BEHAVIORAL MANAGEMENT AND TASK PERFORMANCE IN ORGANIZATIONS: CONCEPTUAL BACKGROUND, META-ANALYSIS, AND TEST OF ALTERNATIVE MODELS

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In this study, we provide the conceptual background, meta-analyze available behavioral management studies ($N = 72$) in organizational settings, and examine whether combined reinforcement effects on task performance are additive (sum of individual effects), redundant (combined effects are less than the additive effects), or synergistic (combined effects are greater than the sum of the individual effects). We found a significant overall average effect size of (d.) = .47 (16% improvement in performance; 63% probability of success), and a significant within-group heterogeneity of effect sizes. To account for this variation, we conducted a theory-driven moderator analysis, which indicated that money, feedback, and social recognition each had a significant impact on task performance. However, when these 3 reinforcers were used in combination, they produced the strongest (synergistic) effect on task performance. Based on our findings, we offer directions for future research, and suggestions for effective application of behavioral management at work.

Both scholars and practitioners recognize that for today's organizations to attain competitive advantage, a skilled work force, cutting edge technological proficiency, exemplary customer service, and higher quality products and services are needed (O'Reilly & Pfeffer, 2000). Because these demands require high employee motivation and effort, the critical factor in gaining distinctive competencies in today's era of global hypercompetitiveness seems to be on the human side of organizations (Argyris, 1993; Pfeffer, 1995, 1998). Most managers of today's organizations would agree, and research is demonstrating, that employees drive success, whether that be defined as productivity, customer satisfaction, or even profits (Harter, Schmidt, & Hayes, 2002). However, although this

message seems clear, as Pfeffer (1995, 1998) suggests, the real challenge is in finding specific, empirically supported ways to motivate employees for improved performance (see also Ambrose & Kulik, 1999; Luthans & Stajkovic, 1999; Pfeffer, 2001).

Behavioral management, which has been around for about 3 decades, is one approach to improving performance at work (Frederiksen, 1982; Komaki, 1986; Luthans & Kreitner, 1975, 1985; Luthans & Stajkovic, 1999). The main premise of behavioral management is that employee behavior is a function of contingent consequences (Bandura, 1969; Komaki, Coombs, & Schepman, 1996; Pfeffer, 1995). Simply, behaviors that positively effect performance must be contingently reinforced. Contingently administered money, feedback, and social recognition are the most recognized reinforcers in behavioral management at work (Bandura, 1986; Kluger & DeNisi, 1996; Mitchell & Mickel, 1999; Rynes & Gerhart, 2000; Stajkovic & Luthans, 2001).[1]

Although widely recognized and applied in organizations, behavioral management still produces lingering questions regarding its conceptual background and empirical effectiveness. Conceptually, on the one hand, there seems to be general agreement regarding the validity of the principle of contingent reinforcement (Bandura, 1969; Pfeffer, 1995; Vroom, 1964). On the other hand, behavioral management has generated theoretical disagreements regarding its main premise that behavior is solely a function of contingent consequences. To illustrate, although Vroom (1964) states that "without a doubt...the principle of reinforcement must be included among the most substantiated findings in experimental psychology and is at the same time among the most useful findings for applied psychology..." (p. 13), Locke (1997) suggests that we "can refute the entire enterprise with 30 seconds of introspection" (p. 376).[2]

Empirically, Bandura (1986) suggests that "If people acted...on the basis of informative cues but remained unaffected by the results of their actions, they would be insensitive to survive very long" (p. 228). Yet, questions remain regarding the overall impact of various reinforcers on task performance in organizations (e.g., Welsh, Luthans, & Sommer, 1993). In fact, although there have been numerous conceptual reviews (e.g.,

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[1] We base our terminology on reinforcement theory, where the term reward is not the same as reinforcer, and hence, rewarding is not the same as reinforcing. A reward is something that is valuable to the reward giver, whereas a reinforcer is something that increases the desired behavioral response. Thus, a reward is not necessarily a reinforcer, nor is a reinforcer necessarily a reward. However, only a reinforcer increases desired behavioral response (see Luthans & Kreitner, 1975, 1985; Luthans & Stajkovic, 1999; Skinner, 1969).

[2] Current arguments (Davis-Blake & Pfeffer, 1998; DeGrandpre, 2000), are largely reminiscent of those from 20 years ago (Locke, 1977; Luthans & Smith, 1980), which followed the original controversy in psychology over behaviorism (see Skinner, 1938).

Andrasik, 1989; Heneman, & VonHippel, 1997; Komaki et al., 1996; Merwin, Thomason, & Sanford, 1989; O'Hara, Johnson, & Beehr, 1985) and analyses of more limited subsets of the literature (e.g., Andrasik, 1979, 1989; Gupta & Shaw, 1998; Stajkovic & Luthans, 1997), no study has yet quantitatively synthesized, analyzed, and evaluated the variations in effect sizes of the behavioral management impact on task performance across all available studies conducted in organizational settings.

The purpose of this study is to meta-analytically examine, in terms of applications at work, important, yet still open, research questions regarding: (a) the *average individual* effects of the three reinforcers (money, feedback, social recognition) on work performance, (b) the *average combined* effects of reinforcers on work performance (e.g., money, feedback, and social recognition combined), and, importantly, (c) the *average relative* impact of individual (e.g., money) versus combined (e.g., money, feedback, social recognition) effects of reinforcers on task performance at work. The latter analysis tests whether combined reinforcement effects on task performance in organizations are additive, redundant, or synergistic. The lack of knowledge regarding these questions poses difficulties for researchers and practitioners to accurately predict what to expect (in terms of average effects) from behavioral management in organizations. At this point, where average quantitative estimates based on generalizations from multiple studies are called for, a theory-driven meta-analysis provides the method to address unresolved research questions regarding the effectiveness of behavioral management at work.

We organize this article into three parts. First, we review the conceptual background of behavioral management, followed by the proposed theory regarding the different motivational nature of individual reinforcers and their combined effectiveness. Second, we test hypotheses in primary and moderator meta-analyses, and by meta-analytic orthogonal polynomials. Finally, based on our findings, we suggest directions for future theory development and research, and offer suggestions for more effective management of task performance in today's organizations.

Theoretical Foundation of Behavioral Management

Main Premises of Behavioral Management

Behavioral management is based on reinforcement theory, with its historic roots in Skinner's (1938) operant conditioning and Thorndike's (1913) law of effect. The behavioral approach to work motivation assumes that the causal agents of human action are found in the functional relationship between environmental variables (e.g., reinforcers)

and the behavior they affect (e.g., Komaki et al., 1996). Applying this approach, behavioral managers would specify: (a) the occasion upon which desired employee behavior occurs, (b) the behavior itself, and (c) the behavioral consequences. The behavioral management literature interprets these contingencies as antecedent–behavior–consequence or simply A–B–C (Luthans & Kreitner, 1985).

Types of Reinforcers and Reinforcement

Behavioral management is primarily concerned with employee learning as behavioral change through the consequences of reinforcers and positive reinforcement. In particular, a reinforcer represents a desired consequence by an employee that, when added to the situation, increases the frequency of an employee's task-related behavior. A positive reinforcement (most commonly used technique in behavioral management) is an application of a positive reinforcer upon desired employee behavior. Thus, in behavioral management, the unit of analysis is employee behavior, direct measurement of the frequency of behavior is needed, and behavior is functionally analyzed in terms of its antecedents and consequences (Luthans & Kreitner, 1985).

Effectiveness of Behavioral Management at Work

Notwithstanding an outlying view of Kohn (1993), few (i.e., Deci, 1971) would question the idea that contingent consequences positively impact performance. As Bandura (1986) notes, "social scientists who warn that high pay will ruin the interest and motivation of ... workers, rarely counsel low reward of professional services and creative efforts" (p. 236). Therefore, based on the conceptual foundation of behavioral management and the considerable existing empirical evidence in terms of individual studies (see the 72 asterisked studies in the reference section that are used in this meta-analysis), we hypothesize that:

Hypothesis 1: Behavioral management has a positive effect on task performance in organizational settings.

