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Intrinsic Motivation and Extrinsic Incentives Jointly Predict Performance: A 40-Year Meta-Analysis

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More than 4 decades of research and 9 meta-analyses have focused on the undermining effect: namely, the debate over whether the provision of extrinsic incentives erodes intrinsic motivation. This review and meta-analysis builds on such previous reviews by focusing on the interrelationship among intrinsic motivation, extrinsic incentives, and performance, with reference to 2 moderators: performance type (quality vs. quantity) and incentive contingency (directly performance-salient vs. indirectly performance-salient), which have not been systematically reviewed to date. Based on random-effects meta-analytic methods, findings from school, work, and physical domains ($k = 183$, $N = 212{,}468$) indicate that intrinsic motivation is a medium to strong predictor of performance ($\rho = .21$–45). The importance of intrinsic motivation to performance remained in place whether incentives were presented. In addition, incentive salience influenced the predictive validity of intrinsic motivation for performance: In a "crowding out" fashion, intrinsic motivation was less important to performance when incentives were directly tied to performance and was more important when incentives were indirectly tied to performance. Considered simultaneously through meta-analytic regression, intrinsic motivation predicted more unique variance in quality of performance, whereas incentives were a better predictor of quantity of performance. With respect to performance, incentives and intrinsic motivation are not necessarily antagonistic and are best considered simultaneously. Future research should consider using nonperformance criteria (e.g., well-being, job satisfaction) as well as applying the percent-of-maximum-possible (POMP) method in meta-analyses.

Keywords: productivity, academic achievement, literature review, employee motivation, rewards

> If you want people to perform better, you reward them, right? Bonuses, commissions, their own reality show. Incentivize them. But that's not happening here. You've got an incentive designed to sharpen thinking and accelerate creativity, and it does just the opposite. It dulls thinking and blocks creativity.
>
> —Dan Pink, *The Puzzle of Motivation*

Motivation is a fundamental component of any credible model of human performance (D. J. Campbell & Pritchard, 1976; Maier, 1955; Pinder, 2011) and has been a core focus of industrial and organizational (I/O) psychology for many years (Steers, Mowday, & Shapiro, 2004). It is a central component of healthcare systems (Franco, Bennett, & Kanfer, 2002), a critical issue for academic performance (Hidi & Harackiewicz, 2000), and a deciding factor in personal health and well-being (W. A. Fisher, Fisher, & Harman, 2003). It is arguably the number one problem facing many organizations today (Watson, 1994). Although an exact understanding of motivation continues to evolve (Kanfer, Chen, & Pritchard, 2008), motivational forces can be described for practical purposes as either extrinsic or intrinsic (Pinder, 2011),[1] guiding the direction, intensity, and persistence of performance behaviors (Kanfer et al., 2008). Extrinsically motivated behaviors are governed by the prospect of instrumental gain and loss (e.g., incentives), whereas intrinsically motivated behaviors are engaged for their very own sake (e.g., task enjoyment), not being instrumental toward some other outcome. Yet, despite the importance of both

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[1] This is a substantial oversimplification of existing theory. A more complete perspective of motivational regulation is forwarded under self-determination theory by Ryan and Deci (2000) and Vallerand (1997). In this nuanced perspective, behavior regulation can be classified as one of six or seven types on a continuum from external (controlled) to internal (autonomous), nested hierarchically by global, contextual, and situation-specific factors. Thus, autonomous regulation is a broader concept than intrinsic motivation. However, we suggest that our simplification of this rich theory is forgivable, if only for the practical purposes this article serves.

intrinsic and extrinsic motivation in performance contexts (Deci, 1972; Frey, 1997), their interactive impact has yet to be studied meta-analytically. A scattering of primary studies has independently examined the joint impact of incentives and intrinsic motivation on performance but, as a whole, has drawn inconsistent conclusions. Several meta-analyses of the incentive literature (Jenkins, Mitra, Gupta, & Shaw, 1998; Weibel, Rost, & Osterloh, 2010) have also been inconclusive because the operationalizations of intrinsic motivation are made under the untenable assumption that third-party ratings of task interest serve as an adequate proxy for intrinsic motivation. Therefore, a critical question remains: *What is the interactive impact of incentives and intrinsic motivation on performance*?

Clearly, this question reveals a major gap in the motivation literature. We suggest that there are three reasons this may be the case. First, to our knowledge no quantitative review exists examining the direct impact of intrinsic motivation on performance. This state of affairs may be because research has largely focused on either untangling the impact of autonomy-thwarting extrinsic incentives on intrinsic motivation (cf. Reiss, 2005) or on the impact of incentives on performance (e.g., Jenkins et al., 1998). Second, by extension, it is also unknown whether and to what degree incentives moderate the predictive validity of intrinsic motivation. Self-determination theory (SDT; Ryan & Deci, 2000) has the potential to explain why such an effect might occur, but it requires further development. Finally, despite decades of theory (e.g., Lepper & Greene, 1978) and opinion (e.g., G. P. Baker, 1993; Kohn, 1993; Sansone & Harackiewicz, 2000) regarding the relation between incentives and intrinsic motivation, few empirical attempts show which (intrinsic or extrinsic) carries more relative weight in terms of performance. Thus, three questions of practical and theoretical importance have yet to be empirically addressed: *Does intrinsic motivation predict performance?*; if it does, *what is the role of extrinsic incentives?*; and *which matters more to performance: intrinsic motivation or extrinsic incentives?*

The purpose of this article is therefore to more clearly explain the links among extrinsic incentives, intrinsic motivation, and performance by exploring in conceptual order the three aforementioned questions. First, we take the position that intrinsic motivation is associated with superior performance, arguing that the strength of the relation depends on how performance is defined (i.e., quality vs. quantity). Second, we explore the degree to which incentive contingency (i.e., directly performance-salient incentives and indirectly performance-salient incentives) changes (i.e., moderates) the predictive validity of intrinsic motivation. Finally, we explore which is more important to performance: intrinsic motivation or extrinsic incentives. Coupling an extensive literature review with novel meta-analytic techniques, we respond to the call of previous researchers (Lepper & Henderlong, 2000), meta-analysts (Humphrey, 2011), and practitioners (Frey & Osterloh, 2002) to show not just *whether* but *when* and *why* intrinsic motivation and incentives work together to influence performance.

What Is the Impact of Intrinsic Motivation on Performance?

At the outset, it is important to clarify two definitions. The term performance is "synonymous with behavior . . . it is something that people actually do and can be observed" (J. P. Campbell, McCloy, Oppler, & Sager, 1993, p. 40). Performance is achievement-related behavior, with some evaluative component (Motowildo, Borman, & Schmit, 1997). For example, performance in academic settings may be operationalized as presentation quality, while in a sports setting it may be the number of goals scored. Formally defined, incentives "are plans that have predetermined criteria and standards, as well as understood policies for determining and allocating rewards" (Greene, 2011, p. 219). Although "money is probably the most widely used incentive" (Pinder, 2011, p. 396), incentives include anything provided by an external agent contingent on performance of particular standards of behavior(s). Thus, promotions, grades, awards, health benefits, praise, and recognition are all incentives.

Extrinsic incentives are motivating only to the extent that an individual believes attaining the incentive is instrumental toward other things of value, such as food, cars, housing, pleasure, and so forth. (Vroom, 1964). In many cases, organizations and institutions endorse or rely on "carrot and stick" types of incentive plans: Incentives are provided under the assumption that individuals will exert more effort for desirable behaviors when incentives are promised (Greene, 2011). Solid empirical backing exists for this belief. For example, at least two meta-analyses have found that providing financial incentives is associated with higher performance (Condly, Clark, & Stolovitch, 2003; Jenkins et al., 1998), depending on the type of performance and incentive contingency.

On the other hand, behavior can also be motivated for intrinsic reasons. Rather than being instrumental toward some other object of value, intrinsically motivated behaviors are themselves enjoyable, purposive, and provide sufficient reason to persist (Pinder, 2011). Although a great number of studies have explored the intrinsic motivation–performance link, it is often only as an ancillary discussion, and no meta-analysis of this literature exists. Although multiple researchers claim intrinsic motivation to be an important performance determinant (e.g., Deci, 1976; Sansone & Harackiewicz, 2000), the lack of meta-analysis leaves unclear the expected effect size or boundary conditions under which intrinsic motivation operates. Thus, for example, it is undetermined if intrinsic motivation has the same predictive utility in academia as it does in athletic or work contexts, or if the intrinsic motivation–performance link varies based on demographic or environmental conditions. This state of affairs is especially curious, given how rare it is to see any of the large fields of psychology not yet meta-analyzed (Humphrey, 2011). A core reason may relate to one of the most heated debates in the applied psychology literature. Specifically, nine meta-analyses (Cameron, Banko, & Pierce, 2001; Cameron & Pierce, 1994; Eisenberger & Cameron, 1996; Deci et al., 1999, 2001; Eisenberger, Pierce, & Cameron, 1999; Rummel & Feinberg, 1988; S. H. Tang & Hall, 1995; Wiersma, 1992) spanning three decades have focused elsewhere on a specific issue, called the *undermining effect*. The undermining effect refers to the idea that the presentation of incentives on an initially enjoyable task reduces subsequent intrinsic motivation for the task.

It is time to move beyond the undermining effect body of research because it obfuscates the importance of intrinsic motivation to performance (Reiss, 2005) and hinges on several assumptions unlikely to hold in many nonlaboratory contexts (Locke & Latham, 1990; Lust, 2004). On a fundamental level, the debate fails to recognize that performance is not simply determined by one or the other: To some degree, *both* intrinsic and extrinsic

motivation are functional in performance contexts. Given that most research supporting the undermining argument is derived from tasks that are intrinsically enjoyable from the outset, it is important to expand this line of research because many tasks in field settings, such as organizations and schools, are not necessarily "fun" from the outset. Similarly, it is not clear whether enjoyable or interesting tasks always take precedence over incentives. On the one hand, a survey of 550 individuals across multiple industries asked employees to rank the top five factors that motivate them in their jobs. Results indicated that the top motivational factor employees cared about was "good wages," with "interesting work" coming in at fifth place (Wiley, 1997). On the other hand, some research suggests that the most important values across generations are intrinsic ones, although this may be dropping for younger workers (Twenge, Campbell, Hoffman, & Lance, 2010). Furthermore, although investigators have expended a great deal of effort debating whether rewards should be used in a controlling manner (e.g., to get this reward you *have* to complete this task), the argument may be somewhat moot. Although many authors (cf. Sansone & Harackiewicz, 2000) have pointed out that administrators, teachers, coaches, and employers have a *de facto* need to impose controlling external constraints (such as budgets, deadlines, and even time), external limitations are not necessarily autonomy-thwarting (controlling) because they can be introduced in such a manner as to be autonomy-supportive (Vansteenkiste, Sierens, Soenens, Luyckx, & Lens, 2009). Perhaps most critically, the unilateral focus on the undermining effect pushes aside the question: *What is the ultimate impact of intrinsic motivation on performance?*

The dominant theory of intrinsic motivation, *self-determination theory* (SDT; Deci & Ryan, 1985; Ryan & Deci, 2000) provides a starting point for addressing this question by explaining how intrinsic motivation fuels the direction, intensity, and persistence of motivated behavior (cf. Kanfer et al., 2008). First, a relation exists between *choice* of direction and intrinsic motivation. When individuals find a particular task enjoyable or identifiable with the self, they are more likely to fully endorse and participate in the task (Patall, Cooper, & Robinson, 2008). Similarly, intrinsically motivated students have been found to more actively engage in learning and teaching, while extrinsically motivated individuals instead choose to be more passive (Benware & Deci, 1984). Second, under SDT, those who find a task more intrinsically motivating will expend a higher degree of intensity or *effort* in its production. For example, the enjoyment of learning new material and updating skills has been linked to the level of effort nurses expend under complex learning situations (Simons, Dewitte, & Lens, 2004). Finally, levels of intrinsic motivation should also be linked to performance under SDT through their impact on motivational *persistence.* When individuals find a task enjoyable or interesting, they should engage the task for longer periods of time, persisting beyond the point at which they are rewarded (Deci, 1972). For example, intrinsically motivated individuals tend to persist longer on tasks, which yields better academic achievement (A. E. Gottfried, 1985), job performance (A. M. Grant, 2008), and test performance (Vansteenkiste, Lens, & Deci, 2006), among others.

Given this reasoning, few would debate whether higher levels of intrinsic motivation lead to higher performance (although we admit the strong possibility of a degree of reciprocity between the two). However, we also suggest that strength of the influence of intrinsic motivation will hinge on how performance is defined. Along with others, we acknowledge that the type of performance criteria will have an impact on any motivation–performance link (Dalal & Hulin, 2008; M. Gagné & Forest, 2008; McGraw, 1978). The distinction that may be the most critical is that of "quality" and "quantity" (J. P. Campbell et al., 1993). For example, Adams (1965) noted that quality- and quantity-type performance criteria had differential links with motivational constructs. Meta-analytic methods are necessary to examine this issue, because few primary studies examine both in conjunction.

