Effects of Goal Reward and Feedback Frequency on Motivation: A Control Theory Perspective

Jonathan Michael Balcerek
Old Dominion University

EFFECTS OF GOAL REWARD AND FEEDBACK FREQUENCY ON MOTIVATION: A CONTROL THEORY PERSPECTIVE

by

JONATHAN MICHAEL BALCEREK
B.S. May 1988, St. Lawrence University

A Thesis submitted to the Faculty of
Old Dominion University
in Partial Fulfillment of the Requirement for the Degree of

MASTER OF SCIENCE

PSYCHOLOGY

OLD DOMINION UNIVERSITY
August 1996

Approved by:

Donald D. Davis (Chair)

Glynn D. Coates (Member)

H. Barry Gillen (Member)

ABSTRACT

EFFECTS OF GOAL REWARD AND FEEDBACK FREQUENCY ON MOTIVATION: A CONTROL THEORY PERSPECTIVE.

Jonathan Michael Balcerek
Old Dominion University, 1996
Chair: Dr. Donald D. Davis

The current study investigated the effects of feedback frequency and goal reward on subject motivation. Klein's (1989) control theory model of work motivation was used to conceptualize the method and hypothesis. Subjects performed a simple computer addition task. When we examined subjects who displayed medium to high mathematical ability, significant effects were discovered. Higher goal reward led to higher motivation. In addition, subjects with a low goal reward and high amounts of feedback displayed lower motivation than subjects with a high goal reward and high amounts of feedback and subjects with a high goal reward and low amounts of feedback. The usefulness of control theory is discussed.

To Jane, for all her love and strength,

and to my parents, for all their devotion and guidance.

TABLE OF CONTENTS

LIST OF TABLES

TABLE PAGE

TABLE PAGE

LIST OF FIGURES

INTRODUCTION

A large amount of research has been devoted to the study of work motivation. Numerous studies have examined the factors influencing motivation as well as the effects of motivation in various settings. The present study examined the usefulness of the control theory of work motivation (Klein, 1989; Klein, 1991a; Lord & Hanges, 1987) in predicting performance on a mathematical task. Due to the complex nature of this theory, the current study examined only a few of its components. Specifically, the study investigated the influence of frequency of feedback, goal reward, and their interaction on motivation.

Control Theory Principles

Control theory developed from the field of cybernetics, the science of control and communication systems (Weiner, 1948). Its principles have been applied to a wide variety of disciplines including economics, applied mathematics, communication systems, and medicine (Carver & Scheier, 1982). Researchers use control theory to describe how the quantitative or qualitative value of some system parameter can be confined to specified limits, even with constant variation of the system environment (Lord & Hanges, 1987).

A number of authors (e.g., Carver & Scheier, 1981; Powers, 1973) have presented comprehensive descriptions of how control systems work. The basic processes underlying control systems contain five distinct but integrated elements: a sensor, a standard or reference value, a comparator, a decision mechanism, and an effector (see Figure 1).

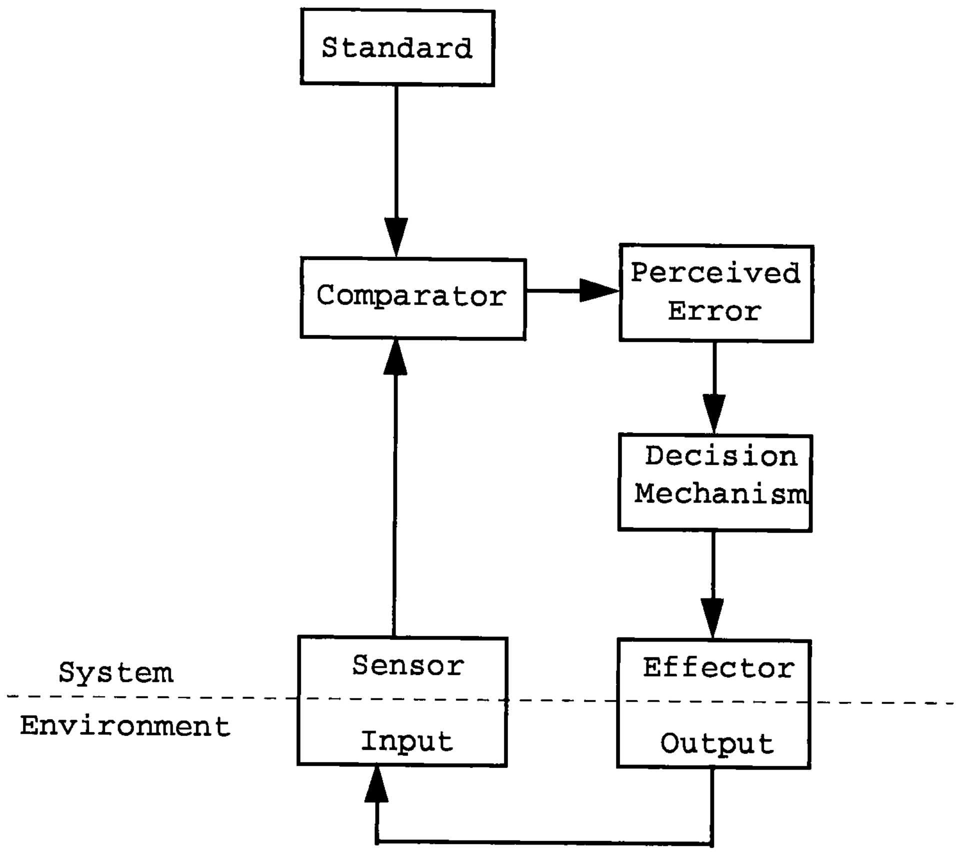


Figure 1. Control Theory Model of Motivation.

The sensor receives input from the environment. This input is then compared to the reference value by the comparator. The reference value is some criterion or standard the system attempts to meet or maintain. If the comparator finds a discrepancy between the criterion and perceived input, the decision mechanism selects a response to reduce the discrepancy. The response takes place through an effector that influences the system's environment (Campion & Lord, 1982; Carver & Scheier, 1982; Lord & Hanges, 1987; Sandelands, Glynn, & Larson, 1991).

These five components make up a negative feedback loop. The loop is considered negative because its main function is to negate or change any differences between the desired condition and the perceived condition (Carver & Scheier, 1982). In this way, the feedback loop maintains system equilibrium.

Control Theory and Motivation

According to Lord and Hanges (1987), motivation is not a separate element of a control system but is "explained and produced by the entire system" (p. 162). They discuss a number of interconnections between the functions of motivation and components of control systems. First, the arousal or initiation function of motivation takes place when the control system's comparator senses discrepancies between the desired and perceived states. Second, the amount of discrepancy determines the intensity of motivation. Up to a certain point, larger differences between perceived and desired conditions usually produce greater amounts of motivation for change. Once these differences become too large motivation drops, and the person either lowers his or her goals or stops the action. Lastly, the control system's decision mechanism determines the direction and type of motivational behavior. The five components of control systems create a negative feedback loop and work together so that when a person perceives a discrepancy between a desired condition and a perceived condition, the person is motivated to correct the situation and reduce the discrepancy.

Recent research and theoretical discussions have focused on the importance of the negative feedback loop and its relationship to motivation. Baron (1991) states that the negative feedback loop is one of the central assumptions of control theory. Klein (1989) suggests it is the "fundamental building block of action" (p. 151). Hyland (1988) states that the negative control loop "can be used as a controlling device that generates behavior so as to reduce differences between the perceptual input and reference criterion" (p. 646). Kernan and Lord (1990) suggest the discrepancy between current and wanted states, as perceived through the negative goal-feedback loop, is the central element in control theory and causes attention and motivation. To test this assertion, they hypothesized that "the size and consistency of discrepancies are related to subsequent change in effort, performance, and goal" (p. 194). Using invoice verification and inventory tracking tasks, Kernan and Lord (1990) found that discrepancies were crucial in predicting motivation. This "implies a single cybernetic model of motivation which emphasizes discrepancy would be capable of predicting performance results" (p. 200). Podsakoff and Farh (1989) used an object listing task and showed that when subjects are provided with feedback, an internal comparison process takes place between goals, feedback, and previous performance levels. This internal comparison leads to changes in motivation.

Not all authors agree with using control theory as an explanation of motivation and behavior. Locke (1991) presented four criticisms regarding the use of control theory to explain human motivation. First, Locke says that the original control theory model is too mechanistic and does not focus enough on human cognitive processes to explain human motivational behavior accurately. Sandelands et al. (1991) agree and state that "human actions are not exclusively movements of matter or energy but are also and more essentially movements of meaning. And because meanings matter in human action in ways that they do not in mechanical systems, human action does not unfold the same way" (p. 1126).

For Locke's (1991) second criticism, he recognizes that recent changes have occurred in the control theory model, including the addition of cognitive processes (e.g., Klein, 1989; Lord & Hanges, 1987). Locke argues that these changes integrate too many assumptions from other motivation theories such as goal setting, attribution, and expectancy theory. These assumptions from other motivation theories de-emphasize the core assumption of control theory, the negative feedback loop. This is a problem because control theory's focus on the negative feedback loop provides control theory with an identity and differentiates it from other theories of motivational behavior. According to Locke (1991, p. 15), control theory has become "based overwhelmingly on findings from other theories."

For his third criticism, Locke (1991) criticizes control theory because its core is based only on discrepancy reduction. This is an incorrect assumption according to Locke because "human action is not initiated by discrepancy reduction but by discrepancy creation" and that "discrepancy reduction actually is a consequence of goal directed behavior, not its cause" (p. 13). Humans choose goals and act to achieve these goals. Discrepancies are a cause of this cycle; discrepancy reduction is not the start of this goal-action cycle.

For his last criticism, Locke (1991) suggests that control theory has no empirical base. This has occurred because all research cited as supporting control theory was derived from research based on other motivation theories. In summary, Locke states "thus far, there is little evidence that the control theory approach to theory building will prove to be a fruitful one" (p. 26).

Klein (1991a), in a spirited rebuttal to Locke's criticisms, states that modern control theory fully explains motivational processes and offers a useful and distinct explanation of human work motivation. He agrees with Locke's first point; the original control theory model provides a too mechanistic model to explain human motivation adequately. He disagrees with Locke's second point and suggests that while recent modifications (i.e., the addition of several cognitive processes) do allow control theory to explain work motivation fully, they have not caused the abandonment of the negative feedback loop as control theory's core. Klein argues that the ideas borrowed from other motivation theories are organized around the central assumption of the negative feedback loop. In this way, control theory provides a means to incorporate feedback, goal setting, and information process theories such as expectancy and attribution theory to explain motivation. Concerning the integration of these other ideas and processes, Klein suggests "the total is greater than the sum of the parts" (p. 36).

Klein (1991a) also disagrees with Locke's third criticism of control theory, that it ignores the importance of goal setting. Klein explains that control theory does not focus only on discrepancy reduction. The control process begins with a choice of a goal, not just a discrepancy. Control theory does not ignore the critical importance of goals, and it acknowledges the significance of these for motivating behavior. In fact, after the addition of cognitive processes to control theory, it has been used to explain the findings of goal setting research. These results include the influence of hard vs. easy goals (see Hyland, 1988) and the influence of specific vs. vague goals (see Klein, Whitener, & Ilgen, 1990).

To counter Locke's fourth criticism of control theory, Klein agrees that, compared to the evidence supporting goal setting, few scientific studies have demonstrated the usefulness of control theory for explaining worker motivation. Klein states that control theory has only been recently used for explaining work motivation and "the empirical investigation of control theory's distinctive hypothesis regarding work motivation has just begun" (p. 36). Hollenbeck (1989) also suggests that researchers have just begun to use the control theory model to explain and investigate motivation in applied psychology, especially concerning the links between feedback and goals.

Control theory is similar to several other explanations of motivation processes such as need hierarchy theory, equity theory, and expectancy theory. In fact, most work motivation theories, including control theory, describe the same basic process. This process begins as each worker feels certain needs, desires, and expectancies. These cause the worker to experience a state of disequilibrium and motivate the worker to perform some action toward meeting specific goals (i.e., his or her desires and needs). The action results in some form of perceived feedback. This feedback causes a reassessment of the situation and produces changes in the worker's needs, desires, and expectancies (Daft & Steers, 1986).

Although control theory resembles other theories, it has several unique features. For example, both control and equity theories state that a behavior-performance feedback loop motivates workers. According to equity theory, the worker will compare his or her inputs and outcomes to the inputs and outcomes of referent others (Daft & Steers, 1986). Equity theory fails to explain changes in motivation adequately when the worker does not have any referent others with which to compare. Control theory solves this problem by suggesting that a worker in this situation compares his or her inputs and outcomes with past outcomes and performance goals. In this case, control theory offers a more flexible view of motivation.

Maslow's need hierarchy theory and Alderfer's ERG theory, a modification of Maslow's theory, both suggest that workers have a hierarchy of needs (Daft & Steers, 1986). The worker must meet lower level needs (e.g., existence needs) before progressing to higher needs (e.g., growth needs). According to ERG theory, the worker can regress back to lower level needs if frustrated by higher needs. Control theory is similar to these theories because it suggests that a worker has needs and goals he or she tries to meet. Control theory also suggests there is a hierarchy of goals and sub-goals (Klein, 1989). The main problem with need hierarchy and ERG theories is they are too simplistic. They fail to explain how multiple goals and goal conflicts interact and are resolved. Control theory solves this problem; it suggests that an individual faced with multiple goals will address the most salient and immediate goal. The saliency of the goal is determined by situational cues, the perceived importance of the goal, and the amount of feedback-goal discrepancy perceived by the individual (Klein, 1989; Taylor, Fisher, & Ilgen, 1984).

Expectancy theory states that the perceived importance of the goal and the perceived expectancy of reaching the goal determines worker motivation. Goal expectancy and importance are also significant factors in control theory. According to control theory, the more value placed on the goal, the more likely the worker will work toward the goal. Expectancy theory fails to explain how the worker's goal importance and expectancy change over time. Control theory solves this problem by suggesting the worker examines perceived feedback and alters his or her goal importance or expectancy according to this feedback. That is, if the worker perceives a large discrepancy between the desired goal and current performance, the worker is more likely to lower his or her expectations for reaching the goal along with the perceived importance for reaching the goal. If the perceived discrepancy is low, there is less chance the worker will lower his or her expectation and importance for reaching the goal.

Despite Locke's (1991) criticism of control theory, it is an important approach to understanding work motivation. A number of researchers have noted the similarities between the central process of control theory, the negative feedback loop, and human motivation (Hyland, 1988; Kernan & Lord, 1990; Lord & Hanges, 1987; Podsakoff & Farh, 1989). Control theory explains motivation processes that earlier theories (e.g., expectancy theory and need hierarchy theory) fail to examine fully. In addition, control theory provides a framework for integrating various motivation theories. One author, Klein (1989), has combined several motivation theories into the control system framework to form one model. This model was used to guide the current research and will now be examined.