This hypothesis establishes the average effect of behavioral management over the years on task performance in organizations. However, the effect magnitudes of the impact of behavioral management on task performance depend on the type and amount of reinforcers applied (e.g., Bandura, 1969, 1986; Stajkovic & Luthans, 1997, 2001). As we note in the introduction, the most commonly applied reinforcers in organizations are money, feedback, social recognition, and their combinations (Bandura, 1986; Gerhart & Milkovich, 1990; Pfeffer, 1995; Rynes

& Gerhart, 2000; Stajkovic & Luthans, 1997, 2001). Thus, given the large number, types, and amounts of analyzed reinforcers in this meta-analysis, we next hypothesize that:

Hypothesis 2: Magnitudes of individual effect sizes are significantly heterogeneous across the initially analyzed behavioral management studies.

This hypothesis suggests that behavioral management effect size magnitudes would deviate among each other beyond chance, depending on the reinforcer applied. This type of hypothesis is common in meta-analysis (Hedges and Olkin, 1985) and is used to rule out the false-positive findings regarding the within-group heterogeneity assumption and subsequent waste of time and effort. In other words, a nonsignificant within-group heterogeneity of effect sizes in this analysis would indicate that all reinforcers, regardless of their type such as money, feedback, or social recognition, produce statistically the same effects, and that it makes no difference empirically which one is applied in organizations. However, because we hypothesize the presence of moderation (significant heterogeneity of effect sizes), we next conceptually suggest the sources of systematic variation among the examined studies.

Effects of Different Reinforcers on Task Performance

In the following sections, we provide a theoretical basis for the proposed moderation regarding the impact of behavioral management on task performance. We base our arguments on the theory and research of behavioral management (e.g., Komaki, 1986; Luthans & Kreitner, 1985), social cognitive theory (Bandura, 1986, 1997, 2001), the compensation literature (Gerhart & Milkovich, 1990; Rynes & Gerhart, 2000), and recent research on incentive motivators (Stajkovic & Luthans, 2001). In short, this literature has one common premise: "Human behavior... cannot be fully understood without considering the regulatory influence of response consequences" (Bandura, 1986, p. 228). However, the behavioral management approach has not yet provided conceptual explanation as to the reasons different reinforcers may have differential effects on performance (hence, the "atheoretical" criticism frequently levied at this field). Thus, we propose a theoretical model suggesting that different response consequences such as money, feedback, and social recognition produce different effects on task performance depending on their content properties. Figure 1 shows the model that summarizes our conceptual arguments.

Given the relative novelty of the proposed theoretical model, it is important to note that we do not use it to meta-analytically test its mediating effects, for no data from individual studies are yet available. Rather, we

Differentiating Factors		Type of Reinforcer		
		Money	Feedback	Social Recognition
Outcome Utility		Exchange	Role Clarity	Predictive
Informative Content	Level	Low / Medium	Medium / High	Low / Medium
	Type	Dich. / Ordinal	Outcome / Process	Dich. / Ordinal
Regulatory Mechanism		Instrumental Symbolic	Self-Reflection	Forethought

Note: Dich. = Dichotomous.

Figure 1: The Nature of the Three Reinforcers.

use the proposed model as a conceptual vehicle to show why we believe that work motivation based on the contingent consequences requires the presence of all three main reinforcers (money, feedback, social recognition) for most effective performance. Specifically, although we maintain that each of the three reinforcers will significantly impact task performance, we suggest that the strongest effect will be attained by the simultaneous application of the three reinforcers combined, and that this effect will be synergistic.

To illustrate, given its wide exchange properties, it is reasonable to assume in most instances that employees may perceive money as having high instrumental value, worth extra effort to increase performance and attain the monetary reinforcement. However, many times, despite the willingness to extend effort, employees may not be sure what needs to be done, where to turn for resources, and how to correct unproductive behaviors. Application of feedback is needed in these instances to clarify the work role, which further facilitates the task performance (Bandura, 1997; Phillips, Hollenbeck, & Ilgen, 1996). Finally, in their work, many employees have learned that valuable outcomes tend to occur in conjunction with or following the approval of others, and aversive consequences tend to follow social disapproval (Bandura, 1986). Social recognition, therefore, further motivates employees based on its power to predict potentially upcoming desirable outcomes (promotion, pay raise, transfer to a better job assignment, etc.), which fosters the behaviors that received social approval (Bandura, 1986).

Unique Motivational Properties of the Three Major Reinforcers

In the above discussion, we suggest that, although necessary, each reinforcer alone is not sufficient for the most effective performance. This is because the three reinforcers conceptually differ. Each contributes unique motivational elements to the contingent consequences motivational domain. As proposed by Stajkovic and Luthans (2001), these unique motivational properties proposed are based on the differences among the three reinforcers in their (a) outcome utility, (b) informative content, and (c) mechanisms through which they influence performance.

Money

Outcome utility. Although many forms of monetary contingencies (e.g., prizes, lotteries, paid vacation, time off) have been used in behavioral management, cash payments have been the monetary reward of choice to most organizations (Merwin et al., 1989; Mitchell & Mickel, 1999). Regarding the outcome utility, tangible, financially based rewards (e.g., prizes) effect action through benefits they provide upon con-

sumption. However, the motivating power of money is in its exchange value, for it can be exchanged for different goods and services (Bandura, 1986). Given the exchange potential of money, employees are typically attracted to financial incentives and are likely to become dissatisfied if these are threatened or taken away.

Informative value. Another characteristic of monetary contingencies is that they do not provide much substantive information concerning performance. The receipt of money may indicate a job well done, but it is up to the recipients to determine what they did well (or not so well) because money does not possess much informative value beyond a good/bad dichotomy ("I must have performed well having been given this financial reward," or vice versa). Thus, money does not provide much specific information regarding the nature of the performance–standard discrepancy (what went wrong/was done right), and it does not provide any task information that could be used in improving subsequent task performance (Stajkovic & Luthans, 2001).

Regulatory mechanism. Considering the mechanism through which it impacts human action, money can take on instrumental or symbolic motivational properties (Gupta & Shaw, 1998; Stajkovic & Luthans, 2001). If perceived in its instrumental mode, money can be used to satisfy physical or psychological needs. If perceived as a valued social symbol, money provides a potent source of social-comparison information (Festinger, 1957), which can indicate a person's standing (e.g., status) relative to comparison others. In either case, money plays a vital role in determining which activities will be initiated, the expenditure of effort, and persistence.

Feedback

Outcome utility. Although feedback can be conveyed in a variety of different forms and ways (Annett, 1969; Kluger & DeNisi, 1996), it usually refers to information regarding the level of performance outcomes, and/or the manner and efficiency in which performance processes have been executed (Early, Northcraft, Lee, & Lituchy, 1990; Williams & Luthans, 1992). Feedback derives its motivating power almost exclusively from the information it provides about the employee's performance, which, in turn, enhances role clarity about the task performed (Bandura, 1986; Kluger & DeNisi, 1996; Komaki, Heinzmann, & Lawson, 1980). To achieve role clarity, performance feedback needs to be: (a) operationalized as an external intervention, (b) conveyed in a positive manner, (c) immediate, and (d) specific (Stajkovic & Luthans, 2001).

Informative content. Even though feedback information generally conveys more task-specific information to the employee than either

money or social recognition, there are still variations in the level of information depending on whether outcome or process feedback has been delivered (Williams & Luthans, 1992). Outcome feedback conveys to the employee only the discrepancies between the level of performance and the desired performance standard. In addition to this information, process feedback includes communicating to the employee how the performance was executed (e.g., what were the critical task behaviors), and, importantly, what could be done in the future to improve the performance (e.g., what may be the better sequencing of behaviors, and what are the dynamic complexities where sequencing may need to change) (Balcazar, Hopkins, & Suarez, 1986; Early et al., 1990; Komaki, Heinzmann, & Lawson, 1980; Kopelman, 1986).

Regulatory mechanism. In terms of its cognitive mechanism, feedback regulates human action through a feedback-standard discrepancy process (Bandura, 1986; Carver & Scheier, 1981; Hollenbeck, 1989; Locke & Latham, 1990). In particular, the receipt of feedback initiates an evaluative process whereby current performance is compared to an objective standard of performance. If a discrepancy is discerned, behavior is altered in an effort to minimize the discrepancy. However, although feedback is largely recognized as a way to potentially improve performance (Kluger & DeNisi, 1996; Kopelman, 1986; Stajkovic & Luthans, 1997), and there is a widely held agreement that feedback regulates action by initiating the evaluation of and stimulating the reaction to the feedback-standard discrepancy, no agreement exists regarding explanations of the reaction to it (see Ashford & Cummings, 1983; Bandura, 1986, Carver, 1979; Hollenbeck, 1989; Locke & Latham, 1990; Phillips et al., 1996, for details).