We expect (see Kruglanski, Friedman, & Zeevi, 1971; Lawler, 1969; Wimperis & Farr, 1979) that on the one hand, tasks emphasizing performance *quality* will have a strong link to intrinsic motivation. The reason is that quality-type tasks tend to require a higher degree of complexity and engagement of more skill, which commands a greater deal of personal investment. For example, intrinsically motivated employees tend to have higher levels of work engagement (Rich, 2006), which through vigilance, focus, and discretionary efforts (*The 21st Century Workplace,* 2005, as cited in Macey & Schneider, 2008), predicts both quality performance (cf. Bakker, Schaufeli, Leiter, & Taris, 2008; Simpson, 2009) and performance in general (Christian, Garza, & Slaughter, 2011). Intrinsic motivation should also be a strong predictor because quality-type tasks tend to be characterized by a higher valuation of personal investment and lower external control, both of which are theorized to be central to self-determination (Deci & Ryan, 2000; Ryan & Deci, 2000). In part, this deeper absorption occurs through greater autonomous function and orientation toward intrinsic goals, which contributes to better performance (Vansteenkiste, Matos, Lens, & Soenens, 2007).

On the other hand, as others have argued (Kruglanski et al., 1971; Lawler, 1969; Wimperis & Farr, 1979), we expect that tasks emphasizing performance *quantity* have a weaker link to intrinsic motivation. Quantity-type tasks can also be interesting, but tend to be lower in complexity, and require less personal cognitive investment (Gilliland & Landis, 1992). They therefore tend to be less intrinsically interesting. For example, the number of boxes put together would be a measure of performance quantity. These types of tasks do not require a substantial degree of judgment and autonomy for their satisfactory production; instead, they are produced primarily by intensely focused, persisted, and structured behavior. In addition, we argue that such tasks are experienced as pressuring toward particular outcomes and require a high degree of external control, which is typically not conducive to intrinsic motivation (Deci & Ryan, 1985; Frey, 1994), and would further erode its importance to performance. Thus, we predict a weaker relationship between intrinsic motivation and quantity-type performance tasks.

In sum, although several meta-analyses have been conducted to support the independent role of extrinsic incentives in performance, no similar aggregation exists for intrinsic motivation. Based on arguments derived from SDT, we believe that intrinsic motivation should predict performance in multiple contexts, a contention also supported by the job characteristics model (JCM; Hackman & Lawler, 1971; Hackman & Oldham, 1976) and theories surrounding work engagement (Christian et al., 2011) and empowerment (Siebert, Silver, & Randolph, 2004). Further, we also align ourselves with those who have suggested a stronger tie between intrinsic motivation and quality (vs. quantity) of perfor-

mance (cf. M. Gagné & Deci, 2005; M. Gagné & Forest, 2008). Thus, we hypothesize the following:

Hypothesis 1A: Intrinsic motivation is positively related to performance.

Hypothesis 1B: The relation between intrinsic motivation and performance is stronger for quality-type tasks than for quantity-type tasks.

Does Incentivization Moderate the Predictive Validity of Intrinsic Motivation?

We have argued that intrinsic motivation should predict performance, noting that the strength of the link depends on how criteria are defined (i.e., quality vs. quantity). However, it is likely that intrinsic motivation accompanies the presence of incentives in most applied domains (e.g., work, school, health care). Thus, it seems reasonable to assume that the presence and contingency of performance-salient incentives should influence the relation between intrinsic motivation and performance. Incentive presence refers to *whether* an incentive is offered, whereas contingency refers to *how* the incentive is predicated on performance (an expectation or contract of sorts). We provide some background on incentive contingency and our thoughts on how incentives might moderate the intrinsic motivation–performance relationship.

The most well-known breakdown of incentive contingency has been made by SDT researchers (Deci, Koestner, & Ryan, 2001). This distinction includes four contingency categories: engagement-, completion-, performance-, and non-contingent incentives. As the labels suggest, the categories describe whether an incentive was promised for mere engagement in the task, mere completion of the task, attaining some level of performance/achievement on the task, or not at all related to the task. The four SDT contingencies became widely used in lab research because they were thought to serve as a proxy for external control and competence feedback, two factors critical to the theory. All incentives have been hypothesized to reduce intrinsic motivation, through providing an "undermining effect." The reason is hypothesized to be that the design of incentives is to externally control an individual (Greene, 2011), which thwarts satisfaction of the need for autonomy (consciously or otherwise)—and by extension reduces intrinsic motivation (Ryan & Deci, 2000; Warneken & Tomesello, 2008). Some incentives, however, have been hypothesized not to have the undermining effect because receipt of the incentive on a completion-contingent or performance-contingent incentive would impart a competence-boosting message, thus also boosting intrinsic motivation. A meta-analysis comprised mostly of experimental data largely supported this distinction—namely, that controlling incentives reduce but supporting incentives enhance intrinsic motivation (Deci et al., 1999).

For the purposes of the current meta-analysis, the traditional contingency continuum (from very controlling to less controlling incentives) would be inappropriate. The traditional four incentive contingencies were originally developed for use in highly controlled, carefully manipulated laboratory experiments. Under these circumstances, it could be determined which type of incentive was being used and the incentive could be unambiguously linked to performance. A clear distinction among contingency types is unlikely to hold in practice. In field settings, there are many incentives and far less control as to how incentives are linked to performance. For example, a student may play college basketball for a scholarship *and* because s/he enjoys the sport. It is also challenging, if not impossible, to separate the contingencies. For example, it would not be possible to categorize an employee's base salary into a single contingency category (Greene, 2011).

For practical purposes, a simple way to conceptualize incentive contingency is the degree to which the incentive is directly performance-salient or indirectly performance-salient.[2] On the one hand, *directly* salient incentives provide a clear, proximal, unambiguous link between the incentive and performance. For example, sales commissions and expected end-of-year bonuses create an extrinsic reason to perform because they clearly predicate receipt of the incentive upon successful completion or varying degrees of performance (Greene, 2011). On the other hand, *indirectly* salient incentives still have a tie to performance, but the link is less clear or direct. For example, base salaries tend to be distally related to performance, such that it is difficult to expect measurable gains in base salary from immediate improvements in performance. Admittedly, there is much overlap between our categorization and that of SDT; most completion- and performance-contingent studies tend to be directly performance-salient, while engagement- and non-contingent incentives would be indirectly salient to performance. However, we believe that the present framework is more accurate. In short, directly salient incentives set up a clear, proximal link between the incentive and performance, whereas indirectly salient incentives provide an indirect or weak link between performance and the receipt of the incentive.

Furthermore, this distinction can explain the moderating role of incentives by invoking a "crowding out" hypothesis (cf. Frey & Osterloh, 2005; M. Gagné & Forest, 2008).[3] On the one hand, when incentives are directly performance-salient, they possess two factors that are necessary for controlling behavior: immediacy and salience (Greene, 2011). Directly salient incentives make it abundantly clear to the individual that a certain behavior will lead to the incentive, which sets up a strong extrinsic incentive to perform. Assuming that performance motives are intrinsic or extrinsic (again, an oversimplification), we argue that intrinsic motivation will be a *poorer* predictor because it is no longer the sole determinant of performance motivation. In other words, when direct incentives are present, a crowding-out of intrinsic motivation occurs because incentives become the more salient factor to performance. Thus, we argue that the predictive utility of intrinsic motivation will be weakened because it is no longer the sole, or perhaps even most, salient motivational determinant of performance. Put differently, while also possibly reducing intrinsic motivation, directly performance-salient incentives also reduce the leverage (and therefore predictive validity) that intrinsic motivation has on performance.

On the other hand, indirectly performance-salient incentives (i.e., those that are not directly or clearly tied to performance) lack the critical salience and immediacy factors. As a result, the extrinsic motivation to perform is less (if at all) salient. Put differently, indirectly salient incentives exert a weaker influence on behavior

[2] We thank two anonymous reviewers for this suggestion.

[3] We thank an anonymous reviewer for helping to refine this point.

because the behavior-reward relationship is much less clear or certain than with directly salient incentives. For example, receiving experimental credits as an incentive to participate in an experiment is not directly tied to class grades (performance criteria); thus, the incentive is not salient or immediate to performance. Again, assuming that performance motives are largely intrinsic or extrinsic and that extrinsic motives are less potent when incentives are indirectly salient, the importance of intrinsic motivation should rise when indirectly salient incentives are presented. More simply put, when extrinsic motives are weak or absent (as is the case under indirectly salient incentives), it can be argued that intrinsic motivation will be a better predictor because it becomes the only functional driver of performance.

Thus, we predict the following:

> *Hypothesis 2A:* When incentivized, the relationship between intrinsic motivation and performance is positively moderated (strengthened) by the presence of indirectly performance-salient incentives.
>
> *Hypothesis 2B:* When incentivized, the relationship between intrinsic motivation and performance is negatively moderated (weakened) by the presence of directly performance-salient incentives.

Two points of clarification are necessary. First, we have deliberately omitted discussion of the extent to which the mere presence of incentives moderates the intrinsic motivation–performance link. A core reason is that we do not have reason to believe that incentives will have an omnibus (i.e., a definite positive or negative) impact on these associations. What is important is the informational value of the incentive (Deci et al., 1999) or as we argue, the salience to performance. Collapsing across either contingency would in theory mask any effects.

Second, the extent to which incentives boost or reduce intrinsic motivation is to some degree irrelevant to performance. What matters is the degree to which intrinsic motivation predicts performance. Thus, the issue is not whether incentives reduce the *level* of intrinsic motivation, but whether they reduce the extent to which intrinsic motivation can *covary* with (predict) performance. Despite the importance of this premise, to our knowledge it has gone unexamined until now. We contend that examining the interactive effect of intrinsic and extrinsic incentives on performance will advance the literature.

Which Matters More for Performance: Incentives or Intrinsic Motivation?

We argued that intrinsic motivation should predict performance, depending on how performance is defined and the contingency of incentives provided. This argument focuses largely on intrinsic motivation alone, saying nothing surrounding its comparative contribution to performance. Further knowledge of whether incentives or intrinsic motivation is the primary driver of performance in a particular context is extremely valuable for educational and organizational development interventions (Dalal & Hulin, 2008). Thus, we next examine the relative contribution of intrinsic motivation and extrinsic incentives to performance, and speculate as to why such an important question has been unaddressed.

To address the second question first, historically it has been argued that extrinsic incentives explain the dominant share of variability in performance. For example, many have suggested that the problem with incentives is that they are almost too effective at boosting performance, akin to a supercharged engine in a car (G. P. Baker, 1993). Similarly, some researchers in motivation have relegated the role of intrinsic motivation to that of well-being and happiness, suggesting instead that extrinsic factors (typically incentives such as pay and promotion) play the dominant role in performance (Locke & Latham, 1990, p. 58). Part of the impetus for the current review is that this viewpoint is quickly falling away, as the proximal salience of intrinsic motivation to performance is increasingly recognized (Diefendorff & Chandler, 2011).

A more practical reason for the lack of research on intrinsic motivation, incentives, and performance pertains to logical issues. Specifically, there has been an inability to reconcile three seemingly true, but incompatible premises: (a) incentives boost performance, (b) intrinsic motivation boosts performance, and (c) incentives reduce intrinsic motivation.

We term this the *uncomfortable conclusion.* If (a) and (c) are true, then one has to conclude that (b) could not be true: If incentives boost performance and reduce intrinsic motivation, then intrinsic motivation must be associated with lower performance, which runs counter to (b). Or, if (b) and (c) are true, then (ignoring for a moment that a large enough incentive can overcome any drop in intrinsic motivation) one must logically conclude that (a) could not be true. That is, if intrinsic motivation boosts performance and is negatively related to incentives, then incentives must be negatively or unrelated to performance (which is not the case, given existing meta-analyses).[4] We suggest that this uncomfortable conclusion is reached because the argument is not logically sound: the three premises above cannot always or even usually be true because they ignore the critical moderators we address in this article. Specifically, assertions (a), (b), and (c) assume omnibus relationships: They ignore the fact that performance type (e.g., quality, quantity) and incentive contingency (e.g., directly performance-salient, indirectly performance-salient) will change the strength of the relationship among incentives, intrinsic motivation, and performance.

Considering the research surrounding these moderators, we suggest (see also Dalal & Hulin, 2008) that the type of criteria will drive whether incentives or intrinsic motivation are more important to performance. For *quantity* criteria, theory suggests that incentives should be the deciding (i.e., dominant) predictor. Quantity-type criteria are likely to be noncomplex, repetitive, and require chiefly focus and drive for their completion. As an extensive body of research shows, incentives are excellent for these types of tasks because the prospect of instrumental gain sharply focuses one's attention and directs one's behavior. Provided the incentive is contingent upon gaining the outcome of interest, incentives will be powerful. Combined with the fact that incentives are an excellent predictor of *quantity* performance (Jenkins et al., 1998), it is reasonable to assume they will be maximally predictive here.

