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THE EFFECTIVENESS OF OVERT AND COVERT MOTIVATORS ON INTRINSIC INTEREST AND ATTRIBUTIONS

By

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ABSTRACT

THE EFFECTIVENESS OF OVERT AND COVERT MOTIVATORS ON INTRINSIC INTEREST AND ATTRIBUTIONS

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The purpose of this research was to test and contrast the effectiveness of two procedures that were designed to increase performance and produce different types of attributions at social tasks. The first is covert motivation (via priming) and the second is explicit instructions (via goal setting). The author hypothesizes that while each type of motivator should be equally effective in the short-term, the covert motivator should lead to more internal attributions for success as more persistence and intrinsic enjoyment of the task. The task used was an arm-holding measure. The two types of motivators more calibrated to be equally effective at short-term performance. However, counter to the hypotheses, these motivators did not differ at longer-term persistence at the activity. There was some support for more internal attributions for success via the covert motivator. Reasons for the failure of the results are discussed as well as others means of testing the hypotheses.

Dedicated to the memory of Dr. Larry Messé

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TABLE OF CONTENTS

LIST OF TABLES....viii

LIST OF FIGURES....ix

CHAPTER 1
INTRODUCTION....1
Overjustification Effect....2
Cognitive Dissonance, Insufficient Justification, and Self-Perception....3
Automatic Goal Pursuit....7
Overt Motivation....9
Goal Setting....11
Covert Motivation....12
Hypotheses....14

CHAPTER 2
PILOT STUDY 1....16
Method....16
Participants....16
Design....16
Procedure....16
Results and Discussion....20

CHAPTER 3
PILOT STUDY 2....22
Method....22
Participants....22
Procedure....22
Results and Discussion....23

CHAPTER 4
PILOT STUDY 3....24
Method....24
Participants....24
Design....24
Procedure....25
Results....26
Discussion....27

CHAPTER 5
MAIN STUDY....28
Method....28
Participants....28

Design....28
Procedure....28
Measures....29
Results....31
Excluded Data....31
Power and Effect Size....33
Discussion....48
Goal Setting....49
Priming Task....51

APPENDICES....60

REFERENCES....82

LIST OF TABLES

Table 4.1 – Trial Difference Scores by Condition on Pilot Studies.....26

Table 5.1 – Scores on Measures of Persistence and Intrinsic Motivation in Main Study.40

Table 5.2 – Scores on Attribution Measures in Main Study.....44

LIST OF FIGURES

Figure 3.1 – Distribution of Expectations for Next Trial Block.....23

Chapter 1

INTRODUCTION

Those who have reason to motivate other individuals or groups face a common dilemma. By motivation I here mean the effort or drive that invigorates one to do well at a task. How does one maximally change someone's motivation at a task that is initially unenjoyable but has longer-term benefits (e.g., better health)? This question can interest anyone from a mother trying to get her children to eat broccoli to a coach trying to get athletes to engage in long term fitness behaviors. The dilemma of interest is whether it is more effective for the purposes of enhancing intrinsic task motivation to overtly motivate others (e.g., by such common means as "getting in their faces" or giving them a clear incentive) or to do something more covert and subtler? Research has shown the effectiveness of several different overt (i.e. monetary reinforcement, goal setting) as well as covert (subliminal priming) techniques of motivating people for short-term tasks.

However, there is relatively little research exploring a related question: what are the more long term implications of using more vs. less overt means of motivation for task interest and the intrinsic motivation of task activity? In this project, I suggest that covert motivators have different effects on the kinds of attributions people make for task success, and that these attributional effects, in turn, affect their task enjoyment and persistence. Reasoning from certain motivational and attributional literatures that will be examined below, I argue that compared to overt forms of motivation, subtle or covert forms are more likely to lead to internal attributions for success--specifically that success is due to one's own high ability and/or enjoyment of the task, attributions which should

enhance long term persistence and enjoyment of the task. This argument has several interesting implications for theory (e.g., how does the overtness of a task motivator influence attributional or dissonance processes?) and for application [e.g., just when should motivators (i.e. coaches, managers, teachers) prefer covert means of motivating as a means of enhancing long term task motivation?].

Throughout the remainder of this introduction section, I plan to do several things. First, I will review motivational and attributional literature (e.g., overjustification effect, insufficient justification, cognitive dissonance) which examine the role of different size motivators and attributions for performance. Then I will discuss how each of these areas would explain and predict how the use of overt vs. covert motivators would differ for long term persistence and enjoyment at unenjoyable tasks. This will be followed by a discussion of commonly used overt and covert motivational techniques of interest to the present research. Finally I will propose hypotheses comparing these techniques.

Overjustification Effect

Previous research has examined some related aspects of my research idea. Specifically, research examining the role of large extrinsic rewards on subsequent motivation shows the undermining effect of extrinsic rewards. This classic research showed that when initially enjoyable behavior was externally rewarded by incentives such as money, the behavior would likely only persist if reinforced extrinsically in the future. Providing smaller rewards such as verbal praise leads to relatively greater persistence in the task domain. Participants rewarded extrinsically (with money) tend more to attribute their effort to the extrinsic reward instead of their own enjoyment or motivation. While those receiving only a small incentive in the form of verbal praise

tend more to attribute their effort to internal factors such as their own enjoyment and ability. So giving someone an extrinsic reward (i.e. money for something that was already rewarding will reduce their subsequent enjoyment of it and persistence at it in the future when the incentive is removed. This is of course the classic overjustification effect (Lepper, Greene, & Nisbett 1973; Boggiano, Harachiewicz, Bessette, & Main, 1985; Deci & Ryan, 1985, 1991).

Although the magnitude of an extrinsic incentive may increase the level of task motivation in the short run, the overjustification effect informs us that it may have the opposite effect on intrinsic task motivation and long-term task persistence. This is only one piece of the theoretical puzzle of the current research however. The overjustification effect applies only to behavior that the individual already found rewarding in and of itself—i.e., task interest and intrinsic motivation is initially high. Task interest and persistence is then less likely to occur when extrinsically rewarded because the individual has made an external attribution for his/her work at the task. However, the question I am most interested in is how to enhance intrinsic motivation for tasks which are initially low in intrinsic interest (as is the case with our above examples of fussy potential broccoli eaters or novice athletes). So how can one take an individual with an initially low or zero level or enjoyment at a task and increase it so that it will persist into the future without then defeating it with external rewards? The next section will further inform us on this question.

Cognitive Dissonance, Insufficient Justification, and Self-Perception

Earlier classic research on the results of different size rewards on subsequent behaviors, attitudes, and attributions from a cognitive dissonance perspective (Festinger

& Carlsmith, 1959) is informative. The very first experiments in this area informed us that we are more likely to report enjoying a boring task if paid less rather than more. Participants had a negative attitude toward the clearly boring task (turning wooden pegs) but, at the experimenter's prompting, acted in a counterattitudinal manner by professing to enjoy the task to another participant. They received either $1 or $20 for their compliance to engage in counterattitudinal behavior. Participants were assumed to have felt dissonance because of this inconsistency of attitude and behavior, but those receiving $20 felt less dissonance and reported not genuinely liking the tasks as opposed to those who received $1. This is the case because a relatively large extrinsic reward (i.e. $20) gave them sufficient justification for behaving in a counterattitudinal manner. On the other hand, performing the same act for far less extrinsic reward (i.e. $1) was insufficient justification.

Of course, from a historical perspective, this finding was quite shocking. Conventional wisdom at the time held that larger rewards would not only lead to greater vigor in task behaviors but greater enjoyment of the task as well. Festinger and Carlsmith's (1959) work showed that reward size or intensity could affect not only behavior but also intrinsic interest in the opposite direction. This intrinsic interest is important because as Lepper, Greene, and Nisbett (1973) have informed us, intrinsic interest is much more likely to guide long term persistence at a task as opposed to large external rewards.

While dissonance theory did a good job of explaining how attitudes towards unpleasant tasks could be changed, a newer perspective, self-perception theory (Bem, 1972) explained development of intrinsic interest for unpleasant as well as pleasant tasks.

From this perspective, when we are unsure of our attitudes, we explain our own behavior as we would when observing others. That is when we try to explain why we did something unpleasant such as eating broccoli (if we are fussy eaters) or something pleasant such as eating ice cream, we attribute a positive attitude toward the behavior. The reasoning is that if when we do something and we have to think about why, we are apt to explain it by our own enjoyment or interest in the behavior as we would when observing another behave similarly. This is especially the case when our behavior is freely chosen and not clearly influenced by external factors such as rewards.

Both of the aforementioned theories, cognitive dissonance and self-perception, predict similar outcomes for the present research. Both predict that when given feedback that one has done well at an unpleasant task without any extrinsic reward or motivator, performance will be attributed to one's own enjoyment or effort at the task which should thereby increase future persistence. So, when a motivator is subtle, so that it can not easily be attributed as the cause of behavior, participants will not have sufficient justification for their effort and performance from external factors. However, when performance is clearly influenced by extrinsic factors (the kind that many people use to motivate others) effort and performance will be attributed to that factor, not any intrinsic motivation or enjoyment. Therefore future effort will decrease without these extrinsic factors. So one's attitude toward the task should also be more positive without extrinsic factors influencing motivation. However it is unclear whether dissonance or self-perception theory is better at predicting the outcome. Indeed others have attempted to competitively test these theories (i.e. Greenwald, 1975) but no consensus has been reach over which is better. While it may be theoretically interesting to test these two theories it

is beyond the scope of the current research. Having two theories which both predict the same outcomes is encouraging in a way because it underscores the scope and robustness of the effect.

Finally, self-presentation theory or impression management (Tedeschi, 1981; Paulus, 1982) gives us another perspective. According to this theory, we may change our attitudes about how much we like something (like an unpleasant task) in order to present ourselves as being consistent (not to actually be consistent in our attitudes and behavior). This alternative to the dissonance explanation for attitude change posits that attitude change in traditional dissonance scenarios only occurs when the truth of participants' responses cannot be measured. To test this Tedeschi and colleagues (Gaes, Kalle, & Tedeschi, 1978; Tedeschi, 1981) measured attitudes in forced compliance situations using the bogus pipeline (Jones & Sigal, 1971). When participants believed their true attitudes could not be measured (when not attached to bogus pipeline apparatus) they demonstrated the usual insufficient-justification effect. However when hooked up to the bogus pipeline, believing their true response could not be hidden, they professed no attitude change.

Tedeschi (1981) argued that this supported impression management since participants were only reporting attitude change to appear consistent but would not due so if they could be caught in a lie (when attached to bogus pipeline). However, Stults, Messé, and Kerr (1984) argued according to dissonance arousal attribution theory (Fazio & Cooper, 1982) that when participants can attribute counterattitudinal behavior to externally induced arousal (such as that associated with being attached to a bogus pipeline apparatus) attitude change would not occur. Instead of attributing the arousal to

their discrepant behavior, participants attribute it to the machinery which is indeed what they found in their study. When this arousal could not be attributed to external sources (after habituation to the equipment) attitude change occurred as was predicted by dissonance theory but not by impression management theory. So while each explanation has support, competitive tests show that dissonance theory offers a more parsimonious explanation than impression management theory.

Automatic Goal Pursuit

Striving towards a goal or desired outcome can sometimes occur outside our conscious awareness, intent, and control (Chartrand & Jefferis, 2003). Aspects of the social environment, with repeated exposure can automatically activate a particular goal which is frequently accessible in the given situation (Chartrand & Bargh, 2002). A model of how this can occur is proposed by Chartrand and Jefferis (2003) in three stages.

The first stage (Direct Situation-Goal Linkages) proposes that goals are mental representations in memory which become automatically activated when stimuli that has been associated with them in the past is present. So the situation serves as a cue to activate this goal. An example of this might be the sight or sounds of the competitive arena or playing field for an athlete activating achievement goals. Research supports this idea. One example showed that for those who possessed chronic goals of egalitarianism, the presence of a minority group member will suddenly activate the goal of fairness (Moskowitz, Gollwitzer, Wasel, & Schaal, 1999).

Stage 2 (Pursuit of Goals without Awareness) states that an automatically activated goal energizes and directs behavior and thought just as a conscious goal would. An example of this stage demonstrated by Chartrand and Bargh (1996) showed that

priming an impression formation goal led to the same effects of online impression formation as did studies which instructed participants to form impressions of others, such as categorize behaviors according to traits (Hamilton, Katz, & Leirer, 1980). In addition, other research found that once primed with goals, participants would persist in the face of obstacles, increased in strength over time, and led to the resumption of goal-related behavior after interruption (Bargh, Gollwitzer, Lee-Chai, Barndollar, & Trötschel, 2001). Of particular interest to the current of investigation from these studies, is the finding that participants persisted at a word-search puzzle even after they were given instructions that they could stop when they had been primed with the goal of high performance by a word-search puzzle containing words related to the target concept such as "win," "achieve," "strive," and "master". Also, participants persisted at the achievement task (word-search) after interruption and being given the choice of a more fun, but non-performance related task (judging humorous cartoons). So, just like consciously chosen goals, primed goals exert persistent motivational effects.

