2007

The impact of reward power on creativity: Does it depend on the nature of the reward?

Edward Rickamer Hoover
University of South Florida

The Impact of Reward Power on Creativity:

Does it Depend on the Nature of the Reward?

by

Edward Rickamer Hoover

A thesis submitted in partial fulfillment
of the requirements for a degree of
Master of Arts
Department of Psychology
College of Arts and Science
University of South Florida

Major Professor: Edward Levine, Ph.D.
Joseph Vandello, Ph.D.
Judith Bryant; Ph.D.

Date of Approval:
December 11, 2006

Keywords: Motivation, Cognitive Evaluation Theory, Social Power, Compensation, Remote Associate Test

Table of Contents

List of Tables

List of Figures

The Impact of Reward Power on Creativity:

Does it Depend on the Nature of the Reward?

Edward Rickamer Hoover

ABSTRACT

This experiment investigated the influence of reward property and reward power on creative performance. It was hypothesized that the magnitude of reward power would moderate the relationship between reward property and creativity. Fifty undergraduate students (45 females, 5 males, $\overline{X}$ *age* = 20.72 years, *SD age* = 4 years) participated. The experimental design was reward power ($0.00, $0.50, or $2.00 per trial) x reward property (informational vs. controlling undertones in the script) x trials (5). Results demonstrated a positive correlation between intrinsic motivation and creative performance (r = .411, p = .03, n = 50). Hypotheses concerning the moderating influence of reward power and reward property on creative performance were not supported. However, this experiment replicated past research demonstrating that intrinsic motivation facilitates creativity.

The Impact of Reward Power on Creativity:

Does it Depend on the Nature of the Reward?

Creativity is an important psychological concept to examine because it has practical implications for education, research, and work settings (Barron, 1965; Eisenberger & Rhoades, 2001; Parnes, 1967). Students who approach assignments creatively are more likely to become active, self-directed learners (Torrance, 1965). Research discoveries by scientists such as Einstein, Feynman, von Neumann, and Szilard arose, in part, through their persistent application of creative thought (Clark, 1972; Gleick, 1992; Lanouette, 1992; Macrae, 1992). In the workplace, creativity facilitates long-term productivity and innovation (Galbraith, 1982; Smeltz & Cross, 1984). Innovation helps to alleviate problems caused by downsizing and allows organizations to adapt to changing markets, enhancing their global competitiveness (James, Clark, & Cropanzano, 1999; Nonaka, 1991). Employees who deal with business problems innovatively are more likely to contribute to the success of the organization (George & Brief, 1992). A number of organizations acknowledge the benefits of creativity by offering employees monetary incentives for creative suggestions leading to increased productivity and/or reduced costs (Edwards, 1989; Nelson, 1994). The impact of creativity on individual (Puccio, Talbot, & Joniak, 2000), team (Jackson & Ruderman, 1995), and organizational (Oldham & Cummings, 1996) productivity can be substantial. Thus, efforts to understand, control, and facilitate creativity represent an important contribution to scientific research.

The purpose of this experiment was to examine reward power's effect on creativity. Past research on the topic is limited and has failed to reveal any relationship between the two constructs. However, it is possible the apparent lack of relationship is due to an inadequate conceptualization of reward power. By conceptualizing the construct in terms of controlling and information properties, researchers should be better able to understand reward power's effect on creativity.

Creativity is a heuristic cognitive process that results in a novel, useful, and socially agreed upon idea, product, or procedure (Amabile, 1988; Amabile, Conti, Coon, Lazenby, & Herron, 1996; Guilford, 1968; Hennessey & Amabile, 1998; Maltzman, 1960; Shalley, 1991; Stein, 1974; Stokes, 1999; Wallach & Kogan, 1965; Winston & Baker, 1985; Woodman, Sawyer, & Griffin, 1993). Fundamental to the definition of creativity is the concept of novelty, which differentiates between conventionality and creativity. A creative output must also be useful for or relevant to a specific situation. A potentially creative output not in context may be viewed as bizarre or odd rather than creative. Social agreement allows individuals to discriminate between what is creative and what is merely statistically uncommon (Medina, 2000).

In addition to being useful or relevant, creativity must also be goal directed (James, Clark, & Cropanzano, 1999). Goal-directedness helps distinguish between what is creative and what others perceive as creative. For instance, an employee who comes up with a creative solution to a business problem by pure luck or chance may be perceived as creative when in actuality is not.

Some researchers attempt to measure creativity through subjective scales such as "usefulness", "originality", and "creativity" for storytelling, poem construction, circle

completion, and collage construction tasks (Amabile, 1979; Hennessey, 1989; Shalley & Oldham, 1997). Others have operationalized creativity as divergent thinking (Guilford, 1968; Kruglanski, Friedman, & Zeevi, 1971; Runco, 1991; Ruscio, Whitney, & Amabile, 1998). Divergent thinking involves the development of multiple solutions to an open-ended problem (Guilford, 1968; Runco, 1991; Winston & Baker, 1985). Researchers in this area typically attempt to measure creativity more objectively through indices such as flexibility (number of categories of responses) and originality (statistically uncommon responses) (Torrance, 1965).

Amabile (1983) described creativity as being composed of domain- relevant skills, creativity- relevant skills, and task motivation. Domain-relevant skills include the factual knowledge, technical skills, and special talents for a specific domain. Creativity-relevant skills consist of cognitive thinking styles, the use of heuristics for generating novel ideas, and a work style conducive to creativity. Task motivation involves one's attitude towards the task and one's motivation for undertaking the task. Amabile (1983) also outlined the cognitive process underlying creativity. In this model, task motivation is responsible for initiating and maintaining creativity. Domain-relevant skills are the materials that are drawn upon, while creativity-relevant skills influence the way the procedure takes place. Amabile (1988) maintains that task motivation is the most important component to study, since it can compensate for deficient domain- and creativity- relevant skills.

Motivation is any psychological and/or physiological factors within an organism or an external reinforcer that provides direction, intensity, and persistence to behavior (Kanter, 1990). Motivation can be either extrinsic or intrinsic. Extrinsic motivation is

the desire for, or the desire to avoid, stimuli or events outside the individual. Amabile (1988) viewed extrinsic motivation as one form of extrinsic constraint. Extrinsic constraints are non-essential task features introduced by the social environment to control performance. Examples of extrinsic constraints include evaluation, surveillance, restricted freedom, competition, and rewards.

Intrinsic motivation is an individual's innate drive for competency and self-determination (Deci, 1975). White (1959) states that individuals have an intrinsic need to effectively manipulate their environment. De Charms (1968) added that individuals strive for self-determination. By effectively mastering their environment, individuals increase their autonomy, thus gravitating towards self-determined behavior.

The intrinsic motivation principal of creativity posits that intrinsically motivated individuals will be more creative than extrinsically motivated individuals (Amabile, 1988). For instance, extremely desirable extrinsic rewards may distract the individual from the task. Lepper, Greene, and Nisbett (1973) proposed the overjustification hypothesis, which states that when an intrinsically motivated individual is extrinsically rewarded for a task the individual may come to see the task as merely a means to an extrinsic end. Individuals working towards an extrinsic end are more likely to think algorithmically, which is often rewarded in society, than heuristically, which is necessary for creative performance.

Medina (2000) noted that, because innate abilities and personality traits are relatively stable, social variables that may influence creativity should be examined extensively. There are a number of social environmental factors theorized to influence the creative process. Oldham (2003) suggested that support from supervisors, co-

workers, family members, and friends leads to positive affect, which in turn facilitates creativity. Amabile, Conti, Coon, Lazenby, and Herron (1996) found that supervisor interaction could increase creativity through mechanisms of problem definition and goal clarity, while constructive challenge within a workgroup can increase intrinsic motivation, which in turn increases creativity. Ludwig (1992) took an even broader perspective on the issue and examined creativity in terms of culture. He concluded that the relationship between culture and creative expression is complex. Culture may affect creativity through a number of mechanisms, such as the availability of resources, and influences on which, how, and when individuals can be creative.

Another possible social variable is social power. Although often ignored in creativity research, social power is the foundation of leadership from which a leader derives the capacity to influence others (French & Raven, 1959; Hinkin & Schriesheim, 1989). French and Raven (1959) developed a taxonomy of five primary social power bases consisting of power obtained through rewards, expertise, coercion, legitimacy, and identification. They described these relationships in terms of a social agent's (*O*) influence over a person (*P*). Each power base varies in strength, range, and resistance depending on the source of power.

Historically, reward power has been, and still is, the most common power base within organizations (Medina, 2000). Reward power is the ability of *O* to influence *P* through the administration of outcomes with positive valences and the removal or decrease of outcomes with negative valences. The strength of reward power is a function of *P's* perception of the magnitude and probability of rewards that *O* can mediate for *P* (French & Raven, 1959).

Although most supervisors (*Os*) believe that reward power generally leads to an increase in intensity and persistence of work activities by subordinates (*Ps*), empirical research has been limited and has produced no conclusive results in the context of creative performance. In fact, only one study was located that bears directly on the issue. Medina (2000) examined how principals' (*Os'*) power base influenced primary and secondary grade teachers' (*Ps'*) motivation and creative performance. The findings demonstrated that referent and legitimate power bases were positively correlated with creativity, while expert power was negatively correlated. No relationship was found between reward or coercive power bases and creativity.

There are a number of plausible explanations for reward power's lack of relationship with creativity. First, Medina (2000) cautioned that her results might be due to the low reliability of the reward power subscale ($\alpha = .63$). Second, Medina (2000) cites principals' general lack of reward power. On a 5-point scale, principals were rated an average 2.38 ($SD = .80$), statistically lower than their ratings on any of the other power bases. Finally, it is proposed that French and Raven's (1959) conceptualization of reward power is inadequate.

French and Raven's (1959) construct of reward power is based on *O* administering outcomes with positive and removing outcomes with negative valences in order to influence *P's* behavior. These outcomes not only have controlling properties, but also informational and amotivational properties. Informational properties provide competency feedback, whereas amotivational properties represent incompetence (Deci, 1985). When a reward has salient controlling properties, the individual's perceived locus of causality (PLOC) changes from internal to external. This leads to an increase in

extrinsic motivation at the expense of intrinsic motivation. When a reward has salient informational properties, the individual feels competency in that area. Feelings of competency are reinforcing and increase intrinsic motivation. When a reward has salient amotivational properties, the individual feels incompetent at the task. This leads to decreased intrinsic motivation and eventually task disengagement. Amotivational properties have received little attention because they lead to unintentional responding and impersonal causation (Deci & Ryan, 1987; Medina, 2000). Therefore, rewards are not single property constructs, but rather complex constructs with multiple properties. A reward power construct that takes reward property differences into account may better explain variation in performance than French and Raven's (1959) reward power construct..

A way that one could incorporate reward property differences into reward power is by adopting a Cognitive Evaluation Theory (CET) framework. CET (Deci, 1971) posits that intrinsic motivation is a function of an individual's perceived autonomy and competency on a given task. Constraints meant to control behavior decrease intrinsic motivation, while information concerning competency increases intrinsic motivation. CET asserts that when controlling properties are more salient than informational properties, *P's* intrinsic motivation will decrease. Conversely, when informational properties are more salient than the controlling properties, *P's* intrinsic motivation will increase (Deci, 1975). Several meta-analyses have supported the idea that CET with controlling rewards negatively affects intrinsic motivation during free-choice periods (Cameron & Pierce, 1994; Rummel & Feinberg, 1988; Tang & Hall, 1995; Wiersema, 1992). This effect is amplified when rewards are expected and not contingent on

performance. However, different reward contingencies and operationalizations of intrinsic motivation have produced less consistent results (Cameron & Pierce, 1994; Tang & Hall, 1995; Wiersema, 1992).

There has been limited research on CET and creativity. Garczynski (1995) conducted two experiments that examined controlling and informational properties' influence on motivation and creative performance. In the first experiment, Garczynski (1995) examined controlling (competition vs. no competition) and informational properties (feedback vs. no feedback) on the Remote Associates Task (RAT). Participants in the competition with no feedback condition demonstrated less intrinsic motivation in a free-choice period than other conditions. There was no difference in creative performance between conditions. In the second experiment, Garczynski (1995) examined controlling (win vs. lose) and informational properties (feedback vs. no feedback) along with a control condition on the RAT. Participants in the lose with no feedback condition demonstrated less intrinsic motivation in a free-choice period than other conditions. Again, there was no difference in creative performance between conditions.