Social Recognition

Outcome utility. Social recognition has recently been increasingly used as a behavioral management intervention in organizations (Luthans & Stajkovic, 2000). This is due in part to the fact that money is often awarded on a less than contingent basis (e.g., seniority pay) and under less discretion (Bandura, 1986), and that social recognition costs the organization financially much less while promising similar results. Social recognition includes personal attention through the use of verbal consequences including expressions of approval, interest, and compliments (Bandura, 1986; Haynes, Pine, & Fitch, 1982; Luthans & Stajkovic, 2000).

Social recognition derives motivation potential from its predictive value and, importantly, not from the social reactions themselves (Bandura, 1986; Luthans & Stajkovic, 2000). Because desired personal consequences (e.g., promotion, raise) are usually preceded by social ap-

proval, by reversing the correlates, positive reactions of relevant others become predictors of valuable rewards, and, thus, become incentives for future action. As a result, people are likely to engage in behaviors that receive social recognition and weaken those behaviors that lead to disapproval and/or criticism of others (Stajkovic & Luthans, 1997). In other words, social reactions to performance become a predictor of future rewards, which, in turn, strengthens one's behavior.

Informative content. Similar to money, social recognition does not entail much of the informative task-related content that may be useful for the direct improvement of performance. However, whereas the value of money is differentiated by the amount, the informative value of social recognition focuses on the content value of what has been delivered and not necessarily on the quantity of appreciation. In particular, showing employees how much their work is valued through social recognition is not achieved by using noncontingent standardized phrases (good job!), but by the acts of recognition that convey genuine personal involvement, appreciation, and gratitude for the successful performance. This is because indiscriminate approval that does not eventually result in tangible benefits becomes an "empty reward," thus, lacking the potential to control human action (Bandura, 1986). It is the difference between the indiscriminate approval and the genuine appreciation with promising outcomes that portrays the continuum from dichotomous to the ordinal informative level of social recognition (Stajkovic & Luthans, 2001).

Regulatory mechanism. If the predictive properties of social recognition represent its motivational power, then the basic human capability of forethought (Bandura, 1986) is the means to cognitively operationalize it. In particular, based on the social recognition received and, thus, the perceived prediction of desired consequences to come, people will self-regulate their future behaviors by forethought. By using forethought, employees may plan courses of action for the near future, anticipate the likely consequences of their future actions, and set performance goals for themselves. Thus, people first anticipate certain outcomes based on recognition received, and then through forethought, initiate and guide their actions in an anticipatory fashion. The future acquires causal properties by being represented cognitively by forethought exercised in the present (Bandura, 1986, 1997). The forethought is the regulatory mechanism that allows perceived future outcomes (based on social recognition) to be transferred into current action.

Differential Engagement and Synergistic Effect Hypotheses

To sum, money fosters effort, feedback clarifies the task role, and social recognition predicts future outcomes. Effort, role clarity, and

expectations of valued outcomes are likely individually related to task performance, which makes them necessary ingredients in the proposed multifaceted motivational domain. Based on the theory proposed, we hypothesize that:

> *Hypothesis 3*: Each reinforcer in behavioral management—money, feedback, and social recognition—produces a positive average effect on task performance.

With regard to the within-group systematic variance explained, we hypothesize that:

> *Hypotheses 4*: Each reinforcer—money, feedback, and social recognition—produces a significant within-group homogeneity of effect sizes.

In terms of overall effectiveness, we hypothesize that:

> *Hypothesis 5*: Money, feedback, and social recognition applied in combination have the strongest average effect on task performance, as compared to the average effect of each of the three reinforcers used individually. This combined average effect is synergistic (greater than the sum of the effects of individual reinforcers).

Comparisons among the Hypotheses 3, 4, and 5 will allow us to determine if a synergistic effect of the combined intervention is present. In particular, Hypothesis 3 establishes the individual reinforcement effects, Hypothesis 4 allows for unambiguous interpretation, and the first part of Hypotheses 5 shows the actual model in place.

A Meta-Analysis of Behavioral Management

Identification of the Studies

The collection of studies was initiated by computerized searches of *ABI Inform, Business Periodicals Index, PsychInfo, PsychLit, Social Science Index,* and *Sociofile* databases, covering the 20th century. The key words used were behavior management, organizational behavior management, behavior modification, organizational behavior modification, reinforcement theory, and applied behavior analysis. Most recent articles that may not have been covered yet by computerized databases, were manually searched for in the following 10 journals: *Academy of Management Journal, Academy of Management Review, Administrative Science Quarterly, Journal of Management, Journal of Organizational Behavior, Journal of Organizational Behavior Management, Behavior Modification, Journal of Applied Behavioral Analysis, Journal of Applied Behavioral Sci-*

ence, *Journal of Applied Psychology, Organizational Behavior and Human Decision Processes, Personnel Psychology*, and *Psychological Bulletin*.

Searches (limited to articles in the English language) were also conducted using reference sections of relevant reviews and books (Andrasik, 1979, 1989; Bandura, 1969; Bobb & Kopp, 1978; Kluger & DeNisi, 1996; Komaki et al., 1996; Luthans & Kreitner, 1975, 1985; Luthans & Martinko, 1987; Mayhew, Enyart, & Cone, 1979; Merwin et al., 1989; O'Hara et al., 1985; Rapp, Carstenson, & Prue, 1983; Stajkovic & Luthans, 1997), as well as using an ancestry approach (Cooper, 1989). Unpublished manuscripts were also solicited from researchers in this field.

Selection Criteria

Because behavioral management research has been conducted across many disciplines over the past 6 decades, we start by defining the boundaries of our work. This study is about the effects of behavioral management on task performance in organizational settings. This purpose places several limits on the scope and nature of this meta-analysis, which are identified next.

Inclusion Requirements

Reinforcement interventions. The main premise of behavioral management is that human behavior is a function of contingent consequences (Bandura, 1969; Luthans & Kreitner, 1985). Thus, to be included in this meta-analysis, a study was first required to: (a) have used one or more of the three reinforcers (money, feedback, social recognition), (b) have the reinforcer(s) contingently administered, and (c) apply the reinforcer(s) as an external intervention.

Outcome measures. A study also had to examine the dependent variable(s) in the form of behavior-based, task-performance measures. Based on the behavioral management paradigm, every behavior identified for change had to be: (a) observable, (b) measurable, (c) task specific, and (d) performance related (Luthans, Paul, & Baker, 1981; Stajkovic & Luthans, 1997). Using Wood's (1986) theory of task as a theoretical guideline, we defined task performance "in terms of the *behavioral responses* [italics added] a person should emit in order to achieve some specified level of performance" (p. 62). More specifically, task performance had to include three major components of any task such as (a) product of the task, (b) required acts necessary to perform the task, and (c) information cues on which a person can base the judgment about the execution of the task (Campbell, 1988; Kluger & DeNisi, 1996; Stajkovic & Luthans, 1998; Wood, 1986).

Analytical aspects. Finally, a study was also required to provide the minimum statistical information necessary to calculate effect sizes. If effect size transformations were needed, we used equations provided by Hedges (1981, 1982), Rosenthal (1991, 1994), and Stajkovic (1999).

Exclusion Criteria

Nonrelated settings. Our focus on employee performance in organizational settings placed further restraints on the scope of applicable studies. In particular, studies were excluded if they: (a) included tasks performed in laboratory/simulated settings, (b) analyzed general work behaviors (e.g., absenteeism), (c) examined the impact of reinforcers on behaviors unrelated to performances in organizational settings (e.g., oral reading errors of children), (d) used samples from clinical institutions that would typically be rarely found as a majority of the work force (e.g., individuals with disabilities), (e) investigated the effects of reinforcers on performance in the field of sports psychology and medicine, and (f) included study participants who, considering their age, legally cannot be in the work force (e.g., those younger than 15 years of age).

Final selection of the studies. Initially, 279 studies appeared to have met the selection criteria. However, after closely examining each of these studies, an additional 207 studies were excluded for methodological and/or conceptual reasons such as: (a) not being conducted in an organizational setting, (b) the use of same data from previous studies already selected for the analysis, (c) not reporting the description of the task, (d) not reporting any statistical information from which effect sizes could be determined either directly or through the use of statistical transformations, (e) examining behavioral intentions or choice options rather than task performance, (f) using cognitive antecedents as outcome predictors, (g) applying nonsystematic, random reinforcement, and (h) developing interventions based on self-generated rewards. The final sample consisted of $s = 72$ (26%) studies, generating $k = 350$ effect sizes, and a total sample size of $N = 13,301$. The average sample size per effect size was 38 study participants.