Finally, Stage 3 (Consequences of Success and Failure at Nonconscious Goal Pursuit) proposes that whether or not we succeed at these automatic goals, our mood and self-enhancement will be accordingly affected as it would be with effortful goals. Research by Chartrand (2002) showed that succeeding or failing to reach average time completion of an anagram task when primed for achievement led to corresponding changes in mood even though participants did not report an achievement goal when asked. Also those who fail at these nonconsious goals are more likely to engage in self-serving biases even more than those who fail with a conscious goal (e.g., Dunning, Leuenberger, & Sherman, 1995; Chartrand, Cheng, & Tesser, 2002). This may be the

case because those who have nonconscious goals activated and fail are unaware of the source of their negative mood as opposed to those who have a conscious goal and fail. So activating nonconscious goals may lead to different attributional strategies when receiving feedback. This is especially relevant to the current investigation, since differential attributions are proposed depending on whether a goal is overtly or covertly presented.

In the next section, I will present some of the specific external or "overt" techniques psychologists have used to increase short term motivation at task performance.

Overt Motivation

Most previous approaches to motivation gains/task performance enhancement have focused on direct or overt approaches. An overt (i.e., non-subliminal) motivator is any method which directs (usually intentionally) another's behavior with his/her full awareness of its influence. This type of motivator usually informs them of what is expected in a situation or what can be done to achieve success or provides some explicit incentive for high effort. So, for my purposes, awareness of the motivational method or stimuli is not enough, awareness of its possible influence on one's cognitive or motivational processes is the critical property that makes it an overt motivator. So a supraliminal prime (stimuli the participant is aware of) which is presented consciously to the participant but whose intended effect is unknown to the participant would be covert (Bargh, 1992). An example of an overt motivator is monetary reinforcement. Those who wish to motivate others--such as employers, research psychologists, and even parents of fussy children--might use money as a reward for desired behavior. It is categorized as an

overt motivator as long as the desired target of the motivator is aware of the stimulus (perceives that the incentive was offered) and is aware of its potential influence on his/her behavior (believes in the motivational value of money, i.e., the contingency between getting paid and working harder). So the experimenter is setting up a situation in which the behaviors required for success are clear to the participant. The intended effect of the motivator is also clear to the participant. However, it is not the experiment's intention that is vital but the participant's awareness of this and its usual effect on behavior. Overt motivators are motivational in the sense that they energize one towards behavior.[1]

The principals and requirements for overt motivators listed above help us to understand what they are. Now let's look at some results from relevant research. Specific forms of overt motivational techniques include reinforcement, punishment, and goal setting. They are operationalized as overt because the participants are aware not only of their presence but their likely influence on their behavior. These three forms of motivation are among the most researched and well understood, and their effects are robust in the literature. From the era of behaviorism, Thorndikes' law of effect has taught us that rewarded behavior is likely to persist while punished behavior is not (Thorndike, 1927). Research by Skinner and others (e.g. Skinner, 1933) illuminated the generalizeability and the specific applications of this principle through operant conditioning.

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1. Some would argue that motivation requires a directional nature as well. So overt motivators are only as effective as they can provide clear norms for successful behavior in performance situations. So rewards are not enough, they must clearly reward each aspect of desired behavior to be effective. For example reward structures like flat rate pay might not be effective to increase output because they do not reward increased performance, just the behavior while piecemeal pay might serve to better direct effort.

Goal Setting

Goal setting and its applications have been well studied for the last thirty years. A goal is defined as "attaining a specific standard of proficiency on a task, usually within a specified time limit" (Locke, Shaw, Saari, & Latham, 1981, p. 145). Goals also possess the properties of direction and quantity or quality of the outcome (Locke & Latham, 1985). Meta-analyses of the effect of goal setting on performance have supported Locke's (Locke, 1968; Locke & Latham, 1990) theory that difficult and specific goals increase short-term task performance (e.g. Tubbs, 1986; Mento, Steel, & Karren, 1987) and sport performance (Kyllo & Landers, 1995). These reviews have also confirmed that goal difficulty, goal specificity, feedback, and participation in the goal setting process can moderate the goal setting performance relationship. Using these moderators in addition to goal setting alone can often increase the effects of goal setting on performance. While the first three moderators play a role in the procedure used in this study (although not manipulated), the last will not since overt motivation must be assigned by an external source (task instructions).

Other research in sport psychology suggests that goals work because they can influence self-confidence, persistence, and development of new strategies. They also serve to the motivational functions of mobilizing effort and directing attention towards relevant task features (Gould, 2001). In fact, goal setting is recognized as such a powerful motivator by many sport psychologists that it is recommended as a motivational strategy in practice as well as competition. In addition, goals are used most effectively when they discussed and agreed upon by coach and athlete before the season, monitored in quantifiable ways during the season, and readdressed for progress/success at the end of

the season (Gould, 2001). Finally, reviews is sport psychology caution to avoid setting too many goals, setting unquantifiable or general goals, not recognizing individual differences, failing to modify unreachable goals, and failing to create a supportive environment for the goal-setting athlete (e.g., Gould, 2001; Kyllo & Landers, 1995).

In this project, I wish to contrast the impact of an overt motivator on subsequent intrinsic task interest with a covert motivator that is comparably motivating. Due to practical concerns (e.g., the cost of using financial incentives; ethical objections to using threats of punishment) and methodological concerns (e.g., awareness of the motivating power of small financial incentives may be low), goal setting is the preferable technique of overt motivation. I will conduct a preliminary pilot research to 1) establish the motivational impact of a covert motivator (viz. a priming manipulation), 2) identify an overt goal setting motivator that has a comparable immediate effect on task performance. To equate the strength of the overt versus covert motivators in my second pilot study I will parametrically vary how challenging the overt goal is so that I can estimate the functional relationship between goal level and task performance. Then I will compare the covert motivator's effect to see where on this function an equivalent level of performance is achieved. Once the overt and covert motivators are equated for strength, their effects on attribution for success will be compared as well as their effects on intrinsic task interest. The effects of covert motivators will be explained in the next section.

Covert Motivation

Indirect or covert approaches toward motivation are those which direct others' behavior without their awareness. So a participant must either not be aware of the motivating stimulus, or of the connection between it and task motivation. One such

covert technique is known as cognitive priming. Priming refers to any of several ways of increasing the accessibility of a concept or schema by using or activating that concept or schema. Using this technique, a researcher can make concepts more accessible to participants outside their awareness. Such primed concepts are believed to activate an entire category of thoughts and behaviors associated to the concept (Bargh & Chartrand, 2000). So for example, by getting someone to use the concept of "blue" (with or without their awareness), all sorts of thoughts associated with this color become more accessible (such as sky, water, calmness, or school colors). This type of procedure can make certain behaviors more likely as well. For instance research has shown that when the concept of "the elderly" was primed participants walked more slowly than when primed with neutral stimuli (Bargh, Chen, & Burrows, 1996). Research has shown that goal striving can be activated covertly through priming (e.g. Bargh & Chartrand, 2000; Shah & Kruglanski, 2003). Priming the concept of competitiveness has been effective at increasing task motivation and increasing performance at a coactive task where effort is strongly related to performance (Sambolec, Kerr, & Messé, 2004). This is directly relevant to the research I will propose here since the priming effect has already been demonstrated on the same task to be used. So priming can be an effective means of motivating outside of conscious awareness.

So, research has shown the two aforementioned types of methods—overt or covert - to be effective for motivating people at tasks. However, no direct comparisons have ever been made between the two the methods to see how their effects may differ. It is possible that, as a set, overt motivators are generally more effective than more covert ones. However, these classes of motivators are defined so broadly that it would be

difficult to specify all or a representative sample of each class. I can, however, identify two motivators - one overt, the other covert - that are equally potent in their direct and immediate effects on task motivation. That is the aim of my initial pilot studies. The aim of the main study is to then contrast the effects of these two motivators on subsequent, long-term intrinsic task motivation. The main study will compare the effectiveness of the two techniques on longer-term persistence and interest when motivators are absent.

Hypotheses

I hypothesize that there will be such an effect, and that it will be mediated by an attributional process. We know from research in education that when people attribute their high performance to certain internal factors, such as their own ability and interest that they are more likely to persist at and enjoy a task in the long term than when they attribute high performance to external factors (Elliot & Dweck, 2005). People who are high in achievement motivation and thus likely to succeed often attribute success to these stable internal factors (Weiner & Kukla, 1970). Overt motivational approaches are more likely to lead to external attributions for behavior (e.g. Festinger & Carlsmith, 1959). While with priming, since manipulations can be very subtle and out of awareness, it is less likely that participants would make an external attribution for their greater task achievement. Therefore, to the extent that priming is effective in leading to more internal attributions of motivation such as high task interest or high task ability, it will be effective in producing more long term enjoyment and persistence at the task.

In summary, I propose that covert motivators should lead to more long-term persistence at and enjoyment of the task than equally-effective overt motivators, and this effect should be mediated via the attributions made by participants. In my pilot research I

will attempt to develop two motivators, one covert and one overt, and equate them for effectiveness at short-term task performance. Then in the main study I will compare the effects of these motivators on longer-term persistence and interest. I will also compare attributions to the motivators predicting that those in the over motivation conditions should make more external attributions for success while those in the covert motivation conditions should make more internal attributions for success.

Chapter 2

PILOT STUDY 1

The purpose of the first pilot was to test the level effectiveness of priming on task performance. An achievement prime was contrasted to a neutral prime. If the achievement prime proved successful, it would be used as a comparison for the overt motivator (goal setting) to see if an equally strong effect could be obtained in Pilot Study 3. When these two motivators could be equated for effects on performance, their effects on attribution and intrinsic interest would be tested in the main study.

Method

Participants

Eighty-two undergraduate psychology students participated in exchange for partial fulfillment of course requirements.

Design

This study used a simple one-way design with two levels: achievement prime vs. neutral prime in order to test the effectiveness of priming (covert motivator) on performance and estimated the magnitude of this effect.

Procedure

The following section outlining the procedure for signing-up, instructions for the arm-holding task on the computer, and priming are identical in this study, Pilot Study 3, and the Main Study except where noted. Participants signed-up via the web for a study designed to examine their performance on both physical and written tasks to measure their muscle tone as well as their linguistic and creative abilities. Sessions were able to

accommodate one to four participants. Experimenters instructed participants that they would be working at several different tasks measuring linguistic abilities and physical fitness. When participants arrived at experimental sessions, an experimenter greeted them and instructed them how to perform an arm-holding persistence task that would be used as their physical fitness task during the experiment. This task has been used in previous research in motivation gains due to the fact that performance at it is plausibly monotonically related to effort/motivation (e.g. Hertel, Kerr, & Messé, 2000). Because of this relationship this task was ideal for measuring not only performance but also effort. In addition, the relative simplicity of this task reduces the effect that individual differences in understanding, learning, and practice would have on performance at it. Also, other previous research has demonstrated that priming could be used to enhance performance at this task (Sambolec, Kerr, & Messé, 2004). However this previous research used a competitively-themed prime in which words were hidden within other words. So, this prior work differs in both content and task from the current investigation. Also the effect was only significant for males on a coactive task not individual performance. Thus, an empirical demonstration that the present achievement prime could successfully motivate immediate task effort was sought.

The experimenter instructed participants to sit up straight and fully extend their arms over a tripwire with elbow locked while holding up their arms as long as possible while gripping a hand-weight until they could no longer do so without discomfort. They were then told they would receive further instructions via computer once they were brought into individual booths. The experimenter then asked if there were any questions and led participants into their designated lab booths.

Once in the lab booths, participants received computer instructions. The booths contained a computer desk and adjustable chair. On the desk was a computer, tripwire timing device over the keyboard, hand-weight, a small bag to hold any watches or bracelets, and a small (bogus) video camera to monitor their compliance with task rules. Participants were told to situate themselves in chairs so that their arms were directly over the tripwire and then click the mouse to receive further instructions.

Participants in both conditions: achievement and neutral prime, were instructed that they would perform a few practice trials of the arm-holding task. These practice trials were used as a baseline for subsequent trials in order to measure performance, but participants were not told this. The participants performed two of these trials, one with each arm.