For Hypothesis 1B, we argued that compared to overall performance, intrinsic motivation should more strongly predict quality-

[4] We take no position at this point, as the same problem is encountered whether or not (c) is changed to assert that incentives *increase* intrinsic motivation.

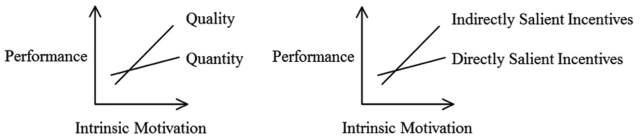

Figure 1. Graphical depiction of study hypotheses.

performance. Here, we argue intrinsic motivation is also more important for predicting quality criteria. Quality criteria require an individual to be absorbed in the task, work more autonomously, draw on personal resources, and maintain a broad focus. When intrinsically motivated by a task, individuals are more likely to keep an open mind, persist autonomously, and adopt mastery goals that guide task completion (Rawsthorne & Elliot, 1999), especially on quality-type tasks. Many (if not most) types of incentives do not operate toward those ends: they can thwart openness and creativity because they create a focus and urgency that is counterproductive (Byron & Khazanchi, 2012). In addition, the meta-analysis by Jenkins et al. (1998) demonstrates that there is almost no link between the presence of incentives and the quality of performance.

Thus, we formally hypothesize the following:

> *Hypothesis 3A:* Considered concurrently in the prediction of performance quantity, extrinsic incentives are a better predictor than intrinsic motivation.
>
> *Hypothesis 3B:* Considered concurrently in the prediction of performance quality, intrinsic motivation is a better predictor than extrinsic incentives.

A graphical depiction of the study hypotheses is shown in Figure 1.

Method

Literature Search and Criteria for Inclusion

A number of databases were extensively searched for published research, including PsycINFO, ERIC, PubMed, Scopus, and Dissertation Abstracts International (although, we note that not all dissertations are formally published). In addition, a call was placed for unpublished research using electronic listservs, including Academy of Management Organizational Behavior, SDT, the Society for the Study of Motivation, and the American Educational Research Association Motivation Special Interest Group. Finally, related published or unpublished articles were solicited using Facebook. Broad and narrow variations of terms related to the operationalization of intrinsic motivation (e.g., "intrinsic motivation," "autonomous regulation," "task satisfaction," "free-choice persistence," "task enjoyment") and performance (e.g., "productivity," "effectiveness," "job performance") were searched.

An article had to report an effect size for the relation between intrinsic motivation (described below) and performance with an independent sample not previously published elsewhere. Studies publishing the same findings with the same sample in multiple articles, under the guise of independent research, were completely omitted from the study. The study had to provide some defensible measure/instrument of both intrinsic motivation and performance. When possible, the original source containing the referenced measure/instrument was obtained. If any articles disagreed about what particular construct an instrument assessed, deference was given to the original author of the instrument. Other than non-English research, no a priori moderators, specific populations, study designs, time periods, year, or geographical locations were rejected. Unless otherwise indicated, all analyses include both published and unpublished samples.

Coding Data

Each source was read for content prior to coding. A coding schema was set up in advance and every data point was coded independently by the first two authors. Through subsequent discussion, all 14,070 individual data points (35 categories from Table 5 $\times$ 402 correlations) were cross-verified against the predetermined coding schema. Initial coding agreement was 81.89%. Following discussion with the third author, all disagreements were resolved, yielding 100% agreement.

Initially, data surrounding the operationalization of intrinsic motivation were coded into one of four categories. *Autonomous regulation* was defined as the extent to which a behavior was initiated/maintained by intrinsic or extrinsic forces, and reflected in a Relative Autonomy Index (RAI) computed in line with Deci, Connell, and Ryan (1989). *Intrinsic motivation* was coded and defined as the participation in an activity because it was intrinsically enjoyable, or as task fulfillment. *Task enjoyment/satisfaction* was defined as any measure of the degree to which a particular task was found enjoyable, satisfying, or fun. *Free-choice task persistence* was defined as the length of any instance in which an individual was intentionally (but not overtly or consciously) given the opportunity to engage in a task for no compensation, when no other activities were present (cf. Deci, 1972).

We subsequently decided to collapse across the four categories for several reasons. First, it was desirable to maintain a simple intrinsic-extrinsic distinction because a dichotomy provides a cognitively manageable (although somewhat simplistic) way to think about the moderating impact of incentives on the IM $\rightarrow$ performance relationship. This is especially true for increasingly complex breakdowns and three-way interactions. Second, a further breakdown (either by the four categories above or by those prescribed under SDT) would have resulted in smaller cell sizes that would make the drawing of conclusions too tenuous. Third, the term "intrinsic" is much more intuitive than the terms "autonomous regulation" or "free-choice persistence." It is widely used by theorists, and readily understood by practitioners. Thus, the four categories in all subsequent analyses are collapsed and treated as a measure of intrinsic motivation.[5]

Several related constructs were also considered, but not included in the current review. Measures of intrinsic satisfaction or attitudinal constructs at the contextual or general level (such as job satisfaction) were excluded (see Judge, Thoresen, Bono, & Patton, 2001 for a related review). We also excluded constructs like employee engagement, which refers more to an attitudinal and behavioral construct (for a review, see Christian et al., 2011). The job characteristics model posits related constructs such as auton-

[5] To validate our decision, we ensured there were no substantial differences among the four categories through separate meta-analyses, which are available from the authors upon request.

omy (cf. Humphrey, Nahrgang, & Morgeson, 2007) and internal work motivation, but we did not include these measures because they are a more cognitive reflection/evaluation of the impact of the job on the individual, including items such as "My opinion of myself goes up when I do my job well" (Fried, 1991; Fried & Ferris, 1987). Achievement goals (e.g., mastery, learning) were also not included as an operationalization of intrinsic motivation.

Performance was divided into three categories. Performance was coded as *quality* when output was compared with some evaluative performance standard other than quantity (e.g., creativity, assembly quality, research proposal). Criteria were coded as *quantity* when performance was evaluated by counting discrete units of output (e.g., number of points, number errors detected, number of problems solved). Finally, any criteria that were not explicitly/definitionally either quality or quantity were considered to have elements of *both* (e.g., academic performance). Productivity was included in this category. Most criteria conformed well to the behavioral conceptualization of performance in the introduction. We note that the lines may be blurred between performance and outcomes in practical contexts. However, these types of studies were only included where performance and outcomes were clearly very proximal to one another.

Extrinsic incentives were coded broadly as *present* when there was any prize, credit, or financial compensation surrounding task performance, and as *absent* when the study explicitly stated that none was expected or offered. Although it may have been reasonable to infer that no incentive was provided in many cases (e.g., anonymous surveys), we coded as *no information* for those studies that were not fully explicit either way. The incentive category was further divided by incentive contingency using incentive salience. Incentives were coded as *directly performance-salient* when an incentive was clearly predicated on engagement/completion of a particular performance task, and the performance task in the study was our performance dependent variable. This designation would include, for example, an incentive to participate in a research study and performance on a task in the research study. Incentives coded as *indirectly performance-salient* were also clearly predicated on engagement/completion of a particular performance task. However, in this case, the performance task was instrumental only to the dependent performance variable we measured (i.e., a more distal link between the study incentive and our performance measure). An indirectly salient example would be an incentive to participate in a research study, with performance captured at the end of the semester (such that credit for participating in the study indirectly/distally influenced our performance measure).

With a nod to previous research (Deci et al., 1999), we also attempted to code for the traditional incentive contingency. Incentives were coded as *engagement-contingent* when individuals were required to participate to obtain the incentive, but neither completion nor performance affected whether or how much incentive was received. Incentives were coded as *completion-contingent* when individuals had to a complete a task to receive credit, but performance did not influence how much incentive was received. Incentives were coded as *performance contingent* when the individual incentive was determined by final task performance levels. We did not use this contingency for the reasons described earlier (viz., it was virtually impossible to clearly separate into discrete categories). However, the majority of engagement- and non-contingent incentives fell into the indirect salience category, while completion- and performance-contingent fell mostly into the direct salience category.

It should also be noted that we coded for a number of demographic variables and potential methodological moderators, including context (school, work, physical) age (child, adolescent, college, adult), criterion type (objective vs. subjective, self- vs. non-self-report), and source (lab vs. field, cross-sectional vs. longitudinal). Given the experimental tradition of most previous work, we also coded for experimental versus correlational designs. Experimental was defined narrowly, such that the study had to experimentally manipulate intrinsic motivation, not merely occur in a lab or under tightly controlled circumstances. Only five studies met this criterion, precluding further analyses.

Analysis

Three general analytic approaches were taken. First, the meta-analytic methods and accompanying software of Hunter and Schmidt (2004) were used to aggregate effect sizes and create meta-analytic estimates. Hunter and Schmidt's method uses a random-effects model, which assumes that between-study variation in effect size estimates can be attributed to (a) study artifacts and (b) potential moderators. This method is generally superior to fixed-effects models, which are based on the untenable assumption that between-study variation in effect size is due purely to sampling error.

Some meta-analytic methods employ statistical significance testing to determine whether an effect size is likely to have additional moderators (cf. Rosenthal & DiMatteo, 2001), or be significantly different from either another effect size or from zero (Hedges & Olkin, 1985). Hunter and Schmidt's (2004) method strongly advocates against doing so because a good meta-analysis is assumed to represent population-level (rather than sample-level) estimates. Further, there are substantial statistical and theoretical controversy/limitations behind significance testing in meta-analysis (Hunter & Schmidt, 2000; National Research Council, 1992; F. L. Schmidt & Hunter, 2001). For practical purposes, the preponderance of several pieces of evidence can suggest whether two estimates are "significantly" different from each other or from zero. As recommended by Hunter and Schmidt (2004), we report and rely only on differences in corrected population parameters (ρ). A percent error attributable to artifacts exceeding 60%–70% suggests no remaining significant moderators. Finally, credibility intervals can suggest whether one corrected population parameter (ρ) is "significantly" different from another: If the 80% credibility interval of one fails to overlap the point estimate of the other, the two estimates can be assumed different. Similarly, an absence of zero in the interval suggests the relationship is uniformly in one direction. When the percent error attributable to artifacts meets or exceeds 100%, SD_ρ will equal zero, indicating that observed variance in effect sizes can be fully attributed to statistical error. We report all this information for each estimate for the reader to decide accordingly.

When not explicitly reported in correlation form, we inferred Pearson product-moment correlations from exact *p*-values, group means/standard deviations, and *t*-values. Composite effect sizes (Hunter & Schmidt, 2004, p. 433) and composite reliabilities (Mosier, 1943) were calculated where multiple assessments of an effect size of interest were reported in a single sample, to yield one

overall effect size for each sample. Corrections were made for predictor and criterion unreliability using artifact distributions. This method was used on the overall sample to test Hypothesis 1A, and for each categorical moderator hypothesized to test Hypotheses 1B, 2A, and 2B.

Second, to use both intrinsic motivation and extrinsic incentives to predict performance simultaneously, we turned to matrix regression (Berkey, Hoaglin, Mosteller, & Colditz, 1995; van Houwelingen, Arends, & Stijnen, 2002), a common practice in meta-analysis. Matrix regression enables multiple predictors by creating a matrix of correlations (each representing a single meta-analysis) in place of raw/primary data. To accomplish this, we took the findings from the current study for intrinsic motivation and performance and combined them with meta-analytic estimates taken from Jenkins et al. (1998) on extrinsic incentives. Calculating the harmonic mean for each, we used the corrected meta-analytic correlations to create a metacorrelation matrix. Once we had this matrix, we were then able to perform matrix regression to test Hypotheses 3A and 3B.

Finally, we pioneered a new method to answer several post hoc questions. The above methods (and most meta-analyses) take the effect sizes published in each primary study, weight them by some indicator of variability (e.g., sample size, variance), and seek to explain *between-study* variance among effect sizes with reference to *between-study* categorical (e.g., male vs. female) or continuous (e.g., year, percent female) factors. An upside to this method is that it allows one to explore the relation among study factors that are placed on a common scale. This is commonplace and readily done with categorical variables because it is easy to place them on the same scale across studies: For example, it is a straightforward task to classify a given study as either "incentivized" or "not incentivized." It is also feasible when the variables of interest are on a *continuous* scale, provided the variables are on the same scale. For example, publication year, percent female, and response rate naturally occur on the same scale across studies. However, when continuous variables do not fall on the same scale, such as different measures of motivation, analyses are problematic.

To place each variable on a scale that could be collapsed across studies, we returned to our full data set and rescaled all categorical moderating characteristics of the study using simple dummy coding, as is commonplace. For example, studies that were incentivized were coded as "1," and those that were not as a "0," allowing categorical variables to be used in a regression equation. To place the two focal continuous variables (intrinsic motivation and performance) on the same scales across studies, two pieces of information were collected from each individual study: the mean of the variable of interest, and the possible lower and upper values the scale in question could take (e.g., 0.00–4.00 for GPA, 1–5 for many Likert-type scales). Using this information, the mean scores of each were converted to percentage of maximum possible (POMP) score based on the response scale range to give an estimate of the average level of IV or DV within a study, on a scale of 0%–100% (cf. Cohen, Cohen, Aiken, & West, 1999). Once converted to a POMP score, measures of intrinsic motivation (and performance) were on the same scale across all studies. This number was then used to examine, for example, whether between-study variation in mean levels of intrinsic motivation or performance was related to other between-study moderator characteristics such as performance, incentive type, gender, age, and so forth. Although dummy coding categorical variables for regression purposes has been used many times for one or two variables in meta-analytic regression, to our knowledge, ours is the first to dummy code all categorical moderators and rescale all continuous variables by applying Cohen et al.'s (1999) POMP method.