The primary finding from this research was that competition without positive informational feedback demonstrated lower intrinsic motivation than other conditions. However, there was no effect of intrinsic motivation on creative performance. One possible explanation is that the RAT is a closed-ended task. Garczynski (1995) speculated that an open-ended task, such as poem construction, would be more sensitive to differences in intrinsic motivation.

Another study, conducted by Shalley and Oldham (1997), examined how the informational and controlling properties of a competitive task influenced creative performance. The researchers utilized a 3 x 2 design that manipulated competition (do not compete, compete with others present, compete with absent others) and visibility (visible or non- visible to others) on an unusual uses task. Responses were scored according to the fluency, flexibility, and overall creativity of responses. Results provided mixed support for the CET framework. In general, fluency, flexibility, and creativity scores were higher for participants in informational salient conditions than control salient conditions. However, there were several inconsistent findings. Participants in the seemingly highest control salient condition (competition with others present and visible) demonstrated creativity levels similar to those in the no competition conditions. Furthermore, those participants in competition with non-present others, a seemingly high information condition, demonstrated low creativity. Shalley and Oldham (1997) speculated that the controlling and informational salience were insufficient to influence creativity.

By combining French and Raven's (1959) concept of reward power with Deci's (1971) CET framework, a new reward power framework is proposed that addresses past research difficulties. This framework posits that *O's* reward power is directly related to *O's* ability to utilize salient rewards in order to influence *P*. Salience can be manipulated through a number of mechanisms including valence, magnitude, proximity, and reinforcement schedule. When the controlling properties of reward are more salient than the informational properties, reward will decrease intrinsic motivation. Conversely, when the informational properties of reward are more salient than the controlling

properties, reward will increase intrinsic motivation. As the strength of reward power increases, so does the magnitude of the informational or controlling properties' effect on intrinsic motivation. According to intrinsic motivation principal of creativity, as intrinsic motivation increases so too will creativity (Amabile, 1988).

The present study

The present study examined how reward power within a CET framework affects creativity when rewards are performance-contingent. In a performance-contingency, rewards are administered when performance meets a specific criterion, norm, or level of competence. Performance-contingent rewards have been demonstrated to possess both informational and controlling reward properties (Ryan, Mims, & Koestner, 1983). The research design was a two factor mixed design. The between subjects variables are reward property, with two levels (informational and controlling) and amount of reward power (high vs. low). The within subjects variable was trials. A control condition will be used to establish a baseline of creative performance (see Figure 1).

In this experiment, intrinsic motivation and creativity were examined before, during, and after the reward contingency. The experiment began by obtaining a baseline measure of intrinsic motivation and creativity, after which the experimenter, acting as a supervisor with different levels and types of reward power, will initiate a performance-contingent reward. During the manipulation trials, participants will receive one point for each creative response they provide. Those participants who score in the 80^{th} percentile or better will receive a reward corresponding to their experimental condition. Conditions will differ by reward property (controlling, informational) and the experimenter's (*O's*) amount of reward power (high vs. low), creating four conditions. There will also be an

additional control condition where participants will not be informed of the performance-contingency or rewarded. This condition is meant to establish an intrinsic motivation and creativity baseline across all trials in order to aid interpretation of the results. Creativity will be assessed during each trial of the manipulation, while a measure of intrinsic motivation will be administered at the end of the manipulation. Next, manipulation checks for reward property and amount of reward power will be administered. Finally, intrinsic motivation and creativity will be assessed during a free choice period.

It was hypothesized that when the salient property of the reward was informational, intrinsic motivation would increase. Conversely, when the salient property of the reward was controlling, intrinsic motivation would decrease. As reward power increased, the salience of the reward property utilized would also increase. Rewards perceived as more controlling or more informational would lead to a greater decrease or increase, respectively, in intrinsic motivation. As intrinsic motivation increased, creativity would also increase. Conversely, as intrinsic motivation decreased, creativity would also decrease. This effect should be apparent both during and after the reward contingency. Therefore, it was expected that when the experimental supervisor (*O*) possessed high reward power utilizing informational rewards, participants (*Ps*) would be more creative. Conversely, when the experimental supervisor (*O*) possessed high reward power utilizing controlling rewards, participants (*Ps*) would be less creative. When the experimental supervisor (*O*) possessed low reward power, the salience of the reward would be minimal and no effect on participants' (*Ps'*) creativity level was expected (Figure 2).

Specific hypotheses

Hypothesis 1: Rewards of an informational nature will result in higher intrinsic motivation than rewards of a controlling nature or the control condition.

Hypothesis 2: The magnitude of reward power will moderate the relationship between reward property and intrinsic motivation. Specifically, when rewards are informational intrinsic motivation will be significantly greater when reward power is high, but the difference will be reversed and smaller in magnitude when reward power is low (Figure 2).

Hypothesis 3: Rewards of an informational nature will result in greater creativity than rewards of a controlling nature or the control condition.

Hypothesis 4: The magnitude of reward power will moderate the relationship between reward property and creativity. Specifically, when rewards are informational creativity will be significantly greater when reward power is high, but the difference will be reversed and smaller in magnitude when reward power is low (Figure 2).

Hypothesis 5: Intrinsic motivation will mediate the relationship between reward property and creativity.

Methodological Issues

There were several methodological issues that had to be addressed prior to conducting the experiment. These issues included reward valence, the reward property manipulation, and the rewarded performance-contingency. Past research, pilot testing, theoretical, and/ or practical considerations were taken into account for each issue. A primary concern was the effectiveness of the reward power manipulation. The strength

of reward power is partially determined by the magnitude of the reward offered. In turn, the influence of reward magnitude is contingent on a participant's desire, referred to as valence, for the reward offered. Experimental research on reward power using a college population typically involved either additional academic extra credit or monetary incentives to maintain high valence. However, University of South Florida policy prohibited the use of additional academic extra credit as a reward. Therefore, monetary incentives were utilized. The reward magnitude used in the high reward power conditions was determined by practical considerations. The amount of $2.00 per trial with a maximum of $10.00 for the experiment was the greatest that could be financed. This amount is greater than that used in many similar experiments (Moran & Liou, 1982). The experiment also employed a control condition to maximize the variability of reward magnitude. Therefore, reward valence was maximized as well as possible.

The reward property manipulation posed another concern. Past research has demonstrated that participants who received feedback in controlling terms, such as *should,* were significantly less intrinsically motivated than those who received feedback in terms of competency evaluation (Ryan, 1982; Ryan et al., 1983). Due to the cost of the experiment, pilot testing[1] of this manipulation was deemed appropriate. The manipulation was assessed during pilot testing though a three- items scale (see Appendices B & D). The reward property manipulation influenced two of the three items in the predicted direction. The third item, which attempted to isolate the information properties of reward power, had the predicted ordinal relationship between the control, low reward power with informational properties, and high reward power with

[1] Information detailing the normative and pilot testing phases of this experiment may be located in Appendices E and F.

informational properties (Table 1). However, neither reward power conditions utilizing controlling rewards behaved as predicted. It was concluded that the reward property manipulation was acceptable, though not perfect.

The establishment of the reward performance-contingency was the final issue that had to be addressed. In this experiment, rewards were performance- contingent as opposed to predetermined. Although this made interpretation across trials less meaningful, performance contingent rewards have both informational and controlling properties. In order to maximize reward property salience, a difficult but obtainable performance contingency for creative performance was necessary. Both Sansone (1986) and Garczynski (1995) cite performance at the 80th percentile as indicative of competency without making the task seem too easy. Pilot testing determined it was necessary to change the Wallach and Kogan (1965) Pattern Meaning Task to the Remote Associates Test (RAT) (Mednick, 1962). Trials were constructed to have a mean .5 probability of solution given normative information provided by Shames (1994). In order to maximize the salience of the experimenter's use of reward power, while not sacrificing difficulty in obtaining the reward, the performance contingency was set at 66.66% or correctly answering 3 of the 5 problems presented in each trial.

Method

Participants

All participants were obtained through the University of South Florida (USF) Psychology Department participant pool. In accordance with policies guiding use of the participant pool, all participants received non-contingent extra- credit regardless of any additional compensation. A total of 50 students (45 females, 5 males, ***mean age*** = 20.72

years, *SD* = 4 years) participated in the final experiment. Participants were randomly assigned to 1 of the 5 conditions. Participants reported their ethnicity as Caucasian (64%), African American (24%), Asian (4%), Hispanic (4%), and other (2%). This sample was composed of participants with freshman (36%), sophomore (24%), junior (20%), and senior (20%) academic standing.

Materials

The normative phase, pilot testing, and final experiment were administered utilizing Microsoft Excel on an IBM Computer. There are several benefits associated with computerization of an experimental task, such as automatization of complex or repetitive tasks, time saved due to automated data entry, and removal of data entry errors. This was essential, though the end product was not utilized, for collecting and analyzing the Wallach and Kogan (1965) Pattern Meaning Task. During the normative phase of the experiment, twenty eight thousand three hundred and sixty seven responses were collected and automatically stored. Then by utilizing Microsoft Visual Basic code several methods were explored to organize the qualitative data and assess creativity. Strategies ranged from quite simple, such as matching case words, to much more complex. The most daunting of these was creativity assessed by the mean frequency of the decomposed phrase components (i.e. individual words). Another benefit of computerization was that, with correct programming, it allowed for an unobtrusive measure of time spent for each trial to be collected. A basic desktop printer was used to print participant's responses after each experimental trial for the purpose of scoring. This information was then entered into a second IBM computer. This was meant to reinforce

the salience of the experimenter's reward power, but also provided an additional copy of the experimental data.

Measures

Creativity. The RAT[2] measures an individual's cognitive flexibility and capacity to make associations between seemingly unrelated stimuli. Numerous researchers have used Mednick's (1962) test or similar items to measure creativity ability (Isen, Daubman, & Nowiki, 1987; Mednick, 1962; Mednick, Mednick, & Mednick, 1964). The RAT has also been shown to be intrinsically interesting to college students and has been used in motivational research (Calder & Straw, 1975; McFarlin & Blascovich, 1984).

RAT items consist of three seemingly unrelated words (a word triad), and the participant must supply a fourth word that is related to each. For example, the correct answer to the item ***rat, blue, cottage*** is ***cheese.*** Items are dichotomously scored with one point being awarded for each correct item. Normative information for probability of solving by time period is typically collected for each item (Ochse & van Lill, 1990).

In this experiment, six (one baseline plus five experimental) trials each consisting of five RAT problems were administered. The probability of solving each problem ranged from .4 to .6 and had an average difficulty of .5 (Shames, 1994). Each item was dichotomously scored, and trial scores ranged from zero to five. Participants who correctly answered 60% of the items per trial were rewarded. The probability of correctly solving and time elapsed until a solution was provided were collected for each problem in the study (Table 2).

[2] Wallach and Kogan's (1965) Pattern Meaning Task was found to be an unreliable measure of creativity when scored by the created software program. Additional details may be found in Appendix E.

There were several concerns and disadvantages in using the RAT in this experiment. First, the answer format of the RAT rendered the motivational measure of time spent per trial meaningless. Second, a dichotomously scored, correct or incorrect, creativity item is almost conceptually contradictory. A creative alternative answer provided by the participant would still be scored as incorrect (Medina, 2000). Third, Medina (2000) found no evidence to support that the RAT is influenced by reward property or reward power. Though the RAT had these noted pitfalls, a measure of creativity that could be quickly administered and scored and was based on normative standards was a necessity of the experiment. Therefore, the RAT was adopted as a replacement for Wallach and Kogan's (1965) Pattern Meaning Task.

Reward Property. Ryan et al. (1983) suggest that participants' perception of performance- contingent reward properties may be manipulated through the use of informational or controlling feedback. The manipulation used in this experiment is based on experiments conducted by Ryan (1982) and Ryan et al. (1983). Informational feedback was presented through use of terms such as perform well and will help you understand. In contrast, terms such as should and met my standard were used to create controlling feedback. Either informational or controlling feedback was consistently provided after each experimental trial.