After performing these practice trials, participants received different priming stimuli depending on experimental condition. However all performed two more trials of the arm-holding task as well as receiving feedback suggesting that they had performed very well (87^{th} percentile). Although performance feedback was not directly relevant to the hypotheses of Pilot Study 1, it would be critical in the Main Study, so this information was included to keep experimental procedures as consistent as possible. Participants performed a sentence completion task. This was the priming stimulus. This task was introduced as a means of measuring linguistic abilities and their relation to performance at the other tasks. This task consisted of taking groups of five words and rearranging them into grammatically correct four-word sentences. Two thirds of these sentences contained words that described high achievement. This type of task as well as the proportion of target stimuli (achievement words) is a standard priming methodology

(Bargh & Chartrand, 2000). An example of these word groupings was: "desirable here with success is"; the correct solution is: "success is desirable here." This would be a target stimulus (achievement words). Also when arranged into a grammatically correct sentence, the content of the sentence expresses the desired achievement message. An example of a neutral word grouping is: "sky is red the seamless." The correct solutions would be: "the sky is red" or "the sky is seamless." The full priming task is displayed in Appendix A.

Participants had ten minutes to complete the priming task. If they completed it more quickly, the computer program did not allow them to move onto the next block of trials until the time had passed. They were instructed to wait quietly until time had elapsed so that all participants received the same amount of resting time between blocks (to hold rest and fatigue constant). If they had not completed the task within ten minutes, the program would automatically advance to the next block of trials. While some past research describes that most participants finish the priming task within five minutes (Bargh, Chen, & Burrows, 1996; Sambolec, 2002), those studies allowed participants as much time as they needed until they finished the task and alerted the experimenter before advancing to the next part of the study. That type of participant dependent time interval was undesirable here since differential time periods would allow for differences in rest and fatigue between blocks of the arm-holding trials which could in turn affect scores on that task (a dependent measure of intrinsic interest). So a longer universal resting period of ten minutes was employed to ensure that more participants would complete the priming task.

Results and Discussion

Performance was measured by subtracting trial scores in seconds by arm. So, for example, the experimental trial score for the dominant arm (Trial 3) was subtracted from the practice trial for that arm (Trial 1) to measure differences in performance after the priming manipulation. This serves as a means of controlling individual differences in ability or performance on the first two trials (Hertel, Kerr, & Messé, 2000). To measure the main effect of priming, difference scores on the second or experimental block (Trials 3 & 4) were averaged and compared by priming condition. ANOVA revealed the overall effect of priming was not significant, $F(1, 80) = 0$, *ns*.

However, since previous research on priming (Sambolec, Kerr, & Messé, 2004) shows that priming concepts related to competition, which is similar to achievement in this case, may be more accessible to men than women, this gender moderation effect was tested. Planned contrasts revealed a nonsignificant trend on the gender simple main effect, $t(78) = 1.0$, *ns*; men's performance tended to be higher in the priming ($M = -22.9$, $s = 72.5$, $n = 22$) versus the neutral condition ($M = -39.5$, $s = 45.0$, $n = 23$). This same contrast test on the women also revealed no significant effect, but rather a trend in the opposite direction, $t(78) = .8$, *ns*, in which women primed with achievement ($M = -29.6$, $s = 50.1$, $n = 19$) performed worse than those in the neutral prime condition ($M = -14.4$, $s = 44.4$, $n = 18$). The interaction between gender and priming condition was not significant, $F(1, 80) = 1.7, p < .20$ ($\eta^2 = .02$).

Since there was an encouraging trend in the priming effect for males, it was decided to use this priming procedure in the Main Study, but for males only. It may be the case that this priming task, with its emphasis on achievement, with content such as:

"victorious, defeat, and weakling" may have been too strongly associated with interpersonal competition. Previous research has shown that using competition related words to prime good performance in females is not effective (Sambolec, Kerr, & Messé, 2004).

Chapter 3

PILOT STUDY 2

The purpose of this study was to obtain expectations about achievable goals at trials of the arm-holding task from participants in a similar study. This information would be used to help set goal setting levels that would be piloted in Pilot Study 3 and eventually used as the overt motivator in the Main Study.

Method

Participants

Nineteen undergraduate psychology students participated in exchange for partial fulfillment of course requirements. The students had participated in another study measuring motivation gains. They were all from the individual or control condition, which most closely mirrors the arm-holding task paradigm used in the current research.

Procedure

All participants who were in the individual control condition of a motivation gains study were e-mailed by the experimenter. Of the twenty-eight whom were contacted, nineteen responded. There were asked two questions asked: 1. "after performing the arm-holding task, did you expect to do better, same, or worse on the next trial" 2. "please indicate how much you expected improve or get worse on the next trial from –100 to 100%". They were then thanked for their time. All responded within one week.

Results and Discussion

Analyses revealed that on average participants expected to get worse at the next trial by 15.5% (s = 42.2). These results helped to set levels of attainable goals in the next pilot study. Based on the distribution of expectations (see Figure 3.1), I reasoned that an

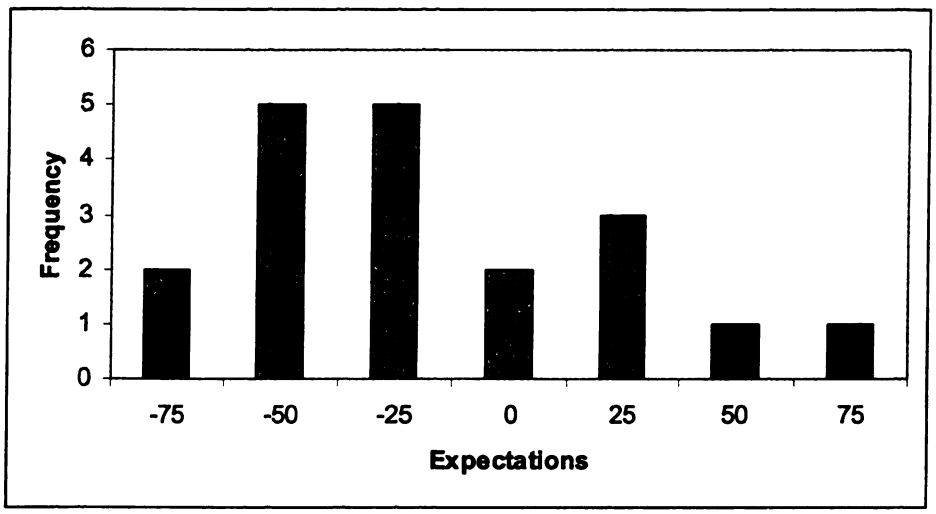

Figure 3.1 Distribution of Expectations for Next Trial Block

increase of 10% would be seen as a very challenging (but achievable) goal. In fact, only 25% of participants believed they would be able to improve by 10% or more at subsequent trials. So this increase would be used as the highest goal setting condition in Pilot Study 3. The remaining goal setting levels chosen in this study were 0% (moderately challenging goal) and –10% (low challenge goal). With these goal setting levels obtained, they could be compared with the effect of the priming manipulation in Pilot Study 3 in order to choose the level that would be closest at short-term task performance so that contrasts on longer-term persistence and intrinsic motivation would not be confounded with performance differences in the Main Study.

Chapter 4

PILOT STUDY 3

The purpose of the third pilot study was to test the effectiveness of each of the goal setting levels identified in Pilot Study #2 as an overt motivator on task performance and to obtain a level of performance for this manipulation that would produce an immediate motivating effect on the task that was comparable in size to the covert motivator (priming) from the first pilot study. Three levels of goal setting were tested to estimate the function that related goal setting level and task motivation. This assumes that the corresponding priming effect would fall within the bounds of the estimated function so that an equivalent level of goal setting could be estimated for use in the main study. These two equally effective (at short-term task performance enhancement) techniques would then be compared at longer-term interest (intrinsic motivation) and attributions in the main study.

Method

Participants

Eighty-six undergraduate psychology students participated in exchange for partial fulfillment of course requirements.

Design

This study utilized a simple one-way design with three levels of goal setting: low, medium, or high to test the effective of this overt motivator on performance.

Procedure

The same procedures for signing up and task performance as in Pilot Study 1 were used. The only changes were that participants were told that they would perform the task while being presented with one of three different levels of goal performances before Trial 3 on the computer program instructions. In all conditions, participants were told that on average, people decline by 15% across trials (the expected value of similar participants, estimated in Pilot Study 2). They were then given specific goals based on Pilot Study 2. In the high goal setting condition participants were told: "On the next few trials your goal will be to significantly improve from the first few trials. On average people decrease performance at this task by about 15% after two trials. You goal is to improve your performance by 10%." In the moderate goal condition, they were told: "On the next few trials your goal will be to improve from the first few trials. On average people decrease performance at this task by about 15% after two trials. Your goal is to not decrease at all, that is to last as the long at the next few trials as you did on the first two." In the low goal condition, they were told: "On the next few trials your goal will be to improve a little from the first two trials. On average people decrease performance at this task by about 15% after two trials. Your goal is to not decrease your performance by more than 10%." Participants in all conditions were then told: "You will get the results of each trial after you are done to let you know how you did." Also to equate for resting time between the second and third trials that those in the first pilot study received due to the priming procedure, these participants were given the neutral prime. Performance was measured and calculated by the arm-holding task as described above in the first pilot study.

Results

First, difference scores were computed by arm in seconds as in Pilot Study 1 in order to help control for individual differences. Then scores for the second or experimental block of trials (trials 3 & 4) were subtracted from the first or control block of trials (trials 1 & 2). These block difference scores were compared by level of goal setting (high, medium, or low) to assess the effect on performance. These scores were compared to the males who were primed with achievement in Pilot Study 1. The level of goal setting which led to the performance most equivalent to the modest priming effect in Pilot Study 1 were wanted for use in the main study.

Results of the one-way ANOVA revealed no significant positive effect of goal setting level on trial difference scores $F(2, 83) = .6$, *ns*. In fact, there was a nonsignificant trend in the opposite direction, in which there higher the goal setting level, the more performance dropped off suggesting that some of these goals may be perceived as unachievable. Planned contrasts revealed that even the two most disparate conditions,

Table 4.1

Trial Difference Scores by Condition on Pilot Studies

Condition											
Low Goal			Medium Goal			High Goal			Prime		
M	*S*	*n*	*M*	*S*	*n*	*M*	*S*	*n*	*M*	*S*	*n*
-27.8	31.4	28	-35.5	61.6	35	-43.7	54.6	23	-22.9	72.5	22

the low versus the high goal setting conditions did not significantly differ from one another, $t(83) = 1.1$, *ns*. In order to assess the whether each goal setting condition differed from the priming condition, a one-way ANOVA with the three goal setting conditions and the achievement primed males from Study 1 was performed. The ANOVA revealed no significant effect of condition on trial difference score, $F(3, 97) = .4$, *ns*. Planned contrasts revealed that not even the high goal setting condition was significantly different from the priming condition, $t(97) = .5$, *ns*.

Discussion

The above results were designed to find a goal setting level (overt motivator) that would be just as effective (i.e., motivating) as a priming the concept of achievement (covert motivator) at short-term task performance. These two equally motivating procedures will then be compared for their effects on longer-term interest, persistence, and attributions in the main study. Based on these results, the low goal setting condition, which asked participants to try to do at least as well as -10% of their previous trials on the arm-holding task was closest to the achievement prime in its effect on performance.

Interestingly, in this study the more challenging the goal that participants were given, the (nonsignificantly) worse they did at the task. While this trend was not significant it seems to make sense in terms of literature on the subject. Locke's theory (Locke, 1968; Locke & Latham, 1990) states that difficult and specific goals should have the best impact on short-term performance amongst other goals. Since a decrease of 10% on the second block of trials corresponded to the 68th percentile of expectations in Pilot Study 2, this appears to be a challenging but obtainable goal.

Chapter 5

MAIN STUDY

Method

Participants

Ninety-six undergraduate psychology students participated, 87 in exchange for partial fulfillment of course requirements from Michigan State University, and nine in exchange for a $10 donation to Great Lakes Christian College.[2] Those recruited from Michigan State University signed-up via the Psychology Department's website for Participation in Research. At least one of the psychology classes in which they are enrolled either require or allow participation in a certain number of research studies for some regular or extra course credit. Those who were recruited from Great Lakes Christian College responded to fliers on campus advertising participation in a Michigan State University Psychology Study and a chance to gain a donation for the college. This population was solicited because sign-up rates from Michigan State University became very low.

Design

A one factor (type of motivator: overt vs. covert) plus two controls (neutral prime and average feedback) between-subjects design was employed.

Procedure

The procedure mirrored the above studies in terms of type of task. The key modification was another, third block of trials that measured persistence and task interest.

[2] To view the results of all the main analyses for the Michigan State sample only, refer to Appendix J.