Results

Our electronic search returned a total of 2,903 non-duplicated unique original articles. From this total, 950 articles, conference papers, and dissertations were selected for coding. Our call for unpublished research yielded 32 studies, of which 7 were coded and included. In total, as shown in Table 1, we selected for inclusion and coded 154 sources (28 unpublished) reporting effect sizes from 183 independent samples and 212,468 respondents. We computed composite correlations from 402 raw correlations, resulting in a final 183 effect sizes. Main results are reported in Table 2. Sample and other criteria characteristics are reported in Table 3. File-drawer analyses (also referred to as fail-safe analyses) are included throughout. These indicate the number of studies that would have to be subsequently located or published reporting an effect size of 0 to reduce the effect size in question to one of two levels (.10 or .05). It has been noted that file drawer analyses can be misleading at times because they take a very limited amount of information into account (Aguinis, Dalton, Bosco, Pierce, & Dalton, 2011). Thus, consistent with other recent investigators (e.g., Tannenbaum & Cerasoli, 2013), we ensured that file drawer analyses were in line with a preponderance of the evidence surrounding publication bias. Specifically, the file drawer analyses are in agreement with funnel plots and published–unpublished study comparison of effect sizes.

As demonstrated in Table 2, Hypothesis 1A received support. The corrected population correlation between intrinsic motivation and performance across all samples was $\rho = .26$ ($k = 183$, $N = 212{,}468$; 80% credibility interval = .16–.36). File drawer analyses indicate that 586 studies reporting null findings (i.e., $r = .00$) would be necessary to reduce our population estimate to $r = .05$, suggesting the threat of inadequate search to be low. As shown in Table 2, Hypothesis 1B also received support. The corrected population correlation between intrinsic motivation and performance was stronger for quality performance ($\rho = .35$; $k = 34$, $N = 8{,}926$; 80% credibility interval = .21–.48) than for quantity performance ($\rho = .26$; $k = 78$, $N = 185{,}323$; 80% credibility interval = .21–.31). A percentage of error due to artifacts (% error) approaching or exceeding 75.00% (F. L. Schmidt & Hunter, 1977) would suggest that reported population estimates of the true effect size are relatively stable across settings and methods (i.e., that artifactual, not substantive moderators, can account for the variability in observed effect sizes). In this case, a larger percentage of error due to artifacts for both quantity (69.81%) and quality (35.63%) performance, compared to overall analyses (31.60%), indicates that the quality-quantity breakout accounted for some of the variance in the overall effect sizes. Fail-safe analyses also indicated that a large number of additional studies would have to emerge (156 for quality, 234 for quantity) reporting null findings ($r = .00$) to reduce our estimate to $r = .05$.

Hypotheses 2A and 2B were supported. As expected, results presented in Table 2 show a three-way interaction between intrinsic motivation, incentive presence, and incentive contingency on

Table 1
Data Used for Studies in the Meta-Analysis

Source	Year	r	r_c	n	r_{xx}	r_{yy}	Incentive present?	Salience?
Amabile et al. (1)	1986	.32	.32	115				
Amabile et al. (3)	1986	.32	.27	60				
Amabile et al. (3)	1986	.21						
Arnold	1985	.50	.49	42	.17			
Arnold	1985	.23						
Artelt	2005	.21	.21	110,991	.82	.81	no	
Aunola et al.	2006	−.10	.08	207	.86	.94	no	
Aunola et al.	2006	.08					no	
Aunola et al.	2006	.01					no	
Aunola et al.	2006	−.09					no	
Aunola et al.	2006	.18					no	
Aunola et al.	2006	.14					no	
Aunola et al.	2006	−.02					no	
Aunola et al.	2006	.09					no	
Aunola et al.	2006	.12					no	
Baer	1997	.09	.09	128				
S. R. Baker	2003	−.02	.04	91	.92		no	
S. R. Baker	2003	.17					no	
S. R. Baker	2003	.04					no	
Bartelme	1983	.32	.38	104	.34			
Bartelme	1983	.27						
Becker	1992	.07	.07	89				
Bergin	1992	.24	.24	158	.87		no	
Black & Deci	2000	.38	.28	137	.82		no	
Black & Deci	2000	.05					no	
Boiché et al.	2008	.26	.26	210	.49	.93	no	
Boiché et al.	2008	.17					no	
Bourgeois	2007	−.01	−.01	183	.94		yes	direct
Broder	2004	.21	.21	186	.74		no	
Butler	2006	.03	.21	312	.75			
Butler	2006	.40						
Butler	2006	.19						
Callahan et al.	2003	.37	.45	229	.92			
Callahan et al.	2003	.38						
Callahan et al.	2003	.42						
Callahan et al.	2003	.44						
Cerasoli & Ford	in press	.63	.84	89	.89	.76	yes	indirect
Cerasoli & Ford	in press	.48					yes	indirect
Cerasoli & Ford	in press	.55					yes	indirect
Cerasoli & Ford	in press	.63					yes	indirect
Cerasoli & Ford	in press	.63					yes	indirect
Cerasoli & Ford	in press	.64					yes	indirect
Cerasoli & Ford	in press	.54					yes	indirect
Cerasoli & Ford	in press	.58					yes	indirect
Cerasoli & Ford	in press	.68					yes	indirect
Cerasoli & Ford	in press	.18					yes	indirect
Cerasoli & Ford	in press	.23					yes	indirect
Cerasoli & Ford	in press	−.01					yes	indirect
Charbonneau et al.	2001	.21	.36	168	.88			
Charbonneau et al.	2001	.22						
Charbonneau et al.	2001	.14						
Charbonneau et al.	2001	.18						
Charbonneau et al.	2001	.25						
Charbonneau et al.	2001	.23						
Chillarege et al.	2003	.07	.08	67	.94	.82	no	
Chillarege et al.	2003	.07					no	
Cho	2006	.34	.27	151	.87		yes	indirect
Cho	2006	.08					yes	indirect
Church et al. (2)	2001	.33	.33	297	.93		no	
Cock & Halvari	1999	.03	.23	110	.82			
Cock & Halvari	1999	.33						
Cole	2007	.18	.26	246	.92		yes	direct

(*table continues*)

Table 1 (*continued*)

Source	Year	r	r_c	n	r_{xx}	r_{yy}	Incentive present?	Salience?
Cole	2007	.25					yes	direct
Collins	1996	.20	.20	441	.85		no	
Conti	2000	.13	.19	86	.81		no	
Conti	2000	.17					no	
Corpus et al.	2009	.13	.24	1,051	.92	.91		
Corpus et al.	2009	.17						
Corpus et al.	2009	.19						
Corpus et al.	2009	.15						
Corpus et al.	2009	.15						
Corpus et al.	2009	.17						
Corpus et al.	2009	.17						
Corpus et al.	2009	.24						
Corpus et al.	2009	.08						
Corpus et al.	2009	.19						
Cury et al. (2)	2006	.02	.29	96	.88	.68	no	
Cury et al. (2)	2006	.28					no	
Cury et al. (2)	2006	.14					no	
Cury et al. (2)	2006	.32					no	
d'Ailly	2003	.10	.10	801	.88			
de Ghetaldi (Post-control)	1998	.31	.07	20	.85		no	
de Ghetaldi (Post-experimental)	1998	−.21					no	
de Ghetaldi (Pre-control)	1998	.11					no	
de Ghetaldi (Pre-experimental)	1998	.07					no	
Debowski et al.	2001	.02	−.04	48	.94			
Debowski et al.	2001	−.09						
DeVoe & Iyengar	2004	.31	.44	1,760	.35	.66	yes	indirect
DeVoe & Iyengar	2004	.11					yes	indirect
DeVoe & Iyengar	2004	.14					yes	indirect
DeVoe & Iyengar	2004	.61					yes	indirect
Dodd & Ganster	1996	.12	.12	197	.94		yes	direct
Donovan	2009	−.14	.02	100	.87			
Donovan	2009	.10						
Donovan	2009	.09						
Douthitt & Aiello	2001	.41	.41	128	.89		yes	direct
Dysvik & Kuvaas	2008	.39	.39	333	.72	.72		
Dysvik & Kuvaas (1)	2011	.27	.27	199	.88	.80		
Dysvik & Kuvaas (2)	2011	.25	.25	103	.82	.86		
Efron	1976	−.04	−.13	85			no	
Efron	1976	−.25					no	
Efron	1976	.12					no	
Elmadag	2007	.27	.27	220	.71	.93		
Fang	1997	.11	.11	433	.69			
C. D. Fisher	1978	.01	.11	82			yes	
C. D. Fisher	1978	.21					yes	
C. D. Fisher & Noble	2004	.39	.39	114		.91		
Fortier et al.	1995	.33	.50	263	.96	.95		
Fortier et al.	1995	.39						
Fortier et al.	1995	.40						
Fortier et al.	1995	.40						
Fortier et al.	1995	.13						
Fortier et al.	1995	.23						
Fortier et al.	1995	.29						
Fortier et al.	1995	.25						
Fortier et al.	1995	.21						
Fortier et al.	1995	.35						
Fortier et al.	1995	.36						
Fortier et al.	1995	.34						
Fortier et al.	1995	.21						
Fortier et al.	1995	.33						
Fortier et al.	1995	.33						
Fortier et al.	1995	.30						
Fortune et al.	2005	.50	.41	188		.87		
Fortune et al.	2005	.10						
Freedman & Phillips	1985	.19	.20	71	.88			

(*table continues*)

Table 1 (*continued*)

Source	Year	r	r_c	n	r_{xx}	r_{yy}	Incentive present?	Salience?
Freedman & Phillips	1985	.21						
Freedman & Phillips	1985	.32						
Freedman & Phillips	1985	.06						
Freudenthaler et al. (Boys)	2008	.12	.12	526			no	
Freudenthaler et al. (Girls)	2008	.08	.08	779			no	
Frischenschlager et al.	2005	.16	.16	189				
F. Gagné & St. Père (2)	2002	.06	.29	156	.93	.83		
F. Gagné & St. Père (2)	2002	.21						
F. Gagné & St. Père (2)	2002	.62						
F. Gagné & St. Père (1)	2002	.03						
F. Gagné & St. Père (1)	2002	.21						
F. Gagné & St. Père (1)	2002	.61						
Gao	2008	.15	.15	307	.76			
Gardner (Post)	2004	.41	.48	116	.78			
Gardner (Pre)	2004	.37						
Gibbs	1980	.05	.14	74			yes	
Gibbs	1980	.01					yes	
Gibbs	1980	.22					yes	
Gibbs	1980	−.04					yes	
Gillet, Berjot, & Gobancé	2009	.06	.33	90	.84	.37	no	
Gillet, Berjot, & Gobancé	2009	.25					no	
Gillet, Berjot, & Gobancé	2009	.26					no	
Gillet, Berjot, & Gobancé	2009	.24					no	
Gillet, Vallerand, & Rosnet (1)	2009	.08	.08	170	.74	.91	no	
Gillet, Vallerand, & Rosnet (1)	2009	.07					no	
Gillet, Vallerand, & Rosnet (2)	2009	.24	.20	250	.73	.18	no	
Gillet, Vallerand, & Rosnet (2)	2009	.06					no	
Gillet et al.	2010	.00	.13	101	.83		no	
Gillet et al.	2010	.20					no	
Gillet et al. (1)	2012	.26	.26	240	.93			
Gillet et al. (2)	2012	.24	.19	262	.26			
Gillet et al. (2)	2012	.05						
Goldstein	1977	.04	.04	64				
A. W. Gottfried et al.	2005	.40	.40	104				
Goudas et al.	1995	.74	.67	40	.88		yes	direct
Goudas et al.	1995	.34					yes	direct
Graham et al. (Text 1)	2008	.28	.26	142				
Graham et al. (Text 1)	2008	.21						
Graham et al. (Text 1)	2008	.21						
Graham et al. (Text 2)	2008	.25						
Graham et al. (Text 2)	2008	.34						
Graham et al. (Text 2)	2008	.25						
A. M. Grant & Sonnentag (2)	2010	.17	.17	215	.92	.95		
A. M. Grant (2)	2008	.19	.16	140		.73	yes	
A. M. Grant (2)	2008	.10					yes	
K. Grant et al.	2001	.18	.18	148	.77	.84	no	
A. M. Grant et al. (1)	2011	.15	.15	106	.69		yes	none
A. M. Grant et al. (2)	2011	.09	.09	219	.95		yes	direct
Graves et al.	2012	.22	.23	346		1.0	no	
Graves et al.	2012	.23					no	
Graves et al.	2012	.19					no	
Grolnick & Slowiaczek	1994	.34	.34	302				
Grolnick et al.	1991	.16	.16	456				
Grolnick et al.	1991	.15						
Hackman & Lawler	1971	.13	.09	208		.77	no	
Hackman & Lawler	1971	.04					no	
Hafsteinsson & Donovan	2005	.27	.27	347	.92		yes	direct
Halvari et al.	2009	.21	.21	111	.82		no	
Hamlet	1999	.52	.55	114				
Hamlet	1999	.63						
Hamlet	1999	.49						
Hamlet	1999	.56						
Hänze & Berger	2007	.25	.31	166	.82	.67		
Hänze & Berger	2007	.18						