Klein's Integrated Control Theory Model of Work Motivation

Klein (1989) notes inconsistencies between the control system models of Campion and Lord (1982), Carver and Scheier (1981, 1982), Hollenbeck and Brief (1987), Hollenbeck and Williams (1987), Lord and Hanges (1987), and Taylor et al. (1984). According to Klein, none of these models provides a comprehensive explanation of human motivation applicable to a wide range of environments and behaviors. To explain worker motivation better he integrated these models, along with expectancy theory, attribution theory, social-learning, and goal setting, into the control theory framework. By doing this, Klein offers a more complete and flexible explanation of human motivation. Klein's model (1989) is presented in Figure 2. The main difference between Klein's model and earlier versions of control theory is the addition of several cognitive processes mediating the comparator and effector components of the control system.

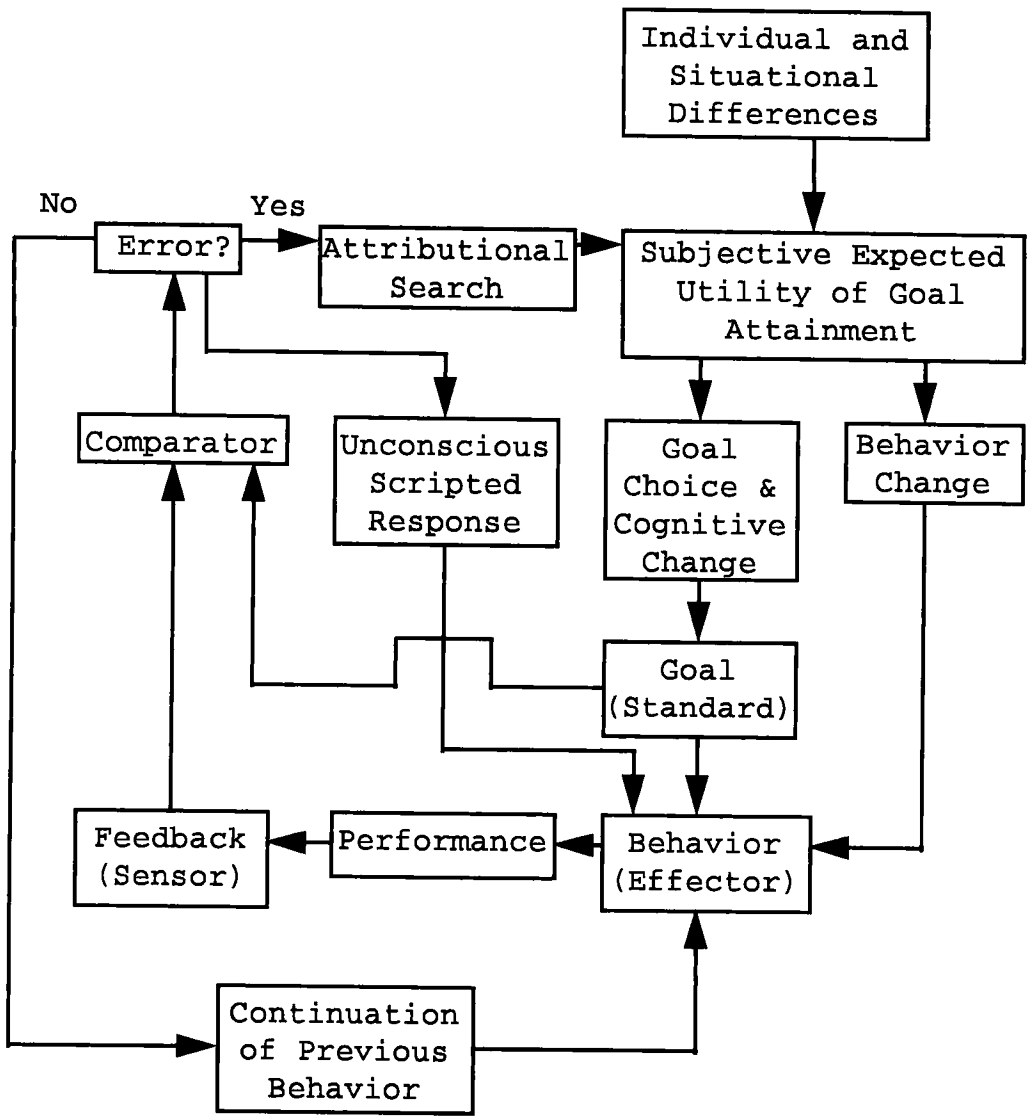


Figure 2. Klein's (1989) Control Theory Model of Work Motivation.

When one has accepted a certain goal, one performs actions to reach this goal and receives feedback. One then compares feedback to the goal during the comparator stage. If no errors or discrepancies between the goal and feedback are perceived, one continues the previous behavior. If errors are perceived and the situation is familiar, one may perform unconscious scripted responses. These are "overlearned performance programs, cognitive structures that provide sequences of events for familiar situations" (Klein, 1989, p. 157). In other words, one performs past behaviors.

Klein, incorporating ideas from Carver and Scheier (1981), suggests that when one perceives an error and no scripted responses are known or are available, one may instead perform an attribution search. Due to this search, one forms causal explanations for why one did not meet the goal. These explanations are usually based on some degree of luck, effort, ability, and task difficulty and influence the subjective expected utility (SEU) of goal attainment (the goal value and the expectancy for reaching the goal).

The individual and situational differences of Klein's (1989) model represent the contributions of Hollenbeck and Klein (1987), Taylor et al. (1984), equity theory, and social-learning. Klein, using the ideas of Taylor et al. (1984), suggests that individual differences in self-esteem and locus of control affect the SEU of goal attainment. Klein, incorporating his previous research with Hollenbeck (Hollenbeck & Klein, 1987), states that the authority of the feedback source can also influence the worker's SEU. Borrowing from social-learning and equity theories, Klein (1989) suggests that experiences of the worker and any social comparisons the worker makes can also influence the SEU of goal attainment. Other individual and situational factors that may affect the SEU include the worker's abilities, needs, values, performance constraints, and rewards.

The SEU of goal attainment influences the response decision. One must decide whether to change behavior (e.g., try harder) or cognitions (e.g., lower perceived task importance). Therefore, the SEU of goal attainment is one of the most critical stages in Klein's model and has the most influence on motivation and behavior (Carver & Scheier, 1981; Klein, 1989). Klein (1991b) tested this idea by analyzing course grades of human resource management students. He found that expectancies significantly related to goal choice, commitment, and performance. Bobko and Colella (1994) also found relationships between goal importance, expectancies, and utility in their discussion of evaluative performance standards and their influence on worker motivation and satisfaction.

Researchers have found a significant relationship between expectancies and affective states. Hollenbeck (1989) suggests that one of the basic components of control theory is the affective element. Negative affect in the form of dissatisfaction will occur when a discrepancy takes place between inputs, referent standards, and expectancies. Locke (1991) also mentions that goals and standards influence satisfaction levels. He suggests that when a person reaches a goal, they experience positive affect, or in other words, satisfaction. If they do not reach the goal, they experience dissatisfaction. Carver and Scheier (1990) suggest that both negative and positive affect is influenced by the amount of perceived progress towards goals. If the rate of progress, as perceived through the negative feedback loop, does not meet expectations, negative affect will take place. Positive affect will occur when goal progress meets the worker's expectations. Saavedra and Earley (1991) also suggest that affective states are related to performance expectations. They state that if progress towards a goal is inadequate, a person will experience negative affect. These researchers found, using an exercise where subjects completed evaluation forms and viewed videos used to induce affective states, that "affective consequences associated with learning a task may promote intrinsic motivation or undermine it" (p. 61).

Behavioral changes due to the SEU of goal attainment are more likely to occur than cognitive changes (Campion and Lord, 1982; Klein, 1989). These changes include either a change in the intensity of the behavior (e.g., more effort) or the direction of the behavior (e.g., trying a new method for reaching a goal). Cognitive changes resulting from perceived discrepancies can include changes in goal commitment or the goal itself. In general, if the SEU of the goal is high, one will persist in behavior toward the goal. If the SEU is low, one will withdraw from the behavior and change one's cognitions.

The present study used Klein's (1989) model to examine the relationship between goal reward, frequency of feedback, the interdependence between goals and feedback, and levels of motivation. Many researchers have studied these motivational components separately or in the context of other theories. No study has examined the components of goal reward, feedback frequency, and motivation while using the control theory model. By doing this, the current investigation will help explain some of the processes involved in control and worker motivational systems, as well as provide evidence concerning the usefulness of Klein's control theory for explaining worker motivation. We will now examine the factors of feedback frequency, goal reward, the interdependence between goals and feedback, and their relationship with levels of motivation.

Goals and Feedback Interdependence

A number of empirical studies have examined the goal-feedback relationship and its effect on goal setting and motivation. Locke (1967) and Locke and Bryan (1969), using a simple addition task, found that feedback, when combined with performance goals, influenced levels of motivation. Difficult goals with feedback led to higher performance. When difficult goals were present without feedback, performance was lower. Locke and Bryan (1968) found that subjects given feedback on a math task chose more difficult goals more often than subjects who did not receive feedback. The subjects who picked the difficult goals performed better. These results show, according to the authors, that feedback may influence motivation only when feedback affects goal setting.

Kim and Hamner (1976) tested the feedback-goal relationship in the field. They used 113 blue-collar unionized workers from four Bell System plants. They used three conditions of feedback (intrinsic [worker-generated], extrinsic [supervisor-generated], and no feedback). All subjects were assigned performance goals. The authors discovered higher performance for subjects with both goals and feedback.

Researchers noted that in previous studies concerning the goal-feedback relationship, some form of feedback was always provided to subjects (Erez, 1977; Becker, 1978; Strang, Lawrence, & Fowler, 1978). Investigators either purposely gave feedback to subjects or provided feedback to subjects informally by the experimental method or task. Erez (1977) acknowledged that these studies showed that feedback on a task is not sufficient to increase motivation; goal setting is also needed. Because provision of feedback was confounded with goal setting, previous research failed to show if feedback is a necessary factor for goal setting to influence motivational processes.

Feedback regarding performance has since been shown to be necessary for goal setting to work successfully (Podsakoff and Farh, 1989). Only when one combines feedback with goals will motivation and performance be influenced.

Podsakoff and Farh (1989) used the negative feedback loop involved with control systems to explain this relationship. They suggest that only after one perceives feedback can one measure performance against the referent standard and then rate the amount of discrepancy between the standard and the feedback.

Erez (1977) predicted that the presence of goals would only increase motivation and task performance when there were high amounts of feedback given to subjects. To test this hypothesis Erez used a number comparison task for a performance measure in which subjects had to find differences between two number lists. One group received feedback about their performance after the first stage of the task. The other group did not receive any feedback. Due to the nature of the task, the no feedback subjects could not have perceived any indirect feedback regarding their performance. Subjects were then asked how well they intended to perform on the task during the second stage. The data showed the feedback group set higher goals more often than the no-feedback group. Higher goals led to higher performance only for the feedback group. Erez concluded that feedback is a necessary condition for goals to influence motivation and performance.

Strang et al. (1978) attempted to replicate Erez's findings. Their study differed from Erez's in that the researchers provided feedback after subjects completed every item and assigned goal level (difficult vs. easy) to subjects. Strang et al. (1978), like Erez, found that greater motivation and performance occurred in groups receiving feedback. Becker (1978) also supported these results.

Bandura and Cervone (1983), using a strenuous physical exertion task, found that only subjects receiving feedback concerning goal achievement performed significantly greater than a control group (no feedback and no goals). In addition, they found that subjects with only goals and subjects with only feedback did not have higher performance than the control group.

To summarize, researchers have found that both goals and feedback are necessary elements to increase motivation levels. This finding has been discovered and replicated in both the laboratory and the field.

Frequency of Feedback

Research has shown that feedback is an integral part of motivational and performance processes (Balcazar, Hopkins, & Suarez, 1985; Ilgen, Fisher, and Taylor, 1979). Ilgen et al. (1979) explained that while most research has examined a few dimensions of the feedback process (e.g., message, recipient, perception of feedback, and acceptance of perceived feedback), little research has examined the "psychological processes triggered by feedback" (Ilgen et al., 1979, p. 349). One aspect of feedback that has not been extensively studied is the effect of feedback frequency on motivation.

Ilgen et al. (1979) stated that it is usually believed that more feedback is better for increasing motivation and work performance. Balcazar et al. (1985), in their review of the literature concerning feedback, found that daily and weekly feedback was more effective than monthly feedback for raising motivation and performance in workers. Seligman and Darley (1977) stated that timely feedback was needed to motivate homeowners to conserve energy, and infrequent feedback did not motivate people to limit their energy consumption. Gatchel (1974) found that immediate feedback was best for helping subjects lower their heartrate. In these cases, more feedback was better.

Alavosius and Sulzer-Azaroff (1990) tested the influence of continuous vs. intermittent feedback on health care providers for the acquisition of proper feeding, positioning, and transferring of physically disabled patient techniques. The researchers found a continuous schedule of feedback, where feedback was provided after every one or two patient care activities, led to a more rapid acquisition of correct procedures than feedback provided once a week.

Some research has shown that more feedback is not always better. For example, Haemmerlie (1985) had subjects learn rules for administering individual intelligence tests. The subjects then completed a retention quiz. Subjects either received minimal performance feedback (whether the subject had reached a mastery of 90% correct), feedback after every item, after the entire test, or 24 hours after the test. All subjects then completed another retention test one-week later, which served as the performance measure. The researcher found that the after-each-item feedback group performed significantly lower than any other group, including the minimal feedback group. The author suggested that subjects in the after-each-item condition experienced negative affect after they missed items. This affect lowered their motivation and their later performance. This finding supports Ilgen et al.'s (1979) suggestion that feedback showing low performance can have a powerful negative effect.

Chhokar and Wallin (1984) examined the impact of feedback frequency on safety behavior. Some workers received feedback about their performance once a week, and some received it once every two weeks. Feedback every two weeks produced the same results as feedback every week. The authors considered the costs and benefits of providing worker feedback and suggested it was reasonable to provide workers with feedback concerning their safety behavior every two weeks. In this case, more feedback led to the same level of performance as less feedback.

Williams, Williams, and Ryer (1990) found job satisfaction for school psychologists varied significantly with the frequency of performance feedback they received from coworkers and administrators. The more often they received positive feedback, the higher their satisfaction.

The more frequent they received negative performance feedback, the lower their satisfaction.

