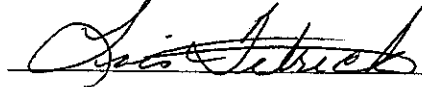


TOWARD A STRONGER MOTIVATIONAL THEORY OF INNOVATIVE
PERFORMANCE

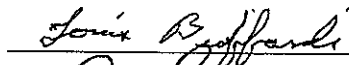
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of
George Mason University
in Partial Fulfillment of
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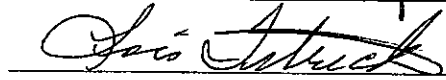
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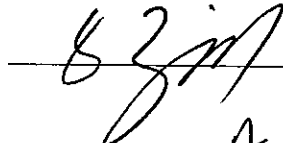


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Spring Semester 2013
George Mason University
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Toward a Stronger Motivational Theory of Innovative Performance

A dissertation submitted in partial fulfillment of the requirements for the degree of
Doctor of Philosophy at George Mason University

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Dedication

This is dedicated to my family, especially my wife Dr. Haixia Kong; my daughter Milan; our parents--Phil Gilmore, Eileen Gilmore, Ronggui Kong and Youlan Wu; and the SLU--Stephanie Gilmore, Sean Gilmore and Jeff Minucci.

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I would like to acknowledge my advisor Dr. Lois E. Tetrick for mentoring me as a scientist and providing the essential training that allowed me to complete this project. My dissertation committee members Dr. Louis C. Buffardi and Dr. Stephen J. Zaccaro have also provided incredible support and insight as has my dear friends and colleagues Vias C. Nicolaides, Dr. Xiaoxiao Hu and Clifford R. Haimann. My research assistants Zitong Sheng and Julie Vu also provided invaluable support in rating the dependent variable, and I would like to thank them. Dr. Luke BrooksShesler turned me on to this debate in the first place, so much credit is due to him if this study proves to be useful. I would further like to acknowledge the scholars whose works were examined in this study, notably: T. M. Amabile and colleagues; R. Eisenberger and colleagues; and P. Tierney, S. M. Farmer and colleagues. Scientific inquiry is necessarily critical, and sometimes critical messages are misconstrued. I want to be clear. Without the courage of visionaries such as these to publish their excellent works, thinkers like me would still be tinkering in the dark. I am honored to have worked with their models.

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Abstract

TOWARD A STRONGER MOTIVATIONAL THEORY OF INNOVATIVE PERFORMANCE

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George Mason University, 2013

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Three prominent but incompatible hypotheses exist describing how to motivate innovative performance through the use of social expectations and/or rewards: the intrinsic motivation principle of creativity (Amabile, 1990), the reward for creativity hypothesis (Eisenberger & Cameron, 1996) and the creative self-efficacy hypothesis (Tierney & Farmer, 2002). This study contrasts these hypotheses and identifies a practical test for falsifying one or more of them. Results from a randomized, controlled, intervention-style laboratory study with university students (N = 209) falsified the creative self-efficacy hypothesis and indicated a need for revision of the intrinsic motivation principle. Theory revision is necessary to explain why contingent rewards lose their impact when mixed with expectations to be innovative and why expectations can simultaneously increase intrinsic motivation while decreasing innovative performance. A new model is suggested that includes an attention-eliciting part and a part that regulates cognitive arousal at a moderate level.

Introduction

Innovative performance is the backbone of innovation, widely regarded as a critical factor for organizational effectiveness (e.g., Ireland & Hitt, 1999; Schumpeter, 1942; Shalley, Zhou & Oldham, 2004). Innovative performance refers to individuals' behaviors related to the intentional introduction of a novel and useful product, process or service (West & Farr, 1990; also referred to as *creative performance*). Organizational and management scholars predominantly have drawn upon a social motivational paradigm (Amabile, 1979; contrasted with a great person paradigm, e.g., Galton, 1869; Simonton, 1990) to understand how to motivate innovative performance among the normal working population (e.g., Woodman, Sawyer, & Griffin).

Incompatibilities of practical significance exist among the three most prominent social motivation theories of innovation. The incompatibilities can be described by three hypotheses that yield different advice regarding whether or not social expectations and/or rewards are effective at increasing innovative performance. These three hypotheses are 1) the intrinsic motivational principle of creativity (Amabile, 1990), 2) the reward for creativity hypothesis (Eisenberger & Cameron, 1996) and 3) the creative self-efficacy hypothesis (Tierney & Farmer, 2002).

The purpose of this study is to contrast the incompatible features of these three hypotheses and to examine the results and conclusions of an experiment designed to

falsify one or more of these hypotheses. The introduction presents theoretical backgrounds and contrasts the incompatible predictions yielded from each hypothesis. After pointing out the incompatibilities between the hypothetical predictions, I describe the results of a study design that allows for the falsification of one or more hypotheses. The spirit of this dissertation is to encourage the development of a stronger motivational theory of innovative performance that can provide deeper insight and more consistent advice to for those wishing to motivate innovative performance.

Theoretical Background

Intrinsic Motivation Principle of Creativity

The intrinsic motivation principle of creativity states that intrinsic motivation is conducive to innovative performance (Amabile, 1990). Intrinsic motivation refers to the drive to do something for subjectively enjoyable reasons (e.g., enjoyment, interest, personal challenge, etc.). Applying concepts from self-determination theory (also referred to as cognitive evaluation theory, Deci & Ryan, 1985), Amabile and students (e.g., Amabile, 1985) first transferred intrinsic motivational hypotheses to predicting creative performance.

Amabile (1990) has suggested that the consistent body of experimental and correlational evidence supporting an intrinsic motivation hypothesis has earned this explanation the title 'principle'. Meta-analytic correlation estimates support this assertion (meta-analytic correlation estimates between intrinsic motivation and innovative performance from Hammond, Neff, Farr, Schwall, & Zhao, 2011). Some of the meta-analytic evidence includes experimental research results (e.g., Amabile, 1985) that allow

for strong causal inferences supporting the intrinsic motivation principle of creativity.

Amabile (1985) experimentally induced intrinsic motivation among creative writers; the intrinsic motivation induction was associated with more creative writing responses compared to a control group.

Amabile's (1985) seminal study also demonstrated a more dramatic detrimental effect of extrinsic motivation on creative performance compared to the incremental effect of intrinsic motivation. The negative effect of extrinsic motivation is a point of theoretical contention (Hennessey & Amabile, 2010).

Extrinsic motivation refers to the drive to do something as a result of external pressures (e.g., expected reward, expected evaluation, surveillance, competition, etc.). Self-determination theory hypothesizes that when people feel as if they are being controlled by extrinsic pressures, intrinsic motivation is undermined (Deci & Ryan, 2002, Ryan & Deci, 2000). This is known as the hydraulic mechanism of intrinsic and extrinsic motivation (i.e., when an environmental stimulus causes extrinsic motivation to increase, intrinsic motivation decreases).

The hydraulic mechanism implies a corollary to the intrinsic motivation principle of creativity, which is that environmental stimuli that increase extrinsic motivation also decrease intrinsic motivation and thus decrease creative performance. Supporting this theoretical deduction, experimental research indicates that a variety of external pressures are associated with decrements in creative performance (e.g., expected reward: Amabile, Hennessey, & Grossman, 1986; expected evaluation: Amabile, 1979; Hennessey, 1989; surveillance: Amabile, Goldfarb, & Brackfield, 1990; competition: Amabile, 1982).

Figure 1 displays the self-determination model for innovative performance including the intrinsic motivation principle of creativity.

Reward for Creativity Hypothesis

The reward for creativity hypothesis states that rewards for creative performance increase creative performance (e.g., Eisenberger & Cameron, 1996). In the context of this hypothesis, rewards refer to benefits received (e.g., money) that are intended to increase the likelihood of a behavior occurring. Behaviorist theories assert that any discriminable class of behavior (including innovative performance) can be strengthened via reinforcement (Maltzman, 1960; Pryor, Haag, & O'Reilly, 1969; Skinner, 1953; Winston & Baker, 1985). Applying behaviorist reinforcement principles to creative performance, Eisenberger and Cameron (1996) brought the reward for creativity hypothesis to salience in a literature review that criticized the previously discussed intrinsic motivation principle of creativity.

In the *American Psychologist* debate over the effect of rewards on intrinsic motivation (e.g., Eisenberger & Cameron, 1996; Hennessey & Amabile, 1998), proponents of the reward for creativity hypothesis reviewed the evidence linking rewards to intrinsic motivation and found variable support for the hypothesis that rewards decrease intrinsic motivation. Extending their argument, Eisenberger and Cameron (1996) drew upon behaviorist principles of reinforcement to hypothesize that rewards can increase creative performance (in disagreement with the intrinsic motivation principle of creativity and the hydraulic mechanism of self-determination theory). According to Eisenberger and Cameron (1996), expected rewards can increase creative performance

under the following conditions: 1) when verbal rewards are given, and 2) when expected rewards are tangible and contingent upon creative performance. This first condition (verbal rewards) is not necessarily contradictory with self-determination theory because in both natural and laboratory settings, verbal rewards are often nonjudgmental and informational and thought to be less of a threat to self-determination (Eisenberger & Cameron, 1996). However, this second condition (expected, tangible, performance-contingent rewards) contradicts the intrinsic motivation principle of creativity.

Some experimental evidence supports the reward for creativity hypothesis (e.g., Eisenberger & Selbst, 1994). To the extent that rewards are classifiable as the extrinsic pressures defined in self-determination theory, correlational evidence also supports the reward for creativity hypothesis (Hammond et al., 2011). However, proponents of the reward for creativity hypothesis have had to explain the contradictory experimental evidence associated with the intrinsic motivation principle (i.e., evidence suggesting that extrinsic rewards decrease creative performance). Eisenberger and Cameron (1996) have suggested that learned industriousness theory (Eisenberger, 1992) provides part of a plausible 'two-factor interpretation' for this seemingly contradictory evidence.

Eisenberger and Cameron (1996) claim that the variable effects of extrinsic rewards on creative performance can be interpreted within a two-part model which includes an attention-eliciting part and a part derived from learned industriousness theory (Eisenberger, 1992). The attention-eliciting part suggests that extrinsic rewards may be detrimental to creative performance when rewards are highly salient (Eisenberger & Selbst, 1994). *Salience* may include the rewards' magnitude or physical proximity (e.g.,

Eisenberger & Selbst, 1994), and *too salient* implies that the rewards' salience is dominating attention and interfering with attention devoted to creative tasks (Balsam & Bondy, 1983; Eisenberger & Selbst, 1994). Although no theoretical specification has been offered for the threshold of reward salience that would negate the positive effects of rewards, Eisenberger and Selbst (1994) have operationalized salience in terms of whether or not the reward was in sight during task performance. When the reward was not in sight, the reward's salience seemed to be reduced sufficiently to allow the reward for creativity effect to operate.

Eisenberger and Cameron (1996) suggest that the reinforcing effect of rewards on innovative performance (when rewards are not too salient) can be predicted by learned industriousness theory. Learned industriousness theory (Eisenberger, 1992) extends previous theories of operant learning (e.g., Hull, 1943) by positing that rewards for high effort cause an organism to become less averse to high effort. Over time, a secondary reward value to the sensation of effort becomes generalized such that reinforced individuals are more likely to give high levels of effort across a variety of behavioral domains (i.e., the organism learns via reinforcement to be industrious). It is generally accepted that compared to more routinized types of performance, innovative performance requires greater levels of cognitive effort (effort: "an unpleasant sensation produced by the intense or repeated performance of any activity", Eisenberger & Cameron, 1996, p. 1161). When applied to the reward for creativity hypothesis, learned industriousness theory suggests that extrinsic rewards can reinforce innovative performance. Previously inconsistent study results can be accounted for by study designs in which participants

were rewarded for low effort or non-innovative task performance. According to Eisenberger and Cameron's (1996) theoretical position, it is not surprising for extrinsic rewards to decrease innovative performance if non-innovative behaviors are being reinforced. In order for rewards to motivate innovative performance, the rewards have to be contingent upon the high efforts associated with innovative performance. Figure 2 displays the reward for creativity hypothesis along with the derivatives of the two-part theoretical model including reward salience and high effort.

Creative Self-efficacy Hypothesis

The creative self-efficacy (CSE) hypothesis states that increases in CSE cause increases in innovative performance. CSE refers to a person's belief that s/he possesses the ability to produce creative outcomes (Tierney & Farmer, 2002). The creative self-efficacy (CSE) hypothesis was first tested by researchers who extended the theoretical construct of specific self-efficacy to the domain of creative/innovative performance (e.g., Tierney & Farmer, 2002).

Using correlational evidence, researchers have reported support for the CSE hypothesis (Carmeli & Schaubroeck, 2007; Choi, 2004; Gong, Huang, & Farh, 2009; Jaussi, Randel, & Dionne, 2007; Strickland & Towler, 2011; Tierney & Farmer, 2002, 2004, 2011). In two of the nine studies, longitudinal designs allow for the plausible inference of temporal stability of the relationship between CSE and innovative performance (e.g., Gong et al., 2009; Tierney & Farmer, 2011). Tierney and Farmer's (2011) study design also allows for the plausible inference of a temporal sequence in which CSE precedes innovative performance. However, no published studies have

allowed for a strong inference regarding the causal effect of CSE on innovative performance. To date, the plausibility of the causal portion of the CSE hypothesis requires one to refer to evidence from the more general social cognitive theory (also referred to as self-efficacy theory; Bandura, 1997) from which the CSE hypothesis is deduced.

The CSE hypothesis follows logically from previous theoretical work on the self-efficacy construct, which according to Bandura (2004) is the central motivational mediator between motivational antecedents and a person's actual behavior: "Unless people believe they can produce desired effects by their actions they have little incentive to act or to persevere in the face of difficulties" (p. 622). Bandura (1997) incorporated the motivational construct of self-efficacy into his general social cognitive theory as a way to explain the generalized effects of a number of different psychotherapeutic techniques on behavioral change interventions. While social cognitive theory was originally developed in a clinical context, the theory has been extended beyond clinical therapeutic applications (Bandura, 2004). The conceptualization of the CSE construct represents one such extension (e.g., Tierney & Farmer, 2002, 2004, 2011; Shalley, Zhou & Oldham, 2004). Thus, the CSE hypothesis can be thought of as a specific application of social cognitive theory to the motivations and behaviors representing innovative performance. This point is important for two reasons: 1) social cognitive theory is supported by evidence causally linking specific forms of self-efficacy to specific behaviors (which is why the causal CSE hypothesis can logically be deduced), and 2) social cognitive theory defines causal antecedents to the development and maintenance of

self-efficacy—the four antecedents of self-efficacy are a) mastery experiences, b) social modeling, c) social persuasion and d) physical and emotional states (Bandura, 1997).

Figure 3 displays the CSE hypothesis along with the broader social cognitive theory.

Given the purpose of this investigation, a full discussion of all four theoretical antecedents to creative self-efficacy must be foregone. In this study, all four antecedents were assessed and statistically controlled for. However, the substantive interest of this study is in the antecedent known as social persuasion for innovative performance because this theoretical antecedent suggests a hypothesis that is directly incompatible with the previously discussed hypotheses.

Social persuasion is enacted by external social agents who utilize persuasion and planning to convince a person that s/he possesses the abilities required for success (Bandura, 2004). Organizational researchers have typically operationalized social persuasion as supervisors' expectations (e.g., Eden, 1992; 2003). For example in the context of the CSE hypothesis, when an employee perceives higher creativity expectations from their supervisor, then the individual may reasonably infer that their supervisor has faith in their competence; as a result, the individual is persuaded to have a stronger sense of CSE. Correlational evidence has generally supported this conceptualization of supervisors' expectations to be creative as an antecedent of CSE (e.g., Choi, 2004; Tierney & Farmer, 2004, 2011). The theoretical influence of supervisors' creative expectations on innovative performance as mediated through CSE is interesting because this hypothetical prediction diverges from the predictions of the previously discussed hypotheses. Namely, supervisors' expectations would be classified

as an extrinsic pressure in the self-determination framework and would be independent of the reward-contingency information that is necessary in the learned industriousness framework.

The CSE hypothesis seems to have originated independently of the debate that occurred between proponents of the intrinsic motivation principle and the reward for creativity hypothesis. Now there exist three prominent hypotheses that describe how to motivate innovative performance, and these three hypotheses lead to different understandings of whether or not expectations to be innovative and rewards are likely to be effective motivational techniques.

Do Expectations and/or Rewards Act as Behavioral Reinforcement, Votes of Confidence or Extrinsic Controls?

A practical theoretical question is whether or not to use rewards, expectations or both to motivate innovative performance among individuals in an organization and to attempt some understanding of why. All three models predict different answers. I have designed an experimental study to test these predictions.

The reward for creativity model (Model_{RC}). Learned industriousness theory predicts that individuals expecting tangible rewards¹ that are *contingent* upon innovative performance display increases in innovative performance (H1_{RC}). The reward for creativity hypothesis could be falsified if *contingent* rewards decrease innovative performance as is predicted by intrinsic motivation model.

¹ Hereafter I will use the term 'rewards' referring to expected tangible rewards of low salience (i.e., out of sight during task performance).

A corollary to the reward for creativity hypothesis is that expected tangible *non-contingent rewards* are insufficient to motivate innovative performance (H2_{RC}). Thus, the reward for creativity hypothesis could also be falsified if *non-contingent* rewards increase innovative performance. None of the extant hypotheses predict that *non-contingent* rewards increase innovative performance; however, the creative self-efficacy model predicts that *expectations to be innovative* increase innovative performance independently of *reward information*. The reward for creativity model is not specific as to the potential main effect or interactive effects of *expectations to be innovative*. By adopting the most parsimonious assumptions, the reward for creativity model suggests that *expectations to be innovative* are unnecessary to motivate innovative performance (Proposition 1_{RC}); what matters is *contingent* reward information. Thus Proposition 1_{RC} suggests that H1_{RC} generalizes to individuals regardless of *expectations to be innovative*.

Finally, the reward for creativity model suggests that the positive effect of *contingent* rewards on innovative performance is mediated by effort levels (Proposition 2_{RC}). The effort construct is never measured in empirical studies which may be related to the behaviorist heritage underpinning this model (i.e., Skinner, 1953). Nevertheless, its mediational effect may be proposed.

The creative self-efficacy model (Model_{CSE}). Social cognitive theory predicts that *expectations to be innovative* increase innovative performance (H1_{CSE}) by acting as a form of social persuasion (e.g., Tierney & Farmer, 2011). This social persuasion effect occurs independently of *reward contingencies* (Tierney & Farmer, 2011). For this reason, the CSE hypothesis would be falsified if *expectations to be innovative* were to fail

to motivate innovative performance in the absence of *contingent rewards*. The CSE hypothesis would also be falsified if *expectations to be innovative* were to decrease innovative performance as is predicted by the self-determination model.

According to the creative self-efficacy model, the *expectation to be innovative* effect is mediated through the motivational construct of creative self-efficacy (H2_{CSE}). Theoretically, setting the *expectation to be innovative* conveys a belief in the individual's innovative abilities. The individual can reasonably feel more confident in their own abilities--that is their creative self-efficacy increases, which then motivates higher levels of innovative performance.