(*table continues*)

Table 1 (*continued*)

Source	Year	r	r_c	n	r_{xx}	r_{yy}	Incentive present?	Salience?
Hänze & Berger	2007	.30						
Hänze & Berger	2007	.21						
Harackiewicz	1979	.10	.19	93	.78			
Harackiewicz	1979	.03						
Harackiewicz	1979	.09						
Harackiewicz	1979	.20						
Harackiewicz	1979	.22						
Harackiewicz	1979	.14						
Harackiewicz & Manderlink	1984	.36	.56	94				
Harackiewicz & Manderlink	1984	.76						
Harackiewicz et al.	1985	.20	.20	120	.90			
Harris et al.	1993	−.14	.03	88	.89	.70	no	
Harris et al.	1993	−.09					no	
Harris et al.	1993	−.16					no	
Harris et al.	1993	.49					no	
Hechanova et al.	2006	.02	.02	527	.79			
Hirschfeld & Lawson	2008	.17	.17	372	.84		yes	indirect
Hirschfeld et al.	2008	.03	−.08	429	.71	.70		
Hirschfeld et al.	2008	−.10						
Hirschfeld et al.	2008	−.05						
Hirschfeld et al.	2008	−.12						
Hirschfeld et al.	2008	.05						
Hirschfeld et al.	2008	−.09						
Hon	2012	.40	.40	250	.79	.94		
Hosie et al.	2007	−.01	.16	125	.99	.85		
Hosie et al.	2007	.18						
Hosie et al.	2007	.14						
Hosie et al.	2007	.32						
Hosie et al.	2007	.47						
Hosie et al.	2007	.31						
Hosie et al.	2007	−.08						
Hosie et al.	2007	.25						
Howard	1976	.12	.12	353	.78	.96		
Jaramillo & Mulki	2008	.24	.24	344	.72	.76		
Jaramillo et al.	2007	.09	.09	223	.86		yes	direct
Jaussi & Dionne	2003	.15	.15	322	.79	.81	yes	direct
Jelstad	2007	.48	.48	249	.88	.74		
Jeon (Parents)	2007	.26	.26	248				
Jeon (Teachers)	2007	.23	.23	231				
Johnson et al. (Trial 4)	1996	.20	.18	247	.83		yes	direct
Johnson et al. (Trial 2)	1996	.15					yes	direct
Jones	2002	−.10	−.10	117	.94			
Kahoe	1974	.14	.14	188				
Kesselman (1)	1975	.14	.25	55			yes	direct
Kesselman (1)	1975	.17					yes	direct
Kesselman (1)	1975	.32					yes	direct
Kesselman (1)	1975	.35					yes	direct
Kesselman (1)	1975	.35					yes	direct
Kesselman (1)	1975	.13					yes	direct
Kesselman (1)	1975	.23					yes	direct
Kesselman (1)	1975	.34					yes	direct
Kesselman (1)	1975	.29					yes	direct
Kesselman (1)	1975	.20					yes	direct
Kesselman (2)	1975	.24	.36	114			yes	direct
Kesselman (2)	1975	.22					yes	direct
Kesselman (2)	1975	.37					yes	direct
Kesselman (2)	1975	.45					yes	direct
Kesselman (2)	1975	.41					yes	direct
Kesselman (2)	1975	.30					yes	direct
Kesselman (2)	1975	.45					yes	direct
Kesselman (2)	1975	.36					yes	direct
Kesselman (2)	1975	.47					yes	direct
Kesselman (2)	1975	.35					yes	direct
Kitsantas & Zimmerman	1998	.65	.65	80		.88	yes	direct

(*table continues*)

Table 1 (*continued*)

Source	Year	r	r_c	n	r_{xx}	r_{yy}	Incentive present?	Salience?
Koestner et al.	1984	.31	.31	44		.83		
Kusurkar et al.	2013	.15	.15	383	.75			
Kuvaas	2007	.29	.29	410	.86	.75		
Kuvaas	2009	.31	.31	779	.82	.79		
Kuvaas & Dysvik	2010	.38	.38	840	.84	.75		
Kuvaas	2006a	.34	.34	587	.83	.82		
Kuvaas	2006b	.30	.30	634	.90	.74		
Langdon	2010	.26	.26	120				
Lasane	1995	.43	.43	79	.76		yes	direct
Lee & Cho (Group 1)	2007	.17	.17	60	.76		no	
Lee & Cho (Group 2)	2007	.36	.36	55	.76		no	
Lopez	1999	.33	.33	120	.92	.87		
Lorenzet	2000	.41	.41	90	.94	.34	yes	direct
Lorenzet	2000	.02					yes	direct
Lorenzet	2000	.37					yes	direct
Mahesh & Kasturi	2006	.16	.16	169	.91			
Mawn	2008	.38	.38	20			no	
Mawn	2008	.36					no	
Mawn	2008	.41					no	
Meigher	2001	.26	.26	115	.90			
Messer et al.	1987	.11	.11	42				
Miao & Evans	2007	.11	.24	175	.70	.80		
Miao & Evans	2007	.36						
Mih	2013	.12	.12	189				
Millette & Gagné	2008	.10	.10	113		.91		
Moneta & Siu	2002	−.24	.06	38	.72		yes	indirect
Moneta & Siu	2002	.36					yes	direct
Moore	2000	.25	.25	272	.84			
Moran et al.	2012	.18	.18	225	.88	.78		
Morgan	1985	−.07	−.07	205				
Mouratidis et al. (1)	2008	.03	.02	228	.83	.97		
Mouratidis et al. (1)	2008	.00						
Mouratidis et al. (1)	2008	.03						
Papaioannou et al.	2006	.22	.22	882		.65		
Pfeifer (Instructor)	2004	.71	.43	16	.94	.86		
Pfeifer (Instructor)	2004	.07						
Pfeifer (Instructor)	2004	.13						
Pfeifer (SDMS)	2004	.11	.28	16	.94	.88		
Pfeifer (SDMS)	2004	.35						
Pfeifer (SDMS)	2004	.12						
P. Phillips et al.	2003	.19	.19	125			no	
E. D. Phillips	1997	.18	.18	151	.94		yes	direct
Radel, Sarrazin, & Pelletier	2009	.21	.21	75	.83			
Radel, Sarrazin, Legrain, & Gobancé	2009	.16	.17	88				
Ratelle et al. (2)	2007	.17	.17	942	.90			
Ratelle et al. (3)	2007	.25	.25	410	.95			
Reeve (1)	1989	.55	.45	59	.47		yes	direct
Reeve (1)	1989	.18					yes	direct
Reeve (2)	1989	.18	.51	50	.47		yes	direct
Reeve (2)	1989	.65					yes	direct
Rich et al.	2010	.21	.21	245	.70	.90		
Roberts et al.	2006	.08	.07	288	.80			
Roberts et al.	2006	.06						
Roberts et al.	2006	.04						
Roberts et al.	2006	.10						
Román & Iacobucci	2010	.56	.56	210	.88	.87	yes	indirect
Ross	2008	.25	.21	27,953	.91	.95		
Ross	2008	.12						
Ross	2008	.18						
Ross	2008	.23						
Ross	2008	.30	.25	4,478	.91	.96		
Ross	2008	.16						
Ross	2008	.22						
Ross	2008	.26						

(*table continues*)

Table 1 (*continued*)

Source	Year	r	r_c	n	r_{xx}	r_{yy}	Incentive present?	Salience?
Ross	2008	.26	.22	4,707	.90	.95		
Ross	2008	.14						
Ross	2008	.20						
Ross	2008	.20						
Ross	2008	.39	.34	5,444	.91	.95		
Ross	2008	.26						
Ross	2008	.29						
Ross	2008	.34						
Ross	2008	.14	.10	9,535	.90	.96		
Ross	2008	.02						
Ross	2008	.08						
Ross	2008	.13						
Ross	2008	.09	.06	5,456	.91	.96		
Ross	2008	.01						
Ross	2008	.04						
Ross	2008	.10						
Ruscio et al.	1998	.21	.23	101	.89		yes	direct
Ruscio et al.	1998	.24					yes	direct
Sachs	2001	.24	.24	78	.77			
C. P. Schmidt	2005	.29	.29	300	.88	.95		
Schnake	1991	−.01	−.01	140	.75		yes	direct
Senko & Harackiewicz (1)	2005	.22	.22	50	.91		yes	direct
Senko & Harackiewicz (2)	2005	−.03	−.03	79			yes	direct
Shalley & Perry-Smith	2001	.16	.16	78	.84		yes	direct
Shalley et al.	2009	.30	.30	1,430	.70	.78		
Sidle	2000	.10	.10	122			yes	direct
Simons et al.	2004	.23	.37	184	.39			
Simons et al.	2004	.35						
Sisley	2008	.16	.02	280	.70		no	
Sisley	2008	−.12					no	
Soenens & Vansteenkiste (1)	2005	.32	.32	328	.77			
Soenens & Vansteenkiste (2)	2005	.22	.22	285	.77			
Suh	2002	.49	.49	131	.83	.94		
Suh	2002	.37						
Tanaka & Yamauchi	2001	.18	.18	292	.91			
T. L. Tang et al. (1st period)	1987	.10	.06	115		.80	no	
T. L. Tang et al. (2nd period)	1987	.00					no	
Tauer & Harackiewicz (1)	1999	.18	.30	260	.19		yes	direct
Tauer & Harackiewicz (1)	1999	.27					yes	direct
Tauer & Harackiewicz (2)	1999	.18	.18	117				
Tauer & Harackiewicz (4)	2004	.46	.46	228	.90		no	
Tierney et al.	1999	.28	.28	159	.74	.95		
Tsigilis	2005	.24	.24	144	.78		no	
Turban et al.	2007	.07	.09	160	.84		yes	indirect
Turban et al.	2007	.07					yes	indirect
Turner et al.	2009	.12	.12	264	.77		yes	indirect
Um	2005	.15	.15	4,566	.78	.99		
Van Yperen (2)	2006	.13	.13	279	.85	.77	yes	none
Vansteenkiste, Simons, Lens, et al. (1)	2004	.58	.58	200				
Vansteenkiste, Simons, Lens, et al. (2)	2004	.71	.71	377	.91			
Vansteenkiste, Simons, Lens, et al. (3)	2004	.43	.43	224	.91			
Vansteenkiste, Simons, et al.	2005	.42	.46	80	.95			
Vansteenkiste, Simons, et al. (3)	2005	.02						
Vansteenkiste, Simons, Soenens, & Lens	2004	.28	.45	501	.40			
Vansteenkiste, Simons, Soenens, & Lens	2004	.34						
Vansteenkiste, Simons, Soenens, & Lens	2004	.25						
Vansteenkiste, Simons, Soenens, & Lens	2004	.20						
Vansteenkiste et al.	2008	.22	.18	138	.82	.62		
Vansteenkiste et al.	2008	.08						
Vansteenkiste, Zhou, et al.	2005	.24	.24	105	.85			
Weymer	2002	.26	.26	142	.82	.80		
Wimperis & Farr	1979	−.23	−.31	45	.85			
Wimperis & Farr	1979	−.09						
Wong-On-Wing et al.	2010	.51	.51	101			no	

(*table continues*)

Table 1 (*continued*)

Source	Year	r	r_c	n	r_{xx}	r_{yy}	Incentive present?	Salience?
Wood et al.	2000	−.26	−.26	34	.90	.60		
Wood et al.	2000	−.19						
Wood et al.	2000	−.29						
Wood et al.	2000	−.15						
Wood et al.	2000	−.07						
Wood et al.	2000	−.08						
Yeh (H group)	2008	.34	.37	115				
Yeh (H group)	2008	.40						
Yeh (SE group)	2008	.25	.30	96				
Yeh (SE group)	2008	.34						
Zapata-Phelan et al. (2)	2009	.00	.20	277	.95	.53	yes	direct
Zapata-Phelan et al. (2)	2009	.10					yes	direct
Zapata-Phelan et al. (2)	2009	.10					yes	direct
Zapata-Phelan et al. (2)	2009	.03					yes	direct
Zapata-Phelan et al. (2)	2009	.16					yes	direct
Zapata-Phelan et al. (2)	2009	.16					yes	direct
Zapata-Phelan et al. (2)	2009	.13					yes	direct
Zapata-Phelan et al. (2)	2009	.12					yes	direct
Zapata-Phelan et al. (2)	2009	.28	.28	152	.80	.83	yes	none
Zimmerman & Kitsantas	1996	.49	.49	40				

Note. r = effect size reported in the primary data, converted to a correlation (if not already done); r_c, r_{xx}, r_{yy} = the composite effect size, reliability of the independent variable, and reliability of the dependent variable averaged across all effect sizes reported in the source using formulas from Mosier (1943); the last two columns refer to whether an incentive was provided to respondents and whether the incentive was directly or indirectly salient to the performance measured as the study's dependent variable; SDMS, H Group, and SE Group refer to groups within specific studies.

performance. The relation between intrinsic motivation and performance, when incentivized, was stronger for indirectly performance-salient incentives (ρ = .45; k = 8, N = 3,133; 80% credibility interval = .14–.77) than it was for directly performance-salient incentives (ρ = .30; k = 27, N = 3,975; 80% credibility interval = .10–.50). Of particular note, although not hypothesized, there was a two-way interaction between intrinsic motivation and incentivization, such that the intrinsic motivation—performance link was stronger when incentivized (ρ = .36; k = 40, N = 7,814; 80% credibility interval = .11–.61) and largely unchanged in the absence of incentives (ρ = .27; k = 34, N = 117,017; 80% credibility interval = .27–.27). Again, we do not place significance statements on these estimates, and direct the reader interested in statistical significance issues to our discussion in the analysis section.