These findings suggest frequency of feedback can influence motivation. More feedback is usually better. But when feedback produces negative affect, more frequent feedback leads to lower motivation.

Goal Reward

Locke (1968) suggested that monetary payments increase subjects' commitment to goals. This increase in commitment leads to higher motivation levels and higher performance. Kernan and Lord (1990) agree that financial incentives can increase the importance of reaching a goal. They suggest that these incentives can increase commitment to goals and heighten motivation.

Locke, Bryan, and Kendall (1968), after a series of five experiments, concluded that money influences goals and intentions. Money did not change performance directly, but influenced the nature of intentions (e.g., hard goal vs. easy goal), acceptance of goals, and degree of commitment to goals. Folger and Doherty (1993), using a memorization task, discovered a significant relationship between financial incentives and goal attractiveness. A $5 reward incentive caused higher goal attractiveness than a $1 incentive.

Ford, Wright, and Haythornthwaite (1985) tested the relationship between goal reward and performance. They used an anagram task with undergraduates as subjects. All subjects received the same incentive ($.10 for every anagram they completed) and were asked to rate the attractiveness of the monetary incentive. The researchers discovered that performance was better for subjects who perceived moderate goal attractiveness.

These findings suggest that money can increase goal importance, commitment, and attractiveness. They also suggest that goal importance, commitment, and attractiveness influence levels of motivation. Thus, monetary payments, by influencing levels of goal importance, acceptance, and commitment, can increase motivation.

Summary

Using Klein's model of control theory, the current study examined the relationship between goal reward, frequency of feedback, interdependence between goals and feedback, and levels of motivation. Specifically, it investigated the effects of no feedback, low amounts of feedback, high amounts of feedback, low and high goal rewards, along with the interaction between these conditions, on performance. Relying on the stages of Klein's model, we investigated several problems: how the situational variables of goal reward and feedback frequency influence the SEU of goal attainment, how these situational variables influence subject affect — specifically satisfaction — and how these changes influence motivation levels.

Motivation is usually defined as psychological processes that initiate behavior and modify the direction, intensity, and persistence of behavior (Baron 1991; Klein, 1989; Lord & Hanges, 1987; Pinder, 1984). One cannot directly measure motivation but can indirectly evaluate it by observing behavior (e.g., intensity and persistence). Matsui, Okada, and Inoshita, (1983) supported the use of the number of attempted problems as a measure of motivation. Numerous researchers have also used the number of correct problems on a task to assess motivational levels (e.g., Erez, 1977; Erez, Gopher, & Arzi, 1990; Saavedra & Earley, 1991). Though there are problems with using task performance as an indirect measure of motivation, if certain subject attributes are controlled (e.g., ability) and task dimensions held constant, one can correctly evaluate motivation by measuring task performance.

For these reasons, in the present study we operationally defined motivation two ways: the subject's number of attempted problems on a mathematical task and the number of correct problems on the task. We also used a measure of perceived effort.

Hypotheses

The main hypothesis for this study is there will be a significant interaction between feedback frequency and goal reward. The following represent the hypothesized order of conditions regarding their motivation levels (from highest motivation to lowest): low feedback/high goal reward, high feedback/high reward, high feedback/low reward, low feedback/low reward, no feedback/high reward, and no feedback/low reward. The reasoning for this order is explained below.

In reference to Klein's model (1989), the hypothesized interaction will take place because goal rewards and feedback frequency are types of individual and situational differences. These differences will influence the SEU of goal attainment (the value of the goal and the expectancy for reaching the goal). Subjects with a low goal reward and no or low amounts of feedback will have a low SEU, be less committed to the goal, and will be more likely to change their cognitions (e.g., they will believe the task is not important). Due to this low SEU, they will display less effort on the task and performance will decrease. Subjects in either the high goal reward or high feedback frequency condition will have a high SEU, high commitment to goals, will be more likely to change behavior (e.g., increase effort), and will be less likely to change their cognitions. The hypothesized interaction is also supported by previous goal setting (Strang et al., 1978) and control theory research (Campion & Lord, 1982), which shows that low performance is found where no feedback is present.

Subjects in the high goal reward condition will perceive a goal with high importance (Hollenbeck & Williams, 1987); this importance level will motivate them to meet the goal. But this assigned goal will be almost impossible to reach and, therefore, should cause subjects to experience negative affect when they do not meet the goal. Subjects who are given more feedback will be more aware they have not reached the goal, experience more negative affect, and be less motivated. Therefore, the subjects in the low feedback/high goal reward condition will be more motivated than subjects in the high feedback/high goal reward condition.

Subjects in the low goal reward condition should not perceive an important goal. Because of this low importance, they should experience little negative affect when feedback indicates they have not reached the goal. In addition, increased feedback levels have been shown to produce higher effort levels when the feedback did not produce negative affect (Seligman & Darley, 1977). For these reasons, subjects in the high feedback/low goal reward condition should be more motivated than subjects in the low feedback/low goal reward condition.

We also expect a significant interaction between trials, feedback frequency, and goal reward. Subjects in a similar goal reward condition will begin the task with the same motivation and performance. After several trials, the effects due to frequency of feedback will take place, and groups with different amounts of feedback should display motivation differences. For example, the low feedback/high goal reward and high feedback/high goal reward conditions should display equal performance during the first few trials because they have the same goal reward. Subjects in the high feedback/high goal reward condition will receive more feedback after a few trials. This feedback will indicate they have not reached their goal, and they will feel greater negative affect concerning their performance. Subjects in the low feedback/high goal reward group will not experience as much feedback and will therefore feel less negative affect. For this reason, after a few trials, subjects in the high feedback/high goal reward group will display less motivation than subjects in the low feedback/high goal reward condition.

METHOD

Subjects

Male (n = 64) and female (n = 38) undergraduates from Old Dominion University in Norfolk, Virginia were employed as subjects. The treatment of these subjects was reviewed and approved by the institution's Human Subjects Review Committee. All subjects were 18 years old or older and received extra-credit for a psychology class in which they were currently enrolled. A power estimation analysis, following the procedures outlined by Cohen (1977) and Hays (1988), was performed. This analysis demonstrated that with a medium effect size (ω^2 = .20) and repeated measures, we would achieve a power of at least .80 if 14 subjects were assigned to each group. Cohen states this is adequate power for most research (p. 56), and therefore, 84 subjects were needed for the current investigation. We used 102 subjects to insure we obtained sufficient power to test the hypotheses.

Research Design

We used a 3 (No Feedback, Low Feedback Frequency, and High Feedback Frequency) x 2 (Low Goal Reward and High Goal Reward) x 8 (Trials) design with repeated measures on trials. We randomly divided subjects into groups as displayed in Table 1. Due to this random assignment, group sizes were slightly unequal. The dependent variables used in the present study included the number of problems attempted on an addition task and the number of correctly solved problems on the task.

Apparatus

The experiment took place in a small laboratory room. The room contained a desk, two chairs, a table, a personal computer workstation, and paper and pencil questionnaires.

Table 1

Experimental Design and Subject Assignment

		Feedback Frequency					
		No Feedback		Low Feedback		High Feedback	
Reward Level		Low	High	Low	High	Low	High
	1	S1-S19	S20-S35	S36-S52	S53-S69	S70-S86	S87-S102
	2	S1-S19	S20-S35	S36-S52	S53-S69	S70-S86	S87-S102
T	3	S1-S19	S20-S35	S36-S52	S53-S69	S70-S86	S87-S102
R I	4	S1-S19	S20-S35	S36-S52	S53-S69	S70-S86	S87-S102
A L	5	S1-S19	S20-S35	S36-S52	S53-S69	S70-S86	S87-S102
S	6	S1-S19	S20-S35	S36-S52	S53-S69	S70-S86	S87-S102
	7	S1-S19	S20-S35	S36-S52	S53-S69	S70-S86	S87-S102
	8	S1-S19	S20-S35	S36-S52	S53-S69	S70-S86	S87-S102

Subject instructions. Instructions provided to each subject are printed in Appendix A. Instructions provided directions for the computer addition task. The instructions also explained that the subjects will be assigned a performance goal, they will receive raffle tickets for reaching this goal, and the raffle will be for a prize of $50. Kernan and Lord (1990) also used lottery tickets for a $50 raffle as an incentive.

Measures

Effort rating. We used Question 2 on the subject pre-questionnaire (How hard will you try to correctly answer the number of problems you have specified in question 1?; see Appendix B) as a measure of subjects' perceived effort before they performed the computer addition measure. Subjects answered this question, Question 3, and Question 4 using a 1 to 5 agreement type response scale. Question 2 on the subject post-questionnaire (How hard did you try to correctly answer the number of problems you have specified in question 1?; see Appendix C) was used as a measure of subjects' perceived effort after they completed the addition measure.

Importance rating. Question 3 (How important is it for you to correctly answer the number of problems you have specified in question 1?; see Appendix B) on the subject pre-questionnaire was used to measure subjects' perceived importance of reaching the goal before they performed the computer addition measure. We used Question 3 (How important was it for you to correctly answer the number of problems you have specified in question 1?; see Appendix C) on the subject post-questionnaire to measure subjects' perceived goal importance after the addition measure. For Question 3 on the subject pre-questionnaire and post-questionnaire, the higher the rating, the lower the perceived goal importance. We reversed all importance ratings during data analysis so that the higher the rating, the higher the perceived importance for reaching the goal.

Expectancy rating. We used Question 4 (What do you think is the chance that you will correctly answer the number of problems you have specified in question 1?; see Appendix B) on the subject pre-questionnaire to measure subjects' perceived expectancy for reaching the goal before the computer addition measure. Question 4 (What did you think was the chance that you would correctly answer the number of problems you have specified in question 1?; see Appendix C) from the subject post-questionnaire was used to measure goal expectancy after the computer addition measure.

Subjective expected utility rating. Two-way cross-products, representing interactions, were computed between the importance and expectancy rating variables (see Hollenbeck and Williams, 1987). This was done separately for ratings provided by subjects on the subject pre-questionnaire and for ratings provided on the subject post-questionnaire. We used these interactions to measure the SEU of goal attainment.

Ability measure. This measure consisted of 48 equations (see Appendix D). These equations were similar to the actual task problems; the numbers for the equations were randomly selected. We used subject performance on the ability measure to obtain an assessment of mathematical skill in order to provide a control measure for numerical ability. Pearson product-moment correlation coefficients were computed between the ability measure and the number of attempted problems on the computer addition measure (r = .87, $p < .05$) and the number of correctly answered problems on the addition measure (r = .87, $p < .05$). This was done to justify the use of ability as a covariate.

Affect measure. This measure consisted of seven ratings (see Appendix E) designed to quantify subjects' level of present affect, specifically, their level of satisfaction with their performance on the computer addition measure. Subjects rated how much they experienced positive or negative emotions as related to the completion of a behavior or action. The score for ratings 1, 2, 4, 5, and 7 were reversed for all analyses. This was performed so that a high score on the ratings indicated a high amount of satisfaction. A principal component analysis was performed to assess the factor structure of the seven ratings in the affect measure. The items produced factor loadings ranging from .73 to .91 and explained 70 percent of the factor variance. The eigen value was 4.88. Based on the principal component analysis results, we combined the seven affect ratings into one estimate of overall satisfaction (satisfaction variable). A coefficient alpha was computed to access the reliability of this seven item scale (α = .79).

Computer addition measure. This measure involved solving simple, computer-generated arithmetic problems presented on a screen. Subjects were asked to add a series of seven single-digit numbers from 2 to 9 (e.g., 7 + 4 + 9 + 2 + 8 + 7 + 9). This task is similar to the performance task used by Matsui et al. (1983) and Strang et al. (1978). The computer randomly chose the numbers used for the addition problems; this reduced any confounding due to problem difficulty. The computer for each trial tabulated the number of problems attempted and the number of problems answered correctly by the subject. The reliabilities for the number of attempted problems (α = .86) and for the number of correctly answered problems (α = .87) were both high. The correlation between the number of problems attempted and the number of problems answered correctly was .88, suggesting the importance of mathematical skill.

Procedure

Pilot test. Twelve subjects performed the procedure as a pilot test (two subjects in each group). This was done to demonstrate that subjects were performing the procedure as expected and the task results displayed group differences.

We tested subjects individually. Each subject entered the experimental room, and the experimenter directed him or her to sit in the appropriate chair in front of the computer. The computer screen was turned off at the time. The subject completed the informed consent form. He or she then performed the mathematical ability measure; each subject had 4 minutes to complete as many problems as possible.

Next, we explained to the subject the procedure and nature of the task. The subject read the instructions (see Appendix A) as the experimenter read them out loud. After this was done, the experimenter turned on the computer screen. The experimenter told the subject: "You will now perform a short practice trial of the task; please answer the following four problems." The first problem was then displayed.

The subject completed four addition problems as described in the subject instructions. The subject typed his or her answers using the horizontal row of numbers on the keyboard. The experimenter asked the subject to stop after he or she completed the fourth problem. The experimenter paused the program and asked if the subject had any questions. The subject was then informed of his or her assigned goal.

Goal manipulation. Subjects in the high reward condition were told: "On the computer screen arithmetic problems will be presented one at a time for eight 3 minute trials. You should try to obtain at least 26 correct responses on every trial. This goal is obtainable by most college students. You could win $50. You will be given ten raffle tickets for every trial you obtain 26 correct responses. If you obtain 26 correct responses on all of the available trials, you will win 80 lottery tickets. If you win this many tickets, you will have a very good chance of winning the $50. Please try to reach this goal to the best of your ability."

Subjects in the low goal reward condition were told: "On the computer screen arithmetic problems will be presented one at a time for eight 3 minute trials. You should try to obtain at least 26 correct responses on every trial. This goal is obtainable by most college students. You could win $50. You will be given one raffle ticket for every trial you obtain 26 correct responses. If you obtain 26 correct responses on all of the available trials, you will win 8 lottery tickets. If you win this many tickets, you will have a limited chance of winning the $50. Please try to reach this goal to the best of your ability."

Matsui et al. (1983), using a similar task, found the mean number of addition problems answered correctly on a 5 minute trial was 27.7. Although these researchers used slightly different instructions, their results demonstrate it is very unlikely that subjects will solve 26 problems during any of the 3 minute trials. In addition, no subjects in the pilot test correctly added 26 groups of numbers in 3 minutes. We chose this almost impossible goal to cause all subjects who received feedback to experience negative performance feedback and negative affect in relation to the assigned goal.

Subjects then completed the subject pre-questionnaire (Appendix B). As this occurred, the experimenter began the computer program. The initial screen of the computer addition measure displayed "GIVE INITIALS OF SUBJECT?" in the upper left hand corner of the screen. The experimenter entered the subject's initials along with a number and letter indicating the group in which we randomly assigned the subject. The experimenter asked the subject if he or she was ready to begin and stated: "When you are ready to begin the experiment, press the ENTER key and the trials will begin. Again, please work as accurately and as quickly as possible."