After the fourth task trial, participants in both experimental conditions and the neutral priming condition received feedback that they had performed very well, namely, that they improved significantly (87th percentile) from the first two trials. Those in the control condition were given feedback that their performance was average (at the 50th percentile). This should be an appropriate control because in order to make attributions, one needs an unusual or unexpected behavior that is worthy of attribution (Hastie, 1984). Performing at the average will likely not lead participants to explain their performance since there is nothing particularly unusual about it.

They then performed two more trials designed to measure intrinsic interest. The cover story for these trials was that this study's computer program was used for other studies and that these next trials were not important for the purposes of this study as a measure of performance. Not only that, the instructions stated that the timer would be turned off, but because of they way the program is set up, even if participants chose not to persist at all each trial would take at least five minutes. They were also told that they could use these unscored trials as a chance to practice the task if they would like. So even if they chose not to participate or only to persist for a few seconds, they had to remain in the booth, sitting for another five minutes per trial. They were told that once they completed the coming trials (5 & 6), they would then fill out some questionnaires in which the experimenters are interested. These were measures of intrinsic interest and attribution.

Measures

In addition to performance at the arm-holding task, posttest, self-report measures were collected as well. Intrinsic motivation was measured in several ways. First, after

the fourth trials, participants were told they would perform two more trials, as mentioned above. Additionally, participants filled out a self-report inventory of intrinsic motivation developed by Reeve and Deci (1996). This inventory included eight items relating to task enjoyment, competence and perceived challenge rated on a seven-point scale from "strongly agree" to "strongly disagree". For the full measure refer to Appendix B. Finally, participants were asked how willing they would be to be eligible for future studies involving the same task.

Two attributional measures were included as well. The measures preceded the intrinsic motivation measure since it was hypothesized that the attributional process would affect intrinsic motivation. The first was a close-ended measure that required participants to rate the relative importance of 23 internal and external factors for their level of performance at the experimental trials. Some of the internal items included: "your ability", "your motivation", "your enjoyment of the task," and "your fitness." External items included: "the goals set by the experimenter", "room temperature", "task difficulty", and "luck." To see the full measure, refer to Appendix D. Participants rated the influence of these items on a seven-point scale from "strong negative influence" to "strong positive influence." The midpoint represented "no influence." Also participants were instructed to pick their most important three attribution factors from the above 23 items from the close-ended measure. I also focused on responses to particular close-ended attributional items such as "your enjoyment", "your ability", and "the goals set by the experimenter" since these are directly relevant to the hypothesis.

Also, a one-item overall measure of attribution asked participants to rate what was responsible for their performance at the task on the experimental trials on a seven-point

scale where 1 = "All Me" and 7 = "All the Situation." To see the full measure, refer to Appendix C. Finally, an open-ended attributional measure asked participants why they performed as they did in their own words. This last item also served as a means of identifying any participants who were aware of the intended purpose of the priming procedure so that they could be excluded from analyses.

After filling out the above measures participants were debriefed using the funnel procedure suggest by Chartrand and Bargh (1996; Bargh & Chartrand, 2000). This procedure involves asking participants increasing specific questions about the nature of the priming task to assess their awareness of its intended effect. Any affirmative responses indicate an awareness of the intent of the prime and data from these participants would be excluded to preserve internal validity. The questions asked to participants included: 1) what they thought the study was about; 2) if any of the tasks were related and how; 3) how what they did at one task affected another; 4) if there was anything unusual about the words in the task; 5) if there was a theme to these words; and 6) if they had any goal while working at the sentence task. Any responses that indicated an awareness of suspicion or awareness of the purpose of the priming procedure were recorded by the experimenter in a logbook so that these data could be excluded from analyses. After responding to these questions and being debriefed, they were sent on their way.

Results

Excluded Data

In order to insure the internal validity of the manipulation of the covert motivator (priming), results of the funnel debriefing on the priming manipulation were examined to

determine if any participants were aware of the intended motivational properties of the word puzzle task and its connection to task performance or attributions. Conventional procedure for exclusion recommended by the creators of the funnel debriefing technique involves disqualifying any data given by participants who respond "in the ballpark" to any of the questions in the procedure indicating even slight awareness of the connection between the prime and the experimental task (Bargh & Chartrand, 2000). They also recommend that if 5% or more of respondents indicate any type of awareness of the intended effects of the prime, that the manipulation is too strong and therefore not a valid covert motivator.

To examine whether any participants should be excluded, responses to the funnel debriefing questions and open-ended attribution item were examined. Any responses that even vaguely indicated an affirmative or an awareness of a connection between the priming procedure and the experimental task were considered positive responses worthy of exclusion from the analyses. Only two participants responded in any affirmative way to the funnel debriefing questions. Both responded that they thought the word puzzle affected their performance at the arm-holding task since they used it as a means of distracting themselves on the arm-holding task. Participants did not indicate awareness of the connection between the word puzzle and the rest of the experimental tasks. So as a result a total of two participants were excluded due to their responses to the funnel debriefing questions.

Only two participants made any reference to the word puzzle task in the open-ended measure (the same two who were excluded on the funnel debriefing measure). One mentioned the word puzzle as a means of distracting himself from the fatigue of the

arm-holding task and the other mentioned the mentally fatiguing effect it had on him before the arm-holding task. However, neither indicated the theme of the words or the motivational nature of the word puzzle task itself. Two other participants indicated that they had counted time in their own heads as a means of assessing progress towards their goals. They were excluded since participants were not allowed to use watches or timers to assess their progress. So along with the two participants excluded because of their responses on the funnel debriefing, a total of four participants were excluded.

Power and Effect Size

Before the main analyses were examined, likely statistical power was examined. For the current sample ($n = 96$), in a one-way ANOVA with four groups, a large effect (η^2 of .1379 equivalent to a $d = .40$ by Cohen's, 1987, standards) would be detectable with probability ($1 - \beta$) of .90. A sample size of 72 would be sufficient to detect this main effect with a probability of .80, a conventional standard of adequate statistical power (Cohen, 1987), If this effect were conventionally moderate (η^2 of .0588 equivalent to a $d = .25$), the current sample size ($n = 96$) would yield a statistical power of .48. A conventionally small effect (η^2 of .0099 equivalent to a $d = .10$) in the above ANOVA would yield a statistical power of only .11.

Several planned contrasts were also examined. Specifically the overt and covert conditions were contrasted and had cell sizes of 28 and 22 respectively. In order to detect an effect of large magnitude ($d = .40$) with a power of .80, in a two-tailed t-test, a sample size of 26 per cell is necessary. If the observed effect were large, the current sample would yield a power of .78. If the observed effect were moderate, the current sample would yield a power of .40. If the observed effect were small, the current sample would

yield a power of .10. Other contrasts examine both covert priming conditions (achievement, $n = 22$ and neutral, $n = 23$) versus the overt condition ($n = 28$). Because of the larger sample size, power would increase beyond that of the above contrast. If the observed effect were large, this sample would yield a power of .91. A moderate effect would yield a power of .54. A small effect would yield a power of .14.

As noted previously, the participant sample contained members of two populations, students from Michigan State University compensated with partial course credit and students from Great Lakes Christian College compensated with a small monetary donation ($10), made in their name. To examine whether participant population played a role in the results of Hypothesis 1, all main effects were recomputed separately for the Michigan State University sample. These were re-analyzed only with the Michigan State sample because the Great Lakes sample was so small ($n = 9$) and was represented in only one of the experimental conditions (control/average feedback) meaning this re-analyzed sample consisted of 87 participants. Again, all cell sizes remained the same except for the control/average feedback condition ($n = 14$). Most of the main analyses did not change when the Great Lakes sample was excluded. None differed for Hypothesis 1 and only a few for Hypothesis 2, most differing between marginal and standard significance values. To view all the results with only the Michigan State University sample refer to Appendix J. Wherever a main analysis differs significantly below in the text when the Great Lakes Christian College sample is excluded, it was noted with a (*) afterward.

First, to evaluate the effectiveness of the motivators in the short-term, the scores on the arm-holding tasks between Block 2 and Block 1 were examined. Results revealed

no significant effect of condition, $F(3, 92) = .7$, *ns*; $\eta^2 = .02$; observed power = .20. Planned contrasts were performed, even in the absence of an overall effect, since it was hypothesized that particular conditions would differ. As expected, the overt and covert motivators did not differ, $t(92) = .7$, *ns*. So this replicated the results of the Pilot Study 3. Next, contrary to expectation, there was no significant effect of the covert motivator (achievement prime) when compared to the neutral priming condition, $t(92) = .2$, *ns*; nor to the control/average feedback condition, $t(92) = .8$, *ns*. Finally, the overt motivator was not significantly higher than the neutral prime condition, $t(92) = .9$, *ns*; nor was it higher than control/average feedback condition, $t(92) = 1.5$, *ns*. So, both the covert and overt motivators failed to produce significant effects on short-term performance relative to controls.

Even though these purported "motivators" did not enhance performance in this study, participants in these motivation conditions were given feedback that they had performed successfully, so Hypotheses 1 and 2 were still testable. That is, although neither the overt or covert motivators actually increased task performance, the participants in these conditions still received feedback indicating that they did particularly well (compared to those in the control condition). So, these participants still had to explain their unusually good performance. The interesting question was whether those given an overt potential explanation (the experimenter's goal) were less likely to attribute the good performance to intrinsic interest in the task and to work at the task longer in the third block of trials than those having no such overt explanation (i.e., those in the priming conditions). All means are displayed in Table 5.1.

In order to test Hypothesis 1: the effectiveness of the motivators (overt, covert, or control) on intrinsic interest, scores on the performance trial difference scores and self-reported intrinsic motivation measures were examined in one-way ANOVA's. Results on the trial difference scores between Block 3 and Block 1 across all conditions revealed no overall effect, $F(3, 92) = .4$, *ns*; $\eta^2 = .01$; observed power = .13. This was also the case if the trials were examined by dominant arm [Trial 5- Trial 1: $F(3, 92) = .4$, *ns*] or non-dominant arm [Trial 6 – Trial 2, $F(3, 92) = .3$, *ns*]. Means for Trial 5 – Trial 1 were as follows by condition: Overt: -73.7, Covert: -72.4, Neutral Prime: -59.1, Control/Average Feedback: -67.4. Means for Trial 6 – Trial 2 by condition were: Overt: -54.7, Covert: -53.6, Neutral Prime: -46.0, and Control/Average Feedback: -45.1.

There was also concern that quitting very soon after starting in Block 3 (5 seconds or less in either of the trials) might affect the results of the analyses on Block 3 – Block 1 scores. Since participants were told that Trials 5 & 6 weren't timed and could be used for practice or could be used as a time for rest, lasting for a very short time was a real possibility and could affect means of difference scores significantly. First of all, if there were a higher proportion of participants who quit after a very short period of time in Block 3, any effect obtained for persistence in Block 3 as a measure of intrinsic interest might be driven by this disproportionate quitting. To examine this possibility, a Pearson Chi-Square analysis was performed that examined if quitting after 5 seconds or less in Trial 5 or Trial 6 was related to condition. The analysis revealed no significant effect, $\chi^2 (3) = 4.7$, *ns*. A closer look reveals 12 of the 96 participants quit after 5 seconds or less on either of these trials, five (17.9%) in the overt condition, four (18.2%) in the covert condition, three (13.0%) in the neutral prime condition, and none in the control/average

feedback condition. Second of all, if the percentage of those who quit after a short period of time differed by condition, this may be interpreted as a measure of intrinsic interest (or lack thereof) since any persistence above the minimal level is not necessary according to instructions given to participants or even recorded. However, since the rates of quitting did not differ, no such intrinsic interest effect can be concluded by this measure.

Also, if there were a high rate of quitting on the third block of trials, there might have been a floor effect which is a definitely possibility with this type of physically fatiguing task across six consecutive trials. However, prior research with the same task and comparable numbers of trials found that adding incentives in late trials still increased performance, suggesting that participants were not completely fatigued here and unable to perform any better, regardless of their level of intrinsic interest (Messé, Kerr, & Seok, 2004). Again though, since the rates of quitting were relatively low (12 participants out 96, 12.5%) and cell means for Block 3 were fairly high (93-143s), the possibility of a floor effect is not plausible.