Primary Meta-Analysis

In this analysis, we examine three research questions: (a) What is the weighted average effect size of the behavioral management on performance in organizational settings? (b) Is that average effect size significantly different from zero? and (c) Are individual estimates of effect sizes homogeneous across all examined studies? These questions addressed Hypotheses 1 and 2.

Method

In this study, we used the Hedges and Olkin (1985) meta-analytic method (see also Hedges, 1986). The computational equations, procedures, and analytical tests used have been outlined in detail by Stajkovic (1999), and were also used in previous research (e.g., Stajkovic & Luthans 1997, 1998; Stajkovic & Lee, 2002). Below, we describe these analytical procedures.

Estimating individual effect sizes. We started the analysis by estimating the single effect size for each study in the form of index (g), which represents the mean difference between the experimental and the control group divided by the pooled standard deviation. If some studies did not report estimates to directly determine effect size (g), we used transformational equations (Hedges, 1981, 1982; Rosenthal, 1991, 1994) to compute it. Because, for small sample sizes $(n < 10)$, (g) has a slight tendency to overestimate population effect size δ, we next multiplied (g) with the correction factor that produces an unbiased estimator (d) (Hedges, 1981; Hedges & Olkin, 1985). The unbiased estimator (d) for every effect size (g) has an approximately normal sampling distribution when all studies share a common effect size with the mean δ and variance (v), where (v) is determined by the sample sizes and the value of (d) (Hedges, 1986).

Outlier analysis. We conducted three outlier analyses: for $n = 1$, effect size magnitudes, and sample sizes (e.g., Stajkovic, 1999; Stajkovic & Luthans, 1997, 1998). The main reason for a priori exclusion of single-case studies was the strong possibility for capitalization on chance that would preclude reliable external validity generalization of the findings. Distributional properties of effect size $(d.)$ (see Hedges & Olkin, 1985) also contributed to this exclusion from further analyses. The problem with unusually high effect size magnitudes is that, given the high power of the χ^2 test, they may keep on indicating the presence of systematic variance (significant within-group heterogeneity) that may not be (practically) meaningful in the organizational reality (Hunter & Schmidt, 1995). The issue with the presence of large sample sizes is that weighted averages tend to give a much larger weight to studies with large sample sizes, which can cause the entire meta-analysis to be defined by one or a few studies (Hunter & Schmidt, 1995).

We used a schematic plot analysis (Tukey, 1977) to conduct outlier analyses (Stajkovic & Luthans, 1997, 1998). The values placed 1.5 to 3 lengths from the upper/lower edge of the 50% interquartile range of all values represent outliers, and values that are more than 3 lengths from the interquartile range are considered extreme values. Upper and lower "viskers" represent the highest and lowest values that are not considered

outliers. We conducted three analyses: with all studies (Set 1), with magnitude (Set 2), and with sample size (Set 3) outliers excluded.

Combining estimates of individual effect sizes. The most accurate and valid procedure for combining estimates of single effect sizes is to calculate a weighted average effect size that incorporates variances (v_i) to (v_k) for each (d_i) to (d_k) (Hedges, 1986; Hedges & Olkin, 1985). Thus, we computed the weighted average effect size ($d.$) across k studies by weighting each effect size by the inverse of its variance. After determining the weighted average effect size ($d.$) and its variance ($v.$), we tested the hypothesis that the common population effect size $\delta = 0$, by comparing the ratio of ($d.^2 / v.^2$) to the χ^2 distribution for $df = 1$. In other words, we intended to determine if there was a significant main effect for the average treatment across k studies.

Testing for homogeneity of effect sizes. Weighted average effect size ($d.$) represents an unbiased estimate of the population effect size only if individual effect size magnitudes do not deviate from each other across all k studies by more than what is expected by chance, in which case, the estimates differ only by unsystematic variance and we can conclude that the model of the average effect size fits the data. However, significant heterogeneity of effect sizes indicates that differences in individual effect size magnitudes may be large enough to reject the homogeneity assumption that single effect sizes are drawn from the same population (presence of the significant treatment-by-study interaction, or, in other words, moderation) (Hedges, 1982, 1986; Hedges & Olkin, 1985). For this test, we used the Q_t homogeneity statistic (Hedges & Olkin, 1985; Stajkovic, 1999), which represents the weighted sum of squares of the effect size estimates (d_i) to (d_k) about the weighted mean ($d.$).

Results of the Primary Meta-Analysis

Average effects and homogeneity assumption. In the first set of studies that excluded studies with only one subject ($s = 3$; $k = 14$), the average unbiased effect size ($d.$) was .98, with variance ($v.$) of .0002. These results indicated a significant effect of behavioral management on performance ($\chi_{(1)}^2 = 4788, p < .01$; 95% $CI_L = .951, CI_U = 1.01$), and a significant heterogeneity of individual effect sizes across the k examined studies ($Q_T = 8879,57, p < .01$). After removing magnitude outliers and extreme values ($s = 7$; $k = 41$) in the second set of studies, $d. = .51$, and $v. = .0002$, which also showed a significant effect ($\chi_{(1)}^2 = 1287, p < .01$; 95% $CI_L = .48, CI_U = .54$) and significant heterogeneity of individual effect sizes ($Q_T = 2142,51, p < .01$). In the final data set, where sample size outliers/extreme values were excluded ($s = 6$, and $k = 11$), the magnitude of average effect size was $d. = .47$, and $v. = .0003$. This average

effect size also indicated a significant effect for behavioral management on performance $(\chi_{(1)}^2 = 731.63, p < .01; 95\% \, CI_L = .44, CI_U = .50)$ and further reduction, although still significant, in the within-group heterogeneity of effect sizes $(Q_T = 1627,25, p < .01)$. These results supported Hypotheses 1 and 2.

Implications of outlier analysis. Implications of outlier exclusions were in accordance with the previous research (Behrens, 1997; Hedges, 1987; Hunter & Schmidt, 1995; Stajkovic, 1999). Thus, to avoid biases introduced by single-subject studies, large magnitudes that may be increasing the heterogeneity of effect sizes, yet as Hunter and Schmidt (1995) suggest, may not be meaningful in organizational reality, and larger weights given for the sample size deviant studies, further analyses were conducted with the outlier and extreme values removed. These reductions represent below average reductions in the social sciences (10%; Hunter & Schmidt, 1995), and notably below reductions in the "exact" sciences (40%; Hedges, 1987).

Heterogeneity of individual effect sizes. Given the diverse attributes of the studies we meta-analyzed, as hypothesized, within-group heterogeneity assumption was supported $(Q_T = 1627, 25, p < .01)$. This finding indicated that: (a) magnitudes of single effect sizes were not consistent among each other, (b) there was significant treatment-by-study interaction, and, most importantly, (c) it was inappropriate to specify the predictive model by an average estimate of effect size without considering moderators. Thus, based on the theory proposed, we tested the moderation model of the hypothesized sources of systematic variations among examined studies.

Meta-Analytic Moderator Analysis

Coding of Studies

Following the theory proposed, each study was coded for the type of reinforcement applied such as (a) money, (b) feedback, (c) social recognition, (d) Combination 1 (simultaneous application of money and feedback), (e) Combination 2 (application of money and social recognition), (f) Combination 3 (application of feedback and social recognition), and (g) Combination 4 (application of money, feedback, and social recognition). Data were coded by the principal investigator in this study and another trained rater. The interrater agreement was $\rho = .97$, and the "effective" reliability was $R = .98$, indicating that a similar group of two other judges would reach almost the same conclusions regarding coded variables (Rosenthal, 1991).