After the subject pressed the ENTER key, the first addition problem appeared. The subject entered a solution to the problem. This answer was displayed on the same line after the equation. The subject again pressed the ENTER key, and the next addition problem was immediately presented in the same position on the screen. Problems appeared on the screen in this manner for 3 minutes.

After 3 minutes, a 30 second rest period began. During this rest period, equations on the screen disappeared and the rest screen appeared. The rest screen consisted of three lines. On the first line the word "RELAX" appeared. The computer displayed this word for the entire rest phase. The second line of the rest screen was the feedback line. If feedback was provided to the subject for the previous trial, the words "NUMBER CORRECT IS" appeared on this line. The computer displayed the number of equations answered correctly during the previous trial on the same line after this statement. This line also appeared on the screen for the entire rest period. If no feedback was provided to the subject for the previous trial, the feedback line was blank. The third line of the rest screen was the counter line. On this line the number "30" appeared. Every second this number decreased by one, indicating to the subject how many seconds remained before the next trial.

Feedback manipulation. All feedback given to subjects was displayed on the rest screen, as described above. For subjects in the high feedback condition, the computer displayed the number of problems answered correctly during the previous trial after the first and all following trials.

For subjects in the low feedback condition, the computer displayed the number of problems answered correctly after the 3rd and 6th trials. They did not receive feedback for trials 1, 2, 4, 5, 7, and 8. The subjects in the no feedback group did not receive feedback after any trial.

The computer produced three similar sounding tones 3 seconds before the 2nd trial began. This was done to notify the subject that the next trial was about to start.

After the 30 second rest screen, the first problem of the 2nd Trial appeared in the center of the screen (in place of the rest screen). The 2nd Trial was also followed by a 30 second rest period. Trials and rest periods alternated until eight trials were completed. After the 8th Trial was complete, a rest screen again appeared. This was similar to the other rest screens except there was only a 10 second counter (instead of a 30 second counter). Again, feedback was given to subjects who were to receive feedback.

The experimenter informed the subject that they completed the task. The subject then completed the affect measure (see Appendix E) and the subject post-questionnaire (see Appendix C).

The experimenter thanked and debriefed the subject regarding the purpose and rationale of the study. We explained to all subjects that it is almost impossible to answer 26 of the equations correctly in only 3 minutes. It was also explained to subjects that they were still eligible to win $50 in a raffle. The experimenter then obtained the address and phone number of the subject. This was done so we could contact the subject who won the raffle.

RESULTS

Descriptive Statistics

Table 2 presents the means and standard deviations for the effort, importance, and expectancy ratings provided on the subject pre-questionnaire and the subject post-questionnaire. Means and standard deviations were also computed for the mathematical ability measure (M = 18.68, SD = 7.45).

Table 2

Descriptive Statistics for the Subject Rating Scales

	Pre		Post	
Rating	Mean	SD	Mean	SD
Effort	4.46	0.77	4.30	0.84
Importance	2.38	1.12	3.56	1.14
Expectancy	3.51	0.92	3.12	1.02

Note. Pre = rating provided on the subject pre-questionnaire. Post = rating provided on the subject post-questionnaire.

Gender

There were no differences between males and females for the ability measure, $t(100) = 0.84$, n.s., and for the motivation measures: the mean number of attempted problems, $t(100) = 0.59$, n.s., and the mean number of correctly answered problems, $t(100) = 0.44$, n.s. In addition, there were no differences between males and females for the effort, importance, and expectancy ratings provided before and after task performance, all $t(100)$ values $\leq .89$, n.s. The responses of male and female subjects were combined for all data analyses.

Motivation Analysis

We computed a 3 (Feedback) x 2 (Goal Reward) x 8 (Trials) repeated measures Analysis of Covariance (ANCOVA) with trials as the within variable and ability as the covariate using number of attempted problems as the dependent measure (see Table 3). There was a significant main effect for trials, $F(7,672) = 5.07$, $p < .0001$. The adjusted means for the trials condition exhibited a practice effect. The adjusted means are the expected means that would be found with the covariate (i.e., ability) at its mean value (SAS Institute Inc., 1985, p. 483). No other effects were significant. (Note: In all ANCOVAs and Analysis of Variances (ANOVAs), effect size is set to zero if the effect's F value is less than one [Hays, 1988]).

A repeated measures 3 (Feedback) x 2 (Goal Reward) x 8 (Trials) ANCOVA using number of correctly answered problems as the dependent measure was also computed (see Table 4). The only significant effect was for trials, $F(7,672) = 2.09$, $p < .05$, which again displayed a practice effect.

Table 3

Repeated Measures Analysis of Covariance for Number of Attempted Problems for All Subjects

Effect	df	MS	F	ω^2
A (Feedback)	2	9.67	0.19	.00
B (Goal Reward)	1	33.53	0.66	.00
A x B	2	0.81	0.02	.00
C (Trials)	7	12.87	5.07*	.24
A x C	14	1.95	0.77	.00
B x C	7	1.24	0.49	.00
A x B x C	14	2.45	0.97	.00
S (Subjects)(A x B)	95	50.81	-	-
C x S(A x B)	672	2.54	-	-
Ability	-	-	-	-

Note. *N* = 102.

*$p < .05$.

Table 4

Repeated Measures Analysis of Covariance for Number of Correctly Answered Problems for All Subjects

Effect	df	MS	F	ω^2
A (Feedback)	2	7.61	0.15	.00
B (Goal Reward)	1	21.01	0.42	.00
A x B	2	32.43	0.65	.00
C (Trials)	7	8.59	2.09*	.07
A x C	14	2.67	0.65	.00
B x C	7	2.34	0.57	.00
A x B x C	14	5.85	1.43	.06
S (Subjects)(A x B)	95	49.71	-	-
C x S(A x B)	672	4.10	-	-
Ability	-	-	-	-

Note. $N = 102$.

$^*p < .05$.

Subject exclusion. We assigned a goal of answering 26 addition problems correctly during each trial to all subjects. Pre-tests showed this goal was very difficult to reach, but not impossible. We chose this number of problems to provide subjects with a goal that they perceived as attainable. We found a small number of subjects ($n = 5$) correctly added this number of problems. We did not want to examine data obtained from subjects who received performance feedback that indicated they had reached their goal. We wanted to examine only results from subjects that received the same type of feedback (i.e., feedback that indicated the subjects had not reached their goal).

Podsakoff and Farh (1989), using a control theory framework, explained why subjects who receive positive feedback should be treated differently than subjects who receive negative feedback. The researchers stated that when individuals receive negative feedback, they will feel pressure to improve future performance. Individuals who receive positive feedback will feel no such pressure to improve performance. They will be less motivated to try harder, and few changes will be found in subject motivation. For these reasons, subjects that reached the goal during performance were excluded from the remaining data analyses.

We completed a 3 (Feedback) x 2 (Goal Reward) x 8 (Trials) repeated measures ANCOVA with this new data set excluding subjects who reached the assigned goal during any trial ($n = 97$), using number of attempted problems as the dependent measure and the ability measure as the covariate (see Table 5). There was a significant main effect for trials, $F(7,637) = 4.54$, $p < .05$, which displayed a practice effect. No other effects were significant. This same analysis was performed with the number of correctly answered problems as the dependent variable (see Table 6). No significant effects were discovered.

Table 5

Repeated Measures Analysis of Covariance for Number of Attempted Problems after Subject Exclusion

Effect	df	MS	F	ω^2
A (Feedback)	2	1.04	0.02	.00
B (Goal Reward)	1	86.50	1.92	.01
A x B	2	11.738	0.26	.00
C (Trials)	7	11.07	4.54*	.22
A x C	14	1.95	0.80	.00
B x C	7	1.91	0.79	.00
A x B x C	14	2.40	0.98	.00
S (Subjects)(A x B)	90	45.05	-	-
C x S(A x B)	637	2.44	-	-
Ability	-			

Note. This analysis excludes subjects who reached the goal of 26 correctly answered problems.

$n = 97$.

*$p < .05$.

Table 6

Repeated Measures Analysis of Covariance for Number of Correctly Answered Problems after Subject Exclusion

Effect	df	MS	F	ω^2
A (Feedback)	2	5.32	0.13	.00
B (Goal Reward)	1	79.55	1.96	.01
A x B	2	68.85	1.70	.01
C (Trials)	7	6.53	1.64	.05
A x C	14	2.68	0.67	.00
B x C	7	2.25	0.57	.00
A x B x C	14	5.63	1.42	.06
S (Subjects)(A x B)	90	40.59	-	-
C x S(A x B)	637	3.97	-	-
Ability	-			

Note. This analysis excludes subjects who reached the goal of 26 correctly answered problems.

n = 97.

To examine the influence of subject rating variables on motivation, a 3 (Feedback) x 2 (Goal Reward) x 8 (Trials) repeated measures ANCOVA was computed using number of attempted problems as the dependent measure, ability as the first covariate, and the importance rating as the second covariate. Only the trials main effect was significant, $F(7,637) = 4.54$, $p < .05$. This same analysis was separately performed six times but with the following subject rating variables as the second covariate: the expectancy rating before performance, the importance rating after performance, the expectancy rating after performance, the importance x expectancy rating interaction before performance, the importance x expectancy rating interaction after performance, and the satisfaction variable. The only significant effect found in these analyses was the trials main effect, $F(7,637) = 4.54$, $p < .05$. This trials effect did not change when different subject rating variables were used as covariates.

We next computed 3 (Feedback) x 2 (Goal Reward) x 8 (Trials) repeated measures ANCOVAs with number of correctly answered problems as the dependent measure. These ANCOVAs used ability as the first covariate and the same variables listed above as the second covariate: the importance rating before performance, the expectancy rating before performance, the importance rating after performance, the expectancy rating after performance, the importance x expectancy interaction before performance, and the importance x expectancy interaction after performance, and satisfaction. None of the main effects or interactions were significant.

Perceived effort. A 3 (Feedback) x 2 (Goal Reward) ANOVA was computed using the effort rating variable provided after performance as the dependent measure. This was done to measure any differences between groups with regard to perceived motivation. No significant goal reward effect, $F(1,91) = .05$, n.s., feedback effect, $F(2,91) = .94$, n.s., or interaction, $F(2,91) = .17$, n.s., was found.

Ability quartile. As discussed earlier, subjects' mathematical ability significantly influenced subject performance. Mathematical ability might have had additional effects on subject performance that were not held constant when we used ability as a covariate in the ANCOVAs. For example, subjects were told they would perform a mathematical task. Subjects with very low mathematical ability probably knew of this limitation. Because these subjects knew they were to perform an addition task, they might have had lower expectations of reaching the assigned goal of 26 correct problems. This lower expectancy would have reduced the effects of the experimental conditions.

To examine the differences between subjects who displayed different mathematical ability levels, we calculated correlations for subjects above the first quartile of the mathematical ability measure (ability ≥ 13, $n = 76$). These subjects displayed medium and high math ability. We also calculated correlations for subjects below the first quartile of the math ability measure (ability < 13, $n = 21$). These subjects displayed low math ability. By comparing these correlations, we found some interesting differences.

Subjects with medium to high math ability displayed a significant relationship between the importance rating before performance and the number attempted problems on the task ($r = .23$, $p < .05$) and between the importance ratings provided before performance and the number of correctly answered problems on the task ($r = .23$, $p < .05$). For these subjects, the greater the perceived task importance, the higher the motivation measure. Subjects with low math ability did not display such relationships ($r = -.10$, n.s., and $r = -.12$, n.s., respectively).

In addition, subjects with low math ability displayed a significant but counter-intuitive relationship between the expectancy for reaching the assigned goal and the number of attempted problems on the task ($r = -.47$, $p < .05$). For these subjects, the higher the perceived expectancy for reaching the goal, the lower the number of attempted problems on the task. Subjects with medium to high math ability did not display such an atypical relationship ($r = .01$, n.s.). Subjects with low math ability also displayed a confounding relationship between perceived effort and the number of attempted problems on the task. The higher their perceived effort before task performance, the lower their number of attempted problems (r = -.47, p < .05). Subjects with higher math ability did not show a significant relationship between these two variables, (r = .08, n.s.).

For subjects with medium to high math ability, the greater the mathematical ability, the greater the expectancy for reaching the assigned goal (r = .32, p < .05). Subjects with low math ability displayed an opposite relationship; the higher their math ability, the lower their expectancy, (r = -.52, p < .05).

The differences between the above correlations show that almost opposite relationships existed for subjects with low math ability as compared to subjects with medium to high math ability. Due to these differences, we performed motivational analyses without subjects who displayed low math ability. To accomplish this, the following analyses only use data from subjects that were above or equal to the first quartile of the math ability measure (ability $\geq$ 13, n = 76).

A repeated measures ANCOVA [3 (Feedback) x 2 (Goal Reward) x 8 (Trials)] was computed using number of attempted problems as the dependent measure and ability as the covariate (see Table 7). As before, the main effect for trials was significant, $F(7,490)$ = 3.70, p < .05. In addition, the main effect for the goal reward condition was significant, $F(1,69)$ = 4.33, p < .05. The low goal group (M = 15.48) attempted a significantly lower number of problems than the high goal group (M = 16.66). We calculated this same analysis with the number of correctly answered problems as the dependent variable (see Table 8). No significant main effects or interactions were discovered.

We next examined the influence of the subject rating variables on motivation for subjects displaying medium to high mathematical ability. To do this we computed a 3 (Feedback) x 2 (Goal Reward) x 8 (Trials) repeated measures ANCOVA with number of attempted problems as the dependent measure and ability and the importance rating provided before performance of the computer addition measure as covariates (see Table 9). Similar 3 (Feedback) x 2 (Goal Reward) x 8 (Trials) repeated measures ANCOVAs were separately computed with number of problems attempted as the dependent measure, ability as the first covariate, and the following subject variables as the second covariate: the expectancy rating before performance (see Table 10), the importance rating before performance (see Table 11), the expectancy rating after performance, (see Table 12), the importance x expectancy interaction before performance (see Table 13), the importance x expectancy interaction after performance (see Table 14), and the satisfaction variable (see Table 15). The trials main effect was significant for each of these analyses, $F(7,490) = 3.70$, $p < .05$. In addition, all analyses displayed a significant goal reward main effect. For all goal reward effects, the low goal reward group exhibited a lower number of attempted problems than the high reward goal group.