Reward property was assessed using a single item from Garczynski (1995) plus two additional items created for this study. The item adopted from Garczynski (1995) was slightly modified in order to fit this experiment. The item stated:

> During this activity, people tend to have different perceptions of the reward. Some people feel the reward is more controlling, or pressuring one to do well. Others find it more informational, or

informative about their skill. The scale below ranges from very controlling to very informational. Please click the response that most accurately represents your feeling about the reward.

The item was placed on a 6-point Likert scale ranging from very controlling to very informational (2- controlling, 3- slightly controlling, 4- slightly informative, 5- informative). Analysis of the pilot test demonstrated that when the reward property was salient in the high power conditions, the manipulation's influence was in the predicted direction (*high power with controlling properties mean* = 2.33, *SD* = 1.15, *n* = 3; *high power with informational properties mean* = 4.33, *SD* = 1.53, *n* = 3). When the reward property was less salient in the low power conditions, the manipulation's influence was weaker and not in the predicted direction (*low power with controlling properties mean* = 4.00, *SD* = .00, *n* = 2; *low power with informational properties mean* = 3.00, *SD* = 1.2, *n* = 7). However, the small sample size limited the generalizability of the results.

Two additional items were included to assess the effectiveness of the reward property manipulation. Both items utilized a 5- point Likert scale ranging from 1- strongly disagree to 5- strongly agree (2- disagree, 3- neutral, 4- agree). These items were the operational products of CET as applied to reward power. The first item focused on the controlling properties of rewards, while the second focused on the informational properties.

The experimenter can control how much money I receive. (controlling)

The experimenter can provide incentives for doing high quality work. (informative)

The pilot test further demonstrated that the reward property and reward power manipulations had the predicted influence (Table 1). For the item "*The experimenter can control how much money I receive*" the high power with controlling properties condition scored the highest (*mean* = 4.33, *SD* = .58, *n* = 3) as predicted. However, the evidence was not univocal. For the item "*The experimenter can provide incentives for doing high quality work.*" the high power with controlling properties condition scored the highest (*mean* = 4.33, *SD* = .58, *n* = 3) not the high power with informational properties (*mean* = 4.00, *SD* = 1.00, *n* = 3) as predicted. The small sample size limited the generalizability of the findings.

Reward Power. The experimenter's reward power was manipulated by varying the reward magnitude used in the experimental script. Participants had the opportunity to earn $0.50 per trial for the low reward power conditions or $2.00 per trial for the high reward power conditions. Participants did not have the opportunity to earn rewards in the control condition. It was assumed that experiment's reward power would be equivalent to zero. This type of manipulation is consistent with past research (Bamber, Jose, & Boice, 1975; Cox, Nash, & Ash, 1976; Dovidio, Ellyson, Keating, Heltman, & Brown, 1988; Fromme, Mercadal, & Mercandal, 1976; Moran & Liou, 1982; Slusher, Rose, & Roering, 1978; Wahba, 1971).

The participant's perception of the magnitude of the experimenter's reward power was used to evaluate the effectiveness of the manipulation. The item first defined reward power for the participant and then asked the participant to rate the magnitude of the experimenter's reward power. The item stated:

> Reward power is the ability of one person to influence another through the use of rewards. In this experiment, the experimenter had the capacity to reward your performance. In your opinion, please indicate your belief about the amount of reward power the experimenter possessed. Please note that you can also choose between responses if you cannot decide between the two.

Responses were placed on a 9-point likert scale ranging from 1- little or no power to 9- extremely powerful (3- slightly powerful, 5- moderately powerful, 7- very powerful). Responses 2, 4, 6, and 8 did not receive anchors and represented moderate positions between the adjacent anchors. A 9-point response scale was employed due to practical limitations in the magnitude of the reward that could be offered. It was deemed unlikely that participants would view the experimenter as extremely powerful. Therefore, the response range was increased in order to enhance precision at the lower end of the scale. Analysis of the pilot test demonstrated that reward magnitude was influencing the reward power manipulation as predicted. The high power conditions (*controlling mean* = 5.67, *SD* = 2.31, *n* = 3; *informational mean* = 4.00, *SD* = 3.61, *n* = 3) were rated as more powerful than the low power (*controlling mean* = 2.5, *SD* = 2.12, *n* = 2; *informational mean* = 3.1, *SD* = 1.6, *n* = 7) or control condition (*mean* = 2.00, *SD* = 1.41, *n* = 2). However, the strength of these results is limited due to the small sample size used in the pilot.

Intrinsic motivation. Originally, intrinsic motivation was meant to be assessed before, during, and after the reward contingency. This was to be done by analyzing time spent per trial during the baseline and experimental manipulation, an attitudinal measure, and a free-choice period. However, due to modifications of the dependent variable,

intrinsic motivation was assessed only during the task by an attitudinal measure and after the task by a free-choice period.

Intrinsic motivation was assessed during the reward contingency through the use of an attitudinal measure administered at the end of the manipulation. Such measures have been extensively used and demonstrate a high convergent validity with behavioral measures (Harackiewicz, 1979; Harackiewicz et al., 1984; Ryan *et al.,* 1983). The 3-item scale was adopted and modified from Sansone (1986) and measured the participant's task enjoyment (Appendix A). Items were placed on a 5- point likert scale ranging from 1- strongly disagree to 5- strongly agree (2- disagree, 3- neutral, 4- agree). The scale demonstrated moderate reliability ($\alpha = .745$).

Intrinsic motivation was then assessed after the reward contingency through a free-choice period. A free-choice period is a behavioral measure where the participant is left alone and unobtrusively observed on task choice and duration (Garczynski, 1995). During the free-choice period, intrinsic motivation was assessed by participation in the creative activity. Analysis of a linear relationship between the behavioral and attitudinal measure of intrinsic motivation was non- significant ($r = .236$, $p = .099$, $n = 50$).

Verbal Fluency. A measure of verbal fluency was added after the RAT replaced Wallach and Kogan's (1965) Pattern Meaning Task. Past research demonstrated moderate correlations between RAT scores and verbal ability. Bower and Clark (1968) reported a correlation of .60 between scores on the RAT and verbal intelligence. Taft and Rossiter (1966) actually reported a higher correlation between RAT and verbal intelligence than between RAT and Guilford's tests of divergent thinking. Therefore, a verbal ability measure was included as a covariate.

The task asked participants to provide as many responses as possible to a series of problems. After each problem was present the participant had 2 minutes to write down their responses. After the 2 minutes a 15 second break was provided after which the next problem was presented. The four problems asked were:

P1. List all the words that you can that start with the letter F.

P2. List as many types of fruits and vegetables as you can.

P3. List all the words that you can that start with the letter S.

P4. List as many types of animals as you can.

Verbal fluency was scored as the average number of responses across the 4 problems provided by the participant.

Procedure

Each participant completed an individual session lasting approximately one hour. The participant was informed that the experiment was meant to measure his or her creative ability. Specifically, the experimenter stated:

> "This experiment is meant to measure your creative ability. Your task will be to find a fourth word that is related to three presented words. This task will be discussed in further detail in a moment. After you have entered an answer you will click the ok button to submit that answer. After that, the next problem will appear. For today's session, we will begin by going over the computer interface and learn more about the task by working on several example problems together. You will then work on several sets of problems by yourself. Next you will complete a task to measure your verbal fluency. In this task, you will be asked to generate multiple answers to a series of questions. An example problem would be to name all the words that you can that

start with the letter "P". This task will also be discussed in further detail later in the experiment. Finally, you will complete a questionnaire and then be debriefed. Do you have any questions? Ok, you will begin the experiment by answering a few demographic questions. Click the ok button to begin."

After the participant entered the requested demographic information, he or she was shown how to use the computer interface. Responses were to be typed into the same Microsoft Excel infobox that was used to present the word triad. After a response was entered, clicking the ok button submitted that response. The experimenter and the participant then worked on several example problems together. During this time the experimenter provided additional information concerning the creativity task and verified that the participant understood both the computer interface and the task. The experimenter stated:

"The object of this task is to provide a fourth word that is related to the three presented words. This fourth word may be related to the other words in numerous ways. Some ways include: the two words together create a compound word, the words are synonyms, one word describes the other, one word is a type of the other, and so on. Take for instance the problem COOKIES / HEART / SIXTEEN the solution to which is SWEET. COOKIES are sweet. SWEET is part of the word SWEETHEART and part of the phrase SWEET SIXTEEN. We will now work on several problems together to get you familiar with the task. You will then complete several trials by yourself, each consisting of five problems."

The experimenter and participant then worked on five problems together. These problems were fairly easy to complete, ranging from .7 to .8 probability of being solved (Shames, 1994). The specific problems were (1) GOLD / STOOL / TENDER (BAR), (2)

WIDOW / BITE / MONKEY (SPIDER), (3) TIME, HAIR, STRETCH (LONG), (4) BASS, COMPLEX, SLEEP (DEEP), and (5) BROKEN, CLEAR, EYE (GLASS). If the participant was unable to solve the problem after approximately one minute, the experimenter provided the solution with an explanation.

Once the fifth problem had been submitted, the demographic and trial information was automatically printed. The experimenter stated:

> "Once you have submitted your answers they are printed so I can score them. You will receive one point for each correct answer. After I score your answers, I will ask you to begin the next trial by clicking the ok button on the screen."

At this point the experimenter retrieved the print out and enter the information into a second computer. This was done to set the precedent that the participant's information was to be analyzed after each step of the process. The experimenter then stated:

> "You will now work on several sets of problems by yourself. There is no time limit for this task. Therefore, take as long as you need on each problem. Do you have any questions? "

The experimenter then answered any questions and asked the participant to begin the task by clicking the ok button. This first trial did not have a reward-contingency and served as a baseline measure of creative performance.

Participants in the control condition continued without feedback or tangible reward for the remaining trials of the manipulation. However, their scores were still entered into the second computer after each trial. In contrast, participants in the rewarded conditions were informed that the remainder of the trials would be rewarded. Participants

in the rewarded conditions continued in the research paradigm adapted from Ryan *et al.* (1983). The wording of which was modified for this experiment.

Participants in the reward power condition utilizing rewards with salient **informational** properties were told:

> "As an incentive, I have been authorized to reward those participants who perform **well** on today's activity. You will receive ($2.00 for the high power condition, $0.50 for the low power condition) for each trial that **you perform well on. This reward will help you understand how well you are performing on this task in comparison to your peers.** After each trial, I will analyze your answers and decide **if you have performed well.** I will then inform you of my decision, after which the next trial will begin. After you have completed all the trials, you will complete the verbal fluency task discussed earlier and be given a questionnaire to complete. At the end of the experiment, you will be debriefed and receive any **money that you have earned due to your performance.**"

Participants in the reward power utilizing rewards with salient **controlling** properties were told:

> "As an incentive, I have been authorized to reward those participants who perform **as well as they should** on today's activity. You will receive ($2.00 for the high power condition, $0.50 for the low power condition) for each trial that **you perform up to my standards. This reward pattern is meant to allow me to control the number of problems you solve correctly.** After each trial, I will analyze your answers and decide **if you have performed up to my standards.** I will then inform you of my decision, after which the next trial will begin. After you have completed all the trials, you will complete the verbal fluency task discussed earlier and be given a questionnaire to complete. At the end of the experiment, you will be debriefed and receive any **money that you have earned because your performance met my standards.**"

The participant then completed five trials under the manipulation. At the end of each trial, the experimenter analyzed the participant's responses and informed him or her whether his/her performance justified being rewarded. Participants were rewarded when they correctly answer three or more of the five problems. Specifically, for those conditions utilizing informational properties, the experimenter stated:

> "After analyzing your answers, I have found that **(you performed, you did not perform) well on this trial.** At the end of the experiment, **you (will, will not) receive the** ($2.00 for the high power condition, $0.50 for the low power condition) **reward because of your performance** on this trial. This for a total of **$$$** to be awarded at the end of the experiment. Remember, this reward pattern **is meant to help you understand how well you are performing on this task in comparison to your peers.** Now move on to the next trial, where you will have an additional opportunity to earn the ($2.00 for the high power condition, $0.50 for the low power condition) **reward if you perform well.**"

The participant received the appropriate feedback depending on whether the participant performed well on the task or not, respectively. For those conditions utilizing controlling properties the experimenter stated:

> "After analyzing your answers, I have found that your performance **(met, did not meet) my standards** on this trial. At the end of the experiment, **you (will, will not) receive the** ($2.00 for the high power condition, $0.50 for the low power condition) **reward because of your performance on this trial.** This for a total of **$$$** to be awarded at the end of the experiment. Remember this reward pattern **is meant to allow me to control the number of problems you solve correctly.** Now please move on to the next trial, where you will have an additional

> opportunity to earn the ($2.00 for the high power condition, $0.50 for the low power condition) reward if **you perform up to my standards.**"

The participant received the appropriate feedback depending on whether he or she performed well on the task. After the fifth experimental trial, the experimenter provided the appropriate feedback, omitting the passage instructing him or her to begin the next trial.