TABLE 1

Summary Statistics for Type of Intervention Moderator Analysis

Type of Intervention[a]	95% Confidence limits						
	$d.$	$v.$	Lower	Upper	χ^{2b}	k	$Q_{w_i}{}^c$
Money	.99	.0029	.8825	1.096	328.55**	37	256.81**
Feedback	.34	.0004	.3055	.3839	297.00**	174	880.66**
Social recognition	.51	.0367	.1356	.8864	7.11**	8	1.46††
C1	.53	.0124	.3144	.7517	22.82**	16	41.99**
C2	.73	.0140	.5018	.9656	38.45**	7	80.08**
C3	.60	.0034	.4887	.7171	106.90**	37	147.44**
C4	1.88	.0260	1.563	2.195	135.76**	5	4.60††

[a] C1 = Combination 1 (simultaneous application of money and feedback); C2 = Combination 2 (simultaneous application of money and social recognition); C3 = Combination 3 (simultaneous application of feedback and social recognition); C4 = Combination 4 (simultaneous application of money, feedback, and social recognition).
[b] $\chi^2 = d.^2/v.$ [c] Within-group homogeneity statistic.
**$p < .01$ *$p < .05$ ††$p > .05$.

Analytical Procedures

According to Hedges and Olkin's (1985) meta-analytic method, we performed several tests to explain the nature of the moderation. We examined the homogeneity of effect sizes among moderator groups by the Q_b homogeneity test. To determine if the moderator groups explained the study-by-treatment interaction found in the primary meta-analysis, we examined homogeneity of effect sizes within each group by the Q_w homogeneity test, which represents an overall test of homogeneity of effect sizes within the partitioned groups across k studies. Finally, extending the between-group homogeneity Q_b test, we used meta-analytic orthogonal polynomials for the three planned comparisons.

Results of the Moderator Meta-Analysis

Based on the coded categories, all studies were split into seven groups. The average effect sizes indicated that each type of reinforcer and combination had a significant effect on performance. The between-group homogeneity test showed that different types of reinforcers had significantly different effects on performance ($Q_B = 214.21, p < .01$). The test for overall within-group homogeneity of effect sizes showed significant heterogeneity of effect sizes within the reinforcer categories ($Q_W = 1413.04, p < .01$). However, the analysis of effect size homogeneity for each moderator group (Q_{B1-7}) indicated that within-group homogeneity was achieved for social recognition and Combination 4. Table 1 shows the results of this analysis.

TABLE 2

Adjustments for the Within-Group Homogeneity of Effect Sizes

Adjustments	$Q_{w-ext.}$	Q_w	$Q_{w-min.}$	$Q_{w-max.}$	d.	k	Q_{wiA}
Money							
Unadjusted	–	6.94	.00	55.87	.99	37	256.81**
1	55.87	5.55	.00	54.15	.93	36	199.65**
2	54.15	4.12	.00	50.63	.86	35	144.15**
3	50.63	2.71	.03	13.61	.79	34	92.08**
4	13.61	2.35	.02	11.59	.74	33	77.60**
5	11.59	2.06	.01	8.44	.72	32	65.93**
6	8.44	1.85	.00	7.93	.71	31	57.42**
7	7.93	1.64	.00	5.82	.68	30	49.34†
Combination 1							
Unadjusted	–	2.62	.00	13.11	.53	16	41.99**
1	13.11	1.91	.00	7.90	.48	15	28.67†
Combination 2							
Unadjusted	–	11.44	3.43	57.31	.73	7	80.08**
1	57.31	.01	.00	.01	.07	6	.03††
Combination 3							
Unadjusted	–	3.98	.00	28.04	.60	37	147.44**
1	28.04	3.30	.00	25.24	.56	36	118.95**
2	25.24	2.65	.00	22.11	.50	35	92.73**
3	22.11	2.05	.00	20.47	.44	34	69.68**
4	20.47	1.49	.00	11.91	.42	33	49.01†

Notes: $Q_{w-ext.}$ = Highest extreme value of the individual homogeneity statistic within the moderator group; Q_w = Mean value of the individual homogeneity statistic within the moderator group after ($Q_{w-ext.}$) has been removed; $Q_{w-min.}$ = Minimum value of the individual homogeneity statistic within the moderator group after the ($Q_{w-ext.}$) has been removed; $Q_{w-max.}$ = Maximum value of the individual homogeneity statistic within the moderator group after ($Q_{w-ext.}$) has been removed; (d.) = Average effect size for the moderator group after ($Q_{w-ext.}$) has been removed; k = Number of effect sizes after ($Q_{w-ext.}$) has been removed; Q_{wiA} = Overall homogeneity value for the moderator group after ($Q_{w-ext.}$) has been removed.
Combination 1 (simultaneous application of money and feedback); Combination 2 (simultaneous application of money and social recognition); Combination 3 (simultaneous application of feedback and social recognition). Given the scope of this analysis, feedback adjustments are available from the authors.
*$p < .05$ **$p < .01$ †$p > .01$ ††$p > .05$.

We next performed homogeneity adjustments (Hedges, 1987; Stajkovic & Luthans, 1998) for the moderator groups with significant within-group heterogeneity of effect sizes. For deviant data, "Tukey (1960) and Huber (1980) recommended deletion of the most extreme 10% of data points—the largest 5% and the smallest 5%—of values" (Hunter & Schmidt, 1990, p. 207). Because removing a priori 10% of the most extreme heterogeneity values may be more than is needed to achieve within-group homogeneity, we used procedures based on the values of individual Q_{wIIi-p} homogeneity statistics and corresponding moving Z_{II+i-p} weighted averages to analyze the within-group homogeneity of

TABLE 3

Summary Statistics for Type of Intervention Adjusted Moderator Analysis

Type of Intervention[a]	d.	v.	95% Confidence limits		χ^{2b}	k	$Q_{wi}{}^c$
			Lower	Upper			
Money	.68	.0035	.5683	.8001	133.74**	30	49.34†
Feedback	.29	.0005	.2451	.3327	167.00**	157	330.05**
Social recognition	.51	.0367	.1356	.8864	7.11**	8	1.46††
C1	.48	.0126	.2614	.7014	18.38**	15	26.67†
C2	.07	.0196	−.2083	.3397	.22	6	.03††
C3	.42	.0038	.2948	.5364	633.19**	33	49.01†
C4	1.88	.0260	1.563	2.195	135.76**	5	4.60††

[a] C1 = Combination 1 (simultaneous application of money and feedback); C2 = Combination 2 (simultaneous application of money and social recognition); C3 = Combination 3 (simultaneous application of feedback and social recognition); C4 = Combination 4 (simultaneous application of money, feedback, and social recognition).

[b] $\chi^2 = d.^2/v.$

[c] Within-group homogeneity statistic.

**$p < .01$ *$p < .05$ †$p > .01$ ††$p > .05$.

effect sizes (Hedges, 1987; Stajkovic, 1999) while removing the most extreme values one at a time (Kluger & DeNisi, 1996). Table 2 shows these results.

Results of the Adjusted Moderator Analysis

After performing homogeneity adjustments, we re-ran the moderator analysis with the data after the within-group homogeneities were achieved. Table 3 shows these results.

After distribution bias corrections, outlier analyses, and homogeneity adjustments, all three reinforcers and the three combinations still showed significant effects on performance (see Figure 2 as percentage improvement in performance), which supported Hypotheses 3. The test for between-group homogeneity of effect sizes revealed that the magnitudes of the different reinforcers were significantly different from each other ($Q_B = 1166.09, p < .01$), reaffirming the results from the unadjusted moderator analysis. Finally, within-group homogeneity of effect sizes was achieved for six out of seven moderator groups, which largely supported Hypothesis 4.

Orthogonal Polynomials

Individual reinforcers versus Combination 4. The above two analysis set the necessary methods stage for testing Hypothesis 5. In particular, significant within-group homogeneity of effect sizes allowed us to unambiguously interpret any subsequent results, and significant between-
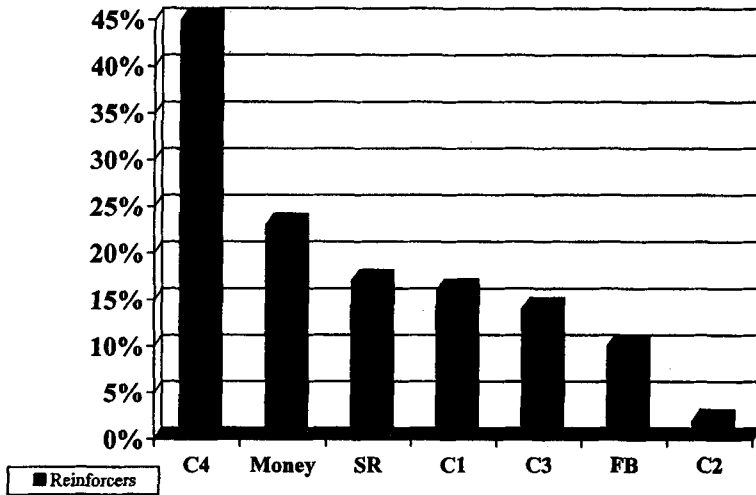
Notes: $C1$ = Combination 1 (simultaneous application of money and feedback; $C2$ = Combination 2 (simultaneous application of money and social recognition; $C3$ = Combination 3 (simultaneous application of feedback and social recognition; $C4$ = Combination 4 (simultaneous application of money, feedback, and social recognition; SR = Social recognition; FB = Feedback.