We next examined the influence of the subject rating variables on motivation for subjects with medium to high math ability but with the number of correctly answered problems as the dependent measure of motivation. Similar 3 (Feedback) x 2 (Goal Reward) x 8 (Trials) ANCOVAs with repeated measures were separately computed with the number of correctly answered problems as the dependent measure and ability as the first covariate. These ANCOVAs also included the following subject variables as a second covariate: the importance rating before performance (see Table 16), the expectancy rating before performance, (see Table 17), the importance rating after performance (see Table 18), the expectancy rating after performance (see Table 19), the importance x expectancy interaction before performance (see Table 20), the importance x expectancy interaction after performance (see Table 21), and the satisfaction variable (see Table 22).

A significant goal main effect was discovered for the analysis that used the importance rating provided before performance and ability as covariates, $F(1,68) = 4.94$, $p < .05$. The number of correctly answered problems for the low goal reward group ($M = 13.50$) was less than the high goal reward group ($M = 14.66$). In addition, the Feedback x Goal Reward interaction was significant, $F(2,68) = 3.95$, $p < .05$ (see Table 16). The adjusted means for the number of correctly answered problems on the performance task for this

Table 7

Repeated Measures Analysis of Covariance for Number of Attempted Problems for Subjects Displaying Medium to High Mathematical Ability

Effect	df	MS	F	ω^2
A (Feedback)	2	9.08	0.20	.00
B (Goal Reward)	1	195.88	4.33*	.04
A x B	2	36.53	0.81	.00
C (Trials)	7	9.49	3.70*	.20
A x C	14	2.48	0.97	.00
B x C	7	1.852	0.72	.00
A x B x C	14	2.266	0.88	.00
S (Subjects)(A x B)	69	45.208	-	-
C x S(A x B)	490	2.565	-	-
Ability	-			

Note. This analysis uses only subjects who scored above the first quartile for the ability measure (ability $\geq$ 13). It excludes subjects who reached the goal of 26 correctly answered problems.

n = 76.

*$p < .05$.

Table 8

Repeated Measures Analysis of Covariance for Number of Correctly Answered Problems for Subjects Displaying Medium to High Mathematical Ability

Effect	df	MS	F	ω^2
A (Feedback)	2	9.75	0.23	.00
B (Goal Reward)	1	136.16	3.28	.03
A x B	2	98.27	2.37	.03
C (Trials)	7	4.39	1.03	.01
A x C	14	2.52	0.59	.00
B x C	7	2.88	0.68	.00
A x B x C	14	5.89	1.39	.07
S (Subjects)(A x B)	69	41.52	-	-
C x S(A x B)	490	4.25	-	-
Ability	-			

Note. This analysis uses only subjects who scored above the first quartile for the ability measure (ability $\geq$ 13). It excludes subjects who reached the goal of 26 correctly answered problems.

n = 76.

Table 9

Repeated Measures Analysis of Covariance for Number of Attempted Problems with the Importance Rating Before Performance and Ability as Covariates for Subjects Displaying Medium to High Mathematical Ability

Effect	df	MS	F	ω^2
A (Feedback)	2	23.73	0.57	.00
B (Goal Reward)	1	250.81	6.03*	.05
A x B	2	68.27	1.64	.01
C (Trials)	7	9.49	3.70*	.20
A x C	14	2.48	0.97	.00
B x C	7	1.85	0.72	.00
A x B x C	14	2.27	0.88	.00
S (Subjects)(A x B)	68	41.60	-	-
C x S(A x B)	490	2.56	-	-
Ability	-			
Importance Rating Before Performance	-			

Note. This analysis uses only subjects who scored above the first quartile for the ability measure (ability $\geq$ 13). It excludes subjects who reached the goal of 26 correctly answered problems.

n = 76.

*p < .05.

Table 10

Repeated Measures Analysis of Covariance for Number of Attempted Problems with the Expectancy Rating Before Performance and Ability as Covariates for Subjects Displaying Medium to High Mathematical Ability

Effect	df	MS	F	ω^2
A (Feedback)	2	9.89	0.22	.00
B (Goal Reward)	1	203.05	4.44*	.04
A x B	2	39.58	0.86	.00
C (Trials)	7	9.49	3.70*	.20
A x C	14	2.48	0.97	.00
B x C	7	1.85	0.72	.00
A x B x C	14	2.27	0.88	.00
S (Subjects)(A x B)	68	45.73	-	-
C x S(A x B)	490	2.56	-	-
Ability	-			
Expectancy Rating Before Performance	-			

Note. This analysis uses only subjects who scored above the first quartile for the ability measure (ability $\geq$ 13). It excludes subjects who reached the goal of 26 correctly answered problems.

n = 76.

*p < .05.

Table 11

Repeated Measures Analysis of Covariance for Number of Attempted Problems with the Importance Rating After Performance and Ability as Covariates for Subjects Displaying Medium to High Mathematical Ability

Effect	df	MS	F	ω^2
A (Feedback)	2	3.73	0.57	.00
B (Goal Reward)	1	194.13	4.23*	.03
A x B	2	36.10	0.79	.00
C (Trials)	7	9.49	3.70*	.20
A x C	14	2.48	0.97	.00
B x C	7	1.85	0.72	.00
A x B x C	14	2.27	0.88	.00
S (Subjects)(A x B)	68	45.84	-	-
C x S(A x B)	490	2.56	-	-
Ability	-			
Importance Rating After Performance	-			

Note. This analysis uses only subjects who scored above the first quartile for the ability measure (ability $\geq$ 13). It excludes subjects who reached the goal of 26 correctly answered problems.

n = 76.

*p < .05.

Table 12

Repeated Measures Analysis of Covariance for Number of Attempted Problems with the Expectancy Rating After Performance and Ability as Covariates for Subjects Displaying Medium to High Mathematical Ability

Effect	df	MS	F	ω^2
A (Feedback)	2	8.79	0.19	.00
B (Goal Reward)	1	197.55	4.32*	.04
A x B	2	37.47	0.82	.00
C (Trials)	7	9.49	3.70*	.20
A x C	14	2.48	0.97	.00
B x C	7	1.85	0.72	.00
A x B x C	14	2.27	0.88	.00
S (Subjects)(A x B)	68	45.73	-	-
C x S(A x B)	490	2.56	-	-
Ability	-			
Expectancy Rating After Performance	-			

Note. This analysis uses only subjects who scored above the first quartile for the ability measure (ability $\geq$ 13). It excludes subjects who reached the goal of 26 correctly answered problems.

n = 76.

*p < .05.

Table 13

Repeated Measures Analysis of Covariance for Number of Attempted Problems with the Importance X Expectancy Interaction Before Performance and Ability as Covariates for Subjects Displaying Medium to High Mathematical Ability

Effect	df	MS	F	ω^2
A (Feedback)	2	18.70	0.43	.00
B (Goal Reward)	1	248.25	5.75*	.05
A x B	2	73.65	1.63	.01
C (Trials)	7	9.49	3.70*	.20
A x C	14	2.48	0.97	.00
B x C	7	1.85	0.72	.00
A x B x C	14	2.27	0.88	.00
S (Subjects)(A x B)	68	43.15	-	-
C x S(A x B)	490	2.56	-	-
Ability	-			
Importance X Expectancy Interaction Before Performance	-			

Note. This analysis uses only subjects who scored above the first quartile for the ability measure (ability $\geq$ 13). It excludes subjects who reached the goal of 26 correctly answered problems.

$n = 76$.

*$p < .05$.

Table 14

Repeated Measures Analysis of Covariance for Number of Attempted Problems with the Importance X Expectancy Interaction After Performance and Ability as Covariates for Subjects Displaying Medium to High Mathematical Ability

Effect	df	MS	F	ω^2
A (Feedback)	2	7.20	0.16	.00
B (Goal Reward)	1	190.25	4.17*	.03
A x B	2	36.93	0.81	.00
C (Trials)	7	9.49	3.70*	.21
A x C	14	2.48	0.97	.00
B x C	7	1.85	0.72	.00
A x B x C	14	2.27	0.88	.00
S (Subjects)(A x B)	68	45.58	-	-
C x S(A x B)	490	2.56	-	-
Ability	-			
Effort X Expectancy Interaction After Performance	-			

Note. This analysis uses only subjects who scored above the first quartile for the ability measure (ability $\geq$ 13). It excludes subjects who reached the goal of 26 correctly answered problems.

n = 76.

*p < .05.

Table 15

Repeated Measures Analysis of Covariance for Number of Attempted Problems with the Satisfaction Variable and Ability as Covariates for Subjects Displaying Medium to High Mathematical Ability

Effect	df	MS	F	ω^2
A (Feedback)	2	8.80	0.19	.00
B (Goal Reward)	1	196.23	4.28*	.03
A x B	2	36.60	0.80	.00
C (Trials)	7	9.49	3.70*	.20
A x C	14	2.48	0.97	.00
B x C	7	1.85	0.72	.00
A x B x C	14	2.27	0.88	.00
S (Subjects)(A x B)	68	45.86	-	-
C x S(A x B)	490	2.56	-	-
Ability	-			
Satisfaction	-			

Note. This analysis uses only subjects who scored above the first quartile for the ability measure (ability $\geq$ 13). It excludes subjects who reached the goal of 26 correctly answered problems.

n = 76.

*$p < .05$.

Table 16

Repeated Measures Analysis of Covariance for Number of Correctly Answered Problems with the Importance Rating Before Performance and Ability as Covariates for Subjects Displaying Medium to High Mathematical Ability

Effect	df	MS	F	ω^2
A (Feedback)	2	24.19	0.64	.00
B (Goal Reward)	1	185.03	4.94*	.05
A x B	2	148.16	3.95*	.07
C (Trials)	7	4.39	1.03	.01
A x C	14	2.52	0.59	.00
B x C	7	2.88	0.68	.00
A x B x C	14	5.89	1.39	.07
S (Subjects)(A x B)	68	37.47	-	-
C x S(A x B)	490	4.25	-	-
Ability	-			
Importance Rating Before Performance	-			

Note. This analysis uses only subjects who scored above the first quartile for the ability measure (ability $\geq$ 13). It excludes subjects who reached the goal of 26 correctly answered problems.

n = 76.

*p < .05.

Table 17

Repeated Measures Analysis of Covariance for Number of Correctly Answered Problems with the Expectancy Rating Before Performance and Ability as Covariates for Subjects Displaying Medium to High Mathematical Ability

Effect	df	MS	F	ω^2
A (Feedback)	2	9.40	0.22	.00
B (Goal Reward)	1	144.14	3.44	.03
A x B	2	103.08	2.46	.04
C (Trials)	7	4.39	1.03	.01
A x C	14	2.52	0.59	.00
B x C	7	2.88	0.68	.00
A x B x C	14	5.89	1.39	.07
S (Subjects)(A x B)	68	41.92	-	-
C x S(A x B)	490	4.25	-	-
Ability	-			
Expectancy Rating Before Performance	-			

Note. This analysis uses only subjects who scored above the first quartile for the ability measure (ability $\geq$ 13). It excludes subjects who reached the goal of 26 correctly answered problems.

n = 76.

Table 18

Repeated Measures Analysis of Covariance for Number of Correctly Answered Problems with the Importance Rating After Performance and Ability as Covariates for Subjects Displaying Medium to High Mathematical Ability

Effect	df	MS	F	ω^2
A (Feedback)	2	8.54	0.20	.00
B (Goal Reward)	1	135.35	3.21	.03
A x B	2	97.63	2.32	.03
C (Trials)	7	4.39	1.03	.01
A x C	14	2.52	0.59	.00
B x C	7	2.88	0.68	.00
A x B x C	14	5.89	1.39	.07
S (Subjects)(A x B)	68	42.12	-	-
C x S(A x B)	490	4.25	-	-
Ability	-			
Importance Rating After Performance	-			

Note. This analysis uses only subjects who scored above the first quartile for the ability measure (ability $\geq$ 13). It excludes subjects who reached the goal of 26 correctly answered problems.

n = 76.

Table 19

Repeated Measures Analysis of Covariance for Number of Correctly Answered Problems with the Expectancy Rating After Performance and Ability as Covariates for Subjects Displaying Medium to High Mathematical Ability

Effect	df	MS	F	ω^2
A (Feedback)	2	9.62	0.23	.00
B (Goal Reward)	1	135.29	3.21	.02
A x B	2	97.21	2.31	.03
C (Trials)	7	4.39	1.03	.01
A x C	14	2.52	0.59	.00
B x C	7	2.88	0.68	.00
A x B x C	14	5.89	1.39	.07
S (Subjects)(A x B)	68	42.10	-	-
C x S(A x B)	490	4.25	-	-
Ability	-			
Expectancy Rating After Performance	-			

Note. This analysis uses only subjects who scored above the first quartile for the ability measure (ability $\geq$ 13). It excludes subjects who reached the goal of 26 correctly answered problems.

n = 76.

Table 20

Repeated Measures Analysis of Covariance for Number of Correctly Answered Problems with the Importance X Expectancy Interaction Before Performance and Ability as Covariates for Subjects Displaying Medium to High Mathematical Ability

Effect	df	MS	F	ω^2
A (Feedback)	2	17.51	0.45	.00
B (Goal Reward)	1	182.70	4.66*	.04
A x B	2	156.60	3.87*	.07
C (Trials)	7	4.39	1.03	.01
A x C	14	2.52	0.59	.00
B x C	7	2.88	0.68	.00
A x B x C	14	5.89	1.39	.07
S (Subjects)(A x B)	68	39.18	-	-
C x S(A x B)	490	4.25	-	-
Ability	-			
Importance X Expectancy Interaction Before Performance	-			

Note. This analysis uses only subjects who scored above the first quartile for the ability measure (ability $\geq$ 13). It excludes subjects who reached the goal of 26 correctly answered problems.

n = 76.

*p < .05.

Table 21

Repeated Measures Analysis of Covariance for Number of Correctly Answered Problems with the Importance X Expectancy Interaction After Performance and Ability as Covariates for Subjects Displaying Medium to High Mathematical Ability

Effect	df	MS	F	ω^2
A (Feedback)	2	8.50	0.20	.00
B (Goal Reward)	1	133.93	3.18	.03
A x B	2	98.22	2.33	.03
C (Trials)	7	4.39	1.03	.01
A x C	14	2.52	0.59	.00
B x C	7	2.88	0.68	.00
A x B x C	14	5.89	1.39	.07
S (Subjects)(A x B)	68	42.08	-	-
C x S(A x B)	490	4.25	-	-
Ability	-			
Importance X Expectancy Interaction After Performance	-			

Note. This analysis uses only subjects who scored above the first quartile for the ability measure (ability $\geq$ 13). It excludes subjects who reached the goal of 26 correctly answered problems.

n = 76.