Hypotheses 3A and 3B were supported. Combining findings from the current study with those of Jenkins et al. (1998), in terms of estimating the effect of financial incentives on performance, we conducted a meta-analytic regression to compute the relative importance of extrinsic incentives and intrinsic motivation on performance. Table 4 presents the results for the regression of criterion type (quality, quantity, both) on intrinsic and extrinsic motivation. As can be seen, consideration of both intrinsic motivation and extrinsic motivation yielded a multiple-R of .36–.43,

Table 2
Meta-Analysis of Intrinsic Motivation and Performance

Moderator	N	k	r_{obs}	SD_{obs}	ρ	SD_ρ	80% CrI .10	80% CrI .90	Δ	% σ^2 error	File drawer .10	File drawer .05	Mean α r_{xx}	Mean α r_{yy}
Overall	212,468	183	.21	.07	.26	.08	.16	.36	.20	31.60	201	586	.81	.81
Compensated?														
Yes	7,814	40	.27	.15	.36	.19	.11	.61	.50	24.19	68	176	.80	.72
Indirectly salient	3,133	8	.34	.20	.45	.24	.14	.77	.63	11.35	19	46	.78	.76
Directly salient	3,975	27	.21	.12	.30	.16	.10	.50	.40	41.58	30	86	.81	.64
No	117,017	34	.21	.02	.27	.00	.27	.27	.00	100.00	37	109	.81	.75
Performance type														
Quality	8,926	34	.28	.09	.35	.10	.21	.48	.27	35.63	61	156	.79	.82
Quantity	185,323	78	.20	.05	.26	.04	.21	.31	.10	69.81	78	234	.81	.79
Both	20,843	83	.25	.15	.31	.18	.07	.54	.47	15.54	125	332	.81	.86

Note. N = number of participants/subjects; k = number of independent samples; r_{obs} = observed correlation after removing sampling error; SD_{obs} = standard deviation after removing sampling error; ρ = corrected population correlation; SD_ρ = corrected population standard deviation; 80% CrI = the lower, upper, and range of the 80% credibility interval of the true population correlation; % σ^2 error = percentage of variance in the corrected population correlation accounted for by statistical artifacts (error); File drawer = number of unpublished/unavailable studies at ρ = 0 needed to pull the corrected population correlation below .10 or .05; Mean α = mean Cronbach's alpha reliability estimate; r_{xx} = mean reliability of the independent variable; r_{yy} = mean reliability of the dependent variable.

Table 3
Moderators of Intrinsic Motivation and Performance

Moderator	N	k	r_{obs}	SD_{obs}	ρ	SD_ρ	80% CrI .10	80% CrI .90	Δ	% σ^2 error	File drawer .10	File drawer .05	Mean α r_{xx}	Mean α r_{yy}
Context														
School	196,778	125	.21	.06	.26	.07	.17	.34	.17	37.93	138	400	.81	.81
Work	13,583	42	.28	.12	.34	.14	.16	.53	.37	18.91	76	193	.81	.84
Physical	1,665	12	.26	.13	.39	.14	.21	.58	.37	58.05	19	50	.82	.58
Age														
Child	2,208	12	.16	.08	.21	.09	.09	.32	.23	49.73	7	26	.81	.80
Adolescent	182,919	47	.21	.05	.25	.04	.20	.31	.11	54.85	52	150	.83	.82
College														
Unspecified	5,216	27	.22	.16	.30	.20	.04	.56	.52	20.93	32	92	.80	.72
Underclassmen	4,164	30	.20	.19	.31	.28	−.05	.67	.72	20.04	30	90	.76	.58
Upperclassmen	1,663	11	.21	.10	.24	.11	.10	.39	.29	39.13	12	35	.85	.84
Adult	14,340	49	.27	.12	.34	.14	.15	.52	.37	21.25	83	216	.80	.84
Criteria														
Objective	194,521	117	.20	.06	.26	.05	.19	.32	.13	56.49	117	351	.82	.79
Subjective	18,090	70	.31	.13	.39	.16	.18	.59	.41	20.73	147	364	.78	.84
Self-report	11,886	42	.29	.12	.37	.15	.18	.57	.39	21.74	80	202	.75	.80
Non-self-report	200,797	146	.21	.07	.26	.07	.17	.34	.17	37.72	161	467	.82	.81

Note. N = number of participants/subjects; k = number of independent samples; r_{obs} = observed correlation after removing sampling error; SD_{obs} = standard deviation after removing sampling error; ρ = corrected population correlation; SD_ρ = corrected population standard deviation; 80% CrI = the lower, upper, and range of the 80% credibility interval of the true population correlation; % σ^2 error = percentage of variance in the corrected population correlation accounted for by statistical artifacts (error); File drawer = number of unpublished/unavailable studies at ρ = 0 needed to pull the corrected population correlation below .10 or .05; Mean α = mean Cronbach's alpha reliability estimate; r_{xx} = mean reliability of the independent variable; r_{yy} = mean reliability of the dependent variable.

explaining 12%–18% of the variance in performance. For overall criteria (i.e., collapsing across both quantity and quality), financial incentives and intrinsic motivation arose as unique predictors of performance. Specifically, the relative importance of intrinsic motivation (β = .29) was identical to that for extrinsic incentives (β = .29). With respect to Hypothesis 3A, extrinsic incentives (β = .33) explained a larger unique proportion of variance in *quantity* performance than did intrinsic motivation (β = .24). In contrast, as expected by Hypothesis 3B, intrinsic motivation explained (β = .35) a much greater unique proportion of variance in *quality* performance than did extrinsic incentives (β = .06).

Finally, *post hoc* analyses were conducted. The variability in findings and low percentage of variance attributable to artifacts (seen in Table 2) suggested the presence of additional moderators. Findings are consistent with existing research, in that subjective and self-report effect sizes tended to be higher (and some might even argue inflated) compared to more objective or non-self-report effect sizes. These analyses indicated that the intrinsic motivation—performance link was strongest in the following situations: under work (ρ = .34) and physical (ρ = .39) contexts; for adults (ρ = .34); and when criteria were either subjective (ρ = .39) or derived from self-ratings (ρ = .37). In contrast the intrinsic motivation–performance link was weakest in academic contexts (ρ = .26); for children (ρ = .21), adolescent (ρ = .25), and college aged (ρ = .24–.31) respondents; and when criteria were objective (ρ = .26) or non-self (ρ = .26) rated.

Table 4
Meta-Analytic Regression on Motivation

Predictor	Both B	Both β	Quantity B	Quantity β	Quality B	Quality β
Intrinsic motivation	.29	.29	.24	.24	.35	.35
Extrinsic incentive	.29	.29	.33	.33	.06	.06
R	.43		.42		.36	
R^2	.18		.17		.13	
ADJ R^2	.18		.17		.12	

Note. B = regression weight; β = standardized regression weight; ADJ R^2 = adjusted R^2.

Although we report here selected notable regression/correlation analyses, it should be noted the POMP scaling procedure unlocked a wealth of information that supports both the current study and future research. By treating each study as a single data point, the overall relation of *between*-study levels of intrinsic motivation to *between*-study levels of performance (r = .33) provides additional support for our previously estimated *within*-study average estimate of the correlation (ρ = .26). In other words, *samples that were more intrinsically motivated (on average) tended to be higher performing (on average)*. Another benefit of treating the data in this manner is the ability to readdress the ongoing debate surrounding the undermining effect. Point-biserial correlation indicates a weak to modest omnibus relationship between incentives and intrinsic motivation, such that respondents who received incentives were marginally likely to report higher mean levels of intrinsic motivation (r = .06). This finding might suggest that incentives have little impact on intrinsic motivation, but is misleading because it collapses across meaningful moderators. Specifically, the relation between average levels of intrinsic motivation and incentive contingency was r = .78: Levels of intrinsic motivation were likely to be higher in the presence of indirect incentives to a strong degree. This finding indicates that incentives per se do not influ-

ence intrinsic motivation; rather, intrinsic motivation is likely to be lower for directly salient incentives, and higher for indirectly salient incentives.

The POMP method also unlocked dozens of correlations, each of which likely involve studies in and of themselves. We have reported all of these here, in the hope it will spur future research. In particular, while not directly related to the current study, several merit specific consideration. For example, intrinsic motivation showed a strong relationship to age (r = .42), but virtually no relation to either gender (r = .01) or race (r = –.09). The intrinsic motivation–performance correlation itself also had a negligible relation to age (r = .01), gender (r = .02), race (r = –.06), operationalization of intrinsic motivation (e.g., free-choice persistence, task satisfaction; r = –.05 to .09), or publication status (r = .02). This represents only a narrow selection of findings, and the interested reader is referred to Table 5 for further results.

Discussion

The practical value of intrinsic motivation theories in performance contexts has been called into question many times. Some investigators argue that whether or not individuals enjoy what they do, they *have to* do it anyway (e.g., Locke & Latham, 1990). From this perspective, if incentives and external control reduce intrinsic motivation but people still require the incentives (e.g., money), then what is the performance-related value of intrinsic motivation (e.g., Locke & Latham, 1990)? The purpose of the current meta-analysis was to provide an empirical response to the general view that incentives and intrinsic motivation are incompatible. Such a response is necessary because the joint role of both intrinsic and extrinsic incentives in performance contexts simply cannot be ignored (Deci, 1976). Thus, our findings demonstrate the joint and relative contribution of intrinsic motivation and extrinsic incentives to performance.

We began this study with three major goals. First, we sought to demonstrate the predictive utility of intrinsic motivation for performance. Using common meta-analytic procedures, credibility intervals indicate that with the exception of college underclassmen, the population-level relation between intrinsic motivation and performance is positive across all moderators examined. Thus, a major contribution of this research is that it would be rare for individuals who derive personal satisfaction or enjoyment from a particular task in any context (work, school, health, etc.) to perform poorly. This finding is consistent with research on related attitudes: For example, individuals who enjoy their jobs in a more general (vs. task-specific) sense tend to outperform those who do not (Judge et al., 2001).

Second, we sought to explain the role of incentive contingency through salience to performance. We found support for the hypothesis that when present, the salience of performance incentives would increase or decrease this link. On the one hand, when extrinsic incentives were present *but only indirectly salient to performance*, intrinsic motivation was a better predictor of performance, because it would arguably have sole motivational "leverage" on performance. On the other hand, when incentives were present *and were directly salient to performance*, intrinsic motivation became a poorer predictor of performance, because it would arguably no longer possess sole motivational "leverage." An unexpected main effect for incentivization was observed, such that the predictive validity of intrinsic motivation did not erode, but in fact increased in the presence of incentives. Thus, incentivization actually boosted the intrinsic motivation–performance link (ρ = .36). Consistent with our "crowding out" prediction, this boost was less pronounced when incentives were directly salient (ρ = .30), and more pronounced when non-salient (ρ = .45). Theory refinement that explains *why* the mere presence of incentives increase the importance of intrinsic motivation to performance is certainly needed.

The third primary goal of this article, accomplished through meta-analytic regression, was to determine which mattered more to performance: intrinsic motivation or extrinsic incentives. As expected, intrinsic motivation mattered more for *quality* than extrinsic incentives and extrinsic incentives explained more of the variance in *quantity* performance criteria than did intrinsic motivation. This pattern of findings confirms that motivation should be considered by what it is supposed to predict (Dalal & Hulin, 2008). Our findings also nicely complement existing meta-analytic work on extrinsic incentives by showing that extrinsic incentives are better predictors of quantity than of quality performance (Jenkins et al., 1998). In fact, most moderators we explored showed similar complementary patterns in the extant literature: When intrinsic motivation matters *more* to performance (i.e., quality vs. quantity, work and physical vs. school, and to a lesser degree field vs. lab), extrinsic motivation seems to matter *less* (cf. Condly et al., 2003; M. Gagné & Deci, 2005; Koestner & Losier, 2002). An unexpected finding was that intrinsic motivation also emerged as a moderately strong predictor of *quantity* criteria. Although not as strong as that for incentives, this finding highlights the importance of intrinsic motivation in performance contexts.