The experimenter then told the participant that the creativity portion of the experiment was completed and that they would begin the verbal fluency task. The experimenter stated:

> "We will now move on to the next portion of the experiment meant to measure your verbal fluency**.** In this task, I will ask you a series of problems and you will have two minutes to list all the answers that you can. You may remember my earlier example that I provided where you would have to list all the words you can starting with the letter "P". I will present a total of four problems with a 25 second break between each. You are to write your answers on the sheet provided. Be sure not to list proper nouns, such as a person's name, because proper nouns will not be counted."

The experimenter then administered the verbal fluency task. Once the task was completed, the experimenter asked the participant to complete a questionnaire composed of the measures of intrinsic motivation, reward property, and reward power. As the experimenter handed the questionnaire packet to the participant, he also included a sheet with additional RAT items in order to initiate the free choice manipulation. The experimenter stated:

> "We will now move on to the final portion of the experiment where you will complete a questionnaire concerning the creativity task. Also, here are some additional creativity problems that you can take home. While you work on the questionnaire, I am going to use this time to get ready for the next participant."

The experimenter then left the room for 5 minutes. Upon return, the experimenter asked the participant if he or she had worked on the additional RAT problems. Finally, the participant was debriefed and awarded any money that was owed.

Results

The control condition was excluded from several analyses due to the condition's apparent misconceptualization. This condition was originally meant to serve as an intrinsically motivated baseline in order to aid interpretation. However, analysis of the condition's motivational properties failed to provide conclusive evidence of the achievement of this aim. Analysis of variance (ANOVA) indicated that there was not a significant difference between rewarded conditions and the control condition's influence on the self report measure of intrinsic motivation ($F_{(4,45)} = 1.412$, $p = n.s.$) (Descriptive statistics located in Table 3).

Analysis of the free choice period provided further conflicting results. The research literature indicates that intrinsic motivation is the quantity and intensity of a behavior in the absence of external motivators. Furthermore, rewards with salient informational properties should facilitate intrinsic motivation, while rewards with salient controlling properties should suppress intrinsic motivation in a task (Deci, 1975). Contrary to the literature, the control condition's 30% participation rate resembled the

high reward power with controlling properties condition's 20% participation rate not the high reward power with informational properties condition's 60% participation rate (see Figure 4).

It is possible that because external constraints such as surveillance, evaluation, and extrinsic reinforcement through non-contingent academic extra credit, were still present in the control condition intrinsic motivation was suppressed. Since the control condition failed to provide an intrinsically motivated baseline, for which it was included, it was removed from several analyses. Those analyses which exclude the control condition are marked by a superscript ^{nc}.

Manipulation Checks

The reward power manipulation was assessed through self report that asked participants to rate their perception of the experimenter's reward power (Appendix D). Additional manipulation checks were deemed unnecessary due to the concrete nature of the reward power manipulation. Though the results regarding the manipulation was in the anticipated direction (*control mean* = 3.78, *SD* = 1.86, *n* = 9; *low power mean* = 3.85, *SD* = 2.23, *n* = 20, *high power mean* = 4.47, *SD* = 2.01, *n* = 19) ANOVA showed the manipulation to be statistically ineffective ($F_{(2, 45)} = .557$, $p = n.s.$).

French and Raven (1959) provide two possible explanations for the ineffectiveness of the manipulation. First, it is possible that the difference in reward magnitude was not great enough to produce a significant effect. Although this may explain the non-significant difference between the high and low reward conditions, it does little to clarify the non- significant difference between the control and rewarded conditions. Second, participants may not have believed that the experimenter could

mediate the magnitude of the reward. This reflects an ongoing problem of deception in psychological research, which has eroded participants' perception of experimenters' integrity. Such a rationalization would adequately explain the non-significant differences between the control, the low reward power, and high reward power conditions.

The influence of the reward property manipulation was assessed through self report and indirectly through observable behavior during the free choice period. The self report measure asked participants to rate the experimenter's use of rewards. The first question asked participants to rate the experimenter's use of rewards from very controlling (1) to very informational (6) (Appendix B). Review of the descriptive statistics showed the results not to be in the predicted direction (*controlling property mean* = 3.85, *SD* = 1.3, *n* = 20; *informational property mean* = 3.35, *SD* = 1.18, *n* = 20). ANOVA showed the manipulation to be ineffective ($F_{(1, 38)} = 1.607$, $p = n.s.$)^{nc}.

The second and third questions asked participants to rate the experimenter's use of rewards in either a controlling or an informational context (Appendix C). ANOVA indicated that there were no significant differences between conditions on either the reward power with controlling properties ($F_{(3, 36)} = .402$, $p = n.s.$)^{nc} or the reward power with informational properties ($F_{(3, 36)} = .237$, $p = n.s.$)^{nc} manipulation checks (Descriptive statistics are located in Table 4).

Hypothesis 1- Rewards of an informational nature will result in higher intrinsic motivation than rewards of a controlling nature or the control condition.

The second method used to indirectly assess the effectiveness of the reward property manipulation was through participants' motivation. According to past research, rewards with strong informational properties should lead to high intrinsic motivation,

while rewards with strong controlling properties should lead to low intrinsic motivation (Deci, 1975). The results were not in the predicted direction (*controlling property mean* = 3.7, *SD* = .70, *n* = 20; *informational property mean* = 3.42, *SD* = .89, *n* = 20). ANOVA demonstrated that the reward property manipulation did not have a significant influence on the attitudinal measure of intrinsic motivation ($F_{(1, 38)} = 1.716$, $p = n.s.$)[nc] (Appendix A).

Next, the influence of the reward property manipulation on behavior during the free choice period was examined. Behavior in the free choice period was dichotomously scored as did or did not participate and was analyzed using Chi -Square. While, the effect was in the anticipated direction (*controlling* = 40%, *informational* = 60%) it was non- significant ($\chi^2 = 1.60$, $p = .206$) Thus, the hypothesis that rewards of an informational nature will result in higher intrinsic motivation than rewards of a controlling nature was not supported. The clause of hypothesis 1 that rewards of an informational nature will result in higher intrinsic motivation than the control condition could not be tested.

Hypothesis 2- The magnitude of reward power will moderate the relationship between reward property and intrinsic motivation.

Deci (1975) theorized that rewards with informational properties would facilitate intrinsic motivation, while rewards with controlling properties would suppress intrinsic motivation. It was expected that as the salience of the reward property increased, so would reward property's influence on intrinsic motivation. In order to manipulate the salience of reward property, different magnitudes of rewards were utilized. ANOVA failed to support this hypothesis ($F_{(1, 45)} = 1.58$, $p = n.s.$, see Table 5). The two

conditions, control and high reward power utilizing informational properties, which were predicted to have the highest intrinsic motivation had the lowest. Furthermore, high reward power utilizing controlling properties, which was predicted to have the lowest intrinsic motivation had the highest (see Table 3).

Hypotheses Regarding Creativity

The RAT was administered across six (one baseline plus five experimental) trials with each trial consisting of five problems. The baseline trial had an average probability of solving equal to .66, while the probability of solving the remaining trials ranged from .35 to .55. The individual problems were selected based on normative data provided by Shames (1994) to have a probability of solving ranging between .45 and .65. However, the actual probabilities varied significantly from those reported by Shames (1994) and ranged from .06 to .94 (Table 2).

Hypothesis 3: Rewards of an informational nature will result in greater creativity than rewards of a controlling nature or the control condition.

Hypothesis 4: The magnitude of reward power will moderate the relationship between reward property and creativity.

A series of mixed models were conducted in order to assess the influence of reward power and reward property on creativity. The first model in the series was a no growth model, which demonstrated that the intercept was significant ($F_{(1,50)}$ = 641.171, ß = 2.144, $p < .001$) (Table 6). The covariance parameters showed that there was significant variability around the intercept ($t = 10.06$, $p < .05$) and that there were additional predictors unaccounted for ($t = 2.23$, $p < .05$, $n = 50$). Therefore, an unconditional growth model was conducted.

In this model, the random effect of trial was entered into the equation. With the addition of this variable the information criteria of -2 Log Likelihood dropped from 731.727 to 706.928 indicating the model was a better fit to the data than the previous model. The intercept remained significant ($F_{(1,50)}$ = 289.04, ß = 2.768, $p < .001$). Time was also significant ($F_{(1,50)}$ = 23.736, ß = -.208, $p < .001$) (Table 7). The covariance parameters indicated there were still unaccounted for predictors (t = 8.66, $p < .05$). However, the variability around the intercept (t = 1.4, p = *n.s.*) and slope (t = .34, p = *n.s.*) were non-significant. The variability around the intercept was not correlated to a participant's rate of decline (t = .64, p = *n.s.*).

Finally, a conditional growth model was conducted by adding reward power, reward property, and fluency to the analysis. Included in this model were all possible interactions between reward property, reward power, and time. With the addition of these variables the information criteria of -2 Log Likelihood dropped from 706.928 to 680.186 suggesting this model is a better fit to the data than the previous model. The intercept became only a trend ($F_{(1,73.8)}$ = 3.4, ß = 1.10, $p < .069$), while time ($F_{(1,49)}$ = 4.39, ß = -.197, $p < .041$) remained significant. Verbal fluency was shown to be significant ($F_{(1,49)}$ = 9.06, ß = -.197, $p = .041$), while all the primary manipulations and all corresponding interactions were still non-significant. Hypothesis 3 that rewards of an informational nature will result in greater creativity than rewards of a controlling nature or the control condition was not supported ($F_{(1,49)}$ = .021, ß = -.059, p = *n.s.*). Hypothesis 4 that the magnitude of reward power will moderate the relationship between reward property and creativity was not supported ($F_{(1,49)}$ = .173, ß = -.14, p = *n.s.*) (Table 8). The covariance parameters indicated there were still unaccounted for predictors (t = 8.57, $p <$

.05). However, the variability around the intercept (t = 1.10, p = *n.s.*) and slope (t = .41, p = *n.s.*) were non-significant. The variability around the intercept was not correlated to a participant's rate of decline (t = .60, p = *n.s.*).

Hypothesis 5: Intrinsic motivation will mediate the relationship between reward property and creativity.

There are four criteria necessary for full mediation. First, the total effect of the independent variable on the dependent variable must be significant. Second, the path from the independent variable to the mediator must be significant. Third, the path from the mediator to the dependent variable must be significant. Fourth, the total effect of the independent variable on the dependent variable is non-significant when the mediator has been controlled (MacKinnon, Lockwood, & Hoffman, 2002). The conditional growth model conducted for hypothesis 3 and hypothesis 4 demonstrated that reward property did not significantly influence creativity ($F_{(1,49)}$ = .021, ß = -.059, p = .886). Furthermore, the correlation between reward property and intrinsic motivation was non-significant (r = .134, p = *n.s.*, n = 50). Therefore, hypothesis 5 can not be supported because the first and second critera of mediation were not satisfied.

Discussion

Past behavioral research on operant conditioning suggested that any behavior could be facilitated through the proper utilization of rewards (Skinner, 1988). Research since then has advocated that rewards have a detrimental effect on creativity. However, the most recent research is beginning to show that rewards are not inherently detrimental to creativity. Although rewards with salient controlling properties have been shown to be detrimental to creativity, there is some evidence that rewards with informational

properties are not (Eisenberger & Cameron, 1998). The purpose of this experiment was to investigate the extent to which an individual's reward power and the salient property of the reward utilized would influence creative performance. The primary hypothesis was that the magnitude of reward power would moderate the relationship between reward property and creativity. Specifically, when rewards are informational, it was expected that creativity would be significantly greater relative to controlling rewards when reward power is high but the difference will be reversed and smaller in magnitude when reward power is low. Results of this experiment, however, were inconclusive. The experiment suffered from several pitfalls that limited its ability to test the hypotheses these included an unsuitable dependent variable and ineffective manipulations.