Table 22

Repeated Measures Analysis of Covariance for Number of Correctly Answered Problems with the Satisfaction Variable and Ability as Covariates for Subjects Displaying Medium to High Mathematical Ability

Effect	df	MS	F	ω^2
A (Feedback)	2	9.96	0.24	.00
B (Goal Reward)	1	139.05	3.34	.03
A x B	2	98.00	2.35	.04
C (Trials)	7	4.39	1.03	.01
A x C	14	2.52	0.59	.00
B x C	7	2.88	0.68	.00
A x B x C	14	5.89	1.39	.07
S (Subjects)(A x B)	68	41.65	-	-
C x S(A x B)	490	4.25	-	-
Ability	-			
Satisfaction	-			

Note. This analysis uses only subjects who scored above the first quartile for the ability measure (ability $\geq$ 13). It excludes subjects who reached the goal of 26 correctly answered problems.

n = 76.

effect are represented in Figure 3. The number of correctly answered problems for the high feedback frequency/low goal reward group (M = 12.29) was significantly lower than the high feedback frequency/high goal reward group (M = 15.03) and the low feedback frequency/high goal reward group (M = 14.96).

The 3 (Feedback) x 2 (Goal Reward) x 8 (Trials) ANCOVA that used the importance x expectancy interaction provided before performance and ability as covariates exhibited a significant Feedback x Goal Reward interaction, $F(2,68) = 3.87$, $p < .05$ (see Table 20). The adjusted means for the number of correctly answered problems are shown in Figure 4. The number of correctly answered problems for the high feedback frequency/low goal reward group (M = 12.40) was significantly lower than the high feedback frequency/high goal reward group (M = 15.04) and the low feedback frequency/high goal reward group (M = 15.04). This analysis also displayed a significant goal main effect, $F(2,68) = 4.66$, $p < .05$. Subjects in the low goal reward condition (M = 13.49) answered fewer problems correctly than subjects in the high goal condition (M = 14.65).

Perceived effort. A 3 (Feedback) x 2 (Goal Reward) ANOVA was computed using the effort rating variable provided after performance as the dependent measure. We found no significant goal reward effect, $F(1,70) = .02$, n.s., frequency of feedback effect, $F(2,70) = .04$, n.s., or interaction, $F(2,70) = .91$, n.s.

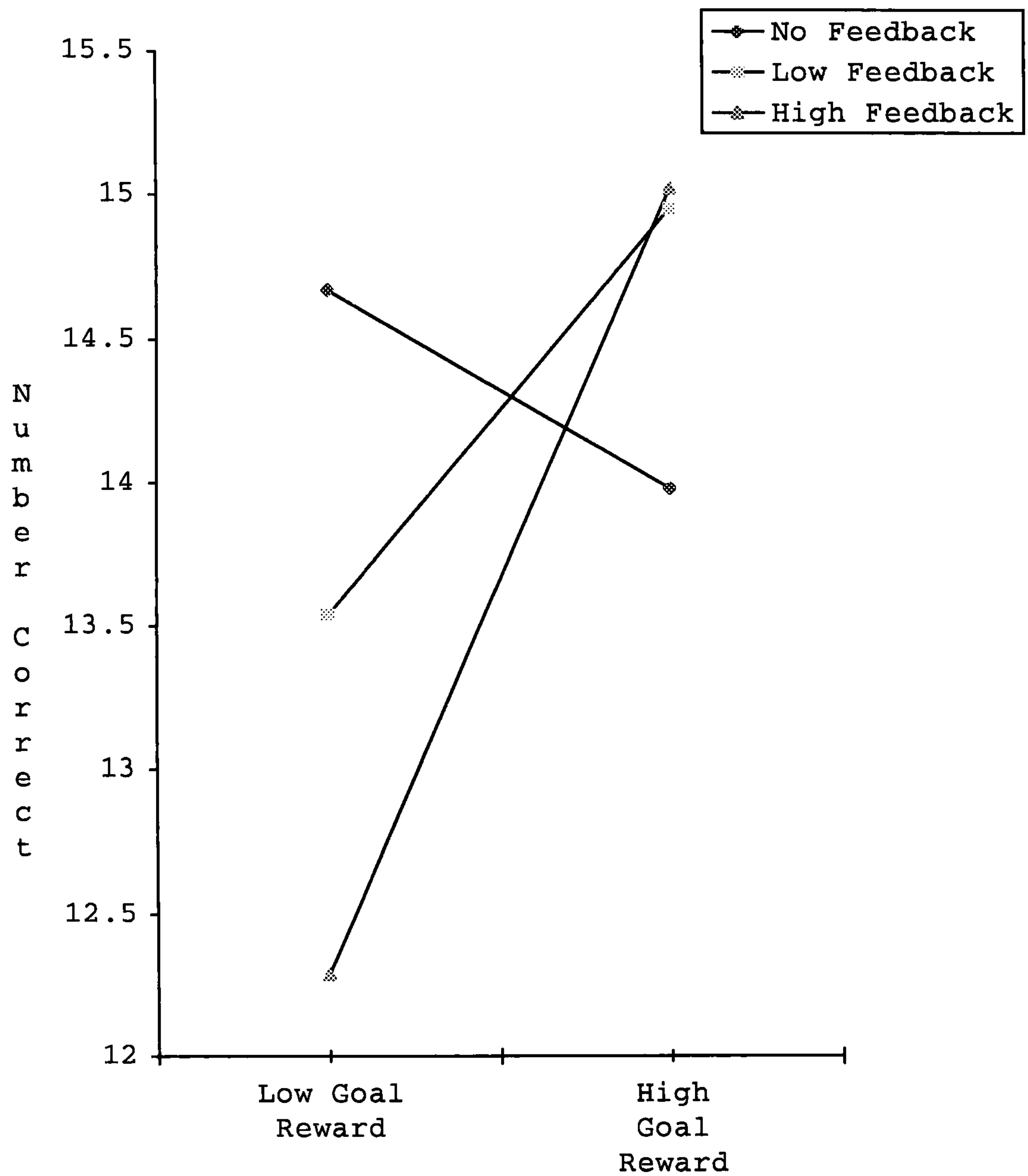
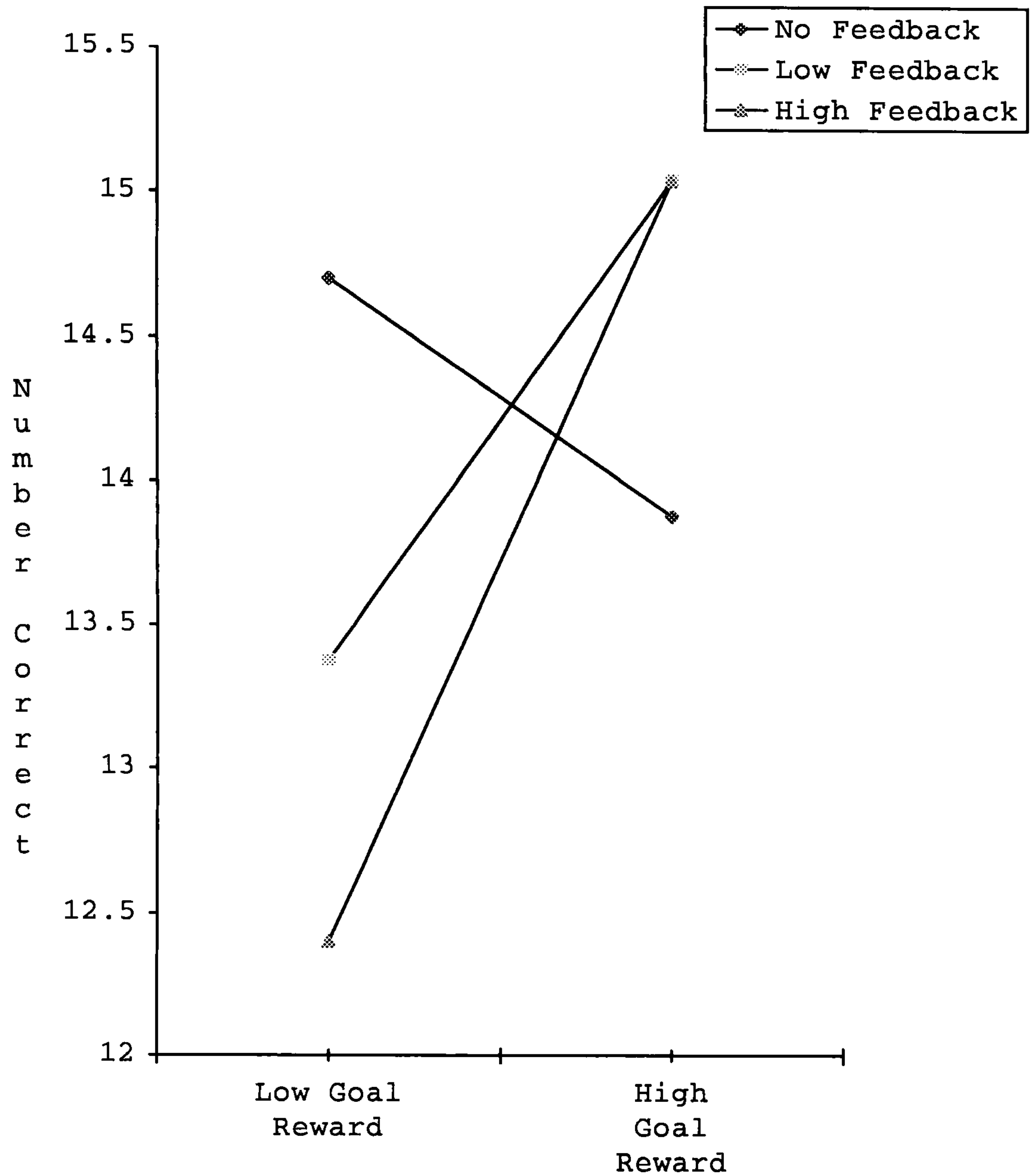


Figure 3. Means for Subjects Displaying Medium to High Mathematical Ability, Adjusted by Ability and the Importance Rating Before Performance, for the Number of Correctly Answered Problems as a Function of Feedback and Levels of Goal Reward.



<u>Figure 4</u>. Means for Subjects Displaying Medium to High Mathematical Ability, Adjusted by Ability and the Importance x Expectancy Interaction Before Performance, for the Number of Correctly Answered Problems as a Function of Feedback and Levels of Goal Reward.

Subjective Expected Utility of Goal Attainment

To test the influence of the experimental conditions on the SEU of goal attainment ratings from the subject pre-questionnaire and the post-questionnaire (pre/post), we computed a 3 (Feedback) x 2 (Goal Reward) x 2 (Pre/Post) repeated measures ANOVA with pre/post as the within variable using the importance x expectancy rating interaction (i.e., the SEU rating) as the dependent variable. We performed this for all subjects who did not reach the goal during any trial (n = 97, see Table 23). Subjects' perceived SEU was significantly greater before the computer addition measure (M = 12.93) than after the addition measure (M = 11.18). This result demonstrates that subjects' perceived expectancy and perceived importance for reaching the goal was higher before they completed the computer task as compared to after the task.

A similar 3 (Feedback) x 2 (Goal Reward) x 2 (Pre/Post) repeated measures ANOVA with pre/post as the within variable using the importance x expectancy rating interaction as the dependent variable was computed for subjects above or equal to the first quartile of the ability measure (n = 76, see Table 24). Again, the perceived SEU was greater before subjects performed the addition measure (M = 12.93) than after they performed the addition measure (M = 11.23). The 3 (Feedback) x 2 (Goal Reward) x 2 (Pre/Post) interaction was significant, but a least-squares means test did not display any significant differences between specific groups.

Table 23

Repeated Measures Analysis of Variance for the Importance x Expectancy Rating Interaction after Subject Exclusion

Effect	df	MS	F	ω^2
A (Feedback)	2	107.81	2.36	.01
B (Goal Reward)	1	63.95	1.40	.01
A x B	2	78.32	1.71	.01
C (Pre/Post)	1	149.08	9.45*	.04
A x C	2	3.49	0.22	.00
B x C	1	1.25	0.08	.00
A x B x C	2	41.16	2.61	.02
S (Subjects)(A x B)	91	45.77	-	-
C x S(A x B)	91	15.77	-	-

Note. This analysis excludes subjects who reached the goal of 26 correctly answered problems.

$n = 97$.

*$p < .05$.

Table 24

Repeated Measures Analysis of Variance for the Importance x Expectancy Rating Interaction for Subjects Displaying Medium to High Mathematical Ability

Effect	df	MS	F	ω^2
A (Feedback)	2	49.63	1.21	.01
B (Goal Reward)	1	61.01	1.48	.01
A x B	2	48.57	1.18	.01
C (Pre/Post)	1	98.69	6.10*	.04
A x C	2	3.76	0.23	.00
B x C	1	10.87	0.67	.00
A x B x C	2	61.93	3.83*	.05
S (Subjects)(A x B)	91	41.12	-	-
C x S(A x B)	91	16.17	-	-

Note. This analysis excludes subjects who reached the goal of 26 correctly answered problems. It uses only subjects who scored above the first quartile for the ability measure (ability $\geq$ 13).

n = 76.

**p* < .05.

Satisfaction

To examine the impact of the experimental conditions on subjects' perceived satisfaction with their performance, we performed a 3 (Feedback) x 2 (Goal Reward) ANOVA with the satisfaction variable as the dependent variable for all subjects who did not reach the goal during any trial (n = 97). There was no significant goal reward main effect, $F(1,91) = .01$, n.s., frequency of feedback effect, $F(2,91) = .35$, n.s., or interaction, $F(2,91) = .60$, n.s. We performed this same analysis for subjects above or equal to the first quartile of the ability measure (n = 76). Again, we found no significant goal reward main effect, $F(1,70) = .01$, n.s., frequency of feedback effect, $F(2,70) = .15$, n.s., or interaction, $F(2,70) = .28$, n.s.

Summary of Results

Subjects who did not reach the goal during any trial (n = 97) displayed a significant trial main effect when we used the number of attempted problems as the dependent measure of motivation. No other main effects or interactions were significant for this measure. In addition, no significant main effects or interactions were found when we used the number of correctly answered problems as the dependent measure.

Correlations between subject measures were different for subjects displaying low mathematical ability as compared to subjects displaying medium to high math ability. Due to these differences, we examined data obtained only from subjects with medium to high math ability (n = 76). When this was done and we used the number of attempted problems as the dependent measure, we found a significant main effect for the goal reward condition. A high goal reward led to a higher number of attempted problems. When we statistically controlled for the importance rating provided by subjects before task performance and used the number of correctly answered problems as the dependent measure of motivation, we found a significant interaction between the frequency of feedback and goal reward conditions. Both the high feedback frequency/high goal reward group and low feedback frequency/high goal reward group answered more problems correctly than the high feedback frequency/low goal reward group. This finding supports our main hypothesis but the experimental conditions were not in the hypothesized order. Similar results were discovered when we controlled the importance x expectancy rating interaction provided before performance and used the number of correctly answered problems as the dependent measure. The reasons for why we found significant differences for subjects with medium to high math ability and why we did not find such differences for the entire subject group will be discussed below. We will also discuss the impact of these results on the usefulness of applying control theory to work motivation research.