Figure 2: The Percentage Effects of Reinforcement Interventions on Employee Performance.

group heterogeneity of effect sizes indicated differences among the magnitudes of different reinforcers. However, being an omnibus between-group differences estimator, the Q_B test does not reveal (unless in case of only two groups) the source of differences in magnitudes of effect sizes. Thus, although effect size magnitudes were in a hypothesized direction, to statistically test our Hypothesis 5, we next performed meta-analytic orthogonal polynomials to examine pairwise magnitude differences among hypothesized comparisons (Hedges & Olkin, 1985; Stajkovic & Luthans, 1998; Stajkovic & Lee, 2002). The results (presented in Table 4) supported Hypothesis 5 (for all three comparisons), where the Combination 4 (simultaneous application of money, feedback, and social recognition) had a significantly higher impact on performance than either money, feedback, or social recognition applied individually.

Additive, redundant, or synergistic model. These results allowed us to determine if the combined effect of the three reinforcers is additive, redundant, or synergistic. An additive model would show an average

TABLE 4

Individual Versus Combined Reinforcement Effects on Performance

Intervention comparison[a]	γ[b]	$v_\gamma c$	95% Confidence limits	
			Lower	Upper
Money vs. C4	1.2	.0295	.8634	1.536
Feedback vs. C4	1.6	.0265	1.271	1.909
Social recognition vs. C4	1.4	.0627	.8793	1.861

[a] C4 (simultaneous application of money, feedback, and social recognition)
[b] γ = Value of the contrast estimate;
$v_\gamma c$ = Variance of the contrast estimate.

effect size for the combined (C4) intervention (simultaneous application of money, feedback, and social recognition) as a sum of effects sizes of all individual reinforcers (money, feedback, and social recognition) comprising the combined intervention. The average effect size d. for the C4 under the redundant model would show lower value (overlap in effects), whereas under the synergistic model it would show greater value, indicating the interaction among the three reinforcers applied simultaneously. Using the effect size data from Table 3, we can show that under the additive model, the expected value of d. for C4 would be 1.48 (.68 + .29 + .51), and the actual value for C4 is in fact d. = 1.88. These results reveal the synergistic nature of the effects of combined reinforcers on performance. A simple calculation shows that the synergistic model has a 21% greater effect on performance than the additive model.

Probability of Success of Various Reinforcers

The study results lend themselves to a useful presentation for practicing managers through an applied index of magnitude of effect size— probability of success (PS)—which has recently been introduced in presenting empirical research (Grissom, 1994). Although not necessarily new to statisticians (Wolfe & Hogg, 1971), and sometimes also called the common language effect size (McGraw & Wong, 1992), or probability of superiority (Grissom, 1994), PS indicates the extent to which a randomly selected person from one treatment condition is likely to obtain a higher score on the dependent variable than the randomly selected person from another or no treatment (see Grissom, 1994 for mathematical/calculation details).

In addition to Grissom's (1994) call to include the PS index in metaanalyses, we also find this index useful in presenting the practical utility of research results. Thus, based on the effect sizes from our study, we present the PS index for each reinforcer (see Figure 3). Adapting the definition of PS to a language with more practical interpretation,
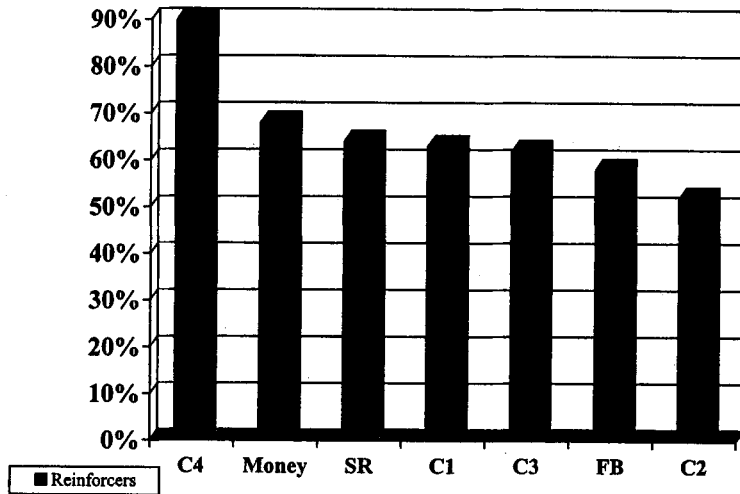
Notes: $C1$ = Combination 1 (simultaneous application of money and feedback; $C2$ = Combination 2 (simultaneous application of money and social recognition; $C3$ = Combination 3 (simultaneous application of feedback and social recognition; $C4$ = Combination 4 (simultaneous application of money, feedback, and social recognition; SR = Social recognition; FB = Feedback.

Figure 3: **Probability of Success for Adjusted Effect Sizes.**

our findings presented through the PS index simply suggest the percentage probability that the reinforced employee will "outperform" the non-reinforced one. Reporting PS estimates (in addition to research-based meta-analytic indices) should help managers in practically evaluating the impact of each reinforcer. This is important because research suggests (Rauschenberger & Schmidt, 1987; Schmidt & Hunter, 1998) that presenting final statistical estimates in more practical terms helps managers arrive at a better understanding of, as Williams (1999) puts it, "what really works."

Discussion

The purpose of this study was to meta-analyze the effects of behavioral management on task performance in organizations. We reviewed the theoretical background of behavioral management, analyzed empirical findings from all available studies, and examined alternative models of combined reinforcement effects. This study represents the first

time that an entire domain of behavioral management has been meta-analyzed, which can be used as a point of departure for further research and practice. As Hunter and Schmidt (1995) note: "the results of meta-analysis are indispensable for theory construction," for "to construct theories, we must first know some of the basic factors, such as the empirical relations among variables." (pp. 39-40)

Primary Meta-Analysis

After all methodological corrections, adjustments, outlier analyses, primary meta-analysis, moderator and adjusted moderator analyses, and orthogonal polynomials analyses, our results show a strong impact of behavioral management on task performance. However, the numerous findings we generated need to be considered one at a time, for they mean different things in different analyses. In particular, in the primary meta-analysis, we found a significant main effect of behavioral management on performance of $(d.) = .47$. This average effect size, which was adjusted for overestimation bias and magnitude and sample size outliers, represents a 16% improvement in performance (Glass, 1976), and 63% probability of success (Grissom, 1994). However, because we also found significant within-group heterogeneity of effect sizes, this finding should be interpreted with caution because it indicates the presence of unaccounted for systematic variance.

Moderator Meta-Analysis

Our goal in the moderator analysis was to theoretically explain the unaccounted for systematic variance found in the primary meta-analysis, and to test the moderation model. We aimed to show the differences in effects on performance between the three most commonly used individual reinforcers—money, feedback, and social recognition—and the combined intervention of all three applied simultaneously. However, getting to this point meta-analytically required several steps. First, we found that the individual reinforcer types moderated the relationship between behavioral management and task performance: Each had a significant impact (significant average effect sizes), but with different effect magnitudes (significant between-group heterogeneity). However, before testing the relative differences among individual reinforcers and the combined intervention, we needed to establish that the average effects for each group could be unambiguously interpreted (significant within-group homogeneity of effect sizes). After this was accomplished in adjusted moderator meta-analysis, we were able to proceed and test if the combined intervention had stronger effects on task performance than

each reinforcer individually, and examine if those effects are additive, redundant, or synergistic.

Effects of Individual Reinforcers on Task Performance

We found that money improved performance 23%, social recognition 17%, and feedback 10%. Two points are needed to make practical sense of these findings: (a) historical, in terms of their place in the field of behavioral management, and (b) empirical, in terms of relative comparisons.