This experiment provided limited evidence that intrinsic motivation is moderately positively correlated with creativity. The correlation between the intrinsic motivation scale and the mean RAT score was significant. This finding is consistent with other research in the field (Amabile, 1979, 1985, 2001; Amabile & Gitomer, 1984; Amabile, Goldfarb, & Brackenfield, 1990; Giovanni & Siu, 2002; Hennesey 2002, 2003). However, the correlation between the behavioral measure of intrinsic motivation and the mean RAT score was non- significant.

Though the direct relationship between intrinsic motivation and creativity is unknown, it has been demonstrated that many of the factors that decrease intrinsic motivation are also detrimental to creativity. For instance, Amabile and Gitomer (1984) found that resource constraints were detrimental to both intrinsic motivation and creativity. Analogous findings have been found for other extrinsic constraint such as evaluation, competition, and lack of choice (Amabile & Hennessey, 1992). Amabile

(1988) posited that extremely desirable rewards may distract individuals from the creativity task. Lepper, Greene, and Nisbett (1973) proposed that individuals working towards an extrinsic end are more likely to think algorithmically, which is often rewarded in society, than heuristically, which is necessary for creative performance.

One detriment to the study was the necessity to change the operational conceptualization of the dependent variable. Creativity was to be assessed as the number of original (statistically infrequent) responses to an open ended perception task as scored by a computer program. The strength of this operational conceptualization was that it provided a quickly administered, instantly scored, open ended creativity task based on relevant normative information. However, pilot data indicated that an alternative measure of creative performance was necessary. The criteria imposed by the experiment was that it could be quickly administered and scored. The amount of time necessary to score the creativity measure had to be minimal in order to have an adequate interlude to provide the participants with feedback concerning their creative performance. Furthermore, a measure that could be quickly administered would allow for multiple trials. This was deemed vital because the magnitude of the effect was expected to increase as time progressed. Also, it was necessary to have normative information in order to accurately provide performance contingent rewards. Therefore, after several creativity measures had been evaluated, the original measure was replaced by the RAT.

The RAT is a creativity measure that examines an individual's ability to make abstract associations between word triads. The measure is quick to administer and score. Also, there is well established normative information for each item. There were several concerns with using RAT to assess creativity in this experiment. First, the RAT is

dichotomously scored. Conceptually, a creativity item that has a correct answer seems paradoxical. The consequence of this is that an alternative creative response provided by the participant would be scored as incorrect (Medina, 2000). Such items are insensitive to differences in creative ability because there is limited opportunity to exhibit creative behavior (Garczynski, 1996). Second, the RAT is unable to measure intrinsic motivation as time spent per item. Individuals may be intrinsically motivated, yet spend little time on an item because a solution is quickly apparent to them. It is possible to measure intrinsic motivation as time spent working on an unlimited item set, such as in a free choice period scenario. However, such global measures of intrinsic motivation lose intermediate fluctuations across trials. Third, past research has demonstrated a positive relationship between the RAT and verbal fluency (Mendelsohn & Covington, 1971). This further limits the ability of the RAT to accurately measure participants' creative ability. Consistent with other research, in this experiment verbal fluency and RAT had a significant positive correlation. Although there is mixed support of the RAT in past research (Garczynski, 1996; Ochse & van Lill, 1990), it was selected due to its short administration and scoring time.

Another issue that limited interpretability of the results was the heterogeneity of the trial difficulties. Trials were constructed using previously obtained normative information (Shames, 1994). RAT items with probability of solving ranging from .40 to .60 were selected to create trials with an average probability of solving equal to .50. However, the results of the study showed that the probability of solving individual problems ranged from .06 to .94 (*mean* = .43, *SD* = .27, *n* = 25), while trials ranged from .39 to .55 (*mean* = .43, *SD* = .09, *n* = 5) (Table 2). Although this did not hinder the

criterion contingent reward scheme used to maximize the salience of reward properties, it made interpretation of slope inappropriate.

The ineffectiveness of the reward power manipulation posed another limitation. In this experiment the reward power manipulation was based on French and Raven's (1959) theoretical work which states the strength of reward power is a function of *P's* perception of the magnitude and probability of rewards that *O* can mediate for *P*. Past research has demonstrated that even small rewards can influence reward power. Fromme, Mercadal, and Mercandal (1976) were able to induce reward power in an undergraduate sample by offering only $.02 per correct answer, with a max of $1.40, on a word acquisition task. A later study conducted by Slusher, Rose, and Roering (1978) was able to manipulate reward power by allowing the high reward power participant the ability to reward $1 to the low reward participant. A study by Bamber, Jose, and Boice (1975) found that research assistants utilizing $0.50 rewards, with a max of $3.00, were enough to manipulate reward power. Dovidio, Ellyson, Keating, Heltman, and Brown (1988) were able to successfully manipulate reward power by allowing the high reward power participant the ability to reward the low reward power participant a single experimental participation credit.

Consistent with past research, reward magnitude was varied to manipulate the experimenter's reward power. However, analysis of the reward power manipulation demonstrated that there was no significant difference between conditions. French and Raven's (1959) conceptualization of reward power suggests that the difference between the two reward magnitudes was not great enough to produce an effect. Such findings are not unheard of in reward power research. For instance, Wahba (1971) found that reward

magnitude did not significantly influence reward power in an experiment utilizing mixed-motive games, such as the prisoner's dilemma. In this experiment, the payoffs were manipulated so that in certain conditions a person would have reward power, while in other conditions the participant had coercive power. However, in the current experiment participants in the control condition rated the experimenter as having a similar level of reward power as did those in the experimental conditions. A similar impasse was reported by Cox, Nash, and Ash (1976). In this experiment, a professor offered four magnitudes of extra credit (0, 10, 40, and 80 points) on a 500 point test in order to influence reward power and found no effect. The current experiment's findings, as well as those of other similar research, suggest that, although reward power can be manipulated through reward magnitude, there are additional influencing variables. For instance, Moran and Liou (1982) failed to find main effects, but found an interaction between reward power and intelligence.

Another possible explanation is that experimenters utilizing a non- contingently rewarded participant pool may inherently lose variability in reward power. This is because experimenters reward participation with non- contingent academic extra credit, which would moderate the effectiveness of a reward power manipulation in at least two ways. First, additional rewards would inflate the experimenter's reward power in control or low reward power conditions. Second, if one assumes that the students' primary motivation for participation is academic extra credit, then the effectiveness of high reward power conditions would be reduced. Another possible moderating factor is that participants did not believe that the experimenter had the ability to control the magnitude of the reward.

The reward property manipulation was also found to be ineffective. This manipulation arose from CET. This theory states that a reward has two primary properties. The controlling property pressures the individual to certain outcomes. This property is associated with a decrease in intrinsic motivation and a rise of extrinsic motivation. The informational property conveys meaningful feedback about self determined behavior. Fisher (1978) demonstrated that for a reward to possess an informational aspect it must be self- determined. This property is associated with an increase or maintenance of intrinsic motivation. One method for manipulating the salient reward property is to change the reward contingency. Rewards that are self- determined through the participant's behavior are viewed as possessing a salient informational property. Rewards that are administered regardless of the participant's behavior are viewed as processing a salient controlling property. Deci (1972) found that contingent rewards decreased intrinsic motivation, while non-contingent rewards had no influence on intrinsic motivation. Enzle and Ross (1978) found that task contingent rewards were detrimental to intrinsic motivation, while criterion contingent rewards facilitated intrinsic motivation. Another method for manipulating reward property is to vary the feedback accompanying the reward. A study conducted by Ryan (1982) found that controlling feedback decreased intrinsic motivation in comparison to informational feedback. The reward property manipulation used in this experiment was modeled from previous research. Reward property was manipulated by varying the wording of the experiment's script with controlling or informational undertones. In addition, performance contingent rewards were utilized to make the manipulation salient (Ryan, 1982; Ryan et al., 1983). Analysis of the manipulation check revealed that the manipulation had no significant

influence. Analysis of the free choice period provided limited contrary evidence. Though non-significant, 60% of the participants in the HI condition participated in the free choice period, compared to 20% of participants in the HC condition. This is consistent with CET that salient informational rewards would facilitate intrinsic motivation, while salient controlling rewards would be detrimental.

Early motivation research assumed that intrinsic and extrinsic motivation had an inverse relationship. Rewards were believed to undermine intrinsic motivation by causing one's perceived locus of causality to shift from internal to external (Medina, 1993). However, later research began to demonstrate that rewards are not inherently detrimental to intrinsic motivation (Koestner *et al.,* 1984; Pittman *et al.,* 1980; Ryan, 1982; Ryan *et al.,* 1983). Results of this experiment showed that there were differing levels of intrinsic motivation in extrinsically motivated conditions. This suggests that intrinsic and extrinsic motivation are not polar opposites, but may be orthogonal dimensions (Amabile, Hill, Hennessey, Tighe 1994; Elliot & Harackiewicz, 1994; Gacczynski, 1996; Harackiewicz & Sansone, 1991). This is consistent with a factor analysis conducted by Amabile *et al.* (1994) who found that intrinsic and extrinsic motivation represented two unique factors.

CET suggests that intrinsic motivation is determined by feelings of autonomy and mastery of a task. Fisher (1978) posited that, for a behavior to be intrinsically motivated, an individual has to perceive it as being self-determined. Though one's perceived locus of causality still determines one's motivational state, it is influenced by one's perceived control over a situation, not the reward. Although loss of self-determinism is a common characteristic of extrinsic motivation it is not an integral one. Those tasks that are self-

determined can still facilitate or maintain intrinsic motivation, even when rewarded. It may be that the participants' perception of the reward and situation is more important than the actual characteristics (Condry, 1977; Ryan *et al.*, 1983).

Though not supporting the original hypotheses, there were several interesting lessons from this research. First, French and Raven's (1959) theoretical conceptualization of reward power suggests that experimental manipulations of reward power could be done simply by varying the magnitude of reward. It appears that manipulating reward power may be more complex. For example, Moran and Liou (1982) manipulated reward power by offering a $2.00 reward to top performers ($5.00 to the top 3) on the Picture Completion and Circles task of the Torrance tests (Torrance, 1966). Researches failed to find a main effect for reward power, but did find an interaction between reward magnitude and intelligence. When the experimenter rewarded low ability participants, creativity performance increased. In contrast, when the experimenter rewarded high ability participants, creative performance decreased.

An implication of this research is that the magnitude of reward power may be confounded in academic research when experimenters utilize an incentive driven participant pool. If researchers are unable to tease apart the experimenter manipulating experimental rewards from the experimenter issuing credit for participation, alternative research designs or participant pools may be necessary. Attention should be directed to other components of reward power such as the probability of receiving the reward or participant's perception of the ability of *O* to differentially reward *P*.

Second, this experiment demonstrated the need for additional research to effectively manipulate rewards' informational and controlling properties. It may be that

an individual's perception of the reward is the key component in examining the influence of reward property (Condry, 1977). Individuals may tend to view rewards as either informational or controlling based upon their own past experiences. Also, the possibility that different reward properties are orthogonal needs to be further explored. Such a finding would have significant implications for the measurement of the reward property constructs.

Future experimental research needs to remove the experimenter from the reward power manipulation because such designs have an inherent role conflict. The specific source of the reward power is impossible to differentiate when the experimenter occupies both roles. In addition, an experimenter may be too entangled with other bases of power, specifically legitimate and expert power, to exclusively manipulate reward power. Additional research needs to be conducted exploring the effects of reward power on creativity. If rewards are detrimental to creativity then the use of a rewarded participant pool may be biasing experimental research on creativity.

References

Amabile, T. M. (1979). Effects of external evaluation on artistic creativity. *Journal of Personality and Social Psychology, 37*, 221-233.

Amabile, T. M. (1983). *The social psychology of creativity.* New York: Springer-Verlag.

Amabile, T. M. (1988). *From individual creativity to organization innovation.* In K. Gronhaug & G. Kaufmann (Eds.), Innovation: A cross- disciplinary perspective (pp. 139-166). Oxford, England: Oxford University Press.