DISCUSSION

The purpose of the present study was to investigate the usefulness of applying control theory to the field of motivational research. Specifically, it examined Klein's (1989) control theory of work motivation. The study used this model as a framework to test the influence of frequency of feedback and goal reward on motivation during a simple computer addition task. This was done to investigate several questions: (1) how the situational variables of goal reward and feedback frequency influence the SEU of goal attainment (i.e., the subjects' perceived importance of the task and the perceived expectancy of reaching the goal), (2) how these situational variables influence satisfaction levels, and (3) how these relationships change motivation levels.

We used Klein's (1989) model to develop hypotheses. The main hypothesis was there would be a significant interaction between feedback frequency and goal reward conditions on subject motivation. This result was expected because feedback frequency and goal rewards are situational variables and influence the SEU of goal attainment. The SEU was expected to then change subject motivation. We hypothesized the influence of feedback frequency would occur after a few trials of the task; in other words, we would discover a significant interaction between the feedback frequency conditions, the goal reward groups, and the repeated trials.

Both Klein (1989) and Podsakoff and Farh (1989) explain that subjects who receive positive feedback have different motivation levels than subjects who receive negative feedback. To eliminate any influence of positive feedback on motivation levels in the present investigation, we removed from the data analysis subjects who reached the assigned goal during any of the trials. This sample deletion was done because we wanted to examine only subjects who received negative performance feedback.

The following section is divided into two parts. The first section discusses results obtained from the main subject group (i.e., all subjects who did not reach the assigned goal during any of the trials). The second part discusses results obtained using only subjects with average to high math ability. Each section examines the effects of frequency of feedback, goal reward, and trials on motivation. We also discuss the influence of subjects' perceived task importance and goal expectancy, the multiplicative function between these two variables (i.e., the SEU), and the satisfaction variable on motivation.

Support of Hypotheses

Main subject group. Results from the main subject group provide no support for the hypotheses. The feedback frequency and goal reward conditions displayed no significant effects on motivation levels. We also failed to discover differences between experimental groups when we statistically controlled for the influence of SEU. In addition, no group differences were found when the effects of the satisfaction variable were controlled.

Previous research (e.g., Folger & Doherty, 1993; Locke et al., 1968) shows that rewards increase the attractiveness of goals and, therefore, increase motivation. For this reason, we hypothesized that subjects in the low reward condition would not perceive an important goal and therefore would be less motivated. We found no differences between conditions regarding importance levels. Most subjects perceived medium importance for reaching the goal. This occurred because luck was involved with our goal reward. For example, subjects in the high goal reward condition had the opportunity to win ten times the number of lottery tickets that subjects in the low goal reward group could win. For both groups, though, there was still an element of chance involved with the reward. Even if a subject won 80 tickets for the lottery, there was still no guarantee the subject would win the $50. This reduced the influence of the reward condition on motivation levels.

Kernan and Lord (1990) successfully used $50 lottery tickets to influence subject motivation. In their study, subjects in one condition were told they would receive one lottery ticket if they reached the assigned goal. Subjects in the other condition were not offered a lottery ticket for reaching the goal. In contrast, all subjects in our study were informed they would receive lottery tickets. Subjects in the high goal reward condition were told they would receive eight lottery tickets for reaching the goal. Subjects in the low goal reward condition were told they would receive one ticket if they reached the goal. This goal reward manipulation was different from the conditions used by Kernan and Lord (1990). For this reason, we did not find the same influence of the lottery tickets as a reward on motivation.

Klein (1989) suggests that goals with a short time frame may have a dysfunctional impact on motivation. Previous research that used a mathematical task and discovered a significant impact of goal conditions on motivation used longer trials of the task than the current study. For example, Locke and Bryan (1969) used multiple 8 minute trials of an addition task, and Locke (1967) used multiple 10 minute trials. In the current study, subjects had only 3 minutes to reach the assigned goal during each trial. This time frame might have been too short for the goal reward condition to influence motivation. In addition, according to Ilgen et al. (1979), one can increase goal acceptance by providing subjects an explanation of the goal. We provided no explanation of the goal and task until after subjects completed the experiment. If we provided a rationale of the goal, we may have increased goal acceptance and may have increased the influence of the goal reward on motivation.

Like goal reward, frequency of feedback did not influence motivation in the main subject group. Different researchers have reported conflicting results when they examined the effects of frequency of feedback on behavior and motivation. Data suggest more feedback improves motivation (e.g., Balcazar et al., 1985), does not change motivation (e.g., Chhokar & Wallin, 1984), and decreases motivation (e.g., Haemmerlie, 1985). Research showing more feedback leads to higher motivation usually uses a long-term and complicated task (e.g., patient-care behavior, Alavosius & Sulzer-Azaroff, 1990; energy conservation practices, Seligman & Darley, 1977). In fact, while one study, Haemmerlie (1985), found a significant influence of feedback frequency on motivation for a short-term task, the task required subjects to learn complex instructions for administering intelligence tests. Our task was short-term and simple. For this reason, frequency of feedback may have had little influence on motivation.

The group that experienced no feedback displayed the same amount of motivation as groups that received medium levels of feedback and high levels of feedback. It is possible that subjects were influenced by feedback they provided to themselves. Klein (1989) states that "in the absence of externally provided feedback, it is likely that individuals with goals will engage in feedback seeking behavior in order to monitor the progress of goals" (p. 156). Tubbs, Boehne, and Dahl (1993) explain that there is usually some form of indirect feedback provided to subjects. Klein (1989) and Taylor et al. (1989) suggest that conscious processing of feedback is likely to occur when individuals are cued to attend to feedback and when the situation is unfamiliar. In the present study, we informed all subjects they were to receive feedback after some of the trials. This procedure, along with the unfamiliarity of the task, may have increased subject awareness of feedback, increased attention to any indirect feedback, and caused subjects in the no feedback and low frequency of feedback conditions to receive more feedback than what was provided by the experiment. For these reasons, the different feedback frequency conditions may not have caused significant differences between groups regarding motivation levels.

We did not find support for the hypothesized interaction between the trials, goal reward, and frequency of feedback conditions. The only significant result we discovered for the repeated trials was the trials main effect. This result was not surprising; subjects improved their performance as they received more practice with the mathematical task. We hypothesized that motivation changes would take place over trials because we expected subjects in different feedback frequency conditions to receive different amounts of feedback during the eight trials. Due to the possible processing of indirect feedback mentioned above, subjects may not have received the desired different amounts of feedback. The hypothesized interaction of trials with the frequency of feedback and goal reward conditions may not have occurred for this reason.

We also expected experimental groups that received different amounts of negative performance feedback to display different satisfaction levels; these variations in satisfaction were expected to lead to group differences regarding motivation. Because subjects did not perceive unequal amounts of negative feedback, as described above, they likely did not experience different amounts of satisfaction with their performance. The failure to experience differential satisfaction resulted in the absence of significant differences between experimental groups regarding motivation levels.

Klein (1989) and Carver and Scheier (1990) link emotions to attributions. They suggest that if subjects attribute task success or failure to internal causes, the emotional element involved with the goal-feedback-performance relationship increases. This emotional element becomes less important if subjects link the cause of performance to external factors. Saavedra and Earley (1991) state that subjects usually attribute task performance to external forces if they are provided with negative performance feedback and experience certain experimental conditions such as an unfamiliar situation or a laboratory setting. We did not examine subject attribution, but the same factors mentioned by Saavedra and Earley were present in the current study. These conditions may have caused subjects to attribute their failure to reach the goal to external stimuli and may have reduced the influence of goal attainment due to emotional factors. This process may have reduced the influence of subjects' affect (i.e., satisfaction) on motivation levels.

Groups given more feedback should have displayed a lower expectancy for reaching the assigned goal. They were told more often that they did not reach the goal. This decrease in the expectancy for reaching the goal should have then lowered motivation levels. As mentioned above, subjects in different feedback frequency conditions received relatively equal amounts of feedback because subjects may have processed indirect feedback. For this reason, subjects in different feedback frequency groups may not have had significantly different expectancies for reaching the goal and did not display significantly different motivation levels.

Hollenbeck (1989) explains that self-focus is an important moderator of expectancies, behavior, discrepancies, and motivation. Podsakoff and Farh (1989) suggest that self-efficacy is a moderator of the feedback-performance relationship. We did not examine either of these factors in the present study. If we measured and then statistically controlled these factors, we may have found some differences between groups regarding motivation levels. For example, motivation levels for individuals with high self-focus are more influenced by negative discrepancies than motivation levels for individuals with low self-focus (Hollenbeck, 1989). In this way, subjects' self-focus may have changed the amount that negative discrepancies affected motivation levels in the present study. By statistically controlling for self-focus, we could have eliminated any influence of this variable on our motivation measures and better examined the impact of the experimental conditions.

Ability quartile. Subjects' mathematical ability, as measured by the ability measure, had a large influence on the number of problems attempted and the number of problems correctly answered on the task. In addition, we found different relationships between the subject variables for subjects with low mathematical ability as compared to subjects with average to high math ability. Podsakoff and Farh (1989) found that subjects' ability influenced perceived self-efficacy. Locke and Latham (1990) state that perceived self-efficacy affects motivation and commitment to goals, especially when individuals need to overcome obstacles to meet their goals. These processes may explain why we found different relationships for subjects below the first quartile of the ability measure as compared to subjects above the first quartile of this measure. Subjects below the first quartile had low mathematical ability and thus, lower self-efficacy. When these subjects did not meet their goal, their commitment quickly dropped, and they gave up on meeting the goal. Subjects above the first quartile of the math ability measure had a higher self-efficacy and did not give up on meeting the goal when they received feedback stating that they did not reach the goal. Due to these differences, we re-analyzed the data without subjects who displayed low math ability.

After we removed subjects who displayed low mathematical ability from the data analysis, we discovered a significant effect of goal reward on subject motivation, specifically, the number of attempted problems on the task. Subjects in the high goal reward condition attempted to solve more problems than subjects in the low goal reward. We did not find a significant difference between the goal reward conditions when we used the number of correctly answered problems as the dependent variable. These findings show that the number of problems subjects attempted to answer on the task was probably a better measure of motivation than the number of problems subjects answered correctly on the task.

Podsakoff and Farh (1989) reported that after subjects perceived negative performance feedback, subjects who displayed high ability on an adjective listing task improved their performance more than subjects with low ability. Because of this process, subjects with low math ability in the current study might not have been able to improve their performance a large amount, regardless of their motivation. When we removed these subjects from the analysis, the data set contained subjects that could increase their performance a significant amount after they were motivated by the high goal reward condition. For this reason, we found the above significant differences.

Perceived goal importance is a significant moderator of the goal-feedback-motivation relationship (Klein, 1989; Locke, 1968). In the current study, goal importance did not influence motivation for subjects with low mathematical ability. Subjects with average to high math ability showed a significant relationship between the perceived importance of reaching the goal and the task motivation measures: the higher the task importance, the higher the motivation. We discovered significant differences between the goal reward conditions for these subjects because the required goal importance-motivation relationship was present.

Klein (1989) states that subjects usually accept difficult goals less often than easy goals. Subjects must accept a goal for goal rewards to influence motivation. In the present study, the assigned goal was more difficult for subjects with low math ability. Due to this fact, they were less likely to accept the goal. The subjects with average to high math ability did not perceive an extremely difficult goal and therefore, accepted it. For this reason, the significant goal reward-motivation relationship took place.

These reasons explain why we discovered significant differences between goal reward groups after we eliminated subjects with low math ability from the data analysis. These subjects had low goal acceptance, were not able to improve their performance, and did not display the required relationship between goal importance and motivation. For these reasons, the goal reward condition had little impact on subjects with low math ability. When we removed the subjects with low math ability from the analyses, we found significant differences between goal reward groups.

For subjects with average to high mathematical ability, we also found a significant interaction between the feedback frequency and goal reward conditions. This result was discovered when the goal importance rating provided by subjects before task performance along with the math ability measure were controlled and the number of correctly answered problems on the task was used as the motivation measure. A similar significant interaction was discovered when the math ability measure and the SEU of goal attainment rating provided before performance (i.e., the Goal Importance x Expectancy for Reaching the Goal interaction) were controlled. These findings show some support for our main hypothesis, but the feedback frequency and goal reward conditions were not in the hypothesized direction. We hypothesized that the high feedback frequency/low goal reward group would show higher motivation than the low feedback frequency/low goal reward group. The following results were found; the high feedback frequency/low goal reward group displayed significantly lower motivation than the high feedback frequency/high goal reward group along with the low feedback frequency/high goal reward group.

The above significant interactions between the feedback frequency and goal reward conditions were found when we used the number of correctly answered problems on the task as the dependent measure. We did not discover a significant interaction when we used the number of attempted problems on the computer addition measure as the dependent measure. The interaction between feedback frequency and goal reward was only found for the number of correctly answered problems because subjects received feedback concerning the number of math problems they answered correctly during each trial. They did not receive feedback concerning the number of problems they attempted during each trial.

The interaction between feedback frequency and goal reward was found when the perceived goal importance rating provided before performance was controlled, along with the math ability measure. As described earlier, there was a significant relationship between goal importance and the motivation measures for subjects with average to high mathematical ability. This relationship did not occur for subjects with low math ability. For this reason, when we examined only subjects with average to high math ability and statistically controlled for perceived goal importance, we discovered the significant interaction for feedback frequency and goal reward.

We also found a significant interaction for feedback frequency and goal reward when the goal importance and expectancy for reaching the goal interaction rating (i.e., the SEU) and the math ability measure were controlled. Klein (1989) states that ability, values, performance constraints, and rewards influence the SEU of goal attainment. In the present investigation, subjects with low math ability displayed a negative relationship between math ability and their expectancy for reaching the goal: the higher their ability, the lower their expectancy. This finding suggests that these subjects perceived a low self-efficacy for reaching the goal (see Locke & Latham, 1990; Podsakoff & Farh, 1989). Subjects with average to high math ability displayed a more expected relationship between these constructs: the higher their ability, the higher their expectancy levels. The atypical relationship between ability and expectancy levels for subjects with low math ability was a confound. Once we removed these subjects from the data analysis, we also removed the confounding relationship between ability and expectancy for reaching the goal. Once we removed this confound, we discovered the expected interaction between goal reward, feedback frequency, and motivation.