The intrinsic motivation model (Model_{IMP}). The intrinsic motivation principle of creativity predicts that rewards, both *contingent* and *non-contingent*, and *expectations to be innovative* decrease innovative performance (H1_{IMP}) by acting as external task stimuli and undermining intrinsic motivation. The intrinsic motivation principle of creativity could be falsified if rewards (either *contingent* or *non-contingent*) and/or expectations increase innovative performance as is predicted by the other two competing explanations.

According to self-determination theory, the negative effect of external task stimuli on innovative performance is transmitted through the hydraulic mechanism. External task stimuli increase extrinsic motivation which decreases intrinsic motivation which decreases innovative performance (H2_{IMP}).

The most fair comparison. One can note that large portions of all three hypothesized models are either unique from one another (e.g., the mediating effects of

creative self-efficacy versus intrinsic and extrinsic motivation) or underdeveloped (e.g., the effort construct). For these reasons, the appropriateness of framing the models as competing could be challenged. However, H1s from the three models are comparable and provide a fair basis for contrasting the predicted effects of expectations and rewards on innovative performance (for details on establishing model comparability, see Leavitt et al., 2010).

H1&2_{RC}: Contingent rewards increase innovative performance while non-contingent rewards either decrease innovative performance or have no effect.

H1_{CSE}: Expectations to be innovative, operating independently of expected reward contingencies, increase innovative performance.

H1_{IMP}: Expectations to be innovative, contingent reward and/or non-contingent rewards decrease innovative performance.

Method

Study Overview

After arriving at the lab, participants responded to a brief questionnaire and performed a set of work tasks with no specific expectations and no rewards in the preliminary session (T_0). Experimental manipulations were delivered by the experimenter, and then the participants responded to a new copy of the same brief questionnaire and performed a similar set of work tasks in the main session (T_1). The experimental manipulations were first an expectation ('E' has 2 levels: 0 = no specific expectation; X = expectation to be innovative) and then some reward information ('R' has 3 levels: 0 = no rewards mentioned; N = non-contingent rewards; or C = contingent rewards). This resulted in 6 (2 x 3 factorial design) randomly assigned experimental groups. The products from the work tasks were judged on innovativeness by two, independent, condition-blind, trained research assistants. The primary interests in this study were to examine how participants' innovative performance changed from the preliminary session to the main session as a result of the experimental manipulations (see Figure 4). Participants also provided reports of their psychological states in the brief questionnaires at T_0 and T_1 and on a final questionnaire (T_2) following the experiment (for a depiction of the sequence of methodological events, see Figure 5)

Participants

209 participants self-selected into the study from a population of diverse undergraduate students enrolled in a large mid-Atlantic university in the USA. Participants were able to earn partial course credits for participating in the study. The sample was 69% female. Freshman was the most represented class-level (Freshman = 48.5%, Sophomore = 24.8%, Junior = 14.6%, Senior = 10.7%, Graduate = 1.5%). There was no participant attrition.

Procedure

Preliminary session (T₀). After participants arrived and completed the informed consent, the experimenter informed the participants that he had to be absent for some time (because the experimenter ostensibly forgot to make some copies). The experimenter explained that the participant should respond to the brief questionnaire and that the participant was welcome to “play around” with the work tasks while waiting for the experimenter to return with the “real task”. These experimenter behaviors were intended to establish baseline levels of motivation and innovative performance without any motivational interventions. The session was 35 minutes long.

Main session (T₁). Thirty-five minutes after initiating the preliminary session, the experimenter returned, collected the preliminary session materials (providing no performance feedback) and indicated that the participant could attempt the “real task”. The experimenter then delivered the expectation and reward manipulations and provided the fresh questionnaire and work tasks. No time pressure was induced, but the experimenter terminated the session after 35 minutes, collecting whatever work tasks

were complete at that time.

Experimental manipulations. The *expectation* conditions ($'E' = X$; groups a, b and c in figure 4) included the experimenter stating the following, “Now, we can start on the real part of the study. This means that I will give you some problems and expect you to come with up with solutions that are both **new** and **useful**. In fact, the reason I wanted to conduct this study at [insert name of University] is because the students here are known to be very innovative, and I think you will provide very innovative solutions to these problems.” The *non-expectation* conditions ($'E' = 0$; groups d, e and f in figure 4) included the experimenter, without indicating any specific expectation to be innovative, suggesting that the participant could “play around” with the work packet.

The *no rewards* conditions did not receive any reward opportunities during the main session ($'R' = 0$; groups c and f in figure 4). The *contingent reward* condition ($'R' = C$; groups b and e in figure 4) included the experimenter stating:

In this part of the study, there is a nice reward for people who provide the most innovative solutions. The way this works is that after the study is complete, independent judges will assess the novelty, usefulness and feasibility of everyone’s solutions, in other words the innovativeness of everyone’s solutions. The people achieving in the top 20% of innovativeness will be rewarded with a \$10 Amazon gift card. So in this part of the study, I am rewarding people specifically for their innovative efforts.

The *non-contingent* reward condition ($'R' = N$; groups a and d in figure 4) included the

experimenter stating:

In this part of the study, there is a nice reward for people who complete the tasks. The way this works is that after the study is complete, independent judges will assess the degree to which tasks were completed. Of those people who complete the tasks, 20% of them will be randomly chosen to win a \$10 Amazon gift card. So in this part of the study, I am rewarding people specifically for their efforts in completing the task.

Work tasks. The work tasks included a set of three tasks which were sampled from the research programs most closely associated with each of the three hypotheses under investigation. The reason for this was to defend against potential criticism that the methods biased the study results. Each task has two versions meant to be similar enough to allow for comparisons between the preliminary and main sessions, but different enough to guard against learning effects. Task details can be found in Appendix A; versions ‘A’ are associated with the preliminary set of tasks.

Task 1 (‘Titles’) instructed participants to read a short story (stories from Seyba, 1984) and then to generate five creative titles to the story (this task has been used frequently among proponents of the reward for creativity hypothesis: e.g., Eisenberger & Aselage, 2009, Eisenberger & Rhoades, 2001). This task represents more of the creative and appropriateness requirements of innovative performance and less of implementation requirements.

Task 2 (‘Campus problem’) instructed participants to suggest a solution to a

common problem faced by students of the local university; within the proposed solution, the participant was to explain the utility of the solution as well as how the solution could be implemented. This task represents the research paradigm associated with the CSE hypothesis. CSE researchers typically conduct field studies which report innovative performance in the context of real problems that individuals encounter at work (e.g., Tierney & Farmer, 2011).

Task 3 ('Logo') instructed participants to use recycled goods to design a logo for a company and to suggest how the logo could be implemented to reach as large an audience as possible. This task is essentially a collage-making task, which has been used frequently among proponents of the intrinsic motivation principle of creativity (e.g., Amabile et al., 1986). I have added the instruction about suggesting implementation strategies.

Measures: T₀ and T₁ Innovative Performance

A consensual agreement technique was used to quantify innovative performance on the three tasks. Two trained raters, blind to experimental condition, independently assigned scores for each innovative product on two or three dimensions (all products were rated on novelty; additionally, 'Titles' were rated on appropriateness, 'Campus problems' were rated on effectiveness and feasibility, and 'Logos' were rated on appropriateness and feasibility of implementation strategy). The average inter-rater reliability (i.e., ICC(2,k)) across all products and dimensions was acceptable and no reliability coefficients were significantly less than .60 ($p < .05$). Further information about the rating process and reliability estimates is presented in Appendix B. Ultimately,

raters' scores were summed across products and dimensions so that each participant's innovative performance is represented by a single score for T_0 and for T_1 .

Measures: T_0 and T_1 Motivational States and Perceptions

Directly before working on the work tasks, participants responded to the T_0 and T_1 questionnaires by responding to statements using a 7-point Likert-type scale ("1 = strongly disagree; 2 = disagree; 3 = somewhat disagree; 4 = neutral; 5 = somewhat agree; 6 = agree; 7 = strongly agree").

Creative self-efficacy. Three of four items were used from the Creative Self-Efficacy Instrument (Tierney & Farmer, 2002). "I have confidence in my ability to solve problems creatively", "I feel that I am good at generating novel ideas", "I have [confidence in my ability to develop] the ideas of others" (: $T_0 = .78$, $T_1 = .83$).

Intrinsic motivation. Intrinsic motivation was assessed by a 3-item scale adapted from Eisenberger and Aselage (2009): "I am personally interested in the upcoming tasks", "Completing these tasks is going to be fun", "The upcoming tasks are going to be interesting" (: $T_0 = .89$, $T_1 = .92$).

Extrinsic motivation. Extrinsic motivation was measured by a 3-item scale adapted from Frese, Teng, and Wijnen (1999): "I would try to be innovative on the tasks if there was a nice reward", "The reason I would complete these tasks is to get some reward", "Getting some reward is the most important reason for me to try to be innovative on the tasks" (: $T_0 = .79$, $T_1 = .81$)

High effort. I wrote three reflective items intended to assess the 'high effort' construct derived from learned industriousness theory: "I feel that the circumstances are

right for me to give a high level of effort”, “I will exert a lot of effort on the task because it seems appropriate right now”, “Giving a high level of effort will lead to a reward” (: $T_0 = .61$, $T_1 = .73$).

Perceived innovative expectations. This measure served as a manipulation check for *expectations*. Three items were adapted from Farmer, Tierney and Kung-McIntyre (2003): “The experimenter expects me to be innovative at this task”, “Innovativeness is probably important to the experimenter”, “The experimenter probably thinks that I am an innovative student” (: $T_0 = .75$, $T_1 = .81$).

Perceived reward contingencies. Single-item measures adapted from George and Zhou (2002) were used to assess perceptions of each reward condition, for perceptions of contingent rewards: “My innovativeness on the tasks (that is, the extent to which I come up with new and useful ideas) has a major impact on any rewards I may receive”; for perceptions of non-contingent rewards: “Simply completing the tasks has a major impact on any rewards I may receive.”

Measures: T₂ Post-experiment Assessments

Following the last work task, participants responded to the T₂ questionnaire using a 7-point Likert-type scale (“1 = strongly disagree; 2 = disagree; 3 = somewhat disagree; 4 = neutral; 5 = somewhat agree; 6 = agree; 7 = strongly agree”).

Prior mastery experiences. The first author wrote 3 items: “I have prior experience practicing at least one of the tasks that I worked on in this experiment”, “The tasks in this study are a lot like something that I have experience in performing” and “I have already gained mastery in the tasks found in this study” (= .81).

Innovative role models. Three items from Jaussi and Dionne (2003) were used: “I have role models in my life who try out new ideas and approaches to problems”, “I have role models in my life who demonstrate originality in their work” and “I have role models in my life who serve as good models for creativity” ($\alpha = .88$).

State positive and negative affect. The short version of the PANAS (Watson, Clark & Tellegen, 1988) was used. Participants were instructed to indicate how they felt during the study on five positive affect items (i.e., alert, determined, excited, enthusiastic and inspired) ($\alpha = .86$) and five negative affect items (i.e., afraid, scared, nervous, upset and distressed) ($\alpha = .87$).

Cultural values for innovation. Three items were used to assess the extent to which participants viewed innovation as a cultural value (e.g., “In my culture, people generally look for new and fresh ways to deal with problems”; O’Reilly, Chatman, & Caldwell, 1991) ($\alpha = .79$).

Results

Descriptive statistics and inter-correlations among study variables are displayed in Table 1. Also informative are the summaries of study variables displayed within their experimental conditions in Table 2. The dependent variable, innovative performance, increased by approximately 0.7 standard deviations from the preliminary session to the main session ($M = 36.1$, $SD_{pooled} = 55.3$). Preliminary scores also correlated positively with main session scores ($r = .38$, $p < .01$). The ‘Time’ and ‘Participant’ factors appear to be significant sources of variance in innovative performance. To account for the potentially biasing effects of these factors on the standard error estimates (Singer & Willett, 2003), hypotheses were tested using restricted maximum likelihood (REML) with random intercepts and a diagonal matrix for the Time error structure. Table 3 displays the various empirical models used for formal hypothesis testing.

Model A is a null model ($k = 5$, $-2LL = 4113.3$, $pseudo-R^2 = .74$) to which fixed effects were added--innovative performance is the dependent variable. Model A’s fixed effect estimate for Time (37.2) reflects the increase of innovative performance that was noted in the previous paragraph (the slight difference in estimates is due to pairwise deletion in the correlation matrix and list wise deletion in Model A). This demonstrates that the fixed effect estimates are interpretable as unstandardized regression coefficients (b); the standard error estimates are likely to be less biased than their OLS counterparts

however (Singer & Willett, 2003). While the parameter estimates and their significance tests are useful for understanding the directions and reliabilities of the empirical effects, hypotheses ultimately were tested by comparing changes in model fit (i.e., $-2LL$) associated with the exclusion of hypothesized effects from the *all effects model* (Model B: $k = 13$, $-2LL = 4049.0$, $pseudo-R^2 = .77$). The final conclusions ultimately were based on four formal statistical tests, so the critical p -value for testing changes in model fit (i.e., $-2LL$) has been set at .0125 (i.e., $.05/4 = .0125$).

Model B: All Effects Model

$$\begin{aligned} \text{Innovative performance}_{\text{Model B}} = & 205.6 + 75.4(\text{Time}) - 9.5(\text{E}) - 18.5(\text{Time}*\text{E}) - \\ & 27.2(\text{R_pure}) + 18.4(\text{Time}*\text{R_pure}) + 3.5(\text{Effort}) - 6.9(\text{Time}*\text{Effort}) + \\ & 9.2(\text{Expect}) - 0.9(\text{Creative self-efficacy}) + \text{error} \end{aligned}$$

The *all effects* Model B includes the best empirical conceptualizations of each model's parameters (the advantage of this approach is that Model B can serve for hypothesis testing because all of the more specific models that were introduced are nested within Model B). The parameters were determined based on the following conclusions which can be readily verified by examining Table 2.

First, the experimental factor Time*E (expectations to be innovative) induced a negative effect on innovative performance compared to a control group (from Model B: $b_{\text{Time}*E} = -18.5$, $se = 10.1$, $p = .07$). This result leads us to anticipate falsification of the creative self-efficacy hypothesis ($H1_{\text{CSE}}$) which predicts that the 'E' factor positively influences innovative performance.

Second, the only experimental condition that appeared to induce positive effects on innovative performance after controlling for Time and the effects of Time*E was the contingent reward condition that was not paired with expectations to be innovative. I have conceptualized this effect as a “pure” contingent reward signal (coined: “pure” or “pure signal” because it is not contaminated with explicit information about social expectations) and operationalized it by creating a dummy coded variable (‘R_pure’) that compares the pure contingent reward condition to all other conditions (in Table 2, the R_pure condition is found under ‘0C’). The positive effect of the pure contingent reward signal ($b_{\text{Time}*\text{R_Pure}} = 18.4, se = 13.0, p = .16$) may be considered supportive of the reward for creativity hypothesis (H1_{RC}) only by rejecting Proposition 1_{RC} which states that the benefits of contingent rewards generalize across the E experimental factor. The positive effect of contingent rewards did not generalize across the E experimental factor (losing their effect when E = X).

Third, the intrinsic and extrinsic motivational effects were omitted from the *all effects* Model B. This omission may seem surprising given that these effects are associated with the only model that accurately predicted the negative effects of the Time*E factor (i.e., Model_{IMP}). However, the intrinsic and extrinsic motivational assessments did not operate as specified by the intrinsic motivation model. Namely, the Time*E factor was not associated with decreases in intrinsic motivation; this is inconsistent with the Model_{IMP}’s hydraulic mechanism (i.e., falsifying H2_{IMP}). Results related to the hydraulic mechanism are reported in a later section. At this point, it is certain that if H1_{IMP} is going to survive this empirical competition, then it must exclude

the hydraulic intrinsic and extrinsic motivational explanation.

Fourth, the variables effort ($b_{Effort} = 3.5, se = 4.7, p = .45$; $b_{Time*Effort} = -6.9, se = 4.8, p = .15$), perceived expectations to be innovative ($b_{Expect} = 9.2, se = 4.0, p = .02$) and creative self-efficacy ($b_{CSE} = -0.9, se = 3.5, p = .79$) were necessary to include in the *all effects* Model B so that the effects of their exclusions on model fit could be assessed and hypotheses formally tested. Finally, I examined all of the models with the control variables assessed in the T₂ questionnaire (i.e., retrospectively-reported positive and negative affective states, innovative role models, prior mastery experiences and cultural values for innovation). These variables are known to be related to many of the study variables (e.g., Baas, De Dreu & Nijstad, 2008). However, the inclusion of these variables did not significantly alter the relationships of interest in this study, and the retrospective nature of these variables only allows for speculative conclusions about the nature of their effects. For example, state NA had a significant negative correlation with innovative performance, but there is no way to decide whether state NA negatively influenced innovative performance or whether individuals' poor performance led to more negative moods. For these reasons and to preserve degrees of freedom for formal hypothesis testing, the reported models omit these control variables.

Testing the Most Fair Comparison

Falsify H1_{CSE}. First, the results falsified H1_{CSE} which states that expectations to be innovative, operating independently of expected reward contingencies, increase innovative performance. Model B's estimates indicate that experimentally induced expectations decreased innovative performance ($b_{E*Time} = -18.5, se = 10.1, p = .07$).

Furthermore, excluding creative self-efficacy from Model B resulted in no significant loss of explanatory power (i.e., Model C: $k = 12$, $-2LL = 4053.4$, $pseudo-R^2 = .77$; compared to Model B, $-2LL = 5.7$, $df = 2$, $p > .01$).

H2_{CSE} describes how the effect of expectations to be innovative on innovative performance is mediated through the motivational construct of creative self-efficacy. The falsification of H1_{CSE} undermines the viability of H2_{CSE}. The results indicated that the experimental induction of expectations to be innovative was effective in causing perceptions of expectations to be innovative ($d = 1.0$). Furthermore, perceptions of expectations significantly related to creative self-efficacy as predicted by H2_{CSE} ($p < .01$). Perceptions of expectations also significantly related to innovative performance, primarily in the first time point before experimental manipulations had been delivered (from Model B, $b_{Expect} = 9.2$, $se = 4.0$, $p = .02$). However, creative self-efficacy did not seem to mediate the effect expectations had on innovative performance. Creative self-efficacy had a non-significant effect on innovative performance with (Model B: $b_{CSE} = -0.9$, $se = 3.5$, $p = .79$) and without (Model D: $b_{CSE} = -0.2$, $se = 3.5$, $p = .95$) the expectations parameter.

Perceived expectations to be innovative (i.e., Expect) were retained in the empirical model due to its significant explanatory power (e.g., Model E: $k = 11$, $-2LL = 4063.2$, $pseudo-R^2 = .77$; compared to Model C, $-2LL = 9.8$, $df = 1$, $p < .01$), but its inclusion does not validate the creative self-efficacy model. Creative self-efficacy did not predict innovative performance even though perceived expectations and the Time*E factor did. The Time*E factor affected innovative performance in a way opposite that

predicted by the creative self-efficacy model.