Amabile, T. M., Conti, R., Coon, H., Lazenby, J., & Herron, M. (1996). Assessing the work environment for creativity. *Academy of Management Journal, 39*(5), 1154-1184.

Amabile, T. M. (2001). Beyond talent: John Irving and the passionate craft of creativity. *American Psychologist, 56*(4), 333-336.

Barron, F. (1965). The psychology of creativity. In T. M. Newcomb (Ed.), *New directions in psychology* (Vol. 2, pp. 3-134). New York: Holt, Rinehart, & Winston.

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

Clark, R. W. (1972). *Einstein: The life and times.* New York: Avon Books.

Condry, J. (1977). Enemies of exploration: Self-initiated versus other-initiated learning. *Journal of Personality and Social Psychology, 35*(7), 459-477.

De Charms, R. (1968). *Personal causation: The internal affective determinant of behavior.* San Diego, CA: Academic Press.

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

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

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

Edwards, M. R. (1989). Measuring creativity at work: Developing a reward-for-creativity policy. *Journal of Creative Behavior, 23,* 26-37.

Eisenberger, R., & Rhoades, L. (2001). Incremental effects of reward on creativity. *Journal of Personality and Social Psychology, 81*(4), 728-741.

Fisher, C. D. (1978). The effects of personal control, competence, and extrinsic reward systems on intrinsic motivation. *Organizational Behavior and Human Performance, 21,*273-288.

French, J., & Raven, B. (1959). The bases of social power. In D. Cartwright (Ed.), *Studies in social power* (pp.150-167). Ann Arbor, MI: Institute for Social Research.

Galbraith, J. R. (1982, Winter). Designing the innovating organization. *Organizational Dynamics*, *10* (3), 5-25.

Garczynski, J. A. (1995). The effects of competition and competence feedback on intrinsic motivation and quality of performance. Unpublished Doctoral Dissertation. Adelphi University.

George, J. M., & Brief, A. P. (1992). Feeling good- doing good: A conceptual analysis of the mood at work-organizational spontaneity relationship. *Psychological Bulletin, 112*, 310-329.

Gleick, J. (1992). *Genius: The life and science of Richard Feynman.* New York:

Guilford, J. P. (1968). *Intelligence, creativity and their educational implications.* San Diego, CA: Knapp.

Hennessey, B. A. (1989). The effects of extrinsic constraints on children's creativity while using a computer. *Creativity Research Journal, 2*, 151-168.

Hennessey, B. A. (2002). The social psychology of creativity in the schools. *Research in the Schools, 9*(2), 23-33.

Hennessey, B. A. (2003). The social psychology of creativity. *Scandinavian Journal of Educational Research, 47*(3), 253-271.

Hennessey, B. A., & Amabile, T. M. (1998). Reward, intrinsic motivation, and creativity. *American Psychologist, 53*, 674-675.

Hinkin, T. R. & Schriesheim, C. A. (1989). Development and application of new scales to measure the French and Raven (1959) bases of social power. *Journal of Applied Psychology, 74*, 561-567.

Jackson, S. E. & Ruderman, M. N. (1995). *Diversity in work teams: Research paradigms for a changing workplace*. Washington D.C.: American Psychological Association.

James, K., Clark, K., & Cropanzano, R. (1999). Positive and negative creativity in groups, institutions, and organizations: A model and theoretical extension. *Creativity Research Journal, 12*, 211-226.

Kanter, R. M. (1990). *The new workforce meets the changing workplace.* In K. Erikson & S. P. Vallas (Eds.), The Nature of Work. New Haven, Conn.: Yale University Press.

Kruglanski, A. W., Friedman, I., & Zeevi, G. (1971). The effects of extrinsic incentive on some qualitative aspects of task performance. *Journal of Personality, 39*, 606-617.

Lanouette, W. (1992). *Genius in the shadows: A biography of Leo Szilard.* New York: Macmillan.

Lepper, M. L., Greene, D., & Nisbett, R. E. (1973). Undermining children's intrinsic interest with extrinsic reward: A test of the "Overjustification" hypothesis. *Journal of Personality and Social Psychology, 28*, 129-137.

Ludwig, A. M. (1992). Creativity achievement and psychopathology: Comparison among professions. *Assn for the Advancement of Psychotherapy, 46* (3), 330-356.

Macrae, N. (1992). *John von Neumann.* New York: Pantheon.

Maltzman, I. (1960). On the training of originality. *Psychological Review, 67*, 229-242.

Medina, P. (2000). Leader social power and subordinate creativity. *Dissertation Abstracts* International, 61(3), 203.

Moneta, G. B., & Siu, C. M. Y. (2002). Trait intrinsic and extrinsic motivations, academic performance, and creativity in Hong Kong college students. *Journal of College Student Development, 43*(5), 664-683.

Nelson, B. (1994). *1001 ways to reward employees.* New York: Workman.

Nonaka, I. (1991). Knowledge-creating company. *Harvard Business Review, 69*(6), 96-104.

Oldham, G. R. (2003). Stimulating and supporting creativity in organizations. In S. E. Jackson, M. A. Hitt, & A. S. DeNisi Edition (Eds.) Managing knowledge for sustained competitive advantage: Designing strategies for effective human resource management. San Francisco: Jossey-Bass

Oldham, G. R., & Cummings, A. (1996). Employee creativity: Personal and contextual factors at work. *Academy of Management Journal, 39*, 607-634.

Parnes, S. (1967). *Creative behavior guidebook.* New York: Scribner.

Puccio, G. J., Talbot, R. J., & Joniak, A. J. (2000). Examining creative performance in the workplace through a person-environment fit model. *Journal of Creative Behavior, 34*(4), 227-247.

Rummel, A., & Feinberg, R. 1988. Cognitive evaluation theory: A meta-analytic review of the literature. *Social Behavior and Personality*, 16: 147–164.

Runco, M. A. (1991). *Divergent thinking.* Norwood, NJ: Ablex.

Ruscio, J., Whitney, D. M., & Amabile, T. M. (1998). Looking inside the fishbowl of creativity: Verbal and behavioral predictors of creative performance. *Creativity Research Journal, 11*, 243-263.

Ryan, R. M. (1982). Control and information in the intrapersonal sphere: An extension of cognitive evaluation theory. *Journal of Personality and Social Psychology,* 450-461.

Ryan, R. M., Mims, V., & Koestner, R. (1983). Relation of reward contingency and interpersonal context of intrinsic motivation. *Journal of Personality and Social Psychology, 45*, 736-750.

Sansone, C. (1986). A question of competence: The effects of competence and task feedback on intrinsic interest. *Journal of Personality and Social Psychology, 51*, 918-931.

Shalley, C. E. (1991). Effects of productivity goals, creativity goals, and personal discretion on individual creativity. *Journal of Applied Psychology, 76*, 179-185.

Shalley, C. E., & Oldham, G. R. (1997). Competition and creative performance: Effects of competitor presence and visibility. *Creativity Research Journal, 10*(4), 337-345.

Shames, V.A. (1994). Is there such a thing as implicit problem-solving? Unpublished doctoral dissertation, University of Arizona.

Smeltz, W., & Cross, B. (1984). Toward a profile of the creative R & D professional. *IEEE Transactions on Engineering Management, EM-31*, 22-25.

Stein, B. M. (1974). *Stimulating creativity: Vol 1. Individual Procedures.* New York: Academic.

Stokes, P. D. (1999). Novelty. In M. A. Runco & S. R. Prtizker (Eds.), *Encyclopedia of creativity* (pp. 297-304). San Diego, CA: Academic Press.

Tang, S., & Hall, V. C. 1995. The overjustification effect: A meta-analysis. *Applied Cognitive Psychology*, 9: 365–404.

Torrance, E. P. (1965). *Rewarding creative behavior: Experiments in classroom creativity.* Englewood Cliffs, NJ: Prentice-Hall.

Wallach, M. A., & Kogan, N. (1965). *Modes of thinking in young children.* New York, NY: Holt, Rinehart, & Winston, INC.

White, R. (1959). Motivation reconsidered. The concept of competence. *Psychological Review, 66,* 297-323.

Wiersema, U. J. 1992. The effects of intrinsic rewards in intrinsic motivation: A meta-analysis. *Journal of Occupational and Organizational Psychology*, 65: 101–114.

Winston, A. S., & Baker, J. E. (1985). Behavior analytic studies of creativity: A critical review. *Behavior Analyst, 8,* 191-205.

Woodman, R. W., Sawyer, J. E., & Griffin, R. W. (1993). Towards a theory of organizational creativity. *Academy of Management Review, 18,* 293-321.

Appendices

Appendix A

Intrinsic Motivation Scale

For each statement below click the response that most accurately represents your feeling towards the task. The scales below ranges from strongly agree to strongly disagree.

I found the task enjoyable.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
O	O	O	O	O

I found the task interesting.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
O	O	O	O	O

I found the task absorbing.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
O	O	O	O	O

Appendix B

Reward Property Manipulation Check

During this activity, people tend to have different perceptions of the reward. Some people feel the reward is more controlling, or pressuring one to do well. Others find it more informational, or informative about their skill. The scale below ranges from very controlling to very informational. Please click the response that most accurately represents your feeling about the reward.

Very Controlling	Controlling	Slightly Controlling	Slightly Informative	Informative	Very Informative
O	O	O	O	O	O

Appendix C

Reward Power Manipulation Check

Reward power is the ability of one person to influence another through the use of rewards. In this experiment, the experimenter had the capacity to reward your performance. In your opinion, please indicate your belief about the amount of reward power the experimenter possessed. Please click the response that most accurately represents your opinion about the experimenter. Please note that you can also choose between responses if you cannot decide between the two.

No power		Slightly powerful		Moderately powerful		Very Power		Extremely Powerful
O	O	O	O	O	O	O	O	O

Appendix D

Reward Power within a CET Framework Manipulation Check

During this activity, people tend to have different perceptions of the experimenter. For each statement below click the response that most accurately represents your feeling about the experimenter. The scales below ranges from strongly agree to strongly disagree.

The experimenter can control how much credit I receive.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
O	O	O	O	O

The experimenter can provide incentives for doing good work.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
O	O	O	O	O

Appendix E

Analysis of Wallach and Kogan (1965) Pattern Meaning Task

Creativity was initially assessed using the Pattern Meaning Procedure developed by Wallach and Kogan (1965). In this task participants listed all the things a specific pattern could be conceived as. Sixteen patterns were used for this measure (Figure 3). Wallach and Kogan (1965) recommended scoring each response set on fluency and uniqueness. Fluency is the absolute number of responses, while uniqueness is defined as a response provided by only one participant. Research since then has questioned the validity of these measures. Fluency may be considered confounded with motivation with a greater number of responses stemming from either motivation or creative ability. Wallach and Kogan's (1965) conceptualization of uniqueness is also lacking because it is sample dependent. Participants in a large sample would be less likely to provide unique responses than would participants in a small sample. Therefore, a primary weakness of both scales is that creativity scores can be easily inflated by submitting non-relevant responses. In order to prevent this only responses submitted by more than one participant were scored as creative. An inflated type II error rate was deemed preferable than an unregulated type I error rate.

Therefore, creativity was assessed as the number of original (statistically infrequent) responses submitted by more than one participant on the Wallach and Kogan's (1965) Pattern Meaning Task. However, because the creativity task had to be immediately scored it was necessary to establish a database of responses prior to experimentation. Twenty eight thousand three hundred and sixty seven responses were collected (*mean number of responses per pattern* = 1726.41, *SD* = 400.67 *responses*)

during the normative phase. Participants were asked to limit their responses to a maximum of two words. However, there was no mechanism in place to ensure the condition was met, and 24.7% (n = 7006) of the responses did not fulfill the constraint. This led to a large number of variations of denotatively similar responses. The responses were then sorted by the primary researcher into response categories and then checked by a second individual. Any discrepancy between the two researchers was discussed until consensus was obtained. The frequency of each response category was calculated as the sum of individual responses in a response category divided by the total number of responses for the pattern.

Response categories were then split into conventional or original using a criteria where less than 2% total frequency represented an original response category. One point was awarded for each original response, the sum of which would represent the participant's creative ability. The conventional versus original scoring system was then reapplied to existing responses in order to find percentile creativity scores for each pattern. The 60^{th} percentile and greater was used as the performance criteria necessary for reward. This was a less rigorous performance contingency than 80^{th} percentile recommended by Sansone (1986) and Garczynski (1995). The rewarded performance contingency was reduced in order to increase the opportunity for the researcher to exercise reward power.