Historical context. Taken separately, the motivating power of money found in this study corroborates the original thoughts of management pioneers (e.g., Taylor, 1895), and substantiates other modern theory, research, and practice in various contexts (Heneman & Judge, 2000; Rynes & Gerhart, 2000). Except for some critical, but largely unsubstantiated views (e.g., Kohn, 1993), our findings and other existing research strongly suggest that if applied contingently, as in behavioral management, money will lead to improved performance (Gerhart & Milkovich, 1990; Gupta & Shaw, 1998; Lawler, 1981, 1990; Stajkovic & Luthans, 1997).

Examined in its own terms, social recognition also significantly improves performance. Given its intermittent properties, social recognition, tends to retain its motivational power over a long period of time (Bandura, 1986). Although personal attention has been theoretically recognized to play an important role in human action, as a reinforcer applied in organizations, social recognition has been relatively ignored (Bandura, 1986; Luthans & Stajkovic, 2000). Bandura (1986) notes that "it is difficult to conceive of a society populated with people who are completely unmoved by the respect, approval, and reproof of others" (p. 235). Yet, as Miller (1978) long ago noted, social recognition is "one of the most neglected, taken for granted, and poorly performed management functions" (p. 115). Although managers have intuitively known the importance of providing social recognition for desirable behaviors, our meta-analysis provides evidence that social recognition does indeed have a significant impact on work performance.

Finally, we found that, considered in its own right, feedback also had a significant impact on performance. Given its theorized outcome utility, informative content, and especially, self-regulatory mechanism, feedback is a more complex construct than money and social recognition, and previous research support for it has been mixed (see Kluger & DeNisi, 1996). Although feedback showed an increase in performance of 10%, its complexity is evidenced in this study by being the only reinforcer that was not able to reach within-group homogeneity of effect sizes even af-

ter adjustments. As Ilgen, Fisher, and Taylor (1979) pointed out, "to relate feedback directly to performance is very confusing. Results are contradictory and seldom straight forward" (p. 368). The heterogeneity of effect sizes in the feedback intervention shows what Ilgen et al. (1979) implicitly suggest: further presence of hard-to-identify variance. The complexity of feedback is also reflected theoretically, as conceptualized in control, goal setting, and social cognitive theories (see Bandura, 1997; Hollenbeck, 1989; Locke & Latham, 1990).

Relative comparisons. The second important point is that the three individual reinforcers could be considered individually in their own right, as we describe above, but probably should not be compared in terms of their relative effects. This is because, methodologically, meta-analysis cannot account for the amounts of applications in each intervention in individual studies, which are seldom, if ever, reported (e.g. controlling for level across the designs). For example, it is possible, although not empirically known, that one study may have used a large amount of money as opposed to a "pat on the back" for social recognition and/or vice versa (e.g., $1 as opposed to a full-page ad in a major newspaper). However, this (fixed vs. random effects/scaling) issue is effectively dealt with, as we hypothesize, if each individual reinforcer (money, feedback, social recognition) is compared to the combined intervention (C4), applying all three reinforcers simultaneously. In this case, any differences in the strength of manipulations across the three reinforcement groups are not confounded with the combined intervention because it includes all three individual reinforcers and their effective ranges.

Relative Effects: Individual Reinforcers Versus Combined (C4) Intervention

This analysis showed that the combined C4 intervention, applying all three reinforcers simultaneously, improved performance 45% (see Figure 2),[3] and that it had stronger effects on performance than either money, feedback, or social recognition applied separately (see Table 4). These findings support our theorizing that each reinforcer covers a different aspect of the motivational domain. Thus, the key implication here is that although each reinforcer does work individually, when combined, they produced the strongest effect on work performance.

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[3] The multiplicative effects are based on average effect size magnitudes, as reported in Table 3. The percentage translations of effect sizes shows different relationships because of the diminishing percentage returns on the standard normal distribution. For example (see Glass, 1976, for details), $d. = 1 = 34\%$ whereas, $d. = 2 = 48\%$ ($d. = 3 = 49\%$), so even the effect size difference between $d. = 1$ and $d. = 2$ is 1 (double) the percentage improvement difference is smaller than double (which would be 68%, 34% + 34%) and is 14%. Simple calculations determine other percentage values for different values of average affect sizes ($d.$).

Combined Synergistic Effect

The analysis also showed that combined reinforcers have a synergistic effect on performance (21% greater effect on task performance than the additive model). As we theorize (money fosters effort, feedback clarifies the task, social recognition predicts outcomes), these results indicate a 3-way interaction among money, feedback, and social recognition. Conceptually examining 2-way combinations may help explain this interaction. In particular, combinations of any two of the three basic reinforcers have significant average effects, except for money and social recognition, which did not seem to match well. Even though separately money and social recognition had a significant impact on performance, when applied together they did not seem to work. As we theorize, this finding could be explained by the interpersonal nature of social recognition, impersonal aspects of money, and the clarifying nature of feedback.

Previous research suggests that interpersonal trust, fairness, and caring conveyed by social recognition on the part of managers is conducive to the creation of a "psychological contract" with employees (Pearce, 1987; Rousseau, 1990). Because the basis of a psychological contract is the attachment of employees to the organization based on mutual respect and trust (Robinson, Kraatz, & Rousseau, 1994), the addition of money to this "contract" may introduce an impersonal element potentially incongruent with an existing positive interpersonal climate. It is not hard to imagine where one may get disappointed (with detrimental effects on performance) at the hint of a monetary contingency in place of interpersonal trust, which, by definition assumes openness to vulnerability (MacAllister, 1995). However, when feedback is added to the combination of money and social recognition, the strongest effect on performance occurs. This implies that feedback information may not only mitigate the incongruency between social recognition and money, but fosters a 3-way interaction. In other words, feedback seems to provide the clarity to the money–social recognition relationship needed to obtain not only significant but the strongest effect on task performance in organizations.

To illustrate these interactions in simple terms (by comparing average effect sizes from Table 3), the combination of money and social recognition reduced the effect of money on performance 90% and the effect of social recognition 76% (the "mismatch cost" of combining impersonal and interpersonal reinforcers). Yet, the addition of feedback to the combination of money and social recognition multiplied the combined effects of money and social recognition 26.8 times, to produce the strongest effect on performance (the "information benefit" of feedback in clarifying the apparent interpersonal/impersonal reinforcement conflict).

Limitations and Future Research

Task Complexity

One limitation of behavioral management research is that most studies used low complexity tasks (Kluger & DeNisi, 1996; Komaki, 1986; Luthans & Kreitner, 1975, 1985). For example (see also Appendix A), when Welsh et al. (1993) reported increases in productivity due to the reinforcement applications, the interventions focused on reinforcing behavioral responses in a blue collar manufacturing setting that ultimately led to increased production of goods. In addition, when Luthans et al. (1981) reported increases in sales performance, they reinforced task-specific behaviors such as the timing of meeting the customer, percentage of restocking the shelves, and average distance from the assigned sales position. As another example of tasks used in this field, Haynes et al. (1982) increased safety performance by reinforcing specific driving practices of bus drivers, such as how many times they complied with the traffic signals, which, in turn, led to less accidents in driving city buses.

Although low complexity tasks have their place in every economy, high complexity tasks put greater demands on the employee's (a) required knowledge, (b) cognitive ability, (c) memory capacity, (d) behavioral facility, (e) information processing, (f) persistence, and (g) effort (Bandura, 1986). As a result, the effectiveness of different reinforcers may change for complex tasks given the increased demands on behavioral and cognitive facilities of the task performer. For example, the theory we propose suggests that different reinforcers impact different aspects of the motivational process: Money fosters effort, feedback clarifies the work role, and social recognition predicts the occurrence of future desirable outcomes. This reasoning may explain the somewhat weak effects of feedback in our study, for low complexity tasks may call for more effort as opposed to feedback. On the other hand, as the task complexity increases, the role clarity provided by feedback may gain in importance (Wood, 1986). Thus, as a specific avenue for future research, we suggest that in behavioral management the effects of feedback on task performance may increase for more complex tasks.