Limit the generalizability of H1&2_{RC}. Results allowed for a strong causal inference in support of revised versions of H1&2_{RC} which state that contingent rewards increase innovative performance while non-contingent rewards either decrease innovative performance or have no effect. Support for these hypotheses is limited to conditions in which no expectations were mentioned, thus rejecting Proposition 1_{RC}. I have introduced the concept of a pure reward contingency condition ('R_pure') in order to model the revised hypotheses (H1&2_{RC-Pure}). Model F demonstrates the significant loss of explanatory power associated with ignoring the revised reward for creativity model (Model F: $k = 8$, $-2LL = 4083.7$, $pseudo-R^2 = .76$; compared to Model C, $-2LL = 23.3$, $df = 4$, $p < .01$).

Proposition 2_{RC} describes how effort mediates between the perception of reward contingencies and innovative performance. Results indicated that this mechanism did not operate as specified. By examining Table 2, one can see that the experimental reward manipulations did significantly influence perceptions of reward contingencies (for experimental factor 'C', average in perceived contingent rewards = 1.7; for experimental factor 'N', average in perceived non-contingent rewards = 0.9). However, each reward manipulation (i.e., contingent and non-contingent rewards) also caused a weaker contaminated effect on participants' perceptions (for experimental factor 'C', average in perceived non-contingent rewards = 0.6; for experimental factor 'N', average in perceived contingent rewards = 0.8). The experimental factor 'N' especially contaminated perceptions of contingent rewards when the 'N' factor was paired with the

expectations factor ('XN': in perceived contingent rewards = 1.5). Interestingly, these results along with the strong positive correlations between the two perceptions of reward contingencies indicated that participants entertained the possibility that both reward contingencies might be true despite the experimenter's efforts to fix strictly independent factors.

Although contaminated, perceptions of contingent rewards were significantly influenced by the experimental factors ($p < .01$). The motivational variable Effort was not affected similarly. Effort increased the most ($d = 0.4$) in the two conditions that paired expectations ($E = X$) with some reward contingency ($R = N$ or C). However, I have already established that the Time*E experimental factor decreased innovative performance. Results indicated the need to reject Proposition 2_{RC} which states that effort mediates the positive effect of contingent rewards on innovative performance. A post-hoc and atheoretical observation is that the only motivational variable that operated in clear accord with the R_{pure} experimental factor was extrinsic motivation (in R_{pure} condition, extrinsic motivation = 0.7). Extrinsic motivation did not consistently predict innovative performance, however, so I do not necessarily propose substituting the extrinsic motivational construct for the effort construct.

The effort variable must be retained in the final model because excluding Effort and Time*Effort results in a significant loss of explanatory power (Model G: $k = 10$, $-2LL = 4065.0$, $pseudo-R^2 = .77$; compared to Model C, $-2LL = 11.6$, $df = 2$, $p < .01$). The effort variable positively predicted innovative performance in the preliminary session (from Model C, $b_{Effort} = 3.3$, $se = 4.6$, $p = .47$) although this preliminary effect appeared

to be somewhat redundant with the perceived expectations effect that was discussed in the previous section. Model E shows how effort has a stronger positive effect when expectations are excluded from the model (Model E: $b_{\text{Effort}} = 7.8$, $se = 4.2$, $p = .07$; $b_{\text{Effort-E}} - b_{\text{Effort-C}} = 4.5$). The positive effect of effort was reversed in the main session (Model C: $b_{\text{Time*Effort}} = -7.0$, $se = 4.8$, $p = .14$) and did not appear to operate as a mediator of the Time*R_pure experimental effect ($b_{\text{Time*R_pure-G}} - b_{\text{Time*R_pure-C}} = -0.1$).

Falsify H1_{IMP} and limit the hydraulic mechanism. H1_{IMP} states that rewards, both *contingent* and *non-contingent*, and *expectations to be innovative* decrease innovative performance (H1_{IMP}) by acting as external task stimuli and undermining intrinsic motivation. The results falsified this hypothesis due to the previously reported support for the pure reward contingency factor (Time*R_pure).

The results also falsified the notion that expectations to be innovative operate to undermine intrinsic motivation (H2_{IMP}). The intrinsic motivation model (H2_{IMP}) did not accurately explain the negative effects of the Time*E factor in this study. Results indicated that the Time*E factor did not undermine intrinsic motivation (see Table 2), and in fact, perceived expectations to be innovative were significant positive predictors of intrinsic motivation ($p < .01$).

It is clear that the hydraulic mechanism did not operate consistently across all of the experimental factors. However, strong causal support for the hydraulic mechanism was found in one condition, the no expectations and non-contingent reward condition ('0N'), when we examined that condition's correlation matrix. For that condition, perceptions of non-contingent rewards (i.e., the manipulation check for that condition)

appeared to cause increased extrinsic motivation and decreased intrinsic motivation— exactly as described by the hydraulic mechanism (for condition ‘0N’, the correlations between perceptions of non-contingent rewards and extrinsic motivation increased: $r_{T0} = .18$; $r_{TI} = .47$; the correlations between perceptions of non-contingent rewards and intrinsic motivation decreased: $r_{T0} = .17$; $r_{TI} = -.40$). However, none of these effects transferred over to significantly influence innovative performance. Nor did this mechanism clearly generalize to the other extrinsic task stimuli (i.e., all of the experimental factors except for no expectations and null rewards ‘00’).

The hydraulic mechanism cannot be rejected fully, but the results indicated that expectations to be innovative do not fit the conventional classification for extrinsic stimuli. While expectations did increase extrinsic motivation, they also increased intrinsic motivation. Further, the applicability of the hydraulic mechanism can be limited when talking about motivating innovative performance with pure contingent reward promises. Although I cannot confidently reject the principle that intrinsic motivation increases innovative performance, I can confidently reject its corollary that contingent rewards decrease innovative performance by undermining intrinsic motivation.

Results summary. Model C is currently the working model because it turned out to be the empirical model that best balanced explanatory power, parsimony and facts.

$$\begin{aligned} \text{Innovative performance}_{\text{Model C}} = & 202.1 + 75.7(\text{Time}) - 9.6(\text{E}) - 18.3(\text{Time}*\text{E}) - \\ & 27.3(\text{R_pure}) + 18.7(\text{Time}*\text{R_pure}) + 3.3(\text{Effort}) - 7.0(\text{Time}*\text{Effort}) + \\ & 9.1(\text{Expect}) + \text{error} \end{aligned}$$

Model C did not perfectly fit any of the hypothesized models. Specifically, $H1_{CSE}$ and $H2_{CSE}$ were falsified because experimentally induced expectations to be innovative caused decreases in innovative performance, and creative self-efficacy appeared to play no significant causal role. $H1\&2_{RC}$ received some support because pure contingent rewards did cause increases in innovative performance compared to null and non-contingent rewards, but the hypotheses had to be revised to be limited to conditions when no explicit expectations to be innovative were involved (i.e., Proposition 1_{RC} was falsified). The proposed effort mechanism (i.e., Proposition 2_{RC}) was also falsified although the empirical form of the effort mechanism was retained in Model C due to its significant explanatory power. $H1_{IMP}$ and $H2_{IMP}$ were falsified because all extrinsic stimuli did not cause decreases in innovative performance. Although I recognize the validity of parts of the intrinsic motivation model (viz., the hydraulic mechanism), the results falsified the general applicability of this model to explaining how rewards and expectations motivate innovative performance.

Discussion

The organizational research literature contains incompatible advice regarding whether or not the use of expectations and/or rewards are effective at motivating innovative performance. The incompatibilities can be traced, in part, to three prominent but incompatible hypotheses: the intrinsic motivational principle of creativity (Amabile, 1990), the reward for creativity hypothesis (Eisenberger & Cameron, 1996) and the creative self-efficacy hypothesis (Tierney & Farmer, 2002). All three of the models would need revision if they are to be reconciled with the results of this study. This study proved that expected tangible rewards that are contingent upon innovative performance (compared with no rewards, non-contingent rewards and expectations to be innovative) can cause increases in innovative performance. However, these effects were not observed if the reward information was delivered along with expectations to be innovative. In fact, increases in expectations to be innovative caused decreases in innovative performance regardless of reward information.

First, these results are considered within each theoretical context that was investigated. Then, I provide a novel interpretation at the end.

Specify Temporal Dynamics in the Creative Self-efficacy Model

The creative self-efficacy model, derived from social cognitive theory, has been used to describe the ‘vote of confidence’ type of effect that supervisor expectations can

exert on employees' innovative performance (e.g., Tierney & Farmer, 2011). The present study falsified the causal mechanism specified in the creative self-efficacy model. That model states that setting expectations to be innovative increases individuals' creative self-efficacy. The present study was able to replicate this effect experimentally. However, that model also states that the increases in creative self-efficacy transfer to increases in innovative performance, and this motivational process is ultimately how expectation setting leads to innovative performance. The present study found no evidence that increases in creative self-efficacy transferred to increases in innovative performance.

This study has not directly falsified the possibility that creative self-efficacy could exhibit a positive influence on innovative performance. For example, other antecedents of efficacy may be more powerful (e.g., mastery experiences: Bandura, 2004), or perhaps efficacy's influence becomes more detectable in cases when physical obstacles (e.g., weakness or pain) or phobic disorders are impeding behavior. Bandura and Locke (2003) have presented compelling evidence supporting the general applicability of social cognitive theory, and I agree in that the creative self-efficacy hypothesis should not be wholly dismissed. Future tenability of the creative self-efficacy hypothesis would require at least the following two revisions.

First, the theoretical temporal mechanism in the creative self-efficacy model needs to be more precisely specified (e.g., no one has suggested that it should take 10 minutes or 10 weeks for the phenomenon to occur). Revised models must account for the fact that if creative self-efficacy causes innovative performance, the operation probably takes longer than about 35 minutes. Second, even if creative self-efficacy can cause

innovative performance, using social persuasion (viz., setting expectations to be innovative) to induce that effect may be ill-advised. This study showed that innovative performance can very easily be decreased by setting expectations to be innovative. Revisions of the CSE model would need to explain why the negative effect of social persuasion was detectable in this study while the positive effect of creative self-efficacy was not.

Revise Stimulus Classification System in the Intrinsic Motivation Model

The intrinsic motivation principle of creativity, derived from self-determination theory, has been used to explain the positive effects on creative performance of allowing people to pursue goals that are intrinsically motivating (e.g., Amabile, 1985). This principle has been supported by experimental evidence. However, the theoretical explanation underlying this principle (i.e., the hydraulic mechanism) has given rise to a counter-intuitive corollary hypothesis predicting that the use of extrinsic rewards (like the kind commonly used in management systems) undermines intrinsic motivation and decreases creative performance. This study is the first to allow for confident falsification of this corollary hypothesis. A very specific type of extrinsic motivator (i.e., pure expected tangible reward that is contingent upon innovative performance) can be used to increase innovative performance, and this effect is not dependent upon intrinsic motivation.

A review of socio-motivational theories of creativity (Hennessey & Amabile, 2010) has speculated about the possible need for revision of the hydraulic mechanism. The current study validates this speculation with experimental evidence. I was able to

replicate the operation of the hydraulic mechanism in one of the conditions in this study (no expectations and non-contingent rewards), and I was excited to do so because independent validation of such specific theoretical mechanisms indicates a maturing scientific field. However, the hydraulic mechanism did not ultimately result in undermining innovative performance, and its operation was undetected in other notable conditions. Rather than rejecting the hydraulic mechanism, model revisions should expand the classification system for defining the kinds of stimuli that are likely to trigger the hydraulic mechanism. Future revisions would need to consider the following.

Expectations to be innovative operate positively on both extrinsic motivation and intrinsic motivation. Combining expectations and various reward contingencies (i.e., stacking extrinsic stimuli) has an additive effect on effort but not on extrinsic motivation, and combining these stimuli does not necessarily undermine intrinsic motivation. In the absence of expectations to be innovative, contingent rewards influence extrinsic motivation, but these specific types of extrinsic motivators do not undermine intrinsic motivation and in fact cause increases in innovative performance.

Include Pure Signal Hypothesis in Reward for Creativity Model

The reward for creativity model was originally presented in opposition to the counter-intuitive corollary of the intrinsic motivation principle discussed previously (Eisenberger & Cameron, 1996). This study's results indicate strong evidence for the hypothesis that innovative performance-contingent rewards do not necessarily undermine intrinsic motivation and can in fact increase innovative performance. However, the extant reward for creativity model does not adequately explain the negative effects of

expectations to be innovative and why contingent rewards do not remain effective when paired with expectations.

Eisenberger and colleagues have continued to research the reward for creativity hypothesis by attempting to reconcile their hypothesis with the findings supporting the intrinsic motivation principle. For example, Eisenberger and Aselage (2009) hypothesized that some individual characteristics or circumstances may cause reward information to be interpreted as an intrinsic motivator (rather than extrinsic motivator), which would allow for the viability of both the reward for creativity hypothesis and the intrinsic motivation principle. The current results do not support this integration. This study is the first to explicitly allow these three models to compete rather than attempt to integrate them. This study's findings show that all three models are likely mis-specified. While Eisenberger and colleagues were right about the benefits of performance-contingent rewards on creative performance, the present results do not corroborate their explanatory mechanisms. First, pure contingent rewards did act as extrinsic motivators and did not affect intrinsic motivation. It is likely that both intrinsic motivators and extrinsic motivators can independently motivate innovative performance.

Further, the reward for creativity model cannot account for the finding about the additional negative effects of expectations. These negative effects cannot be predicted by the perceptual learning-based mechanism described in learned industriousness theory (Eisenberger, 1986). This study's perceptual and motivational assessments indicated that the participants in the expectation conditions were generally fulfilling all of the necessary conditions for innovative performance according to the reward for creativity model (i.e.,

perceiving contingent rewards and reporting higher levels of effort). In fact, effort was notably higher in those conditions. However, significant decreases in innovative performance were observed. Future revisions of the reward for creativity hypothesis should be limited to conditions in which no expectations to be innovative have been stated. Revisions of the effort-based mediating mechanism implied by learned industriousness theory (Eisenberger, 1986) and the intrinsic motivation-based mechanism explored in more recent studies (e.g., Eisenberger & Aselage, 2009) may also be necessary.

Pure Signal Might Regulate Attention and Arousal

The two most interesting findings in this study were the proof of the negative effect of expectations to be innovative and the positive effect of the pure contingent reward signal. As previously discussed, none of the competing models can fully explain these two findings without revision. Ways in which the theories can be revised within their own contexts have already been noted. I will also suggest one novel interpretation of the results that could stimulate future research.

Perhaps a fallacy in the assumptions of social motivational models is that the value of managerial interventions is in adding some force or effect. Perhaps a more valid assumption is that there are already multiple competing psychological forces and effects operating within individuals, and the great value of managerial interventions is in helping individuals to ignore those competing forces. For example, Van de Ven (1986) has suggested that the central problem in innovation management is managing attention, and certainly the complex social forces inherent in organizations is demanding on attention

(Katz & Kahn, 1978). The results of this study indicated that individuals already held a plethora of ambivalent, incompatible and diverse motivations, perceptions and experiences. Possibly, the pure contingent reward signal was effective because it provided unambiguous information as to where attention should be directed--toward innovative performance. In order to explain the negative effects of expectations, an addition to Van de Ven (1986) might be made. Perhaps, the central problems of managing innovation is managing attention and regulating arousal.

Over-arousal may explain the negative effects of expectations. Some scholars have defended the position that moderate levels of physiological arousal are optimal for cognitive functioning, including the cognitive functions associated with innovative performance (ca: Yerkes & Dodson, 1908). This physiological explanation is beyond the theoretical and methodological scope of this study. However, if this moderate arousal hypothesis is true, then perhaps the use of expectations and combining them with rewards creates too much arousal. This would explain why the expectation manipulations correctly induced expectations and effort but decreased innovative performance. According to this post-hoc speculation, the major value of pure contingent reward signals may be in their ability to help individuals focus their attention without inducing over-arousal.

Limitations

The operationalization of innovative performance in this study limits certain conclusions. The choice to use a linear composite of innovativeness across three different work tasks sampled from three different research programs was in line with the

purpose of this study to provide theoretical conclusions that were presumably unbiased by the methodologies associated with the competing models. However, the goal of this study does not necessarily preclude the viability of finer grained approaches to modeling motivation for innovative performance. For example, the physiological mechanisms presented in the previous section may operate in the span of seconds or minutes, and it may have been useful to understand how these operations affected participants' motivations throughout the 35 minute performance episodes. Unfortunately, the current study's design, measures and assumptions do not allow for definitive conclusions about effects at that sub-level of analysis.

Practical Implications

First, I must emphasize the practicality of a strong theory. The naïve or skeptical manager may erroneously believe that every type of managerial technique uniquely motivates innovative performance. Such a perspective would require memorizing and practicing at least six eclectic management techniques that combine some types of rewards and expectations (in order to match the conditions in this study). The present results indicate this perspective is full of error. This study has shown that a much simpler explanation would suffice. First, setting expectations to be innovative decreases innovative performance in the short-term (cannot yet confidently generalize to the long-term). Second, innovative performance can be increased with the use of pure contingent rewards that are contingent on innovative performance (i.e., pure signals). This may be as simple as promising a \$10 Amazon gift card for performing in the top 20% on innovativeness, which includes novelty, appropriateness and often feasibility.

The reward does not work if expectations to be innovative are also mentioned. That is why it is called a “pure” contingent reward signal. Managers should deliver this promise without mentioning expectations to be innovative.

Beyond this, future research could help us better understand how the phenomenon we examined operate in more complex multi-level systems like innovative project teams and climates for innovation (e.g., West & Farr, 1990) within organizations and regional and national economies.

Conclusion

This study provides the first empirical test of three prominent but incompatible hypotheses describing how to motivate innovative performance through the use of social expectations and/or rewards. The randomized controlled experimental design provided causal and objective evidence that rewards for innovative performance can cause increases in innovative performance. However, this effect disappears when paired with expectations to be innovative because expectations to be innovative cause significant decreases in innovative performance. The results indicate the need to revise the most prominent social-motivational models of innovative performance. Practically speaking, motivating innovative performance may be relatively straight-forward but not necessarily intuitive. The scientist-practitioner must be able to appreciate the value of inferences gleaned from rigorous experimental design when weighing innovation management advice. A cornucopia of confused and speculative perspectives abound.

