “some signs of learning.” Deci et al.’s d value is inflated because they used the overall error term instead of reconstituting the error term to include variation attributable to other independent variables and their interactions.</td>
</tr>
<tr>
<td>T. W. Smith &amp; Pittman (1978)</td>
<td>Reclassified as fail-low reward. Standards required for reward far surpassed the participants’ abilities, leading to the lowest possible level of reward for most participants.</td>
</tr>
<tr>
<td>V. C. Smith (1975)</td>
<td>Reclassified as fail-low reward. Standards required for reward far surpassed the participants’ abilities, leading to the lowest possible level of reward for most participants.</td>
</tr>
<tr>
<td>Tripathi &amp; Agarwal (1988)</td>
<td>Deci et al. included participants receiving failure feedback and less-than-expected reward. We distinguished and reclassified these conditions as normative-standard performance contingency and fail-low reward, respectively.</td>
</tr>
<tr>
<td>Weinberg &amp; Jackson (1979)</td>
<td>Reclassified as piece-rate contingency.</td>
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</tbody>
</table>

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