Although there was no overall main effect of condition, it was hypothesized that particular conditions (covert vs. overt and covert vs. control) should differ from one another. Therefore, further planned contrasts were performed. Descriptive statistics for these are included in Table 2. First, the two main experimental conditions were contrasted: covert and overt. This contrast revealed no difference, $t(92) = .1$, *ns*. This indicated that regardless of motivator, participants' performance did not change on the third block of trials. Hypothesis 1 also predicted that covert motivation would increase performance at a task above baseline levels. Therefore the covert condition was contrasted against both control conditions. Contrasts revealed that those primed for

achievement did not perform significantly different from those who received a neutral prime, $t(92) = .8$, *ns*, or those in the second control condition who were given feedback that they had performed average, $t(92) = .5$, *ns*. In fact, in both these contrasts, trends were opposite of the predicted direction.[3]

The self-report intrinsic motivation measure was analyzed next. Scores on this measure were the sum of eight responses to items on a seven-point likert scale from "strongly disagree" to "strongly agree." Higher scores indicate more agreement and thus higher levels of intrinsic motivation (Appendix B). Possible scores ranged from 8-56. The items were as follows: "1) I enjoyed the task, 2) I did well at the tasks, 3) I would like to do the task again, 4) The task was challenging, 5) The task was interesting, 6) I felt freedom to do as I would like at the task, 7) Similar tasks are enjoyable, and 8) I would like to do other studies with this task."

These items were examined within an exploratory factor analysis to ensure that analyses on the scale were measuring one concept. A Principal Components analysis with Varimax Rotation and Kaiser Normalization was performed. Analysis revealed the emergence of 2 factors with Eigenvalues over 1. The first factor had an Eigenvalue of 3.6 and explained 45.0% of the variance. All items loaded significantly and positively on this factor, with factor loadings as .81 and no lower than .38. The second factor had an Eigenvalue of 1.0 and explained an additional 13.0% of the variance. However only 2 items (2 and 6) loaded significantly on this factor. Item 2 had a factor loading of .75, this was also the lowest loading item on factor 1 (.38) and Item 6 had a negative factor

[3] Analyses on Arm-Holding Scores were recomputed with Block 1 scores as a covariate to examine if initial performance effects later performance differentially by condition, even after these differences are subtracted. To view these analyses refer to Appendix F.

loading (-.65). All other values were below .16. So, Factor 1 explains most of the variance on the scale, moreover Factor 2 does little to explain the content of the scale. Therefore, a one-factor solution is warranted. The scale was also found to be internal consistent, Alpha = .81. To view factor loadings, refer to Appendix G

Scores on the 8-item intrinsic motivation measure were then analyzed in a one-way ANOVA. The ANOVA revealed no significant effect of condition on self-reported intrinsic motivation, $F(3, 92) = .07$, *ns*; $\eta^2 = .002$; observed power = .06. As in the previous analyses, planned contrasts were performed to examine if the covert condition led to higher scores than the other conditions. These contrasts revealed that those in the covert condition ($M = 32.5$, $S = 8.1$) did not differ significantly from those in the overt condition ($M = 32.0$, $S = 6.5$), $t(92) = .2$, *ns*; nor from those in the neutral prime condition ($M = 32.3$, $S = 9.8$), $t(92) = .06$, *ns*; nor from those in the control/average feedback condition ($M = 31.4$, $S = 7.5$), $t(92) = .4$, *ns*.

Finally, a one-way ANOVA was performed on the item which asked participants about their intentions regarding participation in future studies using the same task. Results revealed no significant effect of condition, $F(3, 92) = .14$, *ns*; $\eta^2 = .005$; observed power = .08. Again, planned contrasts were performed to see of those in the covert condition had stronger intentions than the other conditions. There were no significant differences between those in the covert condition versus those in the overt condition, $t(92) = .4$, *ns*; nor those in the neutral prime condition, $t(92) = .06$, *ns*; nor those in the control/average feedback condition, $t(92) = .4$, *ns*. All means are display in Table 5.1.

Table 5.1

Scores on Measures of Persistence and Intrinsic Motivation in Main Study

	Condition											
	Overt			Covert			Neutral			Control-AF		
Measure	*M*	*S*	*n*	*M*	*S*	*n*	*M*	*S*	*n*	*M*	*S*	*n*
Arm-holding: Block 1	239.6	82	28	250.5	93	22	198.7	104.4	23	255.7	100.5	23
Arm-holding: Block 2	211.8	72.2	28	213.7	84.1	22	159.2	98.7	23	209.5	78.8	23
Arm-holding: Block 3	111.2	77.1	28	124.5	75.7	22	93.6	85	23	143.1	63.9	23
Arm-holding: Block 2-1	-27.8	31.4	28	-36.8	52.2	22	-39.5	45	23	-46.2	51	23
Arm-holding: Block 3-1	-128.4	77.9	28	-126	118.2	22	-105.1	81.7	23	-112.5	70.7	23
Intrinsic Motivation	32	6.5	28	32.5	8.1	22	32.3	9.8	23	31.4	23	23
Future Participation	3.8	1.5	28	3.6	1.3	22	3.6	1.8	23	3.8	1.5	23

Note. Neutral = neutral prime condition, Control-AF = control/average feedback condition.

In order to test Hypothesis 2: the effect of covert versus overt motivators on attributions, one-way ANOVA's were performed on the overall attribution item and

individual attribution items.[4] The overall attribution item was a one-item measure which asked participants, on a seven-point scale, what was relatively more responsible for their performance. A score of "1" indicated "all me", a score of "7" indicated "all the situation", and a score of "4" indicated "an equal blend of both." The ANOVA revealed a marginally significant effect between conditions, $F(3, 92) = 2.5, p < .10$; $\eta^2 = .08$; observed power = .61*. Planned contrasts were then computed to test Hypothesis 2: if the covert condition led to more internal attributions than other conditions. Contrasts revealed that the achievement prime ($M = 3.1$, $S = 1.3$) did not lead to significantly different attributions than the goal-setting condition ($M = 2.9$, $S = 1.1$), $t(92) = .3$, *ns*. When contrasted with the neutral prime ($M = 3.3$, $S = 1.1$), the achievement prime did not differ significantly either, $t(92) = .6$, *ns*. However, when contrasted with the control/average feedback condition ($M = 3.8$, $S = 1.3$), those in the covert condition made significantly more internal attributions, $t(92) = 2.1, p < .05$. So those who had been given feedback that they had done well, and had been primed with achievement attributed more of their performance to themselves than those who were given the neutral prime and feedback that they had performed at the average. Means for conditions are in Table 5.2.

Individual attribution items of theoretical interest were examined as well. Some of these items that refer to internal attributions that aren't related to intrinsic interest/motivation, such as 'your ability' and 'your goals' might give us insight into the lack of support for Hypothesis 1. Participants might attribute their performance to internal factors differently based on motivational condition, but it may have been easier

[4] Attributional responses were also examined as the sum on all internal items and external items, both as raw scores and standardized scores in Appendix I. Results on some of these analyses differed from those in the main analyses.

to attribute to such factors as ability or personal goals rather than interest, perhaps because attributing interest might require doing the task again. If this were the case, such items as interest, ability, one's own goals, and the experimenter's goals might well differ between conditions. These items were scored on a seven-point scale in which "1" indicate a strong negative influence, "7" indicated a strong positive influence, and "4" indicated no influence.

A one-way ANOVA on the attribution of "your interest" revealed a marginally significant effect, $F(3, 92) = 2.37, p < .10$; $\eta^2 = .07$; observed power = .58.* Planned contrasts revealed that those in the overt condition ($M = 4.3$, $S = 1.4$) rated their interest as a less strong positive influence on their performance than those in the covert condition ($M = 5.2$, $S = 1.1$), $t(92) = 2.4, p < .05$. The covert condition was also marginally higher than the neutral prime condition ($M = 4.5$, $S = 1.2$), $t(92) = 1.8, p < .10$; but no different from the control/average feedback condition ($M = 4.9$, $S = 1.2$), $t(92) = .7$, *ns*. Contrasts also revealed that those in the overt condition scored no different from the neutral prime condition, $t(92) = .6$, *ns*; but marginally lower than those in the control/average feedback condition, $t(92) = 1.7, p < .10$.

Next, the ability attribution item was examined in a one-way. ANOVA results revealed an overall effect, $F(3, 92) = 3.5, p < .05$; $\eta^2 = .11$; observed power = .78.* Contrasts were performed to examine differences between conditions. Those in the covert condition ($M = 5.8$, $S = .9$) did not differ from those in the overt condition ($M = 5.9$, $S = 1.1$), $t(92) = .3$, *ns*; nor from those in the neutral prime condition ($M = 5.8$, $S = 1.0$), $t(92) = .1$, *ns*. However, those in the covert condition did scored significantly higher than those in the control/average feedback condition ($M = 5.0$, $S = 1.2$), $t(92) =$

2.5, $p < .05$. Also, when examining the overt condition, we find it did not differ from the neutral prime, $t(92) = .5$, *ns*; but was significantly higher than the control/average feedback condition, $t(92) = 3.0$, $p < .01$. The neutral prime conditions also was significantly higher than the control/average feedback, $t(92) = 2.4$, $p < .05$. So, those who were success feedback rated ability as a stronger positive influence on performance than those who received average feedback.

A one-way ANOVA on the attribution of "your goals" revealed no significant effect, $F(3, 92) = 1.7$, *ns*; $\eta^2 = .05$; observed power = .43.* Planned contrast revealed no difference between the covert and overt conditions, $t(92) = 1.3$, *ns*. Those in the covert condition scored marginally higher on this item than those in the neutral prime condition, $t(92) = 1.9$, $p < .10$; and significantly higher than those in the control/average feedback condition, $t(92) = 2.0$, $p < .05$. Conversely, the goals of the experimenter attribution was examined revealing no overall effect, $F(3, 92) = 2.1$, *ns*; $\eta^2 = .06$; observed power = .51. Planned contrasts revealed no significant effects between the covert and overt conditions, $t(92) = .1$, *ns*; overt and neutral prime, $t(92) = 1.2$, *ns*; overt and control/average feedback, $t(92) = 1.4$, *ns*. This indicated that even for those who had been given explicit goals, they did not rate these goals as a stronger influence than those in the other conditions did. All means are displayed in Table 5.2.

In addition to the four items examined above, there were 19 other attribution items on which participants responded. An exploratory factor analysis was performed on these 23 attributional items to determine if any factors emerged which could summarize responses to these internal and external explanations for performance. A Principal Components analysis with Varimax rotation and Kaiser normalization revealed eight

factors with Eigenvalues of greater than 1.0 that accounted for 76.5% of the variance. As displayed by the rotated component matrix in Appendix H, these factors did little to summarize the data.

For example, the first factor which accounted for 18% of the total variance and had an Eigenvalue of 4.1, was composed of the following attributional items: room temperature, comfort of chair, comfort of room, and the experimenter which are all external attributions but other similar external items such as: luck, fatigue from task or during day, working out, hand slipping, etc. did not load significantly on this factor. The factor accounting for the most internal factors was the third largest which accounted for 11% of the variance and had an Eigenvalue of 2.5. The only internal factors that loaded here were: your motivation, your interest, and your enjoyment but also included the external item: difficulty of task but did not include internal items such as: your ability, your goals, and your fitness. All factors loadings are displayed in Appendix H.

Table 5.2

Scores on Attribution Measures in Main Study

	Condition											
	Overt			Covert			Neutral			Control-AF		
Measure	*M*	*S*	*n*	*M*	*S*	*n*	*M*	*S*	*n*	*M*	*S*	*n*
Overall Attribution	2.9_a	1.1	28	3.1_a	1.3	22	3.3_{ab}	1.1	23	3.8_b	1.3	23
Your	4.3_a	1.4	28	5.2_b	1.1	22	4.5_{ab}	1.2	23	4.9_{ab}	1.2	23

Interest												
Your Ability	5.9_a	1.1	28	5.8_a	0.9	22	5.8_a	1.0	23	5.0_b	1.2	23
Your Goals	5.1_{ab}	1.1	28	5.5_a	1.1	22	4.9_{ab}	1.1	23	4.8_b	1.0	23
Goals of Experimenter	4.3_{ab}	0.6	28	4.3_{ab}	0.6	22	4.5_a	0.8	23	4.0_b	0.5	23
Your Motivation	5.3	1.3	28	5.1	1.8	22	5.5	1.0	23	5.2	1.5	23
Luck	3.9	0.7	28	3.6	0.8	22	3.4	1.3	23	3.6	1.0	23
Difficulty of Task	4.3	1.1	28	4.6	1.5	22	4.3	1.2	23	4.1	0.8	23
Fatigue From Day	3.6	1.5	28	3.5	1.6	22	3.6	1.2	23	4.4	1.4	23
Fatigue During Task	3.9	1.6	28	4.0	1.8	22	4.0	1.5	23	4.3	2.1	23
Room Temperature	3.9	0.8	28	4.0	0.9	22	4.2	0.7	23	3.9	0.7	23
Comfort of Chair	4.0	1.1	28	3.6	1.0	22	4.1	1.5	23	3.7	1.1	23
Comfort of Room	3.9	0.6	28	3.9	0.6	22	3.8	0.9	23	4.0	0.9	23
Experimenter	4.0	0.6	28	4.4	1.2	22	4.2	1.0	23	4.0	0.8	23
Your Enjoyment	4.1	0.9	28	4.5	1.5	22	4.2	1.2	23	4.2	1.0	23
Desire to Get Done	4.8	1.5	28	4.2	1.7	22	4.1	1.4	23	4.7	1.6	23
Working Out Recently	4.3	1.9	28	5.3	1.4	22	4.0	1.8	23	4.5	1.6	23
Hand	3.8	0.4	28	3.6	0.7	22	3.9	0.3	23	4.0	0.4	23

Slipping												
Pain Threshold	4.9	1.4	28	4.5	1.4	22	4.5	1.2	23	5.3	1.2	23
Discomfort	3.6	1.1	28	3.8	1.4	22	3.8	1.3	23	4.2	1.3	23
Boring Task	3.2	1.1	28	3.6	1.5	22	3.6	1.2	23	3.8	1.5	23
Your Fitness	5.8	1.0	28	5.4	1.3	22	5.4	1.4	23	5.2	1.3	23
Your Effort	--	--	--	5.6	1.0	7	5.5	1.3	12	5.3	0.9	23
Impressing Others	--	--	--	5.0	1.0	7	4.8	1.1	12	4.0	0.9	23

Note. Means that share common subscripts across rows do not differ at .05 level on planned contrast tests. The last two items on the scale were added late in the study and as a result have lower response rates.