Table 1

Means, Standard Deviation and Inter-Correlations Among Study Variables

Variables	M	SD	1	2	3	4	5	6
1. Innovative performance (T ₀)	257.2	57.0	--					
2. Innovative performance (T ₁)	293.3	53.5	.38**	--				
3. Creative self-efficacy (T ₀)	5.2	0.9	-.04	.02	--			
4. Creative self-efficacy (T ₁)	5.3	0.9	-.05	.05	.86**	--		
5. Intrinsic motivation (T ₀)	5.0	1.0	.03	.01	.39**	.35**	--	
6. Intrinsic motivation (T ₁)	5.1	1.0	.03	.04	.40**	.44**	.82**	--
7. Extrinsic motivation (T ₀)	4.3	1.4	.13	.14*	.06	.07	-.15*	-.11
8. Extrinsic motivation (T ₁)	4.3	1.3	.05	.02	.07	.12	-.17*	-.01
9. Effort (T ₀)	5.2	0.9	.16*	.09	.24**	.23**	.42**	.43**
10. Effort (T ₁)	5.3	1.0	.04	-.03	.31**	.34**	.35**	.50**
11. Perceived expectations (T ₀)	5.2	0.8	.11	.12	.16**	.21**	.25**	.31**
12. Perceived expectations (T ₁)	5.7	0.9	.02	.05	.25**	.33**	.17*	.33**
13. Perceived contingent rewards (T ₀)	4.0	1.6	-.01	-.02	.05	.07	.19**	.21**
14. Perceived contingent rewards (T ₁)	5.0	1.7	-.07	-.07	.12	.12	.08	.13
15. Perceived non-contingent rewards (T ₀)	4.4	1.5	-.03	.00	.06	.08	.06	.05
16. Perceived non-contingent rewards (T ₁)	4.9	1.5	-.06	.03	.26**	.18**	.03	.08
17. Prior mastery experiences (T ₂)	3.3	1.5	.00	.06	.17*	.11	.17*	.19**
18. Innovative role models (T ₂)	5.5	1.2	.02	.05	.31**	.29**	.17*	.16*
19. Positive affect state (T ₂)	4.8	1.2	.04	.06	.34**	.38**	.54**	.57**
20. Negative affect state (T ₂)	2.2	1.2	-.15*	-.22**	-.20**	-.24**	-.08	-.15*
21. Values for innovation (T ₂)	4.9	1.2	-.10	-.08	.15*	.17*	.13	.16*

Variables	...	7	8	9	10	11	12	13	14
1. Innovative performance (T ₀)	...								
2. Innovative performance (T ₁)	...								
3. Creative self-efficacy (T ₀)	...								
4. Creative self-efficacy (T ₁)	...								
5. Intrinsic motivation (T ₀)	...								
6. Intrinsic motivation (T ₁)	...								
7. Extrinsic motivation (T ₀)	...	--							
8. Extrinsic motivation (T ₁)	...	.76**	--						
9. Effort (T ₀)	...	.17*	.29**	--					
10. Effort (T ₁)	...	.24**	.34**	.67**	--				
11. Perceived expectations (T ₀)	...	.09	.14*	.54**	.38**	--			
12. Perceived expectations (T ₁)	...	.06	.08	.27**	.37**	.57**	--		
13. Perceived contingent rewards (T ₀)	...	.16*	.26**	.37**	.25**	.28**	.15*	--	
14. Perceived contingent rewards (T ₁)	...	.19**	.36**	.23**	.40**	.16*	.30**	.47**	--
15. Perceived non-contingent rewards (T ₀)	...	.30**	.32**	.26**	.19**	.10	.15*	.42**	.28**
16. Perceived non-contingent rewards (T ₁)	...	.37**	.45**	.30**	.36**	.20**	.21**	.32**	.39**
17. Prior mastery experiences (T ₂)	...	-.01	.07	.17*	.17*	.17*	.21**	.20**	.13
18. Innovative role models (T ₂)	...	-.05	.01	.19**	.16*	.24**	.26**	.04	.13
19. Positive affect state (T ₂)	...	-.07	-.03	.24**	.28**	.24**	.20**	.09	.03
20. Negative affect state (T ₂)	...	-.09	-.06	.07	.07	-.04	-.09	-.14	-.01
21. Values for innovation (T ₂)	...	.05	.10	.16*	.22**	.16*	.17*	-.03	.07

Variables	...	15	16	17	18	19	20	21
1. Innovative performance (T ₀)	...							
2. Innovative performance (T ₁)	...							
3. Creative self-efficacy (T ₀)	...							
4. Creative self-efficacy (T ₁)	...							
5. Intrinsic motivation (T ₀)	...							
6. Intrinsic motivation (T ₁)	...							
7. Extrinsic motivation (T ₀)	...							
8. Extrinsic motivation (T ₁)	...							
9. Effort (T ₀)	...							
10. Effort (T ₁)	...							
11. Perceived expectations (T ₀)	...							
12. Perceived expectations (T ₁)	...							
13. Perceived contingent rewards (T ₀)	...							
14. Perceived contingent rewards (T ₁)	...							
15. Perceived non-contingent rewards (T ₀)	...	--						
16. Perceived non-contingent rewards (T ₁)	...	.53**	--					
17. Prior mastery experiences (T ₂)	...	.15*	.10	--				
18. Innovative role models (T ₂)	...	.06	.21**	.27**	--			
19. Positive affect state (T ₂)	...	.05	.09	.06	.21**	--		
20. Negative affect state (T ₂)	...	-.04	.04	-.05	.01	-.15*	--	
21. Values for innovation (T ₂)	...	-.07	.15*	.14	.31**	.14	.05	--

Notes: 'Innovative performance' has been formulated such that the theoretical range is from 0 - 600. Pairwise N's range (195 - 209). ** $p \leq .01$, * $p \leq .05$, † $p \leq .10$

Table 2

*Summaries of Study Variables Within Experimental Conditions***Variable: Innovative performance^a**

	<u>No expectation</u>			<u>Expectation to be innovative</u>		
	Non-contingent (0N)	No reward (00)	Contingent reward (0C ^b)	Non-contingent (XN)	No reward (X0)	Contingent reward (XC)
Pre	275 (52)	259 (46)	236 (74)	256 (59)	260 (50)	259 (51)
Post	311 (34)	300 (43)	293 (62)	294 (63)	292 (44)	270 (62)
	+ 36	+ 41	+ 57	+ 38	+ 32	+ 11

Variable: Creative self-efficacy

	0N	00	0C	XN	X0	XC
Pre	5.5 (0.6)	4.7 (1.1)	5.2 (1.1)	5.5 (0.8)	5.3 (0.8)	5.2 (1.0)
Post	5.7 (0.7)	4.8 (1.1)	5.1 (1.1)	5.5 (0.9)	5.5 (0.7)	5.2 (0.9)
	+ 0.2	+ 0.1	- 0.1	+ 0	+ 0.2	+ 0

Variable: Intrinsic motivation

	0N	00	0C	XN	X0	XC
Pre	5.2 (0.9)	5.0 (1.1)	5.2 (0.9)	5.1 (1.0)	4.8 (0.8)	4.9 (1.1)
Post	5.3 (1.0)	5.1 (1.1)	5.1 (1.0)	5.2 (0.8)	5.0 (0.9)	5.0 (1.1)
	+ 0.1	+ 0.1	- 0.1	+ 0.1	+ 0.2	+ 0.1

Variable: Extrinsic motivation

	0N	00	0C	XN	X0	XC
Pre	4.8 (1.2)	4.4 (1.4)	3.8 (1.3)	4.2 (1.7)	3.9 (1.1)	4.4 (1.2)
Post	4.7 (1.3)	4.1 (1.4)	4.5 (1.1)	4.3 (1.4)	4.0 (1.1)	4.5 (1.4)
	- 0.1	- 0.3	+ 0.7	+ 0.1	+ 0.1	+ 0.1

Variable: Effort

	0N	00	0C	XN	X0	XC
Pre	5.6 (0.8)	5.2(1.0)	5.2 (0.9)	5.2 (0.9)	4.9 (1.0)	5.2 (0.9)
Post	5.5 (0.8)	4.9 (1.1)	5.3 (1.0)	5.6 (1.0)	4.8 (1.1)	5.6 (1.0)
	- 0.1	- 0.3	+ 0.1	+ 0.4	- 0.1	+ 0.4

Variable: Perceived expectations to be innovative

	0N	00	0C	XN	X0	XC
Pre	5.3 (0.7)	5.2 (0.9)	5.1 (0.8)	5.4 (0.9)	5.3 (0.8)	5.2 (1.0)
Post	5.3 (0.7)	5.2 (0.9)	5.3 (0.9)	6.3 (0.6)	6.2 (0.6)	5.9 (1.0)
	+ 0	+ 0	+ 0.2	+ 0.9	+ 0.9	+ 0.7

Variable: Perceived contingent rewards (i.e., contingent on innovative performance)

	0N	00	0C	XN	X0	XC
Pre	3.9 (1.5)	3.8 (1.6)	4.1 (1.3)	3.8 (1.7)	4.2 (1.5)	4.1 (1.7)
Post	4.6 (1.6)	4.0 (1.8)	5.6 (1.3)	5.3 (1.5)	4.6 (1.6)	5.9 (1.2)
	+ 0.7	+ 0.2	+ 1.5	+ 1.5	+ 0.4	+ 1.8

Variable: Perceived non-contingent rewards (i.e., contingent only on completion)

	0N	00	0C	XN	X0	XC
Pre	4.5 (1.4)	4.5 (1.4)	4.2 (1.6)	4.5 (1.4)	4.4 (1.5)	4.5 (1.6)
Post	5.3 (1.2)	4.1 (1.6)	4.9 (1.6)	5.5 (1.4)	4.2 (1.5)	5.0 (1.5)
	+ 0.8	- 0.4	+ 0.7	+ 1.0	- 0.2	+ 0.5

Notes: Pre and Post cells display means (*sd* in parentheses). displays change in cell mean from pre to post. ^a Innovative performance is a linear composite of the Titles, Campus and Logos scores. ^b This is the ‘R_{pure}’ condition, which stands for “pure” contingent reward signal.

*N*s range (33 – 37)

Table 3

Empirical Model Summaries Used in Hypothesis Testing

Model	Description	# Model Parameters	Intercept variance	Error variance T ₀	Error variance T ₁	-2 Restricted Log-Likelihood	Intercept	Time	...
A	<i>Unconditional means and random growth model</i> assumes participants' random intercepts, fixed effect of 'Time' and error structure of 'Time' as diagonal matrix. Model A serves as a null model to which all subsequent models add fixed effects.	5	1188.4** (231.0)	1856.3** (278.2)	455.5 (398.7)	4113.3	257.5** (4.0)	37.2** (4.3)	...
B	<i>All effects model</i> assumes that each hypothetical model may provide some unique explanatory power	13	1124.2** (223.2)	1819.8** (273.8)	466.4 (390.0)	4049.0	205.6** (28.6)	75.4** (26.1)	...
C	<i>No efficacy model</i> assumes that the creative self-efficacy hypothetical model is unnecessary. C = B – Creative self-efficacy	12	1117.8** (222.2)	1824.6** (272.9)	465.0 (388.0)	4053.4	202.1** (25.7)	75.7** (26.1)	...

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D	<i>No expectations model</i> tests whether expectation parameter is suppressing creative self-efficacy parameter. D = B – Expect	12	1133.7** (225.9)	1794.1** (273.3)	521.5 (395.7)	4058.9	226.8** (27.2)	83.3** (26.0)	...
E	<i>No expectations, no efficacy model</i> tests the loss of the expectation parameter from the no efficacy model E = C – Expect	11	1123.0** (224.8)	1794.6** (271.5)	525.8 (393.1)	4063.2	225.9** (23.4)	83.4** (26.0)	...
F	<i>No pure reward, no effort model</i> tests the loss of the reward for creativity model from the no efficacy model F = C – Reward for creativity model(R_pure, Time*R_pure, Effort, Time*Effort)	8	1148.0** (224.7)	1872.3** (276.3)	402.5 (387.9)	4083.7	208.0** (19.0)	44.9** (6.1)	...
G	<i>Only no effort model</i> tests the need for the non-conforming effort mediator G = C – Effort – Time*Effort	10	1120.12** (221.6)	1826.5** (271.7)	462.0 (385.6)	4065.0	219.4** (19.5)	38.9** (7.4)	...

Analysis N = 208. ** $p \leq .01$, * $p \leq .05$, $p \leq .10$

Model	...	'E'	Time* 'E'	'R_pure'	Time* 'R_pure'	Effort	Time* Effort	Expect	Creative self- efficacy	Multiple R (Pseudo-R ²)
A	...	na	na	na	na	na	na	Na	na	.86 (.74)
B	...	-9.5 (8.9)	-18.5 (10.1)	-27.2* (11.8)	18.4 (13.0)	3.5 (4.7)	-6.9 (4.8)	9.2* (4.0)	-0.9 (3.5)	.88 (.77)
C	...	-9.6 (8.9)	-18.3 (10.1)	-27.3* (11.8)	18.7 (12.9)	3.3 (4.6)	-7.0 (4.8)	9.1* (4.0)	na	.88 (.77)
D	...	-8.3 (8.9)	-11.9 (9.7)	-28.0* (11.8)	19.9 (13.0)	7.8 (4.3)	-8.4 (4.7)	Na	-0.2 (4.7)	.88 (.77)
E	...	-8.4 (8.8)	-11.8 (9.7)	-28.0* (11.8)	20.0 (13.0)	7.8 (4.2)	-8.4 (4.7)	Na	na	.88 (.77)
F	...	-1.1 (8.0)	-24.6** (9.0)	na	na	na	Na	9.6** (3.5)	na	.87 (.76)
G	...	-10.4 (8.8)	-18.3 (10.1)	-27.8* (11.8)	18.6 (12.9)	na	Na	9.2** (3.5)	na	.88 (.77)

Analysis N = 208. ** $p \leq .01$, * $p \leq .05$, $p \leq .10$

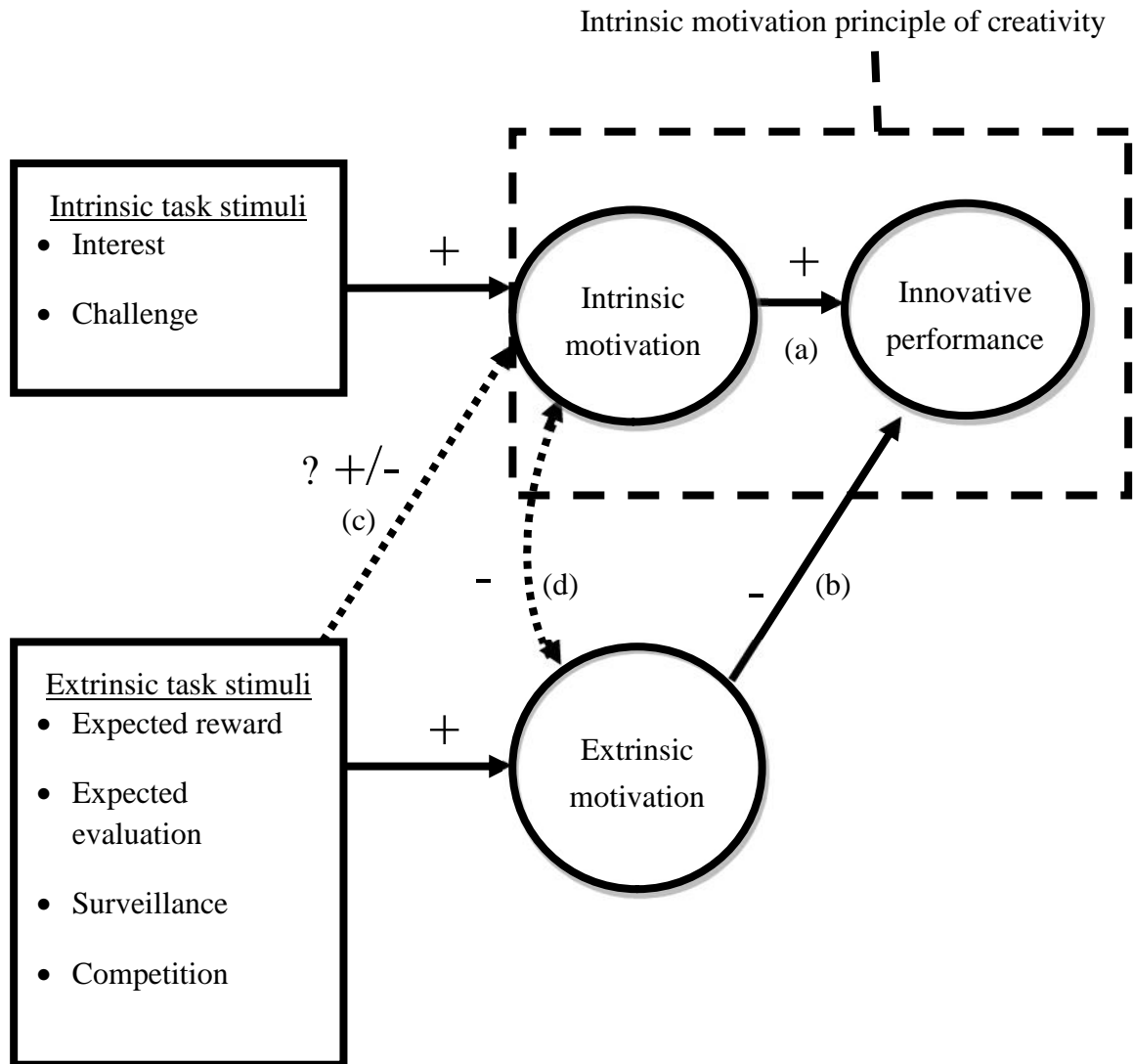


Figure 1. A self-determination model of innovative performance motivation.

Note. a. 95% CI (.16, .32), 80% CV (.06, .43), $k = 16$, $n = 3417$ (Hammond et al., 2011); b. 95% CI (.08, .19), 80% CV (.14, .14), $k = 8$, $n = 1319$ (Hammond et al., 2011); c. + verbal rewards: 95% CI (.25, .52), $k = 14$ (Eisenberger & Cameron, 1996); - tangible expected performance independent rewards: 95% CI (-

.39, -.18), $k = 31$ (Eisenberger & Cameron, 1996); d. The negative correlation between intrinsic and extrinsic motivation reflects the hydraulic assumption of early models; the validity of this assumptions is currently in question.

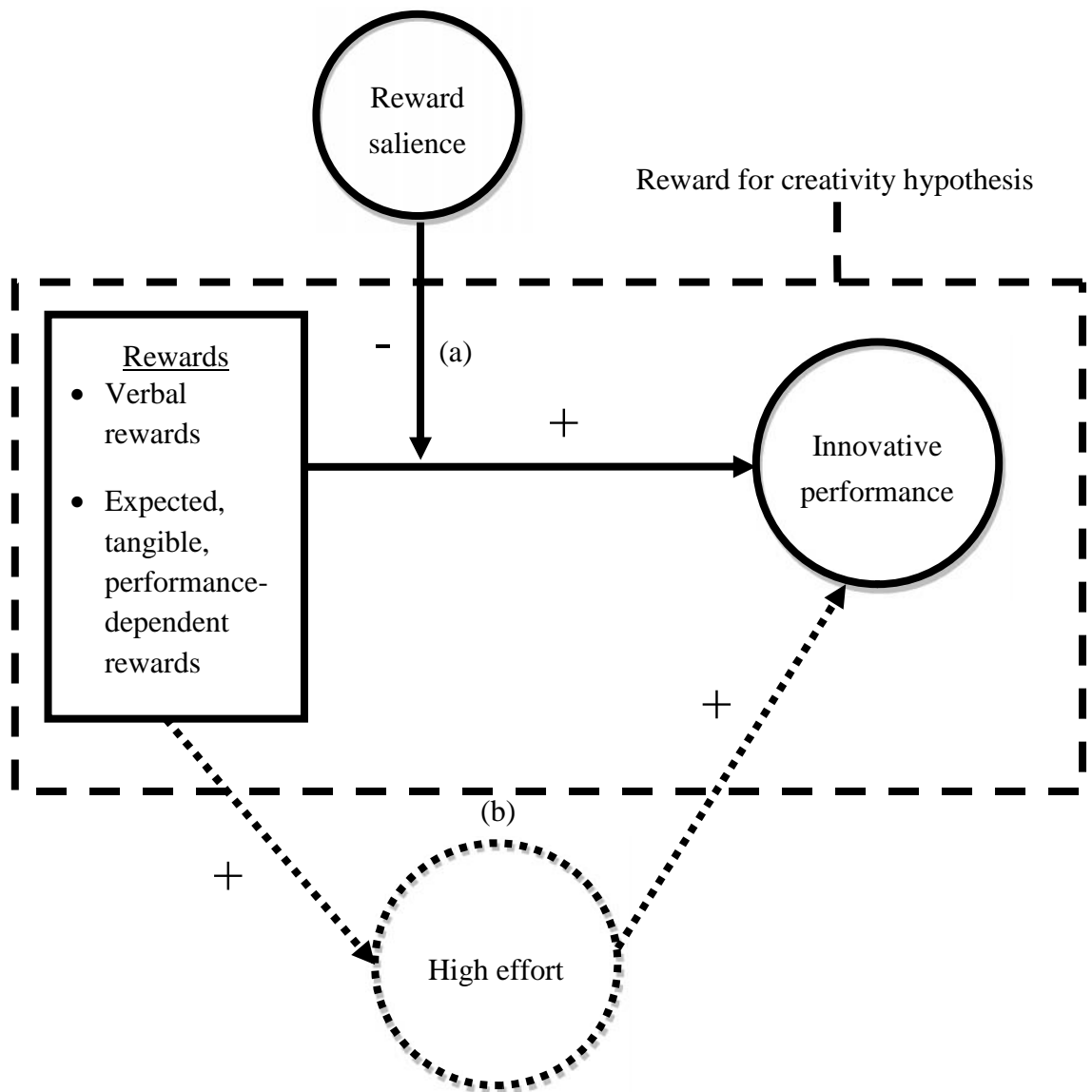


Figure 2. A learned industriousness model of innovative performance motivation.