The significant interaction between feedback frequency and goal reward for the number of correctly answered problems is the only finding that shows the influence of feedback on motivation. The interaction was only discovered after the goal importance rating was held constant. This shows that the subjects' perceived importance for reaching the goal had more influence on motivation than feedback frequency. In addition, this relationship shows that subjects may have thought the task was trivial. If subjects perceived the goal reward and task performance as more important, their motivation levels may have been more influenced by the frequency of negative performance feedback.

Contrary to expectations, subjects with high feedback frequency and low goal reward displayed motivation lower than any other group. The performance of these subjects was significantly lower than the high feedback frequency/high goal reward group and the low feedback frequency/high goal reward group. Subjects in the high feedback frequency/low goal reward group may not have felt the need to try because they were offered a low reward for reaching the assigned goal. In addition, they received feedback after every trial stating that they did not reach the goal.

We expected subjects in the high feedback frequency/high goal reward group to experience low satisfaction levels because these subjects had a high goal reward but were told more often that they did not reach the goal. Subjects in the high feedback frequency/low goal reward group were not assigned a high goal reward and, for this reason, were not expected to have low satisfaction levels. The low satisfaction levels for the high feedback frequency/high goal reward group were expected to cause lower motivation for these subjects as compared to subjects in the high feedback frequency/low goal reward group. As explained earlier, the negative feedback provided to subjects did not produce the expected low satisfaction levels. In fact, groups did not display any differences regarding satisfaction levels. For this reason, we did not discover the hypothesized order of experimental groups regarding their motivation levels.

Another tentative reason for why we did not find strong support for our hypotheses with subjects above or equal to the first quartile of the ability measure is that the power of these analyses was slightly lower than required. Cohen (1977) states that most research should use sample sizes that offer a power of at least .80. A power estimation analysis using results from subjects above or equal to the first quartile of the ability measure ($\underline{n}$ = 76) displayed a power of, at most, .70. This power was lower than recommended but still supplied enough power for these analyses to discover some group differences. If we had used a larger sample size (i.e., at least 14 subjects in each group), we may have discovered stronger support for our hypotheses.

Theoretical Implications

Goal theory suggests that higher goal rewards lead to higher motivation. We found this relationship only for subjects with moderate to high mathematical ability. Klein's model (1989) offers useful cognitive processes that explain this finding. The model suggests that perceived goal importance moderates the relationship between goal rewards and motivation. Rewards influence goal importance, and goal importance influences motivation. As explained earlier, goal importance levels influenced motivation in the present study for subjects with average to high mathematical ability and not for subjects with low math ability. For this reason, the goal reward condition did not influence motivation for subjects with low math ability.

Modern control theory incorporates two basic elements: a cognitive element for processing information and comparing information with goals, and an affective element resulting from perceived goal-performance discrepancies. We found support for the influence of cognitive elements (e.g., the importance for reaching the assigned goal) on motivation. We did not find strong support for the influence of affective elements. This lack of support shows the need for control theorists to define better the impact of affect on motivation and what situational elements are needed for such affect-motivation relationships to take place. It also shows limitations with the current study. We found no influence of the experimental conditions on perceived satisfaction. If we had measured other forms of affect (e.g., general mood) we might have discovered a relationship between the experimental conditions, affective elements, and motivation. The lack of difference regarding satisfaction levels between groups may also show that we needed to measure affect more systematically and more accurately.

The SEU of goal attainment is constructed of two elements: goal importance and the expectancy for reaching the goal. Klein (1989) states that this SEU of goal attainment is one of the most important aspects of control theory and motivation. The current study attempted to examine how the SEU of goal attainment is influenced by the situational variables of goal reward and feedback frequency and how these changes affect motivation levels. We found that goal rewards and feedback frequency influenced motivation levels for subjects with average to high math ability. In addition, we found a significant link between the perceived importance of the goal and motivation.

The present study failed to show a strong relationship between the perceived expectancy for reaching a goal and motivation. It also failed to show a strong influence of goal reward and feedback frequency on the SEU of goal attainment. Maybe the SEU does not have as well defined motivational effects as believed by Klein. In fact, Frisch and Clemen (1994, pp. 46-47) explain that "a great deal of evidence has been compiled demonstrating that people's choices fail to conform to the normative model as a result of cognitive limitations." The authors suggest that individuals have only limited information when producing their beliefs, judgments of uncertainty, and decision choice, and this limited information does not allow the SEU model to work as believed. More work must be done to examine and quantify the influence of the SEU of goal attainment on motivation levels.

As described earlier, because an element of luck was involved with the goal reward, the strength of the reward manipulation may have been diluted. Future research should not allow luck to influence if subjects receive a goal reward. In other words, during future study, if subjects reach an assigned goal, they should receive a reward. This procedure will increase the perceived value of reaching the goal and increase the influence of the goal reward conditions on motivation.

One reason we did not discover strong support for our hypotheses is that subjects may have received indirect feedback concerning their performance. For example, subjects may have counted the number of problems that appeared on the computer screen or the number of answers they typed on the keyboard during each trial. This process may have increased the amount of feedback the no feedback and low feedback groups received and reduced the influence of the frequency of feedback conditions on motivation. During future research, we could ask subjects to estimate the number of problems they answered to determine if this process took place. In addition, if the procedure was designed so that subjects could not provide feedback to themselves or process indirect feedback, we could better quantify the influence of frequency of feedback on motivation levels. There are several methods one might employ to accomplish this. For example, a future study could use very long trials. This procedure would make it more difficult for subjects to keep track of the number of addition problems they answered. Moreover, one could include distractions during the procedure (e.g., other tasks). These would demand more of the subjects' attention and make it difficult for subjects to attend to indirect feedback concerning their performance.

Another limitation of the current investigation was the large impact of mathematical ability on subjects' task performance. This skill may have had such a great influence on subject performance, that it limited our ability to examine the impact of the experimental conditions on motivation. For example, as discussed earlier, the number of attempted problems was probably a more accurate measure of motivation than the number of correctly answered problems. The computer task forced each subject to answer a specific mathematical problem before he or she continued the task. If a difficult problem was presented, the subject had to spend a large amount of time answering it. This process limited the number of problems attempted by each subject, especially for subjects with low math ability. If the math problems were listed on a single sheet of paper, subjects could skip the very difficult problems and quickly answer the others. Because problem difficulty would have less influence on the number of attempted problems, subjects' math ability would have less impact on this measure, as compared to the current study. By making these changes to the investigation, we would obtain a more accurate measure of subject motivation.

Klein (1991) states that theories should serve three purposes: provide accurate predictions regarding phenomenon, explain the processes involved with these phenomenon, and generate new hypotheses for research. Klein's (1989, see Figure 2) model generates new and unique hypotheses for investigating human work motivation, as displayed by the current study. In fact, Klein suggests that one of the main purposes of his model is to generate new areas of research. Klein's model of control theory does display limitations concerning the other two purposes of a theory. For example, we failed to accurately predict the order of our experimental conditions regarding their task motivation levels. One reason for this inaccurate prediction is the complexity of Klein's model. Many stages and processes are involved with the model. We only used a few of these stages to develop our hypotheses, which may explain our inaccurate predictions. Due to the complexity of Klein's model, it may be difficult for any researcher to link all of the involved stages and then correctly predict motivation levels.

Klein's (1989) model also displays limitations with regard to its unique explanations of human work motivation. For example, we found that the high feedback frequency/low goal reward group displayed significantly lower motivation than the high feedback frequency/high goal reward group along with the low feedback frequency/high goal reward group. Goal theory (see Locke & Latham, 1990) could predict and explain this finding, suggesting that researchers have a limited need for Klein's model when investigating and explaining motivation processes. Klein incorporates a number of studies and theoretical explanations into his model. Some of these theories have been well validated by past research (e.g., goal setting). Little research has been done to validate Klein's unique explanations of human motivation and the combination of the multiple theories into one cohesive whole. Due to the complexity of his model, as discussed above, this cross-validation may be difficult to accomplish.

One component of Klein's (1989) model that is not well supported by the current study is the integration of control theory with the subjective expected utility of goal attainment. Very little association was discovered between the influence of our situational variables (i.e., the goal reward and frequency of feedback conditions) and the SEU measures. Kernan and Lord (1990) also examined the SEU process and the influence of goal discrepancies on motivation. They concluded that a simple model, which emphasizes discrepancies, would be better in explaining and predicting motivation than a model which combines discrepancies with the SEU process. The influence on motivation by the SEU of goal attainment may not be as strong as believed by Klein (1989). This is most likely due to subjects' limited information processing capabilities (see Frisch & Clemen, 1994).

Even though Klein's (1989) model does display flaws, especially concerning the complexity of the model and the integration of the control process with the SEU of goal attainment, the current study shows that his model should be used for future research. The model incorporates a large number of processes and relationships needed to explain human work motivation fully. In addition, the current study shows that Klein's model is useful for explaining some motivational processes and does provide some unique explanations of human work motivation. Overall, the study does not conclusively confirm the usefulness of Klein's model for examining motivation but does support the use of his model for further investigating the role of control systems in human work motivation.

REFERENCES

Alavosius, M. P., & Sulzer-Azaroff, B. (1990). Acquisition and maintenance of health-care routines as a function of feedback density. Journal of Applied Behavior Analysis, 23, 151-162.

Balcazar, F., Hopkins, B. L., & Suarez, Y. (1985). A critical, objective review of performance feedback. Journal of Organizational Behavior Management, 7(3/4), 65-89.

Bandura, A., & Cervone, D. (1983). Self-evaluation and self-efficacy mechanisms governing the motivational effects of goal systems. Journal of Personality and Social Psychology, 45(5), 1017-1028.

Baron, R. A. (1991). Motivation in work settings: Reflections on the core of organizational research. Motivation and Emotion, 15(1), 1-8.

Becker, L. J. (1978). Joint effects of feedback and goal setting on performance: A field study of residential energy conservation. Journal of Applied Psychology, 63(4), 428-433.

Bobko, P., & Colella, A. (1994). Employee reactions to performance standards: A review and research propositions. Personnel Psychology, 47, 1-29.

Campion, M. A., & Lord, R. G. (1982). A control systems conceptualization of the goal-setting and changing process. Organizational Behavior and Human Performance, 30, 265-287.

Carver, C. S., & Scheier, M. F. (1981). Attention and self-regulation: A control theory approach to human behavior. New York: Springer-Verlag.

Carver, C. S., & Scheier, M. F. (1982). Control Theory: A useful conceptual framework for personality, social, clinical, and health psychology. Psychological Bulletin, 92(1), 111-135.

Carver, C. S., & Scheier, M. F. (1990). Origins and functions of positive and negative affect: A control-process view. Psychological Review, 97(1), 19-35.

Chhokar, J. S., & Wallin, J. A. (1984). A field study of the effect of feedback frequency on performance. Journal of Applied Psychology, 69(1), 524-530.

Cohen, J. (1977). Statistical power analysis for the behavioral sciences. Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.

Daft, D. L., & Steers, R. M. (1986). Organizations: A macro/micro approach. Glenview, IL: Scott, Foresman & Company.

Erez, M. (1977). Feedback: A necessary condition for the goal setting-performance relationship. Journal of Applied Psychology, 67(5), 624-627.

Erez, M., Gopher, D., & Arzi, N. (1990). Effects of goal difficulty, self-set goals, and monetary rewards on dual task performance. Organizational Behavior and Human Decision Processes, 47, 247-269.

Folger, R., & Doherty, E. M. (1993). Perspectives on value creation: Variations on the energization model. Basic and Applied Social Psychology, 14(4), 421-436.

Ford, C. E., Wright, R. A., & Haythornthwaite, J. (1985). Task performance and magnitude of goal valence. Journal of Research in Personality, 19, 253-260.

Frisch, D., & Clemen, R. T. (1994). Beyond expected utility: Rethinking behavioral decision research. Psychological Bulletin, 116(1), 46-54.

Gatchel, R. J. (1974). Frequency of feedback and learned heart rate control. Journal of Experimental Psychology, 101(2), 274-283.

Haemmerlie, F. M. (1985). Role of immediate feedback in a personalized system of instruction: Evidence of a negative impact. Psychological Reports, 56, 947-954.

Hays, W. L. (1988). Statistics (4th ed.). New York: Holt, Rinehart and Winston, Inc.

Hollenbeck, J. R. (1989). Control theory and the perception of work environments: The effects of focus of attention on affective and behavioral reactions to work. Organizational Behavior and Human Decision Processes, 43, 406-430.

Hollenbeck, J. R., & Brief, A. P. (1987). The effects of individual differences and goal origin on goal setting and performance. Organizational Behavior and Human Decision Processes, 40, 392-414.

Hollenbeck, J. R., & Klein, H. J. (1987). Goal commitment and the goal-setting process: Problems, prospects, and proposals for future research. Journal of Applied Psychology, 72(2), 212-220.

Hollenbeck, J. R., & Williams, C. R. (1987). Goal importance, self-focus, and the goal-setting process. Journal of Applied Psychology, 72(2), 204-211.

Hyland, M. E. (1988). Motivational control theory: An integrative framework. Journal of Personality and Social Psychology, 55(4), 642-651.

Ilgen, D. R., Fisher, C. D., & Taylor, M. S. (1979). Consequences of individual feedback on behavior in organizations. Journal of Applied Psychology, 64(4), 349-371.

Kernan, M. C., & Lord, R. G. (1990). Effects of valence, expectancies, and goal-performance discrepancies in single and multiple goal environments. Journal of Applied Psychology, 75(2), 194-203.

Kim, J. S., & Hamner, W. C. (1976). Effect of performance feedback and goal setting on productivity and satisfaction in an organizational setting. Journal of Applied Psychology, 61(1), 48-57.

Klein, H. L. (1989). An integrated control theory model of work motivation. Academy of Management Review, 14(2), 150-172.

Klein, H. L. (1991a). Control theory and understanding motivated behavior: A different conclusion. Motivation and Emotion, 15(1), 29-44.

Klein, H. L. (1991b). Further evidence on the relationship between goal-setting and expectancy theories. Organizational Behavior and Human Decision Processes, 49, 230-257.

Klein, H. L., Whitener, E. M., & Ilgen, D. R. (1990). The role of goal specificity in the goal-setting process. Motivation and Emotion, 14(3), 179-193.

Locke, E. A. (1967). Motivational effects of knowledge of score: Knowledge or goal setting? Journal of Applied Psychology, 51(4), 324-329.

Locke, E. A. (1968). Toward a theory of task motivation and incentives. Organizational Behavior and Human Performance, 3, 157-189.

Locke, E. A. (1991). Goal theory vs. control theory: Contrasting approaches to understanding work motivation. Motivation and Emotion, 15(1), 9-28.

Locke, E. A., & Bryan, J. F. (1968). Goal-setting as a determinant of the effect of