Finally, the results of the open-ended attribution item (Appendix E) were examined. Responses were coded by two experimenters with a high degree of inter-rater reliability (Cohen's Kappa ratings range from .90 to 1.00 for the 23 possible attribution items). Rating discrepancies were resolved by the author. All responses were coded according to the 23 item attribution measure and whether or not each of the attributions was mentioned as positively or negatively related to performance. In addition to the 23 items listed as possible attributions, raters coded 10 responses which did not match any of the attributions such as: being hungry, distraction, or "I don't know." Seven participants provided no response to this item. Two of them were in the overt condition, three in the achievement prime, and two in the neutral prime. In addition, two participants had no

attributions that fit within the criteria of the 23 items but did fill out the measure, one in the neutral prime condition and one in the control condition.

Chi square statistics on cross tab analyses of these items revealed a significant effect only one of these attribution items, item 14: "your goals," $\chi^2(3) = 8.4, p < .05$. No participants rated this as a negative influence and 22 out of 96 rated it as a positive influence. Breakdown by condition was as follows: eight of 28 (28.6%) in the overt condition, nine of 23 (40.9%) in the achievement prime condition, three of 23 (13%) in the neutral prime condition, and two of 23 (8.7%) in the control condition. This mirrors the result of the analysis of the close ended "your goals" item in which those in the achievement prime condition scored significantly higher than those in the control condition (see Table 5.2).

There was also a marginally significant effect on item 5: "fatigue during the task," $\chi^2(3) = 11.4, p < .10$. Fifteen of 96 participants rated this as a negative influence, and only one as a positive (in the overt condition). The breakdown by condition is as follows: three of 28 (10.7%) in the overt condition, one of 22 (4.5%) in the achievement prime condition, three of 23 (13.0%) in the neutral prime condition, and eight of 23 (34.8%) in the control condition. This effect shows that those who were given average as opposed to exceptional feedback cited fatigue much more often as a negative influence.

Although there were no other significant effects, there were some interesting trends. For example, 26 of 96 participants rated item 1: "your motivation" as a positive attribution, while only two rated it negatively (one in the neutral prime condition and one in the control condition). However this was fairly evenly distributed across conditions: 10 of 28 (35.7%) for overt, seven of 22 (31.8%) for achievement prime, four of 23

(17.4%) for neutral prime, and five of 23 (21.7%) for controls. The ability attribution was also highly rated as 30 out of 96 participants rated it positively and 4 negatively (two in the overt and two in the control conditions). However, this was fairly evenly distributed across condition: nine of 28 (32.1%) in the overt, seven of 22 (31.8%) in the achievement prime, ten of 23 (43.5%) in the neutral prime, and four of 23 (17.4%) in the control condition. Other attributions that were rated high but did not differ between conditions included "working out recently" (25 out of 96 rated positively), "your fitness" (27 of 96 rated positively), and "your effort" (11 of 96 rated positively). All other attributions received less than eight ratings, as they were not mentioned, neither as positive nor negative attributions.

Discussion

Unfortunately the results of the Main Study failed to support Hypothesis 1: that a covert motivator would lead to more intrinsic interest. The only supportive evidence was on the subjective attribution item for interest, where participants made a stronger attribution to task interest in the covert motivator condition than to the overt motivator condition. However, given that there were no performance or performance feedback differences between the covert and neutral prime conditions, one would have expected the same difference between the Neutral and Overt conditions on the interest attribution item, and this was not significant. Further, attributions of interest were not particularly low in the Control condition, where performance feedback provided no reason to make a high interest attribution.

This could have been the case, of course, because the hypothesis is wrong. However, it is also quite possible that the hypothesis is valid, but that the present study

did not provide a strong enough test of it. One potential contributing problem was that the priming and goal setting effects were not obtained on Block 2 arm-holding performance. (This may have occurred because the goal setting manipulation provided unreachable and therefore non-motivating goals. The prime may also have been ineffective or it made salient concerns that did not help performance. These issues will be examined more shortly.) So without a genuine effect of the motivator on short-term task performance, we might not expect an effect on longer-term persistence and intrinsic motivation. That is, if one does not improve his or her performance, attributional inferences are less likely to occur (Hastie, 1984), so making an attribution that one's own interest led to this performance never occurs.

Goal Setting

There are other possible reasons why support was not obtained for Hypothesis 1. First, the overt motivator (goal setting) failed to lead to better performance at the arm-holding task. Lots of prior work has indicated the effectiveness of explicit and achievable goals on performance (e.g., Mento, Steel, and Karren (1987), which makes it perplexing that such a goal didn't serve to motivate here.

The originators of goal setting theory, Locke and Latham, suggest that the effects of goal setting are highly reliable and robust, so a failure to replicate is often a function of the following: 1) not matching the goal to the performance measure, 2) not providing feedback, 3) a lack of goal-commitment, 4) not measuring self-set goals, 5) not providing enough information about the task, 6) not providing the right type of goals, or 7) not using an appropriate range of goal difficulty levels (Locke & Latham, 2002).

Reviewing the features of the task used here, it seems that suggestions 1 and 6 are unlikely candidates. Specifically stated performance goals (level of performance related to Block 1) were used on Block 2 and seem well matched to this performance task situation (Locke & Latham, 1990). Suggestion 5 was likely not a factor here as participants were given explicit instructions on how to perform this simple motor task. Suggestion 3 is a possibility since goal commitment wasn't measured directly and the goals of the experiment may not have matched the goals of the participants. Similarly suggestion 4 may be a factor to consider. However, self-set goals were measured indirectly by the attribution measures and indeed were rated as relatively high positive influences on performance in the experimental conditions (*M*'s range from 4.9 to 5.5 out of 7). However, a more direct measure of participants' goals should be included in any future research. Suggestion 7 regarding a sufficient range of goal difficulty levels could be a factor here. Although the pilot study suggested that the goal level used in the main study matched the level of the priming effect, neither raised performance above control levels. So the goal level set may have been inappropriate.

Finally, and most plausibly is suggestion 3, the role of feedback on goals. Participants received no feedback about their performance relative to their goal while they were performing. During the task, participants were unable to time themselves (all watches were placed out of sight during trials) and there was no feedback given by the computer. Nor did they have an explicit criterion of how well (in seconds) they had lasted on the first two trials. Previous research suggests that feedback increases the effects of goal setting (Erez, 1977; Locke, Shaw, Saari, & Latham, 1981; Neubert, 1998). Here it may have functionally been impossible for participants to tell how well they were

doing relative to the goal. This lack of information regarding goal progress made it impossible for participants to adjust their level of effort or change their strategy to match the goal level (Locke & Latham, 2002). Research shows that when participants are performing below target level, they often increase effort or try a new strategy (Matsui, Okada, & Inoshita, 1983). Using a task for which participants were able to monitor their progress towards a goal might have led to increased persistence. For example, just providing a clock by which participants could monitor their progress could have been helpful. Also, providing a meter of how close they were to their performance goal in percent that grew the longer they lasted could have been effective.

Priming Task

The priming treatment may not have worked because of the individual performance nature of the arm-holding task. Previous research in this area has shown priming effects on performance at a coactive task with a competitive prime (Sambolec, Kerr & Messé, 2004). The prime used here was somewhat similar in content as competitiveness certainly overlaps with achievement. That competitive prime did not lead to any performance gain in an individual condition using the same arm-holding task as I used here. These results suggest that a competitive prime would not increase motivation when there was no one to compete with. This prime in the present study was supposed to prime achievement. We might expect such a prime to increase effort when achievement was valued on the task. However, in retrospect, it is quite possible that this was not the case for the arm-holding task. Since this is not the type of task that most people are concerned with in important domains of performance within their lives, achievement may not be a particularly desirable outcome in light of the effort necessary.

Perhaps a priming procedure that brought to mind thoughts of individual improvement would have worked better; e.g., a subliminal prime that flashed images of others performing well at a similar tasks and exerting high effort.

Alternatively, using a task for which there was some initial intrinsic interest or for which achievement was valued might have been more effective. For example, given that the sample used here was male college students, perhaps some cognitive task that was related to classroom performance would be relevant. A task that predicted social skills such as an interaction with a potential romantic partner or a predictor of athletic performance such as a running race or throwing contest may also have been more effective.

Also, the nature of this task may have been so intrinsically aversive, that no level of motivation manipulated in the laboratory could have led to an attribution of strong task enjoyment. Tasks used in research on the overjustification effect such as decoding tasks (Weiner & Mander, 1978) and shooting baskets (Tauer & Harackiewicz, 2004) have some intrinsically enjoyable qualities. The arm-holding tasks really does not appear to possess many such qualities. Also as mentioned above, high achievement at this task would likely do little to enhance self-esteem since it is not relevant to achievement in important areas of life to participants. These factors probably contributed to the relatively low scores on intrinsic motivation and future participation (Table 2).

However, as mentioned earlier in this section, participants in these conditions were led to believe that they had performed well at the arm-holding task (at the 87^{th} percentile). So, because of this manipulation, it is possible that even though there was no genuine effect on performance at the arm-holding task in Block 2, participants may have

believed they improved. If participants did believe they did well but it was implausible that this was due to increased enjoyment/intrinsic motivation at the task, what other attributions could they make? It appears that when participants were given success feedback, they generally attributed this success to their ability. When one attributes good performance at a taxing, aversive task to high ability instead of high task enjoyment, one is not likely to voluntarily engage in the task in a "free play" period. Also, those who received the overt motivator (goal setting) scored just as high as those in the covert condition on ability as an attribution for their success. This may have occurred because they recognized that the experimenter's goal could do little to motivate under the no-goal-relevant-feedback nature of the task.

It could also be the case that the method in which the priming task was administered did not make the target concept accessible to participants. Based on previous pilot research with this particular task, many participants completed the word unscramble in about five minutes and nearly all (94%) had completed it within ten minutes (Sambolec, 2002; Pilot Study 1). As a result of that pilot work, all participants were given ten minutes to complete the priming task before they moved on to the experimental block (2) of arm-holding trials. This time frame may have allowed the priming effect to deteriorate from accessible memory. Indeed past research shows that priming effects decrease with the time interval between the activation of the target concept and the presentation of stimulus information to be encoded (Srull & Wyer, 1979). Some other studies which have used this task allowed participants as much time as they need to complete the task before alerting the experimenter so they could then move on to the next part of the experiment, the target task or behavior (e.g., Bargh, Chen,

& Burrows, 1996). As with the current study, most participants were done with the task in five minutes but some took longer. However, in the present study, to control for rest and recovery time between arm-holding trial blocks all participants had to wait for ten minutes between the prime and the second block of trials. This may have allowed for the deterioration of the prime from the memory in the majority of participants. So the prime might have been effective had the waiting period been shortened or been allowed to vary with the rates of participant completion. However, this may not have allowed as many participants to complete the prime and would have changed rates of fatigue between task trials, confounding rate of priming task completion with fatigue. So there is a delicate balance between allowing for individual differences in completion rates, average time for the priming task, and control for resting between trial blocks. A smaller, controlled time interval would be preferable in future research, especially if rest time and fatigue were not an issue, as they were here.