Note. a. Reward salience does not fit into a learned industriousness interpretation. Eisenberger and Cameron (1996) incorporated reward salience to supplement learned industriousness theory for explaining the reward for creativity hypothesis; b. The mediating construct of high effort can be inferred from a neobehaviorist perspective. However, this variable is never examined in empirical studies.

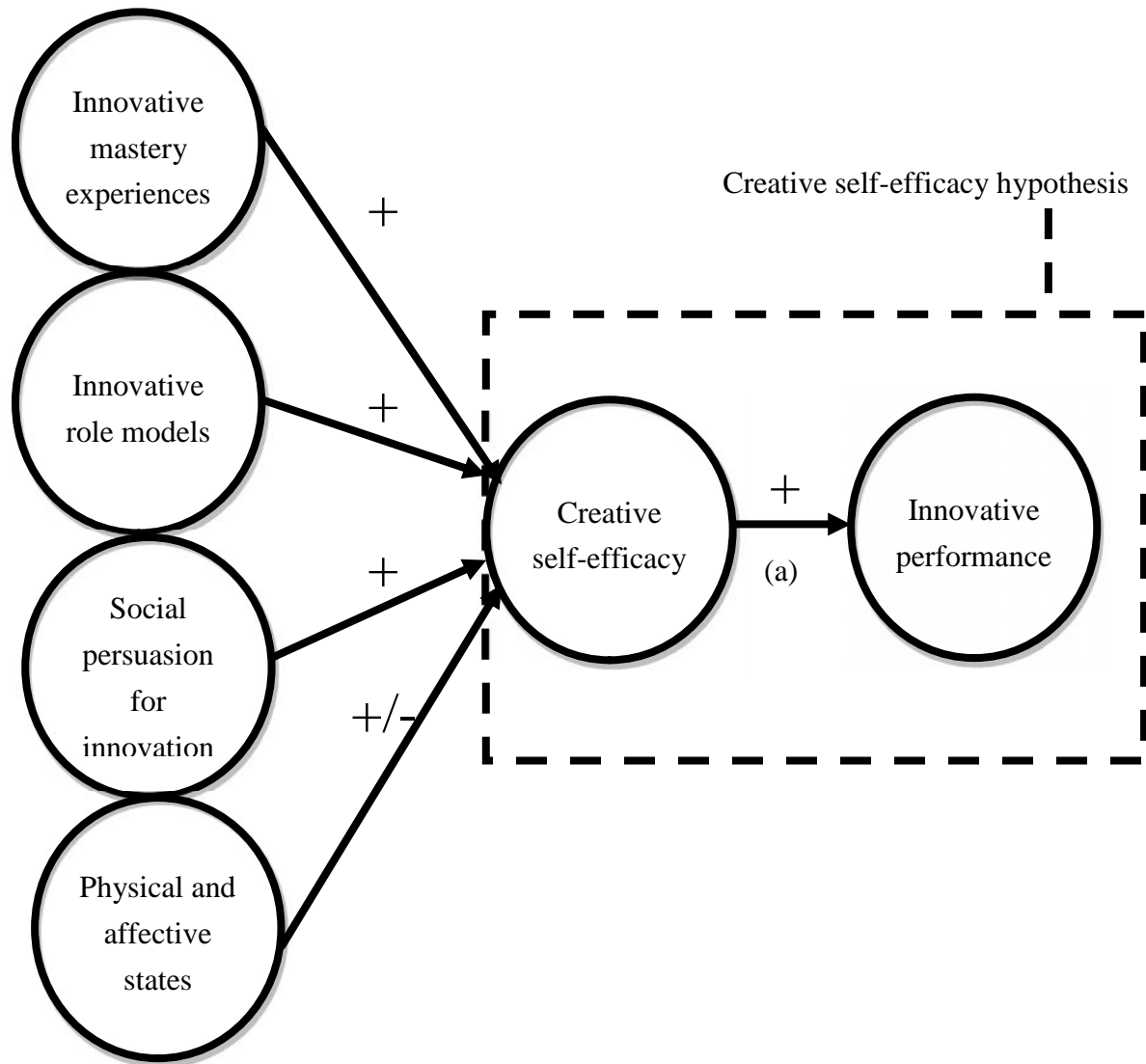


Figure 3. A social cognitive model of innovative performance motivation.

Note. a. 95% CI (.24, .26), 80% CV (.23, .35), $k = 9$, $n = 2044$

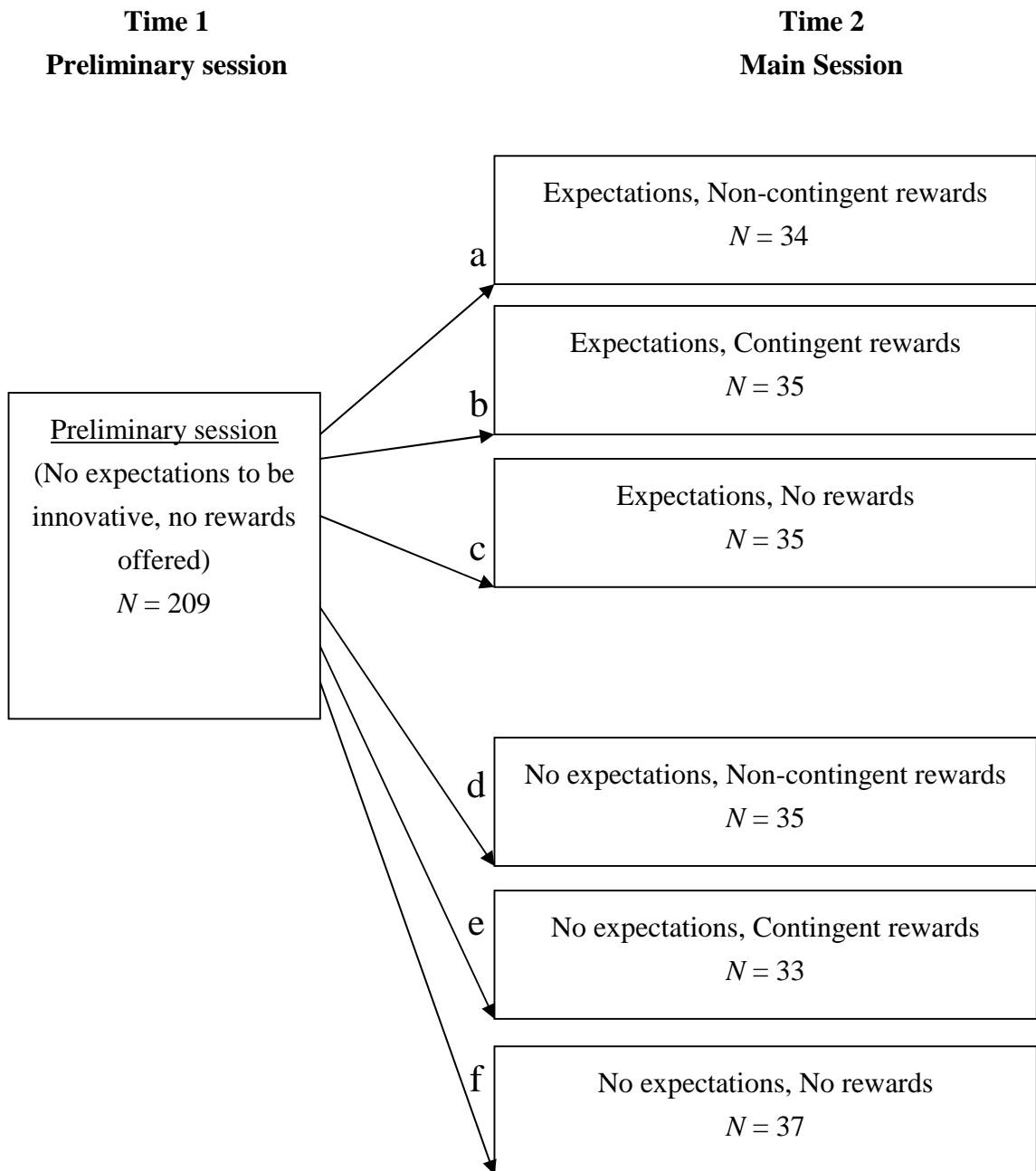


Figure 4. Study hypotheses mapped onto study design.

Note. Social cognitive theory predicts that participants' innovative performance increases from Time 1 to Time 2 due to expectations and regardless of reward contingency. If paths a – f represent changes in innovative performance, then a, b and c should be positive, significant and not different from each other ($H1_{CSE}$); furthermore, paths a, b and c should be more positive than paths d, e and f. $H2_{CSE}$ predicts that the increases in innovative performance are associated with increases in creative self-efficacy.

Self-determination theory predicts that participants' innovative performance does not increase from Time 1 to Time 2 due to expectations and rewards ($H1_{IMP}$). Thus, a – e should be negative or zero. $H2_{IMP}$ predicts that decreases in innovative performance are associated with decreases in intrinsic motivation and increases in extrinsic motivation. Path f may be zero or possibly positive.

Learned industriousness theory predicts that participants' innovative performance increases from Time 1 to Time 2, but only in the contingent reward conditions ($H1_{RC}$ & $H2_{RC}$). Thus, only paths b and e should be significantly positive, while paths a, c, d and f may be negative or zero (Proposition 1 $_{RC}$). Proposition 2 $_{RC}$ predict that increases in innovative performance are associated with increases in high effort.

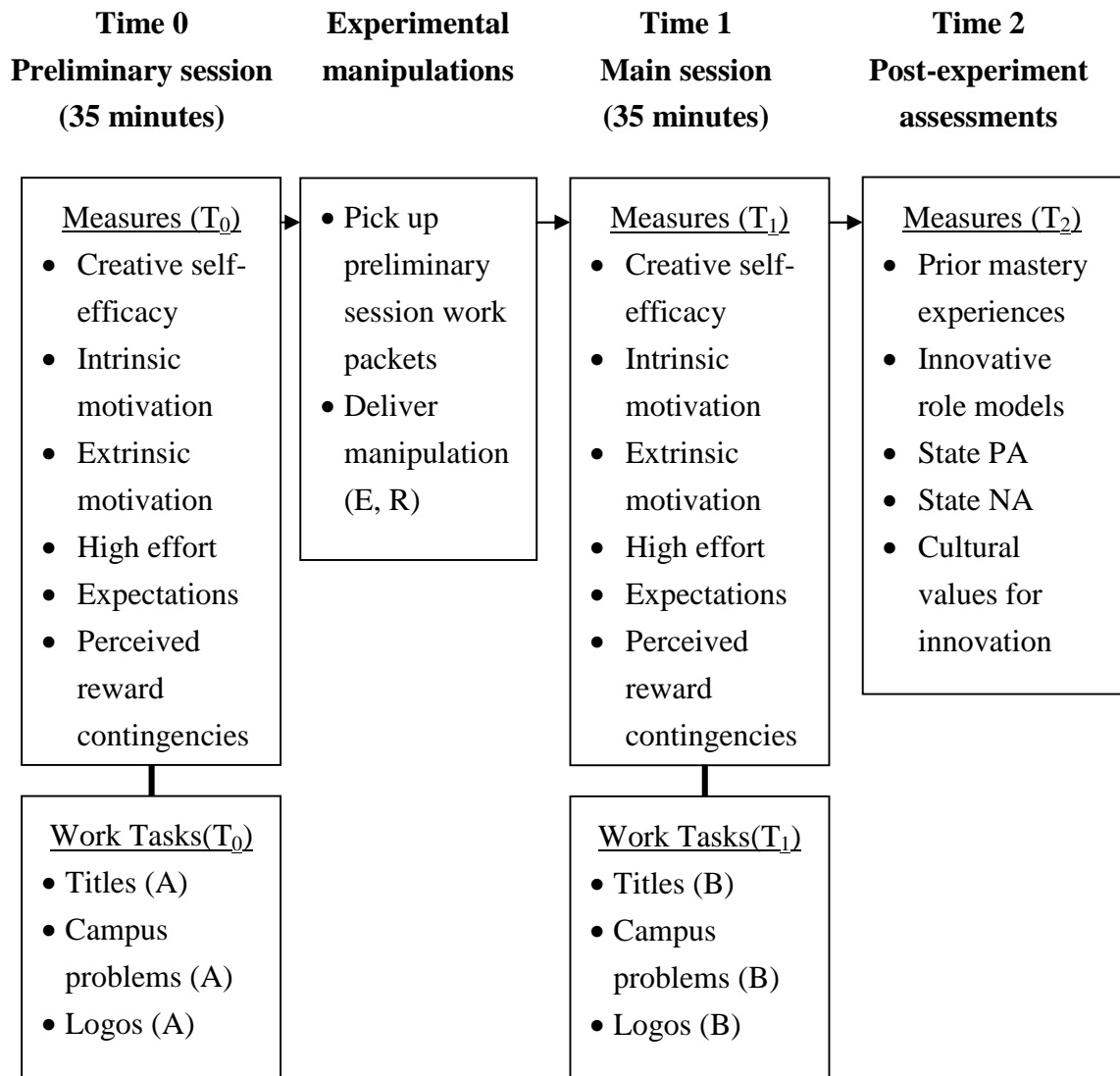


Figure 5. Sequence of methodological events

Appendix A: Innovative Tasks

Each work packets contained one version of each task. The preliminary session packets contained version A of all three tasks. The main session packets contained version B of all three tasks.

Task 1: Title Generation

Version A

Instructions: Your task is to generate 5 titles for the following short story. The titles should be novel and appropriate for the given story. Please read the short story and write down your 5 titles in the blanks provided.

You are a tiny golden kernel of popcorn lying in the bottom of a frying pan. Look around you and see the other popcorn kernels that are snuggled up close to each other. Feel it heating, getting warmer, hotter, now burning underneath you. Close to you a popcorn kernel explodes. One by one other popcorn kernels pop to life. White clouds appear to be bursting out all around you. The sound of popping drums in your ears. You are cramped, uncomfortable, steaming hot, sweating dizzy. Your whole body feels too tight. You are trapped within a too-tight suit. Suddenly, you, the popcorn kernel, feel yourself exploding, bursting. All at once you are light and fluffy. Bobbing up and down with other popcorn. At last the popping sound begins to quiet. Just an occasional pop, pop, and at last silence.

Please write your 5 titles below (if you need more space, you may write on the back of the page):

Version B

Instructions: Your task is to generate 5 titles for the following short story. The titles should be novel and appropriate for the given story. Please read the short story and write down your 5 titles in the blanks provided.

You are outside and the sun has already set. You are walking into nighttime. Lean your head back now. Look up at the evening sky. The night grows darker, blacker, layers of black until it is the darkest evening of the year. The darkness is a black syrup filling in every crack behind the trees' branches blocking out any sign of light. You watch the black blanket of night overhead. Out of it falls a snowflake. Then another. They twinkle

and spin softly. They are very small pieces of nature's jewelry falling gently downward. One after another they come. Dusting the ground. Spreading a powder over the branches of the trees. The woods are white. A damp blanket of snow like wet flower petals covers your face.

Please write your 5 titles below (if you need more space, you may write on the back of the page):

Task 2: University Problems

Version A

Please read the prompts and respond to the instructions.

Visitors and students alike frequently get lost searching for offices and labs in the Robinson B building. Your task is to propose an innovative solution that helps people quickly and reliably find their destination within the Robinson B building.

Your proposal should include 1) a description or prototype of your new and useful solution, 2) a description of why your solution is effective and 3) suggestions for how to implement the solution.

Version B

Please read the prompts and respond to the instructions.

Parking on GMU campus can be impossible at times due to large numbers of commuter students. Your task is to propose an innovative solution for helping students get to campus without major traffic and parking congestion. Your proposal should be effective without reducing the number of students and without expanding the size of Fairfax campus.

Your proposal should include 1) a description of your solution, 2) a description of why your new and useful solution is effective and 3) suggestions for how to implement the solution.

Task 3: Collage Logos

Version A

[For this task, participants will be provided with a blank paper, scissors, glue and a bin of scrap newspapers/journals/magazines]

A new environmentally-conscious company needs a logo designed out of recycle goods. Your task is to make a draft of the design using the recycled materials. You should also describe how the logo could be implemented; that is, describe how the logo

should be used to reach as large an audience as possible.

Version B

[For this task, participants will be provided with a blank paper, scissors, glue and a bin of scrap yarn]

A new yarn company needs a logo designed out of yarn. Your task is to make a draft of the design using the yarn. You should also describe how the logo could be implemented; that is, describe how the logo should be used to reach as large an audience as possible.

Appendix B: Notes on Innovative Performance Ratings

Task 1 consisted of generating five short-story titles (T_0 is Popcorn; T_1 is Snowflake). Inter-rater reliability was acceptable for each title's novelty rating (0 = not at all novel, to 100 = highly novel). $ICC(2,k)$ for novelty of title 1: $T_0 = .65, T_1 = .59$; title 2: $T_0 = .70, T_1 = .70$; title 3: $T_0 = .68, T_1 = .74$; title 4: $T_0 = .79, T_1 = .77$; title 5: $T_0 = .76, T_1 = .82$. Appropriateness ratings were less reliable but still above our *a priori* cutoff value of no less than .60 ($p < .05$) (0 = not at all appropriate, to 100 = absolutely appropriate). $ICC(2,k)$ for appropriateness of title 1: $T_0 = .58, T_1 = .56$; title 2: $T_0 = .58, T_1 = .54$; title 3: $T_0 = .53, T_1 = .60$; title 4: $T_0 = .63, T_1 = .63$; title 5: $T_0 = .63, T_1 = .61$. When judging appropriateness, raters organically formed and used heuristic "elements" of each short story to assess the extent to which titles reflected these appropriate elements (for Popcorn: popcorn/kernel, pop, change/heat/silence/survive/rebirth; for Snowflake: night/dark/black, winter, snow(flake)/white).