Based on the theory we propose, this proposed enhanced effects of feedback on complex tasks occurs because the motivating power of feedback generated from the information it provides about the employee's performance tends to diminish on less complex tasks. The issue on low complexity tasks is typically not clarifying the work role, as it is on complex tasks, but the (extra) amount of effort needed to perform the already known behaviors successfully (Kluger & DeNisi, 1996; Kopelman, 1986). Thus, given its focus on clarifying the work role, feedback, al-

though valuable, may not be as useful or motivating on less complex tasks given their more narrow and straightforward work demands. On the other hand, clarifying feedback information about a task becomes increasingly critical for more complex performance (e.g., annual feedback for assistant professors, or high-tech managers), for it likely leads to improvements through the development of more effective task strategies. These lines of future research may help us further understand the role various reifnorcers play in work performance.

Fixed Versus Random Effects in Meta-Analysis

In the "Relative comparisons" section, because of a methodological issue, we provide an explicit cautionary note regarding making the relative comparisons of the effects of individual reinforcers. On a more technical note, the methodological issue regards the differences between fixed and random effects models in meta-analysis.

In particular, as done in most meta-analysis, in this study, we used the fixed effects model of effect sizes. According to the fixed effect model, "all studies have the same (constant but unknown) effect size" (Hedges & Olkin, 1985, p. 189). Hence, the idea of and general research interest in average effect size. Test of homogeneity of effect sizes determines if the single effect sizes are consistent with the fixed effects model, and, if not, theory is used to determine predictor variable(s) to explain single effect size deviations from each other (Hedges & Olkin, 1985, pp. 189–191). The random effects model "underlies the concept of a study's true effect size as random," where the idea of randomness is coming "from a belief that the outcome of a process cannot be predicted in advance... (Raudenbush, 1994, p. 302). Thus, in random effects model, "there is no single true or population effect of the treatment across studies. Rather, there is a *distribution* of true effects; each treatment implementation (site) has its own unique true effect" (Hedges & Olkin, 1985, p. 190). In the Bayesian approach, "the randomness of the true effect size represents the investigator's subjective uncertainty about the process that produces them" (Raudenbush, 1994, p. 303).

Based on fixed versus random effect model distinctions, one cannot directly compare the relative effects of one reinforcer (e.g., money) versus the other (e.g., social recognition) without: (a) randomly sampling all possible intervention levels, or (b) holding the level of the interventions constant. Although technically we cannot argue with this point, we suggest that it represents a somewhat unrealistic view of the reality as it exists in the research literature. First, virtually no literature that one might meta-analyze is based upon studies where effects were created by random levels, including the classic work in psychology, education, and

medicine (see Hunt, 1997, for descriptions and details). Second, scaling research that would allow one to conclude that two interventions are of the same magnitude is also nonexistent. Finally, because the studies included in this meta-analysis are taken from "real world" contexts, whatever ranges may be captured by the three individual reinforcers, they at least approximate the ranges that are typical or possible with each of the three reinforcers.

Thus, from a normative perspective, we refrain from making comparisons among money, feedback, and social recognition.[4] However, on a descriptive note, we do report their individual effects on task performance and place them, in their own right, in a historical research context. Obviously, we call for future research that scales the reinforcement interventions or that uses random level designs.

Implications for Practice

Application Procedures: Hoping for A and Reinforcing A

Given the potential for application of behavioral management in many domains of organizational functioning, it is important to recognize the implications of our results for more effective management of task performance. The key practical implication from this study is that behavioral management significantly impacts performance in organizations. However, after recognizing the effectiveness of behavioral management, managers should pay close attention to implementation procedures. Most practical applications fail because proper procedures as specified by theory are not followed. (Lawler, 1990; Kerr, 1999; Pfeffer, 1995, 1998).

For instance, although Pfeffer (1995) notes that "one of the oldest and most reliable findings in psychology is the principle of reinforcement" (p. 60) he also states that the "instability in reward practices is not related to instability in underlying principles of human behavior; more likely, it is caused by... incomplete knowledge of basic social science ... [and] what we know about behavior" (p. 60). Similarly, Lawler (1990) concludes that process and design problems may limit the effectiveness of different reinforcers. He notes that although the applications of different reinforcers are meant to improve employee behavior, they are many times aimed at "the wrong behavior" (Lawler, 1990, p. 58). Thus, a practical challenge is to follow application procedures that are

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[4]To simplify the discussion, we only refer in this section to the three individual reinforcers (e.g., money, feedback, social recognition). However, the discussion on fixed versus random effects could also be applied to the other three interventions: C1, C2, and C3, as reported in the manuscript (e.g., Table 1 and Table 3).

consistent with behavioral management principles, as outlined in the introduction of this article (see also Bandura, 1969; Kerr, 1999; Komaki, 1986; Lawler, 1990; Luthans & Kreitner, 1985; Luthans & Stajkovic, 1999; Pfeffer, 1995).

Skill Building and Reinforcement

Since Taylor's scientific management over a hundred years ago, the major purpose of reinforcing employees has been to maintain and/or increase their performance. However, many times, in addition to providing reinforcers, what is needed for performance improvement is further development of employees' competencies through training programs that increase the knowledge of the task, improve skill levels, and help develop better task strategies. However, in these instances, it is important to consider the possible byproduct of reinforcing performance if the training is not provided. In particular, if the reinforcement has become very lucrative for the individual, this may lead unqualified people into believing that they can accomplish the performance level that, in fact, exceeds their objective ability and/or skills. In this case, applying desired reinforcers may be detrimental to the long-term interests of both the individual (repeated failures and stress) and the organization (quality problems, increased turnover rate). Thus, a managerial challenge here is to distinguish between reinforcing qualified people versus inflating the competence perceptions (by attractive reinforcers) of unqualified employees.

Conclusion

Although scholars and practicing managers have embraced the application of behavioral management at work for about 3 decades (see Kluger & DeNisi, 1996; Kopelman, 1986; Luthans & Kreitner, 1985; Pfeffer, 1995), scant attention had been paid to meta-analytically determine the effectiveness of its entire domain as it is used in organizations. In this new and uncertain economy, management scholars and organizational psychologists are frequently being cajoled to make their theories and research more practical and useful to managers (e.g., O'Reilly & Pfeffer, 2000). By providing meta-analytic findings regarding "what we know" so far about behavioral management, we feel that this study should help meet this important challenge.

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APPENDIX

Summary of Several Studies' Characteristics

Study	N	Type of reinforcer[a]	Study participants	Type of task	Research setting	Study design[b]	Performance criteria
Luthans, Paul, & Baker (1981)	82	Money	Retail clerks	Selling products	Department store	1	Use of idle time; aggregate activities
Fox, Hopkins, & Anger (1987)	1,107	Money	Mining workers	Mining	Open-pit mine	2	Days lost from injuries; Time cost from injuries
Anderson, Crowell, Sucec, Gilligan, & Wikoff (1983)	16	Money	Real estate brokers	Selling property	Local market	1	Initialed contacts; follow-up contacts; sales meetings attendance; sales
Ivancevich & McMahon (1982)	209	Feedback	Engineers	Technical work	Production setting	1	Control costs and cites; unexcused overtime; proficiency
Chhokar & Wallin (1984)	58	Feedback	Machine workers	Fixing heat exchangers	Repair shop	1	Safety performance
Adam (1975)	39	Feedback	Production workers	Die casting	Factory	1	Pieces produced; scrap rate
Luthans, Fox, & Davis (1991)	16	Social recognition	Bank employees	Teller services	Bank	1	Speed of service; degree of help; customer appreciation; eye contact; overall quality of service

APPENDIX (continued)

Study	N	Type of reinforcer[a]	Study participants	Type of task	Research setting	Study design[b]	Performance criteria
Welsh, Luthans & Sommer (1993)	33	Social recognition	Textile workers	Production	Factory	1	Productivity; functional activities; dysfunctional activities;
Snyder, & Luthans (1982)	12	Social recognition	Emergency room personnel	Administrative emergency room	Hospital	3	Time to admit; registration errors; filling errors; average errors; daily billings
Haynes, Pine & Fitch (1982)	425	All-three combination	Bus drivers	Driving city bus	Transport authority	1	Accidents rate; accidents severity
Nordstrom, Hall, Lorenzi, & Delquadri (1988)	21	All-three combination	Building inspectors	Inspection service	Building sites	1	Number of inspections
Austin et al. (1996)	7	All-three combination	Construction workers	Roofing	Construction sites	1	Labor cost

Note: No study reported only subjective, self-report ratings of performance
[a] All-three combination = simultaneous application of money, feedback, and social recognition (referred in other tables as C4).
[b] Study Design: 1 = Experimental design; 2 = Multiple baseline, staggered design; 3 = Quasi-experiment