In order to more effectively test the key hypotheses of this study, experimental conditions would have to be altered to deal with all these potential problems in the present study. Specifically the task would have to be one that was minimally or potentially intrinsically interesting to participants. Perhaps an actual weightlifting task that one would encounter in a gym such as a bench press or dumbbell curl would be more interesting to our male sample. A fitness task would also be relevant to the original rationale for the study which involved engaging in activities which are healthy in the long run but aren't always our favorite things to do. This would also serve as the purpose of a task at which achievement would seem appropriate. This type of task would also enable

or at least allow goal pursuit (e.g., if participants could count lifts and compare it with explicit goals), which could be a plausible attribution for improved performance.

Also, the nature of the feedback would be structured in such a way as to make ability a much less plausible attribution. One way to do this would be to have participants perform several trials of the task and give them feedback that they performed at the same level every time. In this way their ability would appear to be stable and known to them. After this, they would receive the motivation manipulation and given feedback that they had increased performance significantly. So the increased performance would be more plausibly attributed to this procedure, such as overt goal setting or the genuine motivation boost from a covert motivator that could be interpreted in terms of intrinsic interest. The plausibility of other attributions such as luck would have to be minimized by emphasizing to participants that effort is the major contributor to performance at this task through direct instruction and feedback. Making all these changes to the procedures would likely provide a fairer test of Hypothesis 1.

Hypothesis 2: that those in the covert motivation condition would make more internal attributions for success than those in the overt motivation condition received fragmentary support. Those in the covert condition attributed performance to more internal factors on the overall attribution measure than controls. So it may be the case that when we do well something without an external motivator like a reward or goal, the default attribution is something internal. However, those in the overt condition rated internal factors just as highly as those in the covert. These two conditions differ in the type of motivational manipulation, but share the same success feedback. So this may

well be an example of a self-serving bias in which we are more likely to attribute success to internal factors and failure to external ones (Miller & Ross, 1975).

However, when looking at other internal attributions such as "your interest," those in the covert condition rating this factor higher than those in the overt and marginally higher than those in the control condition. So, here we have the same amount of success in terms of performance and the same amount of success feedback but a somewhat more powerful internal attribution for those who were primed. This higher interest does not translate into higher scores of intrinsic motivation or actual persistence at the practice trials. This may be the case for reasons mentioned above, such as the aversiveness or irrelevance of the task. So maybe a slightly more enjoyable task would have allowed these interest attributions to turn into actual behavior. Again to provide a fairer test of this hypothesis as well as the first hypothesis, the above procedural changes would be helpful.

Another interesting issue in regards to Hypothesis 2, is the results in the ability attribution. Those in the overt and both covert conditions rated ability as a high contributor to performance compared to controls. Some might think of this as a manipulation check since the participants in these conditions were given feedback that they outperformed 87% of others in Block 2 compared to the 50% level in the control condition. However, as Reeder and Brewer (1979) have stated, we are likely to explain our exceptional performances with attributions of our own ability, while we may attribute poor performance to any cause. While some research shows that we may attribute multiple causes to extreme success and only one when explaining moderate success or failure (e.g., Kun & Weiner, 1973; Kelley & Michela, 1980), we are likely to attribute

extreme success to high ability when we are given this option (Fiedler, 1982). If we look at internal and external attributions separately as independently summed scales we find effects counter to the predictions of Hypothesis 2 (see Appendix I). However, since an exploratory factor analysis of the attribution items reveals that internal and external items do not group together in an consistent way (see Appendix H) these analyses don't help to explain the results of Hypothesis 2 better than an examination of individual items of theoretical interest as examined in the main analyses.

So, what we are left with at the end of this research is a plausible theory without much empirical support. In order to truly test the hypotheses in a more valid manner, several changes to the design of this research are desirable and are outlined below. First of all, greater care would be taken to avoid potential confounds of experimental condition and subject population (e.g., instead of using students from two different colleges, only one would be used). Also sample size would be increased to increase statistical power. For example, using Cohen's (1987) conventions for statistical power (.80), a sample size of 180 would be required to detect a moderate effect ($d = .25$).

Next, the motivational manipulations would need to be modified. The goal setting manipulation used in this study did not increase performance at the arm-holding task. The most likely for this was a lack of performance feedback. So the computer program would need to be reconfigured to display progress towards the goal. This could be done with a bar graph resembling a thermometer which went up as time passed with the arm-holding trials. Also, the goal setting levels may have been too high so lower levels would be pilot tested such as 15-25% below first trial performance. Also

expectations of likelihood of reaching the goals would be collected as well as level of commitment to the set goal.

The priming manipulation also failed to produce a significant performance gain at the arm-holding task. So a new priming procedure would be piloted that included more achievement related as opposed to competition related words (which didn't work for female participants at all). These might include words such as "effort," "striving,", "getting fit," "attain," "master," and "doing my best" which are similar to stimuli used in previous research that primed high performance (Bargh, et al., 2001). Also the priming procedure would be shortened from ten minute to five to decrease the likelihood that any effects would wear off.

The nature of the persistence task would also be changed to show participants that performance was not highly dependent on ability. This would include having participants perform several blocks of trials and then giving them feedback that they had performed at about the average level. They would then be instructed that these trials are an accurate estimate of ability based on prior research, but with increased effort, performance could increase by a large margin.

Next, some measures would be modified. For instance, the one-item attribution item would be changed from a bipolar item, with internal at one end and external at the other, to two items asking participants about the relative contribution of internal factors and then external factors separately. With these changes in place, a stronger test of the hypotheses could be achieved.

Certainly, many of us can think of instances in which we, or others we know took up good habits despite our desires for comfort or pleasure. For example, how many of us

have cut delicious yet unhealthy food from our diets, added a tiring workout routine despite a busy schedule, or went to the theater rather than poker night to enrich our lives despite our internal protests. Now when we ask ourselves: "Why did we do it?" and "Who is responsible for this change?" do we believe the origin of our healthy change came from others who urged us to do so, the external rewards for doing it, or our own insight, interest, effort, and free will? Conversely, when we try to sway others toward behaviors that we know will benefit them in the long term such quitting smoking, eating their broccoli, or reducing their stress, do we urge them: "To do it for us," or when they succeed do we say, "I told you so?" Or, do we let them bask in their own self-satisfying attribution that they did it all along. So, I think the hypotheses may well be supported with procedural modifications in future research.

APPENDICES

APPENDIX A

Achievement Prime

Sentence completion task: This task is designed to measure your problem solving and linguistic abilities. We are interested in the relationship between these abilities and other types of task performance.

Instructions: for each of set of words below, make a grammatical four word sentence and write it down in the space provided.

1. great are achievements for these
2. send I mail it over
3. I fitness prefer often physical
4. is desirable not the failure
5. floor the clean quietly tonight
6. the muscle wood flabby was
7. victorious are for people we
8. can defeat I others will
9. the push wash clothes frequently
10. prepare the gift wrap neatly
11. weakling he is a that
12. competition my shows best a
13. used he it all selfishly
14. maintained she to composure her
15. try should I harder will
16. all look an healthy we

17. off persistence pays my on

18. needed effort maximum is for

19. sky the seamless red is

20. are important very goals my

(when done please follow directions on computer)

Neutral Prime

Sentence completion task: This task is designed to measure your problem solving and linguistic abilities. We are interested in the relationship between these abilities and other types of task performance.

Instructions: for each of set of words below, make a grammatical four word sentence and write it down in the space provided.

1. sky the seamless red is

2. send I mail it over

3. maintain she to composure try

4. the push wash clothes frequently

5. prepare the gift wrap neatly

6. clean the floor quietly tonight

7. used he it all selfishly

8. he observes occasionally people watches

9. fish the wet big is

10. picked drop apples hardly the

11. studies she texts ancient him

12. helpless it hides there over

13. saw hammer he train the

14. good dislikes recognizes she deals

15. should withdraw keep now we

16. the machine wash frequently clothes

17. a have June holiday wedding

18. color is building the brown

19. cross this water please road

20. she bed is home at

(when done please follow directions on computer)

APPENDIX B

Intrinsic Motivation Measure

Please rate your experience of the arm holding task on the following items on the provided scale.

1=Strongly Disagree
2
3
4=Neither Agree nor Disagree
5
6
7= Strongly Agree

1. I enjoyed the task
2. I did well at the task
3. I would like to do the task again
4. The task was challenging
5. The task was interesting
6. I felt a lot of freedom to do as I would like to at the task
7. Similar tasks are enjoyable to me
8. I would like to participate in other studies using this task
9. Would you like to be on our contact list for participation in future studies using this task? (Y/N) If so for how many hours from 0 to 10.

APPENDIX C

Overall Attribution Measure

In general how much of your performance was due to your motivation as opposed to the demands of the situation?

1	2	3	4	5	6	7
all me			equal blend of both			all the situation

APPENDIX D

Close-ended Attributional Measure

Other students in past research using the arm holding task have given the following as reasons why they performed as they did. These reasons have been listed as both positive and negative influences on performance. Please read over the following potential reasons and then rate the importance of each of them as to how much they influenced your performance on the Block 2 of the arm holding task and whether they were a positive or negative influence on the provided scale.

1 2 3 4 5 6 7

strong negative influence no influence strong positive influence

1. your motivation
2. luck
3. difficulty of task
4. fatigue from earlier in day
5. fatigue during task
6. your interest
7. room temperature
8. your ability
9. how comfortable the chair was
10. how comfortable the room was
11. the experimenter
12. your enjoyment

13. desire to get done
14. your goals
15. working out recently
16. hand slipping
17. your pain threshold
18. level of discomfort
19. how boring the task was
20. your fitness
21. the goals provided by the experimenter
22. your effort
23. impressing others

APPENDIX E

Open-ended Attribution Measure

In you own words please explain why you did as well as you did at the arm-lifting task and what was responsible for your level of performance.

APPENDIX F

Recomputed Arm-Holding Trial Scores with Block 1 as Covariate

In order to assess whether Block 1 scores significantly affected later trial scores, regression analyses were performed. Some have argued that relying on difference scores, as was done in the main analyses, presents methodological problems (e.g. Edwards & Parry, 1993; Edwards, 2001) that can be circumvented by using regression analyses instead. Some of these problems include reduced reliability compared to their component measures (Johns, 1981), ambiguous interpretation when component measures are theoretically distinct, confounded effects, untested constraints, and dimensional reduction from three dimensional to two dimensional relationships (Edwards, 2002). By contrast, polynomial regression is based on the principals of congruence as multi-dimensional rather than represented by a single point in a difference score and that constraints should not be imposed on the data but rather tested empirically. For these reasons regression can be a superior means of examining data of this nature compared to difference scores (for an excellent review of merits of regression over difference scores, refer to Edwards, 2002).

To examine whether results of arm-holding scores would differ if examined within a regression framework rather than with differences scores, this approach was used. The regression of Block 1 scores on Block 2 revealed a significant effect, $F(1, 94) = 337.8$, $t(95) = 18.4$, $p < .01$, $\beta = .88$. The regression of Block 1 scores on Block 3 likewise revealed a significant effect, $F(1, 94) = 32.6$, $t(95) = 5.7$, $p < .01$, $\beta = .51$. This confirms the rationale of the ANOVA on the trial difference scores which subtract Block

1 scores from the Block 2 and Block 3 scores in order to control for individual differences.

Once the above regressions were performed, residual scores were computed. These residuals were then analyzed in ANOVA's to assess whether or not Block 1 residuals were significant covariates. ANOVA of Block 2 residuals revealed no significant effect of condition, $F(3, 92) = 1.3$, *ns*. This effect also failed to reach significance in the main analyses when difference scores were used. Also, mirroring the difference scores analyses, none of the contrasts of interest reached significance either. The means for conditions are as follows: Overt: $M = 10.0$, $S = 27.5$; Covert: $M = 3.4$, $S = 46.9$; Neutral Prime: $M = -10.9$, $S = 42.9$; Control/Average Feedback, $M = -4.9$, $S = 40.9$. ANOVA of the Block 3 residuals also revealed no significant effect, $F(3, 92) = .8$, *ns*. Again, none of the contrasts reached significance either. The means for conditions are as follows: Overt: $M = -7.7$, $S = 66.1$; Covert: $M = .6$, $S = 83.6$; Neutral Prime: $M = -8.8$, $S = 66.1$; Control/Average Feedback, $M = 17.6$, $S = 44.9$. So, while Block 1 scores are related to later Block scores, this effect does not vary by condition, so relying on trial difference scores in the main results section is justified and does not differ from results reported here.