Task 2 consisted of proposing solutions to common campus problems (T_0 is Robinson; T_1 is Parking). Inter-rater reliability was acceptable for solutions' novelty ratings (0 = no change from current solution/no solution, 20 = standard solution, 40 = standard solution with novel modifications, 60 = conceptual novelty, 80 = conceptual novelty with elaborate novel modifications, 100 = never before conceived of, extremely novel/unique). $ICC(2,k)$ for novelty of solutions: $T_0 = .87, T_1 = .83$. Inter-rater reliability was acceptable for solutions' effectiveness/usefulness/appropriateness ratings (0 = ineffective, counterproductive or impossible to determine due to incompleteness, 20 = somewhat effective, 40 = elaboration on a somewhat effective solution, 60 = effective solution, 80 = elaboration and extension of effective solution, 100 = extremely effective, cannot fail). $ICC(2,k)$ for effectiveness/usefulness/appropriateness of solutions: $T_0 = .89, T_1 = .83$. Inter-rater reliability was acceptable for solutions' feasibility ratings (0 = impossible or impossible to determine due to incompleteness, 20 = requires exorbitant cost and/or major technological assumptions, 40 = challenging to pull-off, 60 = feasible given some skill/technology/resources, 80 = very feasible, easy to see how this is possible, 100 = even a baby could make this happen). $ICC(2,k)$ for feasibility of solutions: $T_0 = .87, T_1 = .76$.

Task 3 consisted of designing logos from recycled materials, describing the logo and proposing strategies for implementing the logo to as large an audience as possible. Inter-rater reliability was acceptable for logos' novelty ratings (0 - 24 = blank or impossible to determine due to incompleteness, 25 - 49 = simple logos with highly typical elements (i.e., color, shape, text, space usage), 50 - 74 = compound logos that extend typical elements, moderate complexity, recognizable, 75 - 90 = novel usage of element(s) (e.g., extra dimensional space), 91 - 100: awe-inspiring, holistic synthesis of

novel elements). $ICC(2,k)$ for novelty of logos: $T_0 = .87, T_1 = .75$). Inter-rater reliability was acceptable for logos' appropriateness ratings (0 - 24 = blank or impossible to determine due to incompleteness, 25 - 40 = non-related to theme, ambiguous or no audience, 41 - 60 = somewhat addresses theme, but still very "raw", 61 - 74 = somewhat addresses theme, appropriate for ambiguous or general audience (explicitly stated), polished enough for an audience, 75 - 90: clearly addresses theme, logo matches at least 1 specific audience (explicitly stated), fairly polished, 91 - 100: ready for "prime time" with explicit match with target audience). $ICC(2,k)$ for appropriateness of logos: $T_0 = .88, T_1 = .87$. Inter-rater reliability was acceptable for logos' implementation feasibility ratings (0 - 24 = blank or impossible to determine due to incompleteness, 25 - 49 = highly unrealistic given current technology, 50 - 74 = some detail on either how or where/who to implement, 75 - 90 = some detail on both how and where, 91 - 100: significant detail on how and where and gives consideration to modern advertising techniques (e.g., social media, online, etc.)). $ICC(2,k)$ for feasibility of implementation of logos: $T_0 = .92, T_1 = .89$.

Appendix C: Notes on the Innovative Performance Composite

Variable: Innovative performance^a

	<u>No expectation</u>			<u>Expectation to be innovative</u>		
	Non-contingent (0N)	No reward (00)	Contingent reward (0C ^b)	Non-contingent (XN)	No reward (X0)	Contingent reward (XC)
Pre	275 (52)	259 (46)	236 (74)	256 (59)	260 (50)	259 (51)
Post	311 (34)	300 (43)	293 (62)	294 (63)	292 (44)	270 (62)
	+ 36	+ 41	+ 57	+ 38	+ 32	+ 11

Variable: Titles

	0N	00	0C	XN	X0	XC
Pre	124 (13)	118 (25)	110 (41)	126 (8)	124 (11)	121 (18)
Post	116 (10)	113 (15)	111 (30)	110 (27)	116 (13)	111 (24)
	- 8	- 5	+ 1	- 16	- 8	- 10

Variable: Campus problems

	0N	00	0C	XN	X0	XC
Pre	105 (21)	104 (21)	94 (34)	98 (32)	103 (20)	100 (26)
Post	97 (12)	94 (23)	92 (25)	101 (9)	97 (13)	91 (29)
	- 8	- 10	- 2	+ 3	- 6	- 9

Variable: Logos

	0N	00	0C	XN	X0	XC
Pre	46 (45)	36 (37)	32 (37)	32 (41)	34 (43)	38 (36)
Post	98 (31)	93 (34)	90 (39)	83 (45)	80 (42)	69 (42)
	+ 52	+ 57	+ 58	+ 51	+ 46	+ 31

Notes: Pre and Post cells display means (*sd* in parentheses). displays change in cell

mean from pre to post. ^a The innovative performance is a sum of the Titles, Campus and Logos scores. ^b This is the 'R_pure' condition, which stands for "pure" contingent reward signal.

Ns range (33 – 37)

Appendix D: Dissertation Proposal Literature Review

Innovative performance is the backbone of innovation, widely regarded as a critical factor for organizational effectiveness (e.g., Ireland & Hitt, 1999; Schumpeter, 1942; Shalley, Zhou & Oldham, 2004). Innovative performance refers to individuals' behaviors related to the intentional introduction of a novel and useful product, process or service (West & Farr, 1990). Social scientists have recognized the importance of innovative performance and generated multiple research paradigms attempting to describe how innovation can be fostered in a variety of different contexts.

The oldest paradigm encompasses research on highly creative, innovative and eminent individuals; this paradigm can be traced back to the 19th century psychometrician Francis Galton (e.g., Galton, 1869; 1874). The general methodology of this 'Great Person' paradigm is to identify historical or contemporary innovators/geniuses (e.g., Albert Einstein) and by drawing upon biographical data, to describe common traits, attitudes and/or environmental characteristics among said individuals (e.g., Simonton, 1990). Departing from the great person paradigm in the latter part of the 20th century, researchers (e.g., Amabile, 1979) began applying social psychological theories and experimental methodology to the study of creative performance (creative performance is synonymous with innovative performance, the latter term more often being used among organizational scholars). This newer paradigm signaled a rejection of the assumption that great innovations must stem from some unique individual who usually would be believed to possess an extraordinary level of genius. Instead, the newer 'social motivational' paradigm is theoretically applicable to a broader population of individuals who may never produce a revolutionary innovation but may nevertheless enact innovative performance to improve their personal lives, workplaces and/or local communities. Organizational and management scholars have drawn largely from this latter paradigm and extended the assumptions of social motivational innovative performance models to the multiple levels of analysis typically found in industrial, governmental and military organizations. Organizational researchers' methods typically involve naturalistic observation (typically via survey: Anderson, Carsten, De Dreu, & Nijstad, 2004) to identify the configurations of employees', work teams' and/or organizations' characteristics that are associated with innovative performance and consequently innovation (e.g., Woodman, Sawyer, & Griffin, 1993). It is into the social motivational paradigm that the current research fits.

In this study, I draw upon social motivational models of innovative performance to build a stronger theory to guide the management of innovative performance. When I say strong theory, I am referring to theoretical strength in terms of a positivist philosophy (Popper, 2002). Scientific theories are models that codify observations that have been

made; the strongest theories allow one to describe and specifically predict a class of phenomenon given as few essential principles as possible (Hawking, 2001). Social motivational paradigms have been useful for describing how normal individuals can be motivated to innovatively improve the lives of themselves and others (e.g., Bandura, 2004). Perhaps this is why most management and organizational scholars utilize the social motivational paradigm to identify principles of innovation management. Nevertheless, strong motivational theories of innovative performance have remained elusive (Hennessey & Amabile, 2010). The reason for a lack of strong theory is not for lack of trying; in fact, a number of prominent theories and hypotheses have emerged to explain empirical findings with regards to how to motivate innovative performance (e.g., Amabile, 1990; Eisenberger & Cameron, 1996; Tierney & Farmer, 2002). Instead, I suggest that the elusiveness of a stronger motivational theory of innovative performance stems from a general absence of systematic parsing of multiple competing theories and hypotheses.

Therefore, the purpose of this study is to systematically assess the theoretical contributions of three prominent explanations for how to motivate innovative performance and then to propose specific experimental strategies that can be used to rule out one or more of these explanations. The three explanations under investigation will be referred to as the creative self-efficacy hypothesis (Tierney & Farmer, 2002), the intrinsic motivation principle of creativity (Amabile, 1990), and the reward for creativity hypothesis (Eisenberger & Cameron, 1996). These three explanations will be assessed based on Leavitt, Mitchell and Peterson's (2010) systematic strategy for "theory pruning". To begin, I introduce the three explanations by outlining their core theoretical assumptions and supporting evidences. Then, I assess the comparability and compatibility of the three explanations based on the systematic strategy laid out by Leavitt et al. (2010). Finally, I propose experimental designs that would efficiently rule out one or more of the explanations.

Theoretical Background

Creative Self-efficacy Hypothesis

The creative-self-efficacy (CSE) hypothesis states that increases in CSE cause increases in innovative performance. CSE refers to a person's belief that s/he possesses the ability to produce creative outcomes (Tierney & Farmer, 2002). The creative self-efficacy (CSE) hypothesis was first tested by researchers who extended the theoretical construct of specific self-efficacy to the case of creative/innovative performance (e.g., Tierney & Farmer, 2002).

Using correlational evidence, researchers have reported support for the CSE hypothesis (Carmeli & Schaubroeck, 2007; Choi, 2004; Gong, Huang, & Farh, 2009; Jaussi, Randel, & Dionne, 2007; Strickland & Towler, 2011; Tierney & Farmer, 2002, 2004, 2011; meta-analytic correlation estimate: 95% CI = .24, .26, 80% CV = .23, .35, $k = 9$, $n = 2044$). In two of these studies, longitudinal designs allow for the plausible inference of temporal stability of the relationship between CSE and innovative performance (e.g., Gong et al., 2009; Tierney & Farmer, 2011). Tierney and Farmer's (2011) study design also allows for the plausible inference of a temporal sequence in which CSE is antecedent of innovative performance. However, no published studies

have allowed for a strong inference regarding the causal effect of CSE on innovative performance (due to lack of experimental design). To date, the plausibility of the causal portion of the CSE hypothesis requires one to refer to evidence from the more general social cognitive theory (also referred to as self-efficacy theory; Bandura, 1997) from which the CSE hypothesis is deduced.

Creative self-efficacy hypothesis is deduced from social cognitive theory. The CSE hypothesis follows logically from previous theoretical work on the self-efficacy construct, which according to Bandura (2004), is the central motivational mediator between motivational antecedents and a person's actual behavior: "Unless people believe they can produce desired effects by their actions they have little incentive to act or to persevere in the face of difficulties" (p. 622). Bandura (1997) incorporated the motivational construct of self-efficacy into his general social cognitive theory as a way to explain the generalized effects of a number of different psychotherapeutic techniques on behavioral change interventions. While social cognitive theory was originally developed in a clinical context, the theory has been extended beyond clinical therapeutic applications (Bandura, 2004). The conceptualization of the CSE construct represents one such extension (e.g., Tierney & Farmer, 2002, 2004, 2011; Shalley, Zhou & Oldham, 2004). Thus, the CSE hypothesis can be thought of as a specific application of social cognitive theory to the motivations and behaviors representing innovative performance. This point is important for two reasons: 1) social cognitive theory is supported by evidence causally linking specific forms of self-efficacy to specific behaviors (which is why the causal CSE hypothesis can logically be deduced), and 2) social cognitive theory defines causal antecedents to the development and maintenance of self-efficacy.

Upon utilizing the CSE hypothesis to predict motivational principles of innovative performance, one necessarily invokes the broader social cognitive theory from which the hypothesis is derived. An important example of this is that previous social cognitive theory research in clinical and educational settings has provided clear guidance for identifying self-efficacy's causal antecedents, which include mastery experiences, social modeling, social persuasion and physical and emotional states (Bandura, 1997).

Mastery experiences describe one's personal history of persevering in order to overcome obstacles and achieving success through one's efforts in a given domain (Bandura, 2004). Theoretically the most effective way to develop self-efficacy, the enactment of mastery experiences may strongly influence one's self-efficacy beliefs because success's causal attributions implicate one's appropriate efforts and abilities (i.e., success's causal attribution is internal and controllable; Gist & Mitchell, 1992; Weiner, 1985). Although mastery experiences have rarely been studied in relation to the CSE construct, many CSE researchers assume that during the naturalistic study period, innovative mastery experiences are ongoing as a result of creative job requirements or an individual's creative role identity (e.g., Tierney & Farmer, 2011).

Social modeling (also referred to as role modeling or vicarious learning) occurs when a person can witness the successful efforts of another. Theoretically, the observation of successful role models reduces ambiguities in a person's choice of appropriate task completion strategies and self-regulatory processes; the clear proposition of a certain path to success should increase one's self-efficacy. Gist (1989) applied a

social modeling intervention within a training study in which idea generation (an important innovative performance behavior) represented one of the study's outcome variables. Both idea generation and idea generation self-efficacy were positively influenced by the social modeling intervention. The results from Gist's (1989) intervention study and other correlational studies (viz., Shalley & Perry-Smith, 2001; Zhou, 2003) provide support for a positive theoretical influence of innovative/creative role models on CSE.

Social persuasion is enacted by external social agents who utilize persuasion and planning to convince a person that s/he possesses the abilities required for success (Bandura, 2004). Organizational researchers have typically used supervisors' expectations as an operational definition of social persuasion in the context of social cognitive theory (e.g., Eden, 1992; 2003). For example in the context of the CSE hypothesis, when an individual perceives higher creativity expectations from their supervisors, then the individual may reasonably infer that their supervisor has faith in their competence; as a result, the individual is persuaded to have a stronger sense of CSE. Correlational evidence has generally supported this treatment of supervisors' creative expectations as an antecedent of CSE (e.g., Choi, 2004; Tierney & Farmer, 2004, 2011). The theoretical influence of supervisors' creative expectations on innovative performance as mediated through CSE is interesting however because this hypothetical prediction diverges from the predictions of other motivational theories of innovative performance—a point that I will elaborate later in the paper.

Physical and emotional states theoretically provide information to individuals about their current capabilities. For example, feelings of tension and anxiety may signal a deficiency and temporarily reduce a person's self-efficacy (Bandura, 2004). In the context of CSE research, researchers have focused on the role of positive affective states (e.g., joy, enthusiasm, vigor, etc.) in influencing CSE (e.g., Tierney & Farmer, 2011). Although positive affective states are posited to increase creative performance across most extant theoretical paradigms (consistent with a robust body of empirical evidence; for meta-analysis, see Baas, De Dreu, & Nijstad, 2008), social cognitive theory suggests that positive affective states elicit selective recall of previous successes thereby increasing the saliency of one's self-efficacy (Bandura, 1986, 1997). Remaining consistent with the CSE hypothesis, social cognitive theory suggests that positive affective states positively influence innovative performance via the CSE construct. I am aware of no extant empirical studies that have examined the link between physical and emotional states and CSE, thus current arguments for this class of CSE antecedents rely purely on deductive reasoning.

Intrinsic Motivation Principle of Creativity

The intrinsic motivation principle of creativity states that intrinsic motivation is conducive to innovative performance (Amabile, 1990). Intrinsic motivation refers to the drive to do something for subjectively enjoyable reasons (e.g., enjoyment, interest, personal challenge, etc.). Applying concepts from self-determination theory (also referred to as cognitive evaluation theory, Deci & Ryan, 1985), Amabile and students (e.g., Amabile, 1985) first transferred intrinsic motivational hypotheses to predicting creative performance.

Amabile (1990) has suggested that the consistent body of experimental and correlational evidence supporting an intrinsic motivation hypothesis has earned this explanation the title 'principle'. Meta-analytic correlation estimates support this assertion (meta-analytic correlation estimates between intrinsic motivation and innovative performance from Hammond, Neff, Farr, Schwall, & Zhao, 2011: 95% CI = .16, .32, 80% CV = .06, .43, $k = 16$, $n = 3417$). Moreover, experimental research results (e.g., Amabile, 1985) allow for strong causal inferences supporting the intrinsic motivation principle of creativity. Amabile (1985) experimentally induced intrinsic motivation among creative writers; the intrinsic motivation induction was associated with more creative writing responses compared to a control group. However, Amabile's (1985) study also demonstrated a more dramatic detrimental effect of extrinsic motivation on creative performance compared to the incremental effect of intrinsic motivation. This is important because extrinsic motivation is another important variable deduced from the same theoretical core as intrinsic motivation; however, the effect of extrinsic motivation on creative performance is a point of theoretical contention (Hennessey & Amabile, 2010).

Intrinsic motivation principle of creativity is deduced from self-determination theory. Research on self-determination, intrinsic motivation and extrinsic motivation served as the basis for Amabile's original thinking on the intrinsic motivation principle of creativity (Amabile, 1990). Extrinsic motivation refers to the drive to do something as a result of external pressures (e.g., expected reward, expected evaluation, surveillance, competition, etc.). The construct of extrinsic motivation is often treated as a corollary of low intrinsic motivation; that is, extrinsic motivation is thought to be detrimental in cases where intrinsic motivation is beneficial.

When people feel like they are being controlled by extrinsic pressures, self-determination is thought to be undermined reducing intrinsic motivation (Deci & Ryan, 2002, Ryan & Deci, 2000). This hydraulic conceptualization of intrinsic and extrinsic motivation served as an early assumption of the intrinsic motivation principle of creativity. Supporting this assumption, experimental research indicates that a variety of external pressures are associated with decrements in creative performance (e.g., expected reward: Amabile, Hennessey, & Grossman, 1986; expected evaluation: Amabile, 1979; Hennessey, 1989; surveillance: Amabile, Goldfarb, & Brackfield, 1990; competition: Amabile, 1982).

In the 1990s, the journal *American Psychologist* published a series of debate-style articles in which Eisenberger and Cameron (1996) criticized the categorical assumption that extrinsic rewards (as a specific antecedent of extrinsic motivation) decrease creative performance. Although proponents of the intrinsic motivation principle of creativity continue to highlight evidence supporting the benefits of intrinsic motivation and the detriments of extrinsic motivation on creative performance (e.g., Hennessey & Amabile, 1998), the theoretical core of the intrinsic motivation principle of creativity appears to be under revision (Hennessey & Amabile, 2010). While the intrinsic motivation principle of creativity has yet to be falsified, the possibility exists that some extrinsic pressures (viz., expected rewards) can increase intrinsic motivation and in turn increase creative performance (Eisenberger & Shanock, 2003). If traditionally termed 'extrinsic

motivators' can in fact increase intrinsic motivation, then model revision is necessary to explain why extrinsic pressures sometimes benefit a person's creative performance (via intrinsic motivation) while other extrinsic pressures decrease the same. Alternatively, model revision may be necessary if extrinsic motivation were found to benefit innovative performance as is suggested by meta-analytic correlation estimates (Hammond et al., 2011 meta-analysis: 95% CI = .08, .19, 80% CV = .14, .14, $k = 8$, $n = 1319$).