We also unlocked an incredible wealth of information, somewhat unintentionally, using the POMP method. The POMP method enabled us to rescale all the variables in our study so that we could create a cross-matrix of correlations at the study level, yielding information that is unavailable in primary studies and that has not been done until now in meta-analysis. In a sense, each correlation we report in Table 5 is likely enough to warrant additional explanation and spur future research. Although many of the relations reported go beyond the scope of the current study, we feel three are particularly worthy of mention.

First, this review has somewhat unexpectedly advanced the extrinsic incentive–intrinsic motivation debate. This is the 10th meta-analysis to examine the impact of incentives on intrinsic motivation, albeit using a different approach and largely different data than those in the past. In short, our findings are mostly in line with Deci et al.'s (1999) meta-analysis. Incentives alone have little omnibus impact on intrinsic motivation (r = .06). However, incentive contingency has a very strong link to intrinsic motivation (r = .78): More controlling (directly salient) incentives are associated with lower intrinsic motivation, while less controlling (indirectly salient) incentives have a positive link. It is our hope that these findings can focus attention away from a simplistic incentive–intrinsic motivation debate by calling attention to moderators of the intrinsic motivation–performance link.

Second, certain demographic information with respect to levels of intrinsic motivation was enlightening. Our findings show a strong relationship with age, such that levels of intrinsic motivation seem to increase with age (r = .42). Although we did not

Table 5
Meta-Analytic Between Study Means and Correlations

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Intrinsic motivation	0.69	0.13	1.00	74	74	60	43	74	74	37	18	64	28	73	73	73	73
2. Performance	0.71	0.11	.33	1.00	74	60	43	74	74	37	18	64	28	73	73	73	73
3. IM → Performance	0.24	0.17	.00	−.32	1.00	136	69	183	183	91	34	146	43	176	176	176	176
4. IV reliability	0.81	0.15	.08	.20	−.16	1.00	59	136	136	70	25	114	40	130	130	130	130
5. DV reliability	0.81	0.15	.15	.35	.01	.07	1.00	69	69	37	14	58	25	67	67	67	67
6. Year	2002	9.22	.16	.08	.10	.17	−.05	1.00	183	91	34	146	43	176	176	176	176
7. Sample size	1,161.01	8,479.26	.35	.17	−.02	.03	.06	.05	1.00	91	34	146	43	176	176	176	176
8. Mean age	21.84	9.24	.42	.44	.01	−.03	.03	.15	−.11	1.00	20	85	21	90	90	90	90
9. % White	0.61	0.31	−.09	.30	−.06	.05	−.04	−.19	.26	.23	1.00	34	11	31	31	31	31
10. % Female	0.55	0.20	.01	−.10	.02	−.20	−.03	−.23	−.05	.06	−.08	1.00	36	141	141	141	141
11. Response rate	0.58	0.21	.04	−.10	−.06	−.28	−.24	−.07	.10	−.35	−.48	.05	1.00	41	41	41	41
12. Child?	0.07	0.25	−.52	−.15	−.03	.01	−.02	−.14	−.03	−.20	.14	−.09	.18	1.00	176	176	176
13. Adolescent?	0.27	0.44	−.14	−.07	.11	.08	.07	.13	.19	−.55	.13	−.06	.22	−.16	1.00	176	176
14. College 1?	0.17	0.38	−.06	−.16	−.05	−.14	−.37	−.27	−.06	−.11	.06	.18	.14	−.12	−.27	1.00	176
15. College 2?	0.06	0.24	.15	.02	−.01	.09	.04	.00	−.03	.10	.04	.15	.00	−.07	−.16	−.12	1.00
16. College unspecified?	0.15	0.36	−.07	−.20	−.09	−.01	−.15	−.02	−.05	−.02	−.17	.02	.04	−.12	−.26	−.19	−.11
17. Adult?	0.28	0.45	.39	.38	.04	−.01	.18	.19	−.07	.75	−.14	−.14	−.32	−.17	−.37	−.28	−.16
18. Compensated?	0.54	0.50	.06	−.10	.19	−.05	−.08	−.11	−.13	.03	.07	.17	.54	−.23	−.37	.35	.10
19. Direct vs. indirect salience?	0.21	0.42	.78	.37	.20	−.08	.33	.45	.39	−.09	.23	−.01	.88		−.09	−.18	.03
20. Measure: IM?	0.53	0.50	.29	.29	−.05	.09	−.18	.06	.03	.25	.08	.00	−.23	−.09	−.10	−.04	−.01
21. Measure: FC?	0.02	0.13	−.52	−.11	.00		.00	−.26	−.02	−.03		−.04		.33	−.09	−.06	−.03
22. Measure: Interest?	0.28	0.45	−.02	−.16	−.02	−.06	.21	−.18	.02	−.25	.02	.10	.38	−.06	.04	.14	.05
23. Measure: RAI?	0.17	0.38	−.20	−.18	.09	−.05	−.01	.22	−.05	−.02	−.13	−.10	−.25	.07	.11	−.09	−.03
24. Quality?	0.17	0.38	.04	−.10	.04	−.04	.00	−.08	−.05	.17	.14	.05	−.04	.22	−.10	−.07	.00
25. Quantity?	0.39	0.49	−.04	−.08	−.22	.03	−.20	−.06	.14	−.24	−.04	.02	.28	−.04	.14	.03	−.06
26. Quality and quantity?	0.44	0.50	.00	.15	.19	.00	.20	.12	−.10	.14	−.05	−.06	−.19	−.12	−.06	.02	.06
27. DV: Non-self vs. self	0.20	0.40	.32	.16	.24	−.18	−.04	.04	−.05	.30	−.27	−.01	−.36	−.14	−.15	.01	.01
28. DV: Objective vs. subjective	0.36	0.48	.10	.07	.25	−.13	.15	.07	−.08	.45	−.17	−.11	−.29	.09	−.23	−.13	−.09
29. Cross-sectional vs. long.	0.28	0.45	−.11	−.06	−.14	.07	−.17	.15	−.07	−.06	.22	−.03	.38	.07	.00	.11	.01
30. Setting: School?	0.70	0.46	−.42	−.34	−.08	−.03	.00	−.25	.07	−.58	.24	.21	.28	.17	.23	.30	.12
31. Setting: Work?	0.23	0.42	.42	.40	.05	.02	.17	.19	−.06	.84	−.14	−.17	−.32	−.15	−.35	−.26	−.09
32. Setting: Physical?	0.07	0.25	.02	−.17	.06	.02	−.37	.13	−.03	−.19	−.19	−.11	.11	−.06	.18	−.11	−.06
33. Corr. vs. experimental	0.03	0.16			−.11	.07		−.09	−.02	−.02	.09	.00		−.05	−.03	.20	.10
34. Field vs. lab	0.28	0.45	−.40	−.31	−.14	−.12	−.30	−.44	−.08	−.03	−.16	.18		−.07	−.19	.35	−.01
35. Published vs. unpublished	0.24	0.43	−.13	−.11	.02	.12	.20	−.12	.03	−.15	.13	.14	−.08	−.05	.02	.03	−.03

Note. Correlations are below the diagonal, and the number of studies are above the diagonal. Dichotomous variables with a question mark: 0 = no; 1 = yes (otherwise, 0 = first in the pair); 3 = intrinsic motivation (IM)–performance link; 4, 5 = the reliability for IM and performance, respectively; 20–23 = the measure of IM. IV = independent variable; DV = dependent variable; FC = free-choice persistence; RAI = Relative Autonomy Index; long. = longitudinal; Corr. = correlational.

specifically address the full life span, this finding reinforces and extends a growing literature dispelling stereotypes of older workers (Ng & Feldman, 2012). Older respondents (i.e., respondents in studies reporting a higher average age) averaged not only higher levels of intrinsic motivation but also somewhat higher levels of performance compared to younger workers ($r = .44$). As would be expected, little effect was found in terms of intrinsic motivation for gender ($r = .01$) or race ($r = –.09$).

Third, it was interesting to observe what factors did and did not influence the intrinsic motivation–performance relationship. The intrinsic motivation–performance link was largely unaffected ($r < \pm.10$) by age, gender, race, publication status, or any of the four

16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
73	73	25	13	69	69	69	69	69	69	69	70	70	65	74	74	74	74	74	74
73	73	25	13	69	69	69	69	69	69	69	70	70	65	74	74	74	74	74	74
176	176	74	33	167	167	167	167	169	169	169	175	173	167	179	179	179	183	179	183
130	130	57	28	123	123	123	123	129	129	129	130	129	123	134	134	134	136	132	136
67	67	23	7	67	67	67	67	64	64	64	66	66	62	68	68	68	69	67	69
176	176	74	33	167	167	167	167	169	169	169	175	173	167	179	179	179	183	179	183
176	176	74	33	167	167	167	167	169	169	169	175	173	167	179	179	179	183	179	183
90	90	39	16	85	85	85	85	86	86	86	86	85	88	88	88	88	91	90	91
31	31	14	8	32	32	32	32	32	32	32	30	31	30	34	34	34	34	34	34
141	141	60	28	135	135	135	135	138	138	138	139	138	134	144	144	144	146	143	146
41	41	13	4	40	40	40	40	42	42	42	42	43	40	43	43	43	43	43	43
176	176	72	33	160	160	160	160	164	164	164	168	166	163	173	173	173	176	173	176
176	176	72	33	160	160	160	160	164	164	164	168	166	163	173	173	173	176	173	176
176	176	72	33	160	160	160	160	164	164	164	168	166	163	173	173	173	176	173	176
176	176	72	33	160	160	160	160	164	164	164	168	166	163	173	173	173	176	173	176
1.00	176	72	33	160	160	160	160	164	164	164	168	166	163	173	173	173	176	173	176
−.26	1.00	72	33	160	160	160	160	164	164	164	168	166	163	173	173	173	176	173	176
.06	−.09	1.00	33	65	65	65	65	68	68	68	70	71	69	72	72	72	74	73	74
.02	.26		1.00	27	27	27	27	32	32	32	32	32	32	33	33	33	33	33	33
−.14	.29	−.26	.33	1.00	167	167	167	154	154	154	159	157	154	163	163	163	167	163	167
.07	−.09	−.13		−.14	1.00	167	167	154	154	154	159	157	154	163	163	163	167	163	167
.15	−.26	.38	−.28	−.66	−.08	1.00	167	154	154	154	159	157	154	163	163	163	167	163	167
−.02	−.05	−.11	−.10	−.48	−.06	−.29	1.00	154	154	154	159	157	154	163	163	163	167	163	167
−.03	.06	.06	−.25	.18	.18	−.07	−.22	1.00	169	169	164	165	156	166	166	166	169	165	169
.17	−.25	.09	−.38	−.24	−.01	.30	−.04	−.36	1.00	169	164	165	156	166	166	166	169	165	169
−.15	.20	−.14	.62	.10	−.13	−.24	.20	−.40	−.71	1.00	164	165	156	166	166	166	169	165	169
−.06	.27	.04	.09	.15	.05	−.19	.01	.08	−.22	.15	1.00	169	161	172	172	172	175	171	175
−.18	.47	.04	.02	.17	.08	−.13	−.10	.60	−.61	.14	.28	1.00	158	170	170	170	173	169	173
−.15	−.02	−.24	.23	.21	−.08	−.26	.07	−.19	−.02	.17	−.17	−.24	1.00	163	163	163	167	163	167
.25	−.85	.21	−.19	−.27	.10	.23	.05	−.11	.17	−.09	−.23	−.47	.04	1.00	179	179	179	176	179
−.24	.90	.05	.26	.33	−.08	−.24	−.13	.12	−.25	.16	.30	.52	−.05	−.84	1.00	179	179	176	179
−.04	.02	−.33	−.09	−.06	−.04	−.02	.11	.00	.11	−.11	−.08	−.02	.01	−.41	−.15	1.00	179	176	179
−.07	−.11	.11	−.09	.07	−.02	−.10	.03	.01	.00	−.01	−.09	−.04	.05	.11	−.09	−.05	1.00	179	183
.25	−.27	.44	−.79	−.20	.13	.32	−.16	.08	.40	−.45	−.08	−.14	−.24	.31	−.33	.00	.12	1.00	179
.06	−.05	.14	−.05	.03	−.08	.09	−.11	−.03	.10	−.07	.03	−.15	−.18	.06	−.06	.01	−.02	.07	1.00

operationalizations of IM (e.g., free-choice persistence, task satisfaction). As expected, the relation was affected by a handful of factors such as the quality-quantity distinction, as noted above.