This operational conceptualization was used in pilot study in order to examine the validity of the creativity measure. However, there was difficulty in creating programming that could accurately match participants' responses to the normative phase

database. This was primarily due to participants violating the two word constraint placed on responses during the normative phase. Various methods were explored ranging from matching the entire phrase to computing the average frequency of the decomposed phrase components. In the end, there were simply too many variations of denotatively similar responses. In the pilot, of the 1237 responses provided by participants 55.13% were unique (conventional = 30.15%, original = 14.71%). Therefore, it was concluded that Wallach and Kogan's (1965) Pattern Meaning Task did not adequately measure creative ability and was abandoned.

Appendix F

Normative and Pilot Phase Method Section

Method

Participants

Four hundred and thirty five students (353 females, 79 males, 3 gender not reported, ***mean age*** = 21.24 years, ***SD*** = 3.87 years) provided normative information for the Wallach and Kogan (1965) Pattern Meaning Task. Participants reported their ethnicity as Caucasian (67%), African American (10 %), Asian (03 %), Hispanic (17 %), and other (03 %).

Twenty four participants (17 females, 7 males, ***mean age*** = 21.54 years, ***SD*** = 7.71 years) were used to pilot test the experiment. Participants reported their ethnicity as Caucasian (58.3%), Hispanic (20.8%), African American (12.5%), Asian (4.17%), and Native American (4.17%). These participants were of freshman (20.8%), sophomore (25%), junior (16.67%), and senior (37.5%) academic standing.

Normative Phase

Participants accessed Wallach and Kogan (1965) Pattern Meaning Task via an online survey site. Due to concerns with practice, learning, and fatigue effects the 16 experimental patterns were systematically rotated to create four versions of the task. The task required the participant to list as many things a pattern could be conceived as. Participants were instructed that all responses were to be limited to a max of two words. The patterns were then presented one at a time with the participant having an unlimited amount of time to provide responses.

Pilot Phase

The operational conceptualization of creativity was pilot tested utilizing the response category frequencies obtained in the normative phase of the experiment. The participant was informed that this experiment was meant to measure his or her creative ability. The task was to generate as many creative responses to several simple patterns as possible. The participant was then seated at a personal computer and shown how to use the computer interface. The computer interface was designed to be intuitive even for novice computer users. Responses were typed into a text box located to the side of the pattern. After a response was entered, striking the enter key submitted that response. All submitted responses were placed into a list and were still visible to the participant. When no additional responses could be produced, clicking the "done" icon with the mouse ended the trial. Specifically, the experimenter stated:

> "This experiment is meant to measure your creative ability. Your task is to generate as many creative interpretations to a series of simple patterns that you can. A creative response is a rare response that intuitively makes sense. During this task, a pattern will appear on the computer screen. You are then to start listing all the possible things this pattern could be conceived as. There is no time limit for this task and you will have as much time as you need. After you enter a response, hit the enter key to submit that response. When you can no longer think of any more responses, click the "done" icon to end the trial. For today's session, we will begin by going over the computer interface. We will then work on an example pattern together. You will then work on several patterns by yourself. Finally, you will complete a questionnaire and be debriefed. Do you have any questions?"

The participant was then instructed to begin the experiment. First, the participant entered the requested demographic information. The experimenter and the participant then worked on a sample problem together (Figure 3). The experimenter began by stating:

> "A difficult aspect of this task is that all responses are limited to one to two words. Therefore, make sure to remove all elaboration words and words like "a" and "an". For instance, I can conceive of the example pattern as a slice of watermelon. Therefore, I would type the word "watermelon" into the text box and click the submit button. Next, I can conceive the pattern as a ½ of a clock's face. What term would I submit then?

If the participant stated terms such as "clock" or "watch" the experimenter said "correct" and asked the participant to submit the word "clock". If the participant stated a response significantly different from "clock" or "watch" the experimenter said,

> "Terms such as clock or watch would have been more appropriate."

The experimenter then helped the participant through three additional interpretations for the example problem. The specific responses were: sunset, face, and hill. The experimenter then had the participant provide five of his or her own responses and after which click the "done" icon with the mouse. During this period, if the participant was unable to provide five responses than the experimenter helped. Also, the experimenter helped the participant put responses in to the correct format. The participant was instructed to click the "done" icon once responses had been submitted. A message was then displayed along with a "next trial" icon. The message stated:

"Responses are being printed for analysis. Please wait."

The experimenter then stated:

"As you can see, once you have submitted your responses, they are printed so I can analyze them. Each pattern is scored in a similar way. Basically, I use computer software to calculate the frequency of each response. You will receive one point for each statistically infrequent response, which is calculated by comparing your response to responses obtained from a pilot study used to build norms. The best strategy to maximize your score is to provide as many responses as possible. You are not penalized for uncreative responses. Also, because your responses are being compared to a large collection of responses, nonsense and random responses will not be scored as creative. After I analyze your responses, I will ask you to begin the next trial by clicking the "next trial" icon on the bottom of the screen. "

The participant was then asked if he or she had any questions. If not, the participant was asked to begin the task by clicking the "next trial" icon. After each trial the experimenter entered the descriptive statistics, including number of conventional, original, and unique responses, into a second computer. The following two trials did not have a reward-contingency and served as a baseline measure of intrinsic motivation and creative performance.

Participants in the control condition continued without feedback or tangible reward for the remaining trials of the experiment. In contrast, participants in the rewarded conditions were informed that the remaining trials would be rewarded.

Participants in the rewarded conditions continued in a research paradigm adopted from Ryan *et al*., (1983). The scripted was slightly modified for this experiment.

Participants in the reward power condition utilizing rewards with salient informational properties were told:

> "As an incentive, I have been authorized to reward those participants who perform **well** on today's activity. You will receive ($2.00 for the high power condition, $0.50 for the low power condition) for each trial that **you perform well on. This reward will help you understand the number and quality of responses that I want.** After each trial, I will analyze your responses and decide **whether you have performed well or not.** I will then inform you of my decision, which is non-negotiable, after which the next trial will begin. After you have completed all the trials you will be given a questionnaire to complete. At the end of the experiment, you will be debriefed and receive any **money that you have earned due to your performance.**"

Participants in the reward power utilizing rewards with salient controlling properties were told:

> "As an incentive, I have been authorized to reward those participants who perform **as well as they should** on today's activity. You will receive ($2.00 for the high power condition, $0.50 for the low power condition) for each trial that **you perform up to my standards. This reward pattern is meant to allow me to increase the quantity and quality of responses.** After each trial, I will analyze your responses and decide **if you have or have not performed up to my standards.** I will then inform you of my decision, which is non- negotiable, after which the next trial will begin. After you have completed all the trials, you will be given a questionnaire to complete. At the end of the experiment, you will be debriefed and receive any **money that you have earned because your performance met my standards.**"

The participant then completed four trials under the manipulation. At the end of each trial, the experimenter analyzed the participant's responses and informed the participant if his/her performance justified reward. Participants were rewarded when their performance was in the 60th percentile or better. Specifically, for those conditions utilizing informational properties the experimenter stated:

> "After analyzing your responses, I have decided that **(you performed, you did not perform) well on this trial.** At the end of the experiment, **you (will, will not) receive the** ($2.00 for the high power condition, $0.50 for the low power condition) **reward because of your performance** on this trial. Remember this reward pattern **is meant to help you understand the number and quality of responses that is desired.** Now please move onto the next trial, where you will have an additional opportunity to earn the ($2.00 for the high power condition, $0.50 for the low power condition) **reward if you perform well.** "

depending if the participant did or did not perform well on the task, respectively. For those conditions utilizing controlling properties the experimenter stated:

> "After analyzing your responses, I have decided that your performance **(met, did not meet) to my standards** on this trial. At the end of the experiment, **you (will, will not) receive the** ($2.00 for the high power condition, $0.50 for the low power condition) **reward because of your performance on this trial.** Remember this reward pattern **is meant to allow me to increase the quantity and quality of responses.** Now please move onto the next trial, where you will have an additional opportunity to earn the ($2.00 for the high power condition, $0.50 for the low power condition) reward if **you perform up to my standards.** "

depending if the participant did or did not perform well on the task, respectively. After the 4th trial, the experimenter provided the appropriate feedback without directions to move to the next trial. During this time, a new icon labeled "questions" appeared on the screen. After providing the appropriate feedback, the experimenter asked the participant to double click the "questions" icon. This displayed the screen with reward property and reward power manipulation checks along with a scale measuring intrinsic motivation. The experimenter stated:

> "You have completed the pattern task. Now, there are a several questions that you need to answer. Please click the Questions icon. Once you are done, please let me know."

Once the questions had been answered, the experimenter feigned that he was out of debriefing forms and would need to make additional copies. The scenario was that a debriefing form needs to be administered to all participants in accordance with Institutional Review Board (IRB) guidelines. Specifically, the experimenter stated:

> "I just realized that I am out of the debriefing form that I need to give to you. I will go make some additional copies, however it will take a little while. If you want, you can continue providing responses for the pattern task, however, I will not be able to reward you for any additional trials. I will be back in a few minutes."

The experimenter then left the room for 5 minutes. Upon return of the experimenter, the participant was debriefed and awarded any money that was owed.

Table 1

Descriptive Statistics for the Pilot Test Reward Property Developed Items

	Reward Property Controlling			Reward Property Informational		
Condition	Mean	SD	N	Mean	SD	N
Control	2.50	0.71	2	3.00	0.00	2
HC	4.33	0.58	3	4.33	0.58	3
HI	3.33	1.53	3	4.00	1.00	3
LC	4.00	1.41	2	4.00	1.41	2
LI	3.80	0.80	6	3.70	0.80	6

Note: HC = High reward power with controlling properties; HI = High reward power with informational properties; LC = Low reward power with controlling properties; LI = Low reward power with informational properties.

Table 2

Mean Time and Probability of Correctly Solving Individual RAT Items

Triad (*trial # item #; B =baseline*)	Prob. Of Solving	Mean Time (*seconds*)	SD (*seconds*)
TBI1. Playing-Credit-Report	.91	00:15	00:17
TBI2. Rabbit-Cloud-House	.73	00:47	00:45
TBI3. Lick-Sprinkle-Mines	.18	01:35	01:14
TB14. Envy-Golf-Beans	.71	00:42	00:42
TBI5. Rock-Times-Steel	.73	00:37	00:33
T1I1. Manners-Round-Tennis	.44	00:50	00:45
T1I2. Ache-Hunter-Cabbage	.75	00:42	00:46
T1I3. Blade-Witted-Weary	.08	01:05	01:02
T1I4. Chocolate-Fortune-Tin	.73	00:40	00:47
T1I5. Hall-Car-Swimming	.71	00:51	01:05
T2I1. Off-Trumpet-Atomic	.12	01:13	01:18
T2I2. High-Book-Sour	.08	02:04	01:56
T2I3. Barrel-Root-Belly	.56	00:47	01:00
T2I4. Speak-Money-Street	.24	01:19	01:20
T2I5. Big-Leaf-Shade	.93	00:31	00:32
T3I1. Salt-Deep-Foam	.60	00:28	00:42
T3I2. Snack-Line-Birthday	.32	01:12	01:03
T3I3. Strap-Pocket-Time	.75	00:40	00:43
T3I4. Sandwich-Golf-Foot	.52	01:01	00:50
T3I5. Ink-Herring-Neck	.24	01:09	01:06
T4I1. Room-Blood-Salts	.28	01:36	01:21
T4I2. Ticket-Shop-Broker	.06	01:03	00:57
T4I3. Notch-Flight-Spin	.34	01:03	01:04
T4I4. Color-Numbers-Oil	.28	01:19	00:59
T4I5. Measure-Desk-Scotch	.89	00:25	00:46
T5I1. Water-Tobacco-Stove	.28	00:53	00:47
T5I2. Square-Telephone-Club	.06	01:31	01:11
T5I3. Walker-Main-Sweeper	.62	00:47	00:52
T5I4. Mouse-Sharp-Blue	.48	01:00	00:59
T5I5. Strike-Same-Tennis	.30	00:55	00:48

Table 3

Descriptive Statistics for the Intrinsic Motivation Scale

Power	Property	Mean	SD	N
Control	Control	3.33	.54	10
High	Controlling	3.77	.88	10
	Informational	3.13	.96	10
Low	Controlling	3.73	.54	10
	Informational	3.70	.76	10
Total	Control	3.33	.54	10
	Controlling	3.75	.71	20
	Informational	3.53	.89	20

Table 4

Descriptive Statistics for the Reward Property Developed Items

	Reward Property Controlling			Reward Property Informational		
Condition	Mean	SD	N	Mean	SD	N
HC	4.30	0.95	10	3.40	1.35	10
HI	4.20	0.92	10	3.70	1.16	10
LC	4.40	0.70	10	3.40	1.78	10
LI	4.00	0.82	10	3.80	0.92	10

Note: HC = High reward power with controlling properties; HI = High reward power with informational properties; LC = Low reward power with controlling properties; LI = Low reward power with informational properties.

Table 5

Analysis of Variance for Intrinsic Motivation Scale

Source	*df*	Mean square	*F*	*P*
Corrected Model	4	0.81	1.14	0.25
Intercept	1	583.63	1023.24	0.000**
Reward Property (Prop)	1	1.11	1.95	0.17
Reward Power (Pow)	1	0.71	1.25	0.27
Prop x Pow	1	0.90	1.58	0.22
Error	45	0.57		
Total	50			
Corrected Total	49			

***** $p \leq .001$***

Table 6

No Growth Mixed Model for Creative Performance

Source	β	*Std. Error*	df_{den}	*F*	*p*
Intercept	2.14	0.85	50	641.17	0.000**

***** ***p* ≤ *.001***

Table 7

Unconditional Mixed Model for Creative Performance

Source	β	*Std. Error*	df_{den}	*F*	*p*
Intercept	2.77	0.16	50	289.04	0.000**
Trial	-0.21	0.04	50	23.74	0.000**

***** $p \leq .001$**

Table 8

Conditional Mixed Model for Creative Performance

Source	β	*Std. Error*	df_{den}	*F*	*p*
Intercept	1.10	0.60	73.81	3.40	0.069
Reward Power (Pow)	0.42	0.40	48.80	1.07	0.306
Reward Property (Prop)	-0.06	0.40	48.90	0.02	0.886
Trial (T)	-0.20	0.09	49.00	4.40	0.041*
Verbal Fluency (VF)	-0.07	0.02	49.00	9.06	0.004*
Pow x Prop	-0.14	0.32	48.80	0.17	0.680
Pow x T	-0.07	0.11	49.00	0.43	0.514
Prop x T	-0.003	0.11	49.00	0.001	0.978
Pow x Prop x T	0.05	0.09	49.00	0.26	0.611

***** $p \leq .05$

Figure 1- Research Design

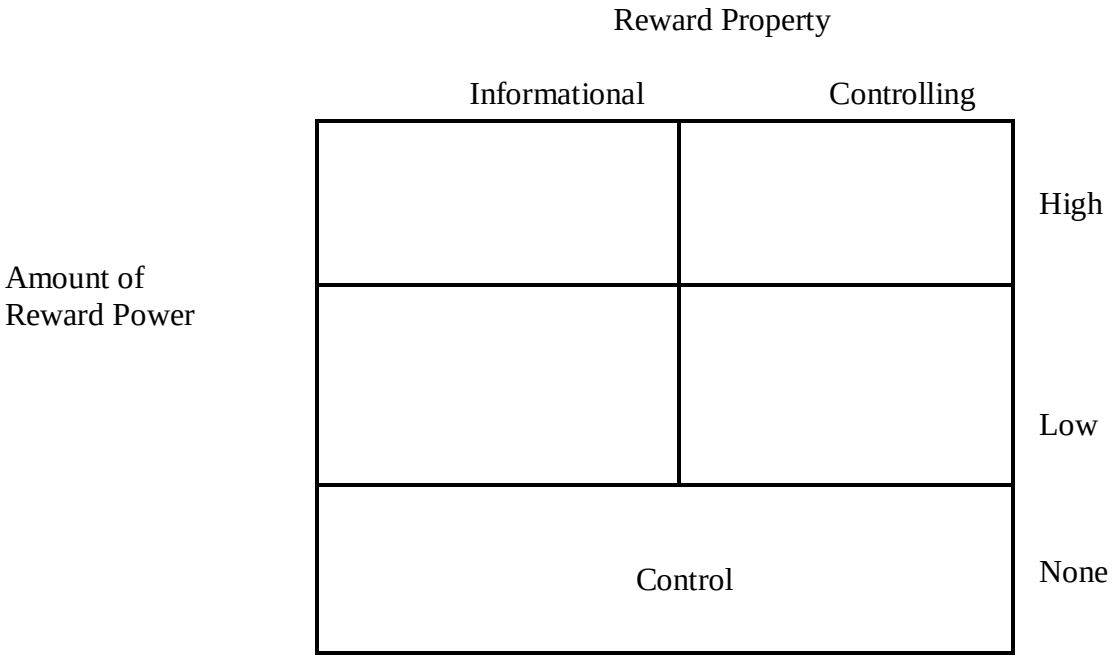
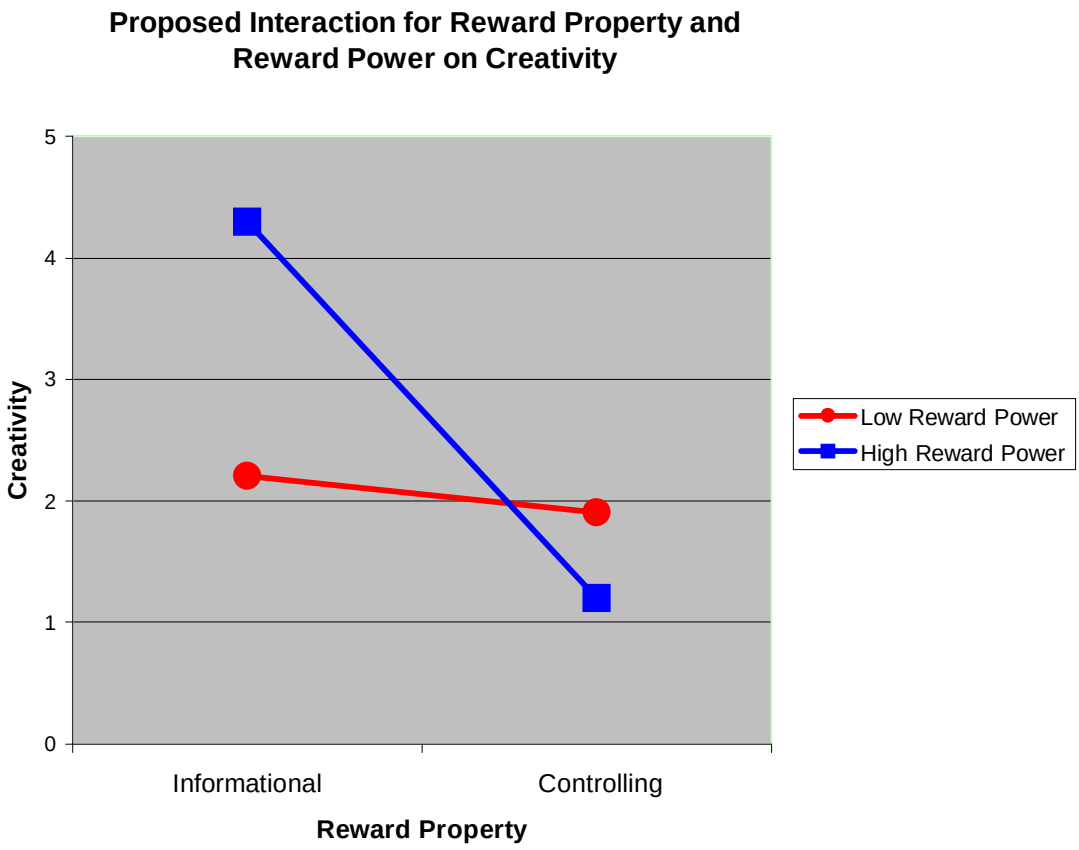


Figure 2- Proposed Interaction for Reward Property and Reward Power on Creativity.



(The exact same interaction is expected for intrinsic motivation.)

Figure 3- Wallach and Kogan's (1965) Pattern Meaning Procedure

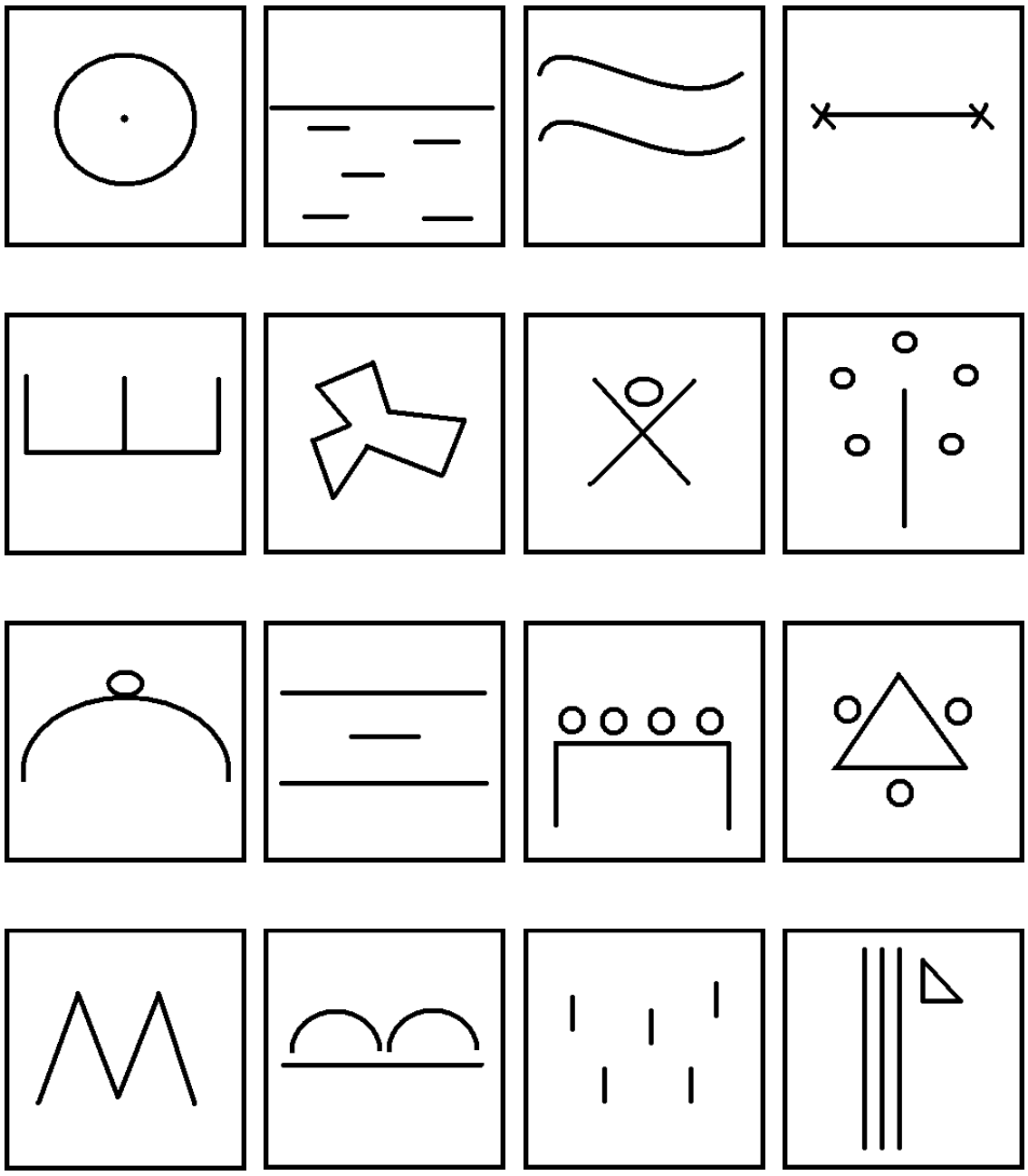


Figure 4- Results of the Free Choice Period