Currently, the intrinsic motivation principle of creativity has been supported by experimental evidence. However, the theoretical core of this explanation has been called into question. Namely, the intrinsic motivation principle of creativity does not clearly specify why some extrinsic motivational antecedents may increase intrinsic motivation. This point of theoretical contention has been highlighted most recently by researchers operating in the behaviorist tradition, toward which I turn in the next section.

Reward for Creativity Hypothesis

The reward for creativity hypothesis states that rewards for creative performance increase creative performance (e.g., Eisenberger & Cameron, 1996). In the context of this hypothesis, rewards refer to benefits received (e.g., money) that are intended to increase the likelihood of a behavior occurring. Behaviorist theories assume that any discriminable class of behavior (including innovative performance) can be strengthened via reinforcement (Maltzman, 1960; Pryor, Haag, & O'Reilly, 1969; Skinner, 1953; Winston & Baker, 1985). Applying behaviorist reinforcement principles to creative performance, Eisenberger and Cameron (1996) brought the reward for creativity hypothesis to salience in a literature review that criticized the previously discussed intrinsic motivation principle of creativity.

In the debate over the effect of rewards on intrinsic motivation (e.g., Eisenberger & Cameron, 1996; Hennessey & Amabile, 1998), proponents of the reward for creativity hypothesis reviewed the evidence linking rewards to intrinsic motivation and found variable support for the hypothesis that rewards decrease intrinsic motivation. More specifically, Eisenberger and Cameron (1996) concluded that rewards can actually benefit intrinsic motivation in a way that is consistent with behaviorist principles of reinforcement. This point is important because Eisenberger and Cameron (1996) extended their argument by hypothesizing that extrinsic rewards can be used to increase creative performance (in disagreement with the intrinsic motivation principle of creativity). According to Eisenberger and Cameron (1996), expected rewards increase creative performance under the following conditions: 1) when expected rewards are tangible and contingent upon creative performance, and 2) when verbal rewards are given. This first condition (expected tangible performance contingent rewards) contradicts the intrinsic motivation principle of creativity. This second condition (verbal rewards) is less contradictory with self-determination theory because in both natural and laboratory settings, verbal rewards are often nonjudgmental and informational and thought to be less of a threat to self-determination (Eisenberger & Cameron, 1996). Previous research also indicates that expected rewards should not be too salient (Eisenberger & Selbst, 1994). *Salience* may include the rewards' magnitude or physical proximity (e.g., Eisenberger & Selbst, 1994), and *too salient* implies that the rewards' salience is dominating attention and interfering with attention devoted to creative tasks

(Balsam & Bondy, 1983; Eisenberger & Selbst, 1994).

Some experimental evidence supports the reward for creativity hypothesis (e.g., Eisenberger & Selbst, 1994). To the extent that rewards are synonymous with the extrinsic pressures defined in self-determination theory, correlational evidence also supports the reward for creativity hypothesis (Hammond et al., 2011). However, proponents of the reward for creativity hypothesis have had to explain the contradictory experimental evidence associated with the intrinsic motivation principle (i.e., evidence suggesting that extrinsic rewards decrease creative performance). Eisenberger and Cameron (1996) have suggested that learned industriousness theory (Eisenberger, 1992) provides part of a plausible ‘two-factor interpretation’ for this seemingly contradictory evidence.

Reward for creativity hypothesis is consistent with a two-part model including learned industriousness theory. Eisenberger and Cameron (1996) claim that the variable effects of extrinsic rewards on creative performance can be interpreted within a two-part model which includes an attention-eliciting part and a part derived from learned industriousness theory (Eisenberger, 1992). Opponents of the reward for creativity hypothesis have suggested that the attention-eliciting effects of extrinsic rewards are a plausible reason for why extrinsic rewards decrease creative performance (via distraction from the creative task). Eisenberger and Cameron (1996) contend that this explanation may be true when extrinsic rewards are highly salient. That is, reward salience seems to moderate the effect of expected tangible contingent rewards such that highly salient awards distract people from their creative task. Less salient rewards have the reinforcement effect predicted by the reward for creativity hypothesis, and learned industriousness theory is used to explain this motivational effect.

Learned industriousness theory (Eisenberger, 1992) extends previous theories of operant learning (e.g., Hull, 1943) by positing that rewards for high effort cause an organism to become less averse to high effort. Over time, a secondary reward value to the sensation of effort becomes generalized such that reinforced individuals are more likely to give high levels of effort across a variety of behavioral domains (i.e., the organism learns via reinforcement to be industrious). It is generally accepted that compared to more routinized types of performance, innovative performance requires greater levels of cognitive effort (effort: “an unpleasant sensation produced by the intense or repeated performance of any activity”, Eisenberger & Cameron, 1996, p. 1161). When applied to the reward for creativity hypothesis, learned industriousness theory suggests that extrinsic rewards can reinforce creative performance. Previously inconsistent study results can be accounted for by study designs in which subjects were rewarded for low effort or generic task performance. According to Eisenberger and Cameron’s (1996) theoretical position, it is not surprising for extrinsic rewards to decrease creative performance if non-creative behaviors are being reinforced. In order for creative performance to benefit from rewards, the rewards have to be contingent upon the high efforts associated with creative performance.

In this paper, I refer to Eisenberger and Cameron’s (1996) treatment of the reward for creativity hypothesis that is consistent with learned industriousness theory and the empirical evidence reviewed in the debate over extrinsic rewards and creativity

(discussed previously). This means that the hypothesis is slightly more specific than originally defined however. Specifically, Eisenberger and Cameron's (1996) reward for creativity hypothesis states that rewards for creative performance increase creative performance, but this effect is negated if the reward is too salient due to the attention-eliciting effects of the rewards. Although no theoretical specification has been offered for the threshold of reward salience that would negate the positive effects of rewards, Eisenberger and Selbst (1994) have operationalized salience in terms of whether or not the reward was in sight during task performance when the reward was not in sight the reward's salience seemed to be reduced sufficiently to allow for the reward for creativity effect to operate.

Theoretical Summary

The previous introduction describes three prominent motivational explanations of innovative performance and outlines the core theoretical assumptions and evidences supporting each explanation. When applied to motivational practices, such as rewarding creativity, the three explanations make distinct predictions that are not entirely consistent with one another. For example, the intrinsic motivation principle suggests that extrinsic reward expectations undermine self-determination and decrease innovative performance. Conversely, both the CSE hypothesis and the reward for creativity hypothesis suggest that extrinsic reward expectations can improve creative performance but under distinct circumstances and for distinct reasons. The CSE hypothesis assumes that expected rewards indicate a person's competence thus increasing CSE and in turn innovative performance. The rewards hypothesis suggests that the reinforcement value of the expected reward increases behavioral response; this hypothesis only informally specifies any mediating motivational construct. Thus, practical implications are substantively affected by the motivational hypotheses one uses in examining innovative performance. However, a systematic comparison of the three explanations is necessary in order to elucidate the ways in which the theories are comparable and to what degree the three explanations make incompatible predictions about the motivations for innovative performance.

Establishing Comparability between the Creative Self-efficacy Hypothesis, the Intrinsic Motivation Principle and the Reward for Creativity Hypothesis

In the following section, I attempt to establish the comparability of the CSE hypothesis, the intrinsic motivation principle and the reward for creativity hypothesis. I do so by following a systematic strategy suggested by Leavitt et al. (2010). Leavitt et al. (2010) developed this strategy based on the premise that organizational science has too much theory generation (Hambrick, 2007) driven by the questionable practice of null hypothesis testing (Meehl, 1978) and not enough theory pruning and strong inference (Platt, 1964). After reviewing empirical work in top tier OB and strategic management journals, Leavitt et al. (2010) recognized that a prerequisite to pitting theories against one another in empirical testing is to establish theory comparability.

The following section is organized around a discussion of the comparability of the three previously introduced motivational hypotheses for innovative performance by discussing each of the six questions laid out by Leavitt et al ("Establishing Comparability", pp. 649 – 654, 2010). For organizational purposes, I do not order my

responses in the same way as Leavitt et al. (2010) although I do address all six of the questions raised in their article: 1) Are the theories generalizable across subject type or context?; 2) Do the theories imply differential time frames between predictor and criteria?; 3) Are the constructs of interest described in reflective models or formative models?; 4) Do the differences in competing theories address issues of mediation versus moderation?; 5) Are equivalent terms and conditions specified within the theories?; 6) Do the theories of interest describe similar types of independent or dependent variables?

The Three Explanations are Comparable for Normal Adult Populations in Lab and Work Contexts

Leavitt et al. (2010) suggest that theories can either be highly constrained or more general with regards to subject type and context (Question 3, p. 653). Basically, it is unproductive to compare theories that are highly specific to explaining different classes of phenomenon. The three explanations in this paper are comparable with regards to subject populations and contexts. Social cognitive theory--from which the CSE hypothesis derives, self-determination theory—from which the intrinsic motivation principle of creativity derives, and learned industriousness theory—from which the reward for creativity hypothesis derives, all have been examined in normal adult populations in both the laboratory and in naturalistic work settings (e.g., O'Hara & Sternberg, 2001; Shin & Zhou, 2003; Strickland & Towler, 2010).

One historical note is that all three motivational hypotheses and their broader theories were originally developed in unique populations and contexts. For example, social cognitive theory was originally developed in the context of clinical therapy (Bandura, 2004), and comparative psychological research (i.e., animal behavior) supported early behaviorist theories (Eisenberger, 1992). However, all three hypotheses and their broader theories have since been generalized to comparable subjects and contexts (viz., normal adults in lab or work contexts).

The Three Explanations are Weak but Comparable with regards to Time Frames

Leavitt et al. (2010) suggest that theories can specify or imply some temporal frame between predictors and criteria (Question 5, p. 653). The three explanations in this paper only weakly imply time frames. Thus, while I consider the explanations comparable in this regard, I concede that theoretical time frames do not allow for specific theoretical competitions, so this is not an area for efficient theory pruning.

All three explanations specify causal motivational effects on innovative performance. Also, social cognitive theory, self-determination theory and learned industriousness theory's motivational effects have all been hypothesized to operate relatively immediately as evidenced by study designs that are generally no more than a couple of hours (e.g., Amabile, 1985; Bandura & Locke, 2003; Eisenberger & Selbst, 1994). For this reason, I am comfortable comparing the three explanations within the time frame of a couple of hours. However, this comparability is purely an assumption implied by previous investigations. None of the theories clearly specify how long it takes for motivation to affect innovative performance, nor do they specify how long it takes for antecedents of motivation to exert their influences.

The Three Explanations are Comparable on Construct Type for One of Two Assumptions

Leavitt et al. (2010) suggest that theoretical constructs can be measured

reflectively or formatively. Generally more comparable, reflective measures utilize operational indicators (usually items on a measure) that reflect an underlying construct. Studies on the CSE hypothesis and the intrinsic motivation principle of creativity have reported reflectively measured motivational constructs (e.g., Amabile, Hill, Hennessey, & Tighe, 1994; Tierney & Farmer, 2002). For the CSE hypothesis, creative self-efficacy is a unidimensional motivational construct that is commonly measured with a reliable set of reflective items developed by Tierney and Farmer (2002). For the intrinsic motivation principle of creativity, researchers (e.g., Amabile et al., 1994) have developed reliable sets of reflective items to measure both intrinsic motivation and extrinsic motivation.

Reflective measurement of the motivational construct(s) associated with the reward for creativity hypothesis is less obvious. One plausible reason is that researchers working in the behaviorist paradigm are traditionally interested only in the link between environmental stimuli and observable behavior, being principally unconcerned with the specification let alone the measurement of mental constructs (e.g., motivational constructs: Watson, 1913). If this traditional behaviorist assumption is adopted, then the reward for creativity hypothesis's motivational construct(s) is not comparable to the other two explanations. Under this traditional behaviorist assumption, the more defensible theoretical comparisons occur in the theoretical domains covering motivational antecedents (e.g., expected rewards).

However, an alternative assumption allows for the specification of a motivational construct, which I will call 'high effort', derived from learned industriousness theory. High effort describes the selection of a high effort level in response to reinforcement-contingency information; high effort then directly influences behavior. The specification of this motivational construct typifies a neobehaviorist assumption, which allows for the modeling of mental constructs despite their invisibility (Stevens, 1935). Eisenberger and Shannock (2003), in their attempt to identify common ground between the intrinsic motivation principle of creativity and the reward for creativity hypothesis, began to entertain the point that some motivational constructs like intrinsic motivation and effort (derived from learned industriousness theory) could be incorporated into a model of rewards and creative performance. If the more neobehaviorist assumption is adopted in modeling the reward for creativity hypothesis, then reflective measurement of the motivational construct 'high effort' is conceivable.

'High effort' has not been measured in empirical studies testing the reward for creativity hypothesis, so reflective measurement of this construct is currently undocumented. For this reason, I recognize that any attempts to falsify the reward for creativity hypothesis by pitting the motivational construct of 'high effort' against CSE and/or intrinsic and extrinsic motivation can legitimately be criticized on the grounds that the behaviorist explanation is misspecified. Nevertheless, empirical investigation must start somewhere, so I have deduced an extension of the reward for creativity hypothesis which can be explored alongside the competing CSE hypothesis and the intrinsic motivation principle of creativity. The first two competing hypotheses reflect the incompatibility between the unidimensional CSE construct and the bi-dimensional intrinsic/extrinsic motivation constructs.

H1_{CSE}: Increases in creative self-efficacy (CSE) cause increases in innovative

performance.

H1_{IMP}: Increases in intrinsic motivation cause increases in innovative performance while increases in extrinsic motivation cause decreases in innovative performance.

The reward for creativity hypothesis does not depend on the specification of a motivational construct. However, in order to explore the possibility that ‘high effort’ is the central motivational construct for the behaviorist explanation, I hypothesize the following.

H1_{RC}: The selection of high effort, as opposed to low effort, causes increases in innovative performance.

In summary, both the CSE hypothesis and the intrinsic motivation principle of creativity are comparable with regards to construct type (i.e., both specify reflectively modeled motivational constructs). Regarding the reward for creativity hypothesis, comparability depends on the assumption one adopts. The traditional behaviorist assumption would suggest that motivational construct type is irrelevant to understanding the effects of reward on behavior; what really matters are the antecedents to motivation (e.g., expected rewards). In this proposal, I explore a neobehaviorist assumption. The neobehaviorist assumption allows for the specification of a motivational construct which I have called ‘high effort’. I maintain that all three explanations are comparable with regard to construct type; however, I recognize that any data that reject the behaviorist explanation can be criticized on the grounds that the behaviorist explanation may be misspecified. For this reason, theory falsification may be more defensible in portions of the theoretical domains where incompatibilities are clearly specified. Motivational antecedents are one such area which I turn to in the next sections.

The Three Theoretical Domains Point to Critical Tests for Theory Pruning

This last section on comparability brings together discussions of three questions from Leavitt et al. (2010) because all three answers are closely related and point to critical tests for theory pruning. These last three questions relate to independent and dependent variables (Question 6, p. 654), mediation versus moderation (Question 1, p. 652) and the equivalence of theoretical terms (Question 2, p. 652). In brief, I argue that all three explanations are comparable because they all 1) address the same behavioral outcomes (i.e., innovative performance) and 2) address motivational models which specify mediations. More germane to theory pruning however, I also argue that while comparable, all three explanations are incompatible (i.e., they disagree) with respect to specific portions of their theoretical models.

All three explanations address the same dependent variable. Innovative performance is the same behavioral construct that serves as the dependent variable for all three motivational hypotheses examined in this proposal. While none of the three general theories are constrained to the outcome of innovative performance, all three theories have been applied to the outcome of innovative performance (O’Hara & Sternberg, 2001; Shin & Zhou, 2003; Strickland & Towler, 2010). My particular interest is in motivational models of innovative performance, and the primary reason these three hypotheses were chosen is because all three explanations are theoretically relevant and empirically prominent in the innovative performance literature (Hammond et al., 2011). The three

explanations are comparable across the dependent variable portions of their theoretical models (related to Question 6: Leavitt et al., 2010).

All three explanations describe motivational models but different mediating mechanisms. All three explanations predict proximal/direct motivational effects that influence innovative performance (related to Question 1: Leavitt et al. 2010), although each model describes different mediating mechanisms. The mediating mechanisms are clearly specified for both the CSE hypothesis and the intrinsic motivation principle of creativity. The social cognitive model describes four classes of motivational antecedents that exert their influence on behavior as mediated through the mechanism known as creative self-efficacy (Gist & Mitchell, 1992; Tierney & Farmer, 2011). The intrinsic motivation principle describes two broad classes of motivational antecedents that exert their influence on behavior as mediated through the dual motivational mechanism known as intrinsic and extrinsic motivation (Amabile, 1990). The reward for creativity hypothesis describes the reinforcement effects associated with operant conditioning (Eisenberger & Cameron, 1996; Eisenberger & Shanock, 2004) although the nature of that mediating construct is not clearly specified. In this proposal, I have called the mediating construct ‘high effort’ (see section “The Three Explanations are Comparable on Construct Type for One of Two Assumptions”). All three explanations describe three competing models for how environmental stimuli motivate innovative performance.

Within motivational research on innovative performance, the existence of three comparable mediation models signifies a maturing field of inquiry because proximal mediators allow for more parsimonious models that require fewer predictor variables (Leavitt et al., 2010). However, examination of the three explanations indicates that they do not yield the same understanding about how the mediators operate, which highlights an area in need of theory pruning. The CSE hypothesis specifies a unidimensional theoretical mediator (i.e., CSE) that operates on innovative performance positively: increases in CSE increase the likelihood of innovative performance (Tierney & Farmer, 2011). In contrast, the intrinsic motivation principle of creativity specifies a two dimensional theoretical mediator (i.e., intrinsic motivation and extrinsic motivation). Intrinsic motivation operates on innovative performance positively while extrinsic motivation is thought to undermine intrinsic motivation and decrease innovative performance (Amabile, 1990). The two dimensional intrinsic/extrinsic motivation construct is less parsimonious than the unidimensional CSE construct. Pitting the CSE mediator against the intrinsic/extrinsic mediator is an area that provides a critical test of these two hypotheses.

H2_{CSE}: The motivational effects of environmental stimuli on innovative performance are mediated through creative self-efficacy (CSE).

H2_{IMP}: The motivational effects of environmental stimuli on innovative performance are mediated through intrinsic motivation and extrinsic motivation.

The reward for creativity hypothesis does not rely on the specification of a motivational construct that mediates environmental stimuli and behavior. I have drawn upon learned industriousness theory to specify a plausible mediating mechanism known as ‘high effort’. According to Eisenberger’s (1992) description, reinforcement expectations signal the individual to provide an appropriate level of effort to achieve the

expected outcome. In the context of innovative performance behaviors, the appropriate level of effort is high effort (Eisenberger & Cameron, 1996). Thus, in order for the reward for creativity hypothesis to operate, rewards must signal the individual to give high effort which then influences innovative performance. Eisenberger and Cameron (1996) predicted that sometimes environmental stimuli signal the individual to give low effort resulting in more standard/non-innovative forms of performance.

H2_{RC}: The motivational effects of environmental stimuli on innovative performance are mediated through high effort.

This second set of hypotheses like the first set of hypotheses share a flaw, neither set can definitively falsify the reward for creativity model. This is due to the ambiguous specification of the mediating mechanism. In order to provide simultaneous critical tests of all three models, one must examine the antecedent portions of the models in which clear incompatibilities are predicted.