Implications for Theory and Research

A strong meta-analysis should provide a roadmap for future research (Humphrey, 2011), so we consider five major directions. First, in the short term, this research provides a much needed first step in reconciling the seemingly incompatible impact of incentives and extrinsic motivation on performance (in other words, the two competing *whys* of motivation). However, our findings are only a first step because the simplest models of performance primarily consider *whether*, rather than *why*, one is motivated. Although we have established an association between incentive presence and motivation, the

role of whether one is actually motivated has yet to be demonstrated. This is important because even when incentives substantially erode intrinsic motivation, if the incentive is powerful enough, there will still be an increase in net motivation and by extension, performance. For example, teachers promise incentives such as pizza parties or cash to boost motivation and thus performance. Those arguing against these types of incentive programs do not question their effectiveness: in fact, many note that the incentives are almost *too* effective (G. P. Baker, 1993). Instead, the concern is that once the incentives are gone, motivation will disappear with it because the remaining intrinsic drive dried up earlier as a result of the extrinsic incentives being used.

Second, given our findings, we advocate that future researchers move beyond the traditional incentive contingency developed years ago, as it may not readily depict the structure of compensation systems that actually exist in practice (cf. Diefendorff & Chandler, 2011; M. Gagné & Forest, 2008). Engagement contingent incentives are unlikely to intentionally appear in many performance situations: these incentives merely reward presence (regardless of the behavior involved), which likely carries little "value added" to most organizations. The same could be said for completion-contingent incentives: they may reward project completion, but projects can usually be completed more quickly when the quality of the end-product is ignored. Performance-contingent incentives do increase performance (Lazear, 2000) but must be used sparingly because, for example, basing an entire salary on attaining objectives can lead to lower well-being (Deci & Ryan, 2000; Shirom, Westman, & Melamed, 1999) and counterproductive behaviors (Weibel et al., 2010). Ironically, non-contingent rewards may be the most commonly found in practice. For example, once teachers and professors reach tenure, pay has very little to do with performance. In fact, the tenure system is based in part of the need to support intrinsically motivated research activities (Bess, 1998). As such, intrinsic motivation (rather than pay) would be the superior performance determinant.

Third, given our findings that performance motives vary in their predictive utility, future research must consider how to design compensation strategies with different types of motivation in mind. Our meta-analysis provides a first step, in that we respond to specific calls to explore compensation alongside intrinsic motivation (M. Gagné & Forest, 2008). For example, our new incentive contingency responds to calls to either move toward simultaneous consideration of the traditional four categories or toward new conceptualizations altogether (cf. Buchan, Thompson, & O'May, 2000; Diefendorff & Chandler, 2011), which include the impact of non-tangibles such as healthcare or retirement contributions. Future research should examine more specific regulatory styles, in relation to incentivization and performance. For example, Burton, Lydon, D'Alessandro, and Koestner (2006) demonstrated that more fine-grained conceptualizations of intrinsic motivation (e.g., identified regulation, a more internal form of extrinsic motivation) had stronger ties to performance than did intrinsic motivation.

Fourth, the POMP method we use here unlocks between-study information that complements and goes beyond the stated purpose of our review. We do not have the space in the current study to discuss all the findings in Table 5, but mention several other notable findings. For example, we revealed relations among methodological factors that are not commonly examined: For example, older (ρ = –.35), White (ρ = –.48), and working (ρ = –.32) respondents had lower response rates, while higher response rates were associated with decreased statistical IV/DV reliability (ρ = –.28, –.24), academic samples (ρ = .28), and (interestingly enough) longitudinal data (ρ = .38). We were also able to look at publication bias (the idea that studies reporting smaller effect sizes or that have undesirable characteristics fail to get published) in a new light. As is hoped to be the case, publication status (published vs. unpublished) was unrelated to most common indicators of the file drawer problem, including effect size (ρ = .02), field versus lab (ρ = .07), sample size (ρ = .03), and year (ρ = –.12). Although there are many other questions raised and potential answers provided by this new analysis technique, with reference to the number of correlations reported in Table 5, it is simply not possible to address all these given space constraints. However, because this method bears fruit for many veins of subsequent research and is relatively non-complicated, we implore meta-analytic researchers to echo our analyses and report findings using the POMP method.

Finally, it is critical to underscore that our study was focused exclusively on performance as a dependent variable. Although providing incentives that are directly salient to performance is associated with lower levels of intrinsic motivation, the impacts on performance do not appear to be negative. Importantly, further research is needed to determine whether these results generalize to other criteria to avoid a "collateral damage" effect.[6] For example, organizations might boost performance/effectiveness quickly and directly by tying incentives more closely to performance, but if this practice occurs at the expense of other critical factors such as individual well-being, morale, and job satisfaction, such programs may not be worthwhile. If incentives do thwart psychological needs, this process could indirectly affect performance, as recent meta-analytic work has demonstrated a strong link of performance to autonomy, competence, and relatedness needs (Cerasoli, Nicklin, & Ford, 2013). This "collateral damage" effect could also be counterproductive to performance by fostering cognitive/attentional deficits (Ariely, Gneezy, Loewenstein, & Mazar, 2009), reducing the well-being of individuals in the short term, incentivizing counterproductive behaviors, and encouraging turnover of quality talent in the long run. In this way, organizations might "win the battle only to lose the war." This possibility is also an important consideration for other performance contexts such as school, sports, and healthcare.

Implications for Practice

Consideration of motivation is important because although it is one of the biggest problems facing organizations today (Watson, 1994), it readily lends itself to organizational development efforts (Pritchard & Ashwood, 2008). Keeping in mind that motivation is multifaceted (Kanfer et al., 2008) and multiply determined (G. P. Baker, Jensen, & Murphy, 1988), we suggest practitioners take the following into consideration.

Tasks that are straightforward, highly repetitive, and perhaps even less inherently enjoyable, should be more closely linked to extrinsic incentives. For example, linking pay to performance has been found to improve productivity on relatively straightforward tasks, such as tree planting (Paarsch & Shearer, 1996), glass installation (Lazear, 2000), and even horse jockeying (Fernie & Metcalf, 1999). On the other hand, tasks that require a great deal of absorption, personal

[6] We thank two anonymous reviewers for this suggestion.

investment, complexity, and overall quality should be less linked to incentives and much more closely linked to intrinsic motivation. For example, teachers who are paid based on their students' performance do no better (Springer et al., 2011), and doctors who are paid based on patient outcomes do not have healthier patients (Petersen, Woodard, Urech, Daw, & Sookanan, 2006). We posit that these are complex jobs that require judgment and intense personal investment.

Our findings suggest that organizations should take a balanced approach to any motivational intervention. Granted, our intrinsic–extrinsic dichotomy oversimplifies motivation. However, it enables us to demonstrate that not only do both intrinsic and extrinsic motives matter, they interact with one another. Our findings are consistent with a growing body of literature that shows additional predictive validity of one factor over the other and even motivational profiles of the two (e.g., Hayenga & Corpus, 2010; Ratelle, Guay, Vallerand, Larose, & Senécal, 2007; Vansteenkiste et al., 2009). Thus, although our findings suggest that it is always beneficial to help people find their tasks intrinsically rewarding, extrinsic incentives can and will also play a role.

We suggest to practitioners in performance contexts that the question is not whether to incentivize. Instead, the types of behaviors desired should drive the salience of the incentive to performance. A more directly salient incentive narrows cognitive focus, strongly encourages behavior X, and intensifies behavior toward a goal ("for each X I do, it is very clear what incentive I will receive and when"). This specification may be desirable when the task is simple, the stakes are high, productivity is the sole concern, or compliance is tantamount to performance and safety. However, as incentives become larger and more directly salient, teamwork and creativity will be disincentivized, intrinsic motivation and its importance to performance will be crowded out, and unethical or counterproductive behaviors may become more likely. Instead, when creativity, autonomy, teamwork, learning, ethical behavior, well-being, and quality are valued, incentives should be framed as less salient ("I should do well on each X I do, because the incentive may be distal or not tied to a single X"). For a discussion on balancing individual and team incentives, an excellent discussion is provided by Barnes, Hollenbeck, Jundt, DeRue, and Harmon (2011).

Limitations

Although meta-analyses are often bestowed with an air of finality or undue objectivity, it is important to remember that they are something of an art (Rosenthal & DiMatteo, 2001; Wilson & Lipsey, 2000). Meta-analysis assures neither objectivity nor accuracy *de facto* (Deci et al., 1999; Lepper, Henderlong, & Gingras, 1999), and we have taken many steps recommended by others (e.g., Cooper, 2003) to reduce threats to the validity of our findings. One threat common in this area of research is collapsing across meaningful moderators (Deci et al., 1999). This practice is problematic because it either oversimplifies research findings or even nullifies them in the case of crossover interactions (Cortina, 2003). A potential limitation of the current study is the decision to collapse across certain moderators. For example, we collapsed across school, physical, and work performance in many analyses to have sufficient data points for further moderator breakdowns.

Subjectivity also poses a direct threat to the validity of any meta-analysis (Eysenck, 1994), as a single coder's subjective judgment call can introduce random and/or systematic error variance into analyses. To mitigate this risk, every data point in the current study was coded, discussed, and consensus reached by a minimum of two authors. Nevertheless, a degree of subjectivity surrounds decisions pertaining to the coding schema and coding itself. Although generalizability is cautioned, others (e.g., Nieminen, Nicklin, McClure, & Chakrabarti, 2011) have demonstrated that although researcher decision making can be subjective or vary from person to person, it is unlikely that meta-analytic findings and conclusions will diverge substantially as a consequence.

Another threat to the validity of almost any meta-analysis is the inability to explore non-linear relationships. In traditional meta-analyses, it is typically not possible to estimate non-linear relationships because linear correlations are typically all that is provided in primary literature for aggregation purposes. Although linear relations may be most common, they should not be assumed as a default and non-linear associations must be at least considered (Guion, 1998, p. 107). Thus, although we did not hypothesize curvilinear relationships a priori, it would be inappropriate to leave them untested, especially given that temporally lagged studies surrounding intrinsic motivation and performance have suggested the presence of non-linearity (e.g., Cerasoli & Ford, in press). As a side benefit of converting between-study data into percent of maximum possible (POMP), we were able to generate a new data-set that enabled us to test both linear and quadratic simple regression equations in a very similar fashion to a primary study. The absence of any observable non-linear pattern in a scatterplot or substantive improvement of a quadratic equation over a linear one suggested that no curvilinear relationship exists.

We also suggest caution in several interpretations common to meta-analyses and motivation research. Analyses based on a small cell size should be interpreted with caution, as small cell sizes and second-order sampling error tend to be more variable and prone to reversal by newly conducted/uncovered studies (cf. Guion, 1998). Whereas an extensive search on our behalf suggests this is a limitation not of our analyses but of the literature, we nevertheless suggest caution when generalizing to future contexts. Most primary data here are correlational, suggesting caution when attempting to draw causal inferences (Ford, Cerasoli, Higgins, & DeCesare, 2011; Knight, Fabes, & Higgins, 1996). For example, as a performance-antecedent, task satisfaction may bolster performance; and as a performance-consequent, task satisfaction may occur because one performs well. Perhaps initially uninteresting tasks performed well subsequently become interesting.[7] It is entirely plausible that there is some degree of reciprocity between intrinsic motivation and performance, which is both a limitation of the current findings and an impetus for future research.

Finally, it is important to reiterate several of the assumptions made here, as many of our claims rely on a simpler view of the literature than may exist. Our dichotomization of the intrinsic-extrinsic motivation continuum, a simplification for practical purposes, omits the richness of self-determination theory. For more conceptual precision than we provide here, we refer the reader to other sources for further detail (e.g., Ryan & Deci, 2000). We also make the assumption that quality-type tasks tend to be more enjoyable and lend themselves to higher degrees of absorption, while quantity-type tasks are less enjoyable or mundane. It is

[7] We thank an anonymous reviewer for this point.

important to keep in mind that many quantity-type tasks can also be enjoying and engaging (e.g., cross-country running, golf, and leisure activities such as folding paper cranes).

Conclusion

Despite the importance of both intrinsic and extrinsic motivation in the workplace (Deci, 1976), and despite the assertion that intrinsic "motivation rarely operates in isolation from other types of motivation" (Locke & Latham, 1990, p. 58), critics have been skeptical of theories of intrinsic motivation in performance contexts. Our review spanning over 40 years of primary data addresses some of these criticisms. Using a novel approach, we have shown that incentives can influence the predictive validity of intrinsic motivation; but more importantly, intrinsic motivation remains a moderate to strong predictor of performance *regardless of whether incentives are present.* In general, our most important theoretical and empirical contribution is that incentives and intrinsic motivation are not of necessity antagonistic: We found that incentives coexist with intrinsic motivation, depending on the type of performance and the contingency of the incentive. The types of desirable and undesirable performance behaviors should first be considered, because they will drive the appropriate degree of incentive salience. Counter to claims otherwise, our research demonstrates the joint impact of incentives and intrinsic motivation is critical to performance. We encourage future research examining potential antecedents and mediators of this relation.

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