APPENDIX G

Rotated Component Matrix of Intrinsic Interest Items

	Component	
Item	1	2
I enjoyed the task	.765	.186
I did well at the task	.334	.765
I would like to do it again	.726	.031
task was challenging	.444	-.090
task was interesting	.809	-.112
I felt freedom at task	.482	-.624
Similar tasks are enjoyable	.796	.070
I would like to other studies with this task	.806	.118

APPENDIX H

Rotated Component Matrix of Attribution Items

	Component							
Attribution	1	2	3	4	5	6	7	8
Your Motivation	.159	-.008	**.548**	.299	.006	.471	.136	.408
Luck	.315	-.225	.109	.003	-.004	-.002	.001	**-.750**
Difficulty of Task	.255	.304	**.501**	.003	.350	.002	-.436	.113
Fatigue from Day	-.004	.286	.127	-.124	-.157	**.849**	-002	-.004
Fatigue During Task	.006	**.794**	-.006	-.307	-.010	.226	-.115	-.002
Your Interest	.211	-.002	**.804**	.226	-.186	-.004	.007	.009
Room Temperature	**.621**	-.009	.007	.008	.000	-.295	-.158	.407
Your Ability	.001	-.007	.121	**.812**	.000	.006	-.144	.006
Comfort Of Chair	**.712**	.186	.153	.000	-.101	.134	.252	-.123
Comfort Of Room	**.853**	-.001	.226	.010	-.270	.122	.004	-.115
Experimenter	**.818**	-.105	.169	.004	.307	-.006	-.009	-.010
Your Enjoyment	.171	.144	**.789**	-.176	.129	.009	-.009	-.172

Desire to Get Done	.226	**.748**	.000	.336	.009	.003	.006	-.008
Your Goals	.150	-.006	.205	.157	**.633**	-.008	.353	.365
Working out Recently	.104	.003	-.004	.002	.006	-.006	**.886**	.000
Hand Slipping	.103	.266	-.126	.223	**-.770**	.002	.148	-.004
Pain Threshold	.224	.001	.451	**.538**	-.004	-.414	.109	-.231
Discomfort	-.120	**.793**	.008	-.002	-.206	-.120	-.002	.228
Boring Task	-.289	**.633**	.246	.008	-.001	.106	.460	-.002
Your Fitness	-.004	.173	-.165	**.869**	-.004	-.007	.228	.001
Goals Set by Experimenter	-.125	.006	-.368	.165	**.598**	.004	.008	-.008
Your Effort	.227	-.177	.136	.556	.188	.009	-.006	**.521**
Impressing Others	.196	-.398	-.225	.006	.368	**.603**	-.118	.004

Note. The above is based a Principal Component Analysis with Varimax Rotation and Kaiser Normalization, the highest loadings for each item are bolded.

APPENDIX I

Analyses of Summed Scales of Internal and External Attribution Items

In the main analyses, attributional responses were examined for differences between motivational conditions at individual items of interest (Appendix D) and at the one-item overall attribution scale (Appendix C). This method was useful to examine potential differences for important explanations for success (i.e., one's own ability versus external factors) as well as whether participants thought internal versus external attributional explanations as separate categories were relatively more important contributors to performance. However, this may not tell the whole story of the attributional explanations participants could use. For instance, it could be the case the all participants prefer internal versus external attributions for performance because of the relative appeal of accessibility of this category of explanations. It could be the case that one category contains more plausible explanations than the other regardless of experimental conditions.

Reviews on attributional research, particularly discounting effects, show us that oftentimes researchers examine forced-choice, bipolar attribution measures by placing internal explanations at one end and external at the other. However these measures can be insufficient for examining the complexity of people's attributional explanations for their own behavior (McClure, 1998). Kelley (1983) observed that the assumption that internal and external attributions are inversely related in a bipolar manner is an overly simple one. While some research shows that this can be the case, (e.g., Thibaut & Riecken, 1955, McClure, Jaspers, & Lalljee, 1993) other studies show that internal and

external attributions are often independent if they are measured separately rather than in a bipolar method (e.g., Lalljee, Watson, & White, 1982; Taylor & Koivumaki, 1976; Wimer & Kelley, 1982). In other words it could be the case that comparing internal and external attributions as categories is like comparing the proverbial apples and oranges. So examining each category as a separate variable is desirable.

To accomplish this, scale scores were summed separately for internal and external attribution items. The internal scale, consisting of eight internal items, included: your motivation, your interest, your ability, your enjoyment, desire to get done, your goals, pain threshold, and your fitness. Possible scale scores ranged from 8-56 as each item was scored on a 1-7 likert scale with 1 being: "strong negative influence," 7 being: "strong positive influence," and 4 being: "no influence." The external scale contained 13 items: luck, difficulty of task, fatigue from earlier in day, fatigue from task, room temperature, comfort of chair, comfort of room, the experimenter, working out recently, hand slipping, discomfort, boringness of task, and goals of experimenter. Possible scores ranged from 13-91.

One-way ANOVA's were calculated on both scales. Results on the internal scale revealed a marginally significant effect of condition, $F(3, 92) = 2.46, p < .07$. Exploratory contrasts were performed to examine which conditions may have differed. The contrasts revealed that the overt ($M = 40.0$, $S = 5.5$) and covert ($M = 41.9$, $S = 6.5$) conditions did not differ from one another, $t(92) = 1.2$, *ns*. The overt condition was significantly lower than the control/average feedback condition ($M = 44.6$, $S = 5.4$), $t(92) = 2.7, p < .01$. The covert did not differ significantly from the control, $t(92) = 1.5$, *ns*. These results indicated that those who had no performance of note to explain and

received no motivator (control/average feedback) rated internal factors as a higher positive influence than the four experimental conditions. This is true when the three experimental conditions are contrasted as a group against the control, $t(92) = 2.36, p < .05$.

To examine if the above effect was driven by the significant effect of the ability attribution item in the main analyses, the scale was recomputed without this item and another ANOVA was performed. This new analysis showed a significant overall effect, $F(3, 92) = 4.25, p < .01$. So, if anything the effect becomes stronger without the ability item. The rank order of means by conditions shows a similar pattern: overt, $M = 34.1$, $S = 5.0$; covert, $M = 36.0$, $S = 6.2$; neutral prime, $M = 36.0$, $S = 6.0$; and control/average feedback $M = 39.6$, $S = 4.8$. The pattern of contrast results was also similar. The overt did not differ from the covert, $t(92) = 1.2$, *ns*. The overt was smaller than control, $t(92) = 3.5, p < .001$. The covert was also smaller than control, $t(92) = 2.2, p < .05$. Finally, the three experimental groups taken as a whole were significantly lower than control, $t(92) = 3.2, p < .01$.

ANOVA results of the external scale revealed an overall effect of condition, $F(3, 92) = 3.55, p < .01$. Exploratory contrasts revealed that the overt ($M = 50.6$, $S = 6.7$) and the covert ($M = 53.8$, $S = 6.8$) differed marginally and opposite of the predicted direction, $t(92) = , p < .08$. The overt was significantly lower than the control/average feedback condition ($M = 56.4$, $S = 5.6$), $t(92) = 3.2, p < .01$, which was again opposite the prediction. The covert did not significantly differ from the control, $t(92) = 1.3$, *ns*. As was the case with the internal scale, when the three experimental conditions are contrasted as a group against the control, there was a significant effect, $t(92) = 2.4, p <$

.05. However, this effect goes in the opposite direction of theoretical expectations as well.

Taken together, the above results show a different pattern than the results in the main analyses. The main analyses showed that those in the experimental conditions generally rated internal factors as more important for their performance than external factors compared to controls on the single-item attribution measure. The same effect was generally observed on some of the individual attribution items of interest such as a "your ability" and "your goals." When the items are combined into internal and external categories, the opposite is observed. This may be a result of the general assortment of explanations observed within each of these scales. The explanations may be so varied that simply classifying them by the internal versus external nature of their explanatory function simplifies and overshadows their variety. There is little internal consistency for these scales. For example, the factor solutions that emerge for these items in a factor analysis (as seen in Appendix H) shows that many factors are needed to explain these items not just two. Some of these factors contain both internal and external items. So summed scales of internal versus external attributions did little to explain the results of Hypothesis 2.

The above analyses were based on the raw scores of the attributional items. It could be the case that participants oftentimes rated responses near the mean. Also some items might tend to be more positive or negative influences on performance and general. In order to adjust for these effects, z-scores were calculated for each item and then summed separately for by internal and external scales. ANOVA's were then performed on the scales. Results of the ANOVA on the summed scale of z-scores of internal

attributions revealed no significant effect, $F(3, 92) = .33$, *ns*. All exploratory contrasts failed to reach statistical significance as well (all t's $< .7$). The summed scales of z-scores of external attributions failed to reach statistical significance as well, $F(3, 92) = .27$, *ns*. All the exploratory contrasts between these conditions failed to differ (all t's $< .9$).

APPENDIX J

Main Analyses Excluding Great Lakes Christian College Sample

Hypothesis 1

Results of the ANOVA on Block 2 – Block 1 arm-holding scores revealed no significant effect, $F(3, 83) = 1.4$, *ns* (control/average feedback: $M = -58.1$, $S = 59.7$); nor did the Block 3 – Block 1 ANOVA, $F(3, 83) = .5$, *ns* (control/average feedback: $M = -140.2$, $S = 75.0$), as was the case when the Great Lakes sample was included. The results of the ANOVA on the intrinsic motivation measure without the Great Lakes sample revealed no significant effect, $F(3, 83) = .38$, *ns* (control/average feedback: $M = 29.8$, $S = 8.0$), which was no different compared to when this sample was included. Finally, when examining the future participation measure, we observe the same results without the Great Lakes sample, $F(3, 83) = 1.1$, *ns*, (control/average feedback: $M = 3.7$, $S = 1.5$) as with it.

Hypothesis 2

ANOVA results of the overall attribution measure revealed a significant effect, $F(3, 83) = 2.86$, $p < .05$, whereas this same analysis had revealed only a marginally significant effect when the Great Lakes Christian College sample was included, $F(3, 92) = 2.5$, $p < .10$. This change in significance level is due to the relatively higher scores (more external attribution) in the control/average feedback condition ($M = 4.1$, $S = 1.4$) in this sample versus the full sample ($M = 3.8$, $S = 1.3$). It could be that the full sample which contained more students from a small private school with a religious affiliation saw task performance as more internally controlled since they are used to smaller classes and interactions and therefore their own contribution can play a larger part than for

students who regularly attend much larger classes. All contrasts of interest on this measures remained at the same significance levels as in the main analyses.

The analyses of individual attributions items with only the Michigan State University sample were recomputed as well. ANOVA results of the "your interest" item revealed no significant effect, $F(3, 83) = 2.1, p < .11$, whereas this effect was only slightly stronger when the Great Lakes sample was included, $F(3, 92) = 2.37, p < .10$. This difference is driven by the change in the control conditions from the main analysis ($M = 4.9, S = 1.2$) to this one ($M = 4.7, S = 1.3$). So those in this sample rate their interest as less of a positive influence on their performance than the whole sample. Again, those in the Great Lakes sample may have higher levels of internal motivation being from a smaller school. However, all contrasts of interest remained the same except the difference between the overt condition and the control which dropped from marginal significance to no significance, $t(83) = .97$, *ns* as opposed to $t(92) = 1.7, p < .10$ in the main analysis.

ANOVA results on the "your ability" attribution revealed a marginally significant effect, $F(3, 83) = 2.26, p < .09$, while this effect was significant when the Great Lakes sample was included, $F(3, 92) = 3.5, p < .05$. The change in significance levels was due to the small change in the control condition, $M = 5.1, S = 1.3$ in this sample as opposed to $M = 5.0, S = 1.2$ and the lowered sample size. However, none of the contrasts of interest differed.

Next, the analysis of the "your goals" attribution was significant, $F(3, 83) = 2.83$, $p < .05$, while this effect was not significant with the full sample, $F(3, 92) = 1.7$, *ns*. The mean score was lower for this sample in the control condition ($M = 4.5, S = .7$) than in

the main analysis ($M = 4.8$, $S = 1.0$) which suggests that the Great Lakes students again are more internally motivated. All planned contrasts remained the same expect for the comparison between the overt and control conditions which was marginally significant here, $t(83) = 1.7$, $p < .10$, but not in the main analysis, $t(92) = .84$, *ns*.

Finally, analysis of the "goals of experimenter" attribution revealed no significant effect, $F(3, 83) = 1.9$, *ns*, as was the case with the full sample, $F(3, 92) = 2.1$, *ns*. The scores in the control condition did not differ very much from this sample, $M = 3.9$, $S = .6$ compared to the full sample, $M = 4.0$, $S = .5$. None of the contrasts of interest differed. Taken together, when we see any differences in the sample, they can be explained by relatively higher ratings of internal attributions when the Great Lakes sample is included. Again, this is probably due to a higher internal locus of control in a college environment with only 200-300 students as opposed to over 40,000 at Michigan State. However, any differences observed were minor and did not change conclusions on the hypotheses.

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