Antecedents to motivation point to areas for theoretical competition. When considered within their broader theories, all three explanations suggest distinct classes of motivational antecedents that may need pruning. Social cognitive theory's application to the CSE hypothesis specifies four classes of antecedents to CSE: creative mastery experiences, creative role models, social persuasion to perform creatively and physical and emotional states. Self-determination theory's application to the intrinsic motivation principle of creativity specifies two classes of antecedents known as task stimuli. Intrinsic task stimuli (e.g., personal interest and challenge: Hennessey, Amabile & Martinage, 1989) induce intrinsic motivation which is associated with an individual's belief that the choice to expend effort on a task comes from within the self. Extrinsic task stimuli (e.g., expected reward: Amabile, Hennessey, & Grossman, 1986; Hennessey, 1985; expected evaluation: Amabile, 1979; Hennessey, 1989; surveillance: Amabile, Goldfarb, & Brackfield, 1990; competition: Amabile, 1982) induce extrinsic motivation which is associated with an individual's belief that the choice to expend effort is being controlled by an external source. Learned industriousness theory's application to the reward for creativity hypothesis specifies reinforcement contingencies as the only class of antecedents to motivation and motivated behavior. Expected rewards often serve as the operational method used to motivate behavior within studies on the reward for creativity hypothesis (e.g., Eisenberger & Aselage, 2009).

A brief review of the three motivational models examined in this proposal reveals that the motivational antecedents are classified in markedly different ways. The social cognitive model appears the most complex covering a range of personal and social experiences with its four classes of CSE antecedents (Gist & Mitchell, 1992; Tierney & Farmer, 2011). The self-determination model classifies motivational antecedents into the two rather broad categories of task stimuli (Amabile, 1960). On the parsimonious extreme, the learned industriousness model only posits one class of antecedents and gives a highly specific description of the type of rewards that motivate innovative performance (viz., verbal rewards and low salience, expected, tangible, contingent rewards: Eisenberger & Cameron, 1996). The differences across models may prompt a reasonable observer to expect that each model contributes some unique explanation to a more comprehensive motivational model of innovative performance. After all, some portions

of the three models agree (e.g., all three models predict that verbal rewards should not decrease innovative performance although the explanations are different). However, other portions of the three models make clearly contradictory predictions, and it is by ruling out the contradictory claims that I hope to arrive at a more concise motivational theory of innovative performance.

The effect of expected tangible rewards on innovative performance provides a clear point of contradiction between the three models. Conceptually, this contradiction refers to the effects of a specific type of motivational antecedent on innovative performance. This is important because in the previous two sets of hypotheses, I have shown how the reward for creativity hypothesis cannot be falsified definitively by examining contradictions in the motivational constructs that mediate antecedents and behavior. All three models can be falsified definitively by examining the effects of this specific type of motivational antecedent on innovative performance.

Are Expected Rewards a Vote of Confidence, External Control or Behavioral Reinforcement?

The reward for creativity hypothesis and learned industriousness theory predict that low salience expected tangible rewards² that are *contingent* upon innovative performance motivate innovative performance (H3_{RC}). The reward for creativity hypothesis would be falsified if *contingent* rewards were to decrease innovative performance as is predicted by the self-determination theoretical model. The reward for creativity hypothesis would also be falsified if *non-contingent* rewards (i.e., rewards given for any level of effort) were to motivate innovative performance as is predicted by the social cognitive theoretical model. According to the reward for creativity hypothesis, *non-contingent* rewards most likely are interpreted as reinforcing generic behaviors of minimal effort thus motivating non-innovative performance as opposed to innovative performance. Depending on how divisively non-innovative efforts interfere with innovative efforts (perhaps by consuming time on task), the effect of *non-contingent* rewards on innovative performance may be, in the worst case, negative or in the best case neutral.

The CSE hypothesis predicts that rewards, both *contingent* and *non-contingent*, act as a form of social persuasion (e.g., Tierney & Farmer, 2011) thus motivating innovative performance (H3_{CSE}). According to the social persuasion explanation, assigning the innovative task conveys a belief in the assignee's innovative abilities. The assigner's competency beliefs positively influence the assignee's creative self-efficacy. In this study, the task is to perform innovatively in response to a variety of problems. According to social cognitive theory, assignment to the innovative task should set expectations to be innovative and convey competency beliefs regardless of reward contingencies (Tierney & Farmer, 2011). Thus, the CSE hypothesis predicts that, independently of reward contingencies, task assignments requiring innovation should motivate innovative performance as mediated via CSE (Tierney & Farmer, 2011). The

² Hereafter I will use the term 'rewards' referring to expected tangible rewards of low salience (i.e., out of sight during task performance).

CSE hypothesis could be falsified if *non-contingent* and *contingent* rewards show differential effects, as predicted by the reward for creativity hypothesis, or negative effects as predicted by the intrinsic motivation principle of creativity.

The intrinsic motivation principle of creativity predicts that rewards, both *contingent* and *non-contingent*, represent external task stimuli which increase extrinsic motivation and undermine intrinsic motivation thus decreasing innovative performance (H3_{IMP}). The intrinsic motivation principle of creativity would be falsified if rewards (either *contingent* or *non-contingent*) were to increase innovative performance as would be predicted by the other two competing explanations.

H3_{CSE}: Rewards, both contingent and non-contingent, operate similarly as forms of social persuasion increasing CSE which increases innovative performance.

H3_{IMP}: Rewards, both contingent and non-contingent, decrease intrinsic motivation which decreases innovative performance.

H3_{RC}: Contingent rewards increase innovative performance while non-contingent rewards either decrease innovative performance or have no effect.

References

- Amabile, T. M. (1979). Effects of external evaluation on artistic creativity. *Journal of Personality and Social Psychology*, 37, 221–233.
- Amabile, T. M. (1982). Children's artistic creativity: Detrimental effects of competition in a field setting. *Personality and Social Psychology Bulletin*, 8, 573-578.
- Amabile, T. M. (1985). Motivation and creativity: effects of motivational orientation on creative writers." *Journal of Personality and Social Psychology*, 48, 2, 393-399.
- Amabile, T. M. (1990). Within you, without you: the social psychology of creativity, and beyond. In M. A. Runco & R. S. Albert (Eds), *Theories of Creativity*, pp. 61–91, Sage: California, USA.
- Amabile, T. M., Goldfarb, P., & Brackfield, S. C. (1990). Social influences on creativity: Evaluation, coaction, and surveillance. *Creativity Research Journal*, 3, 6–21.
- Amabile, T. M., Hennessey, B. A., & Grossman, B. S. (1986). Social influences on creativity: The effects of contracted-for reward. *Journal of Personality and Social Psychology*, 50, 14 -23.
- Amabile, T. M., Hill, K. G., Hennessey, B.A., Tighe, E. M. (1994). The Work Preference Inventory: assessing intrinsic and extrinsic motivational orientations. *Journal of Personal.and Social Psychology*, 66, 950–67.
- Anderson, N., De Dreu, C. K. W., & Nijstad, B. A. (2004). The routinization of innovation research: a constructively critical review of the state-of-the-science. *Journal of Organizational Behavior*, 25, 147-173.
- Baas, M., De Dreu, C. K. W., & Nijstad, B. A. (2008). A meta-analysis of 25 years of mood-creativity research: hedonic tone, activation, or regulatory focus? *Psychological Bulletin*, 134, 6, 779-806.
- Balsam, P. D., & Bondy, A. S. (1983). The negative side effects of reward. *Journal of Applied Behavior Analysis*, 16, 283-296.

- Bandura, A. (1986). *Social foundations of thought and action: a social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: Freeman.
- Bandura, A. (2004). Swimming against the mainstream: the early years from chilly tributary to transformative mainstream. *Behaviour Research and Therapy*, *42*, 613-630.
- Bandura, A., & Locke, E. A. (2003). Negative self-efficacy and goal effects revisited. *Journal of Applied Psychology*, *88*, 87-99.
- Barnett, R. C., & Brennan, R. T. (1997). Change in job conditions, change in psychological distress, and gender: A longitudinal study of dualearner couples. *Journal of Organizational Behavior*, *18*, 253-274.
- Carmeli, A., & Schaubroeck, J. (2007). The influence of leaders' and other referents; normative expectations on individual involvement in creative work. *The Leadership Quarterly*, *18*, 35-48.
- Chan, D. (2002). Longitudinal modeling. In S. G. Rogelberg (Ed.), *Handbook of research methods in industrial and organizational psychology* (pp. 412-430). Malden, MA: Blackwell.
- Choi, J. N. (2004). Individual and contextual predictors of creative performance: The mediating role of psychological processes. *Creativity Research Journal*, *16*, 187-199.
- Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York: Plenum Press.
- Deci, E. L., Ryan, R. M. (2002). *Handbook of Self-Determination Research*. Rochester, NY: Univ. Rochester Press.
- Eden, D. (1992). Leadership and expectations: Pygmalion effects and other self-fulfilling prophecies in organizations. *Leadership Quarterly*, *3*, 271-305.
- Eden, D. (2003). Self-fulfilling prophecies in organizations. In J. Greenberg (Ed.), *Organizational behavior: The state of the science* (2nd ed., pp. 91-122). Mahwah, NJ: Erlbaum.
- Eisenberger, R. (1992). Learned industriousness. *Psychological Review*, *99*, 248-267.
- Eisenberger, R. & Aselage, J. (2009). Incremental effects of reward on experienced

- performance pressure: positive outcomes for intrinsic interest and creativity. *Journal of Organizational Behavior*, 30, 95-117.
- Eisenberger, R. & Cameron, J. (1996). Deterimental effects of reward: reality or myth? *American Psychologist*, 51, 11, 1153-1166.
- Eisenberger, R., & Rhoades, L. (2001). Incremental effects of reward on creativity. *Journal of Personality and Social Psychology*, 81, 728–741.
- Eisenberger, R., & Selbst, M. (1994). Does reward increase or decrease creativity? *Journal of Personality and Social Psychology*, 66, 1116–1127.
- Eisenberger, R. & Shanock, L. (2003). Rewards, intrinsic motivation, and creativity: a case study of conceptual and methodological isolation. *Creativity Research Journal*, 15, 2&3, 121-130.
- Farmer, S. M., Tierney, P., & Kung-McIntyre, K. (2003). Employee creativity in Taiwan: An application of role identity theory. *Academy of Management Journal*, 46, 618–630.
- Frese, M., Teng, E., & Wijnen, C. J. D. (1999). Helping to improve suggestion systems: predictors of making suggestions in companies. *Journal of Organizational Behavior*, 20, 1139-1155.
- Galton, F. (1869). *Hereditary genius: An inquiry into its laws and consequences*. London: Macmillan.
- Galton, F. (1874). *English men of science: Their nature and nurture*. London: Macmillan.
- George, J. M. & Zhou, J. (2002). Understanding when bad moods foster creativity and good ones don't: the role of context and clarity of feelings. *Journal of Applied Psychology*, 87, 4, 687-697.
- Gist, M. E. (1989). The influence of training method on self-efficacy and idea generation among managers. *Personnel Psychology*, 42, 787-805.
- Gist, M. E., & Mitchell, T. R. (1992). Self-efficacy: A theoretical analysis of its determinants and malleability. *Academy of Management Review*, 17, 183–211.
- Gong, Y., Huang, J., & Farh, J. (2009). Employee learning orientation, transformational leadership, and employee creativity: The mediating role of creative self-efficacy. *Academy of Management Journal*, 52, 765–778.
- Goodman, J. S., & Blum, T. C. (1996). Assessing the non-random sampling effects of

- subject attrition in longitudinal research. *Journal of Management*, 22, 627–652.
- Hambrick, D. C. (2007). The field of management's devotion to theory: Too much of a good thing? *Academy of Management Journal*, 50, 1346-1352.
- Hammond, M. M., Neff, N. L., Farr, J. L., Schwall, A. R., & Zhao, X. (2011). Predictors of individual-level innovation at work: a meta-analysis. *Psychology of Aesthetics, Creativity, and the Arts*, 5, 1, 90-105.
- Hawking, S. W. (2001). *The Universe in a nutshell*. New York, NY: Bantam Books.
- Hennessey, B.A. (1989). The effect of extrinsic constraints on children's creativity while using a computer. *Creativity Research Journal*, 2, 151-168.
- Hennessey, B. A., Amabile, T. M. (1998). Reality, intrinsic motivation, and creativity. *American Psychologist*, 53, 674–75.
- Hennessey, B. A. & Amabile, T. M. (2010). Creativity. *Annual Review of Psychology*, 61, 569-598.
- Hennessey, B. A., T. M. Amabile, and M. Martinage. (1989). Immunizing Children Against the Negative Effects of Reward." *Contemporary Educational Psychology*, 14, 3, 212-227.
- Hull, C. L. (1943). *Principles of behavior*. New York: Appleton-Century-Crofts.
- Ireland, R. D. & Hitt, M. A. (1999). Achieving and maintaining strategic competitiveness in the 21st century: the role of strategic leadership. *The Academy of Management Executive*, 13, 1, 43-57.
- Jaussi, K. S., & Dionne, S. D. (2003). Leading for creativity: The role of unconventional leader behavior. *Leadership Quarterly*, 14, 475–498.
- Jaussi, K. S., Randel, A. E., & Dionne, S. D. (2007). I am, I think I can, and I do: the role of personal identity, self-efficacy, and cross-application of experiences in creativity at work. *Creativity Research Journal*, 19, 2-3, 247-258.
- Katz, D., & Kahn, R. L. (1978). *The social psychology of organizations*. New York, NY: Wiley.
- Leavitt, K., Mitchell, T. R., & Peterson, J. (2010). Theory pruning: strategies to reduce our dense theoretical landscape. *Organizational Research Methods*, 13, 644-667.
- Maltzman, I. (1960). On the training of originality. *Psychological Review*, 67, 229-242.

- Meehl, P. E. (1978). Theoretical risks and tabular asterisks – Karl, Ronald, and Slow progress of soft psychology. *Journal of Consulting and Clinical Psychology, 46*, 806-834.
- O'Hara, L. A., Sternberg, R. J. (2001). It doesn't hurt to ask: effects of instructions to be creative, practical, or analytical on essay-writing performance and their interaction with students' thinking styles. *Creat. Res. J., 13*, 197–210.
- O'Reilly, C. A., Chatman, J., & Caldwell, D. F. (1991). People and organizational culture: a profile comparison approach to assessing person–organization fit. *Academy of Management Journal, 14*, 3, 487–516.
- Pitts, S. C., West, S. G., & Tein, J.-Y. (1996). Longitudinal measurement models in evaluation research: Examining stability and change. *Evaluation and Program Planning, 19*, 333–350.
- Platt, J. R. (1964). Strong inference – Certain systematic methods of scientific thinking may produce much more rapid progress than others. *Science, 146*, 347-353.
- Popper, K. (2002). *The logic of scientific discovery*. New York: Routledge. (Original work published 1935).
- Preacher, K. J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior Research Methods, Instruments, & Computers, 36*, 717-731.
- Pryor, K. W., Haag, R., & O'Reilly, J. (1969). The creative porpoise: Training for novel behavior. *Journal of the Experimental Analysis of Behavior, 12*, 653-661.
- Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods* (2nd ed.). Thousand Oaks, CA: Sage.
- Rosing, K., Frese, M., & Bausch, A. (2011). Explaining the heterogeneity of the leadership-innovation relationship: Ambidextrous leadership. *The Leadership Quarterly, 22*, 956 – 974.
- Ryan, R. M., Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*, 68–78.
- Schumpeter, J. (1942). *Capitalism, Socialism, and Democracy*. Harper and Row, New York: NY.

- Seyba, M. E. (1984). *Imaging: A different way of thinking*. Hawthorne, NJ: Educational Impressions.
- Shalley, C.E. & Perry-Smith, J.E. (2001). Effects of social-psychological factors on creative performance: The role of informational and controlling expected evaluation and modeling experience. *Organizational Behavior and Human Decision Processes*, *84*, 1-22.
- Shalley, C. E., Zhou, J., & Oldham, G. R. (2004). The effects of personal and contextual characteristics on creativity: Where should we go from here? *Journal of Management*, *30*, 933–958.
- Shin, S. J., & Zhou, J. (2003). Transformational leadership conservation, and creativity: evidence from Korea. *Academy of Management Journal*, *46*, 6, 703-714.
- Shrout, P. E., & Bolger, N. (2002). Mediation in experimental and nonexperimental studies: New procedures and recommendations. *Psychological Methods*, *7*, 422-445.
- Skinner, B. F. (1953). *Science and human behavior*. New York: Macmillan.
- Simonton, D. K. (1990). History, Chemistry, Psychology, and Genius: An Intellectual Autobiography of Historiometry. In M. A. Runco & R. S. Albert (Eds), *Theories of Creativity*, pp. 92–115, Sage: California, USA.
- Singer, J. D., & Willett, J. B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence*. New York, NY: Oxford University Press.
- Stevens, S. S. (1935). The operational definition of psychological concepts. *Psychological Review*, *42*, 517-527.
- Strickland, S. & Towler, A. (2011). Correlates of creative behavior: the role of leadership and personal factors. *Canadian Journal of Administrative Sciences*, *28*, 41-51.
- Tierney, P., & Farmer, S. M. (2002). Creative self-efficacy: Potential antecedents and relationship to creative performance. *Academy of Management Journal*, *45*, 1137–1148.
- Tierney, P., & Farmer, S. M. (2004). The Pygmalion process and employee creativity. *Journal of Management*, *30*, 413– 432.
- Tierney, P. & Farmer, S. M. (2011). Creative self-efficacy development and creative performance over time. *Journal of Applied Psychology*, *96*, 2, 277-293.

- Van de Ven, A. H. (1986). Central problems in the management of innovation. *Management Science*, 32, 5, 590 – 607.
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, 54, 1063-1070.
- Watson, J. B. (1913). Psychology as the behaviorist views it. *Psychological Review*, 20, 158-177.
- West, M.A., and Farr, J.L. (1990) Innovation at work. In M.A. West and J.L. Farr (Eds), *Innovation and creativity at work: Psychological and organizational strategies* (pp. 3–13). Chichester, England: Wiley.
- Weiner, B. (1985). An attributional theory of achievement, motivation and emotion. *Psychological Review*, 92, 548-573.
- Winston, A. S., & Baker, J. E. (1985). Behavior analytic studies of creativity: a critical review. *Behavior Analyst*, 8, 191-205.
- Wood, R. E., Goodman, J. S., Beckmann, N., & Cook, A. (2008). Mediation testing in management research: A review and proposals. *Organizational Research Methods*, 11, 2, 270-295.
- Woodman, R. W., Sawyer, J. E., & Griffin, R. W. (1993). Toward a theory of organizational creativity. *Academy of Management Review*, 18, 293–321.
- Yerkes, R. M., & Dodson, J. D. (1908). The relation of strength of stimulus to rapidity of habit formation. *Journal of Comparative Neurology and Psychology*, 18, 459–482.
- Zhou, J. (2003). When the presence of creative coworkers is related to creativity: role of supervisor close monitoring, developmental feedback, and creative personality. *Journal of Applied Psychology*, 88, 3, 413-422.

Curriculum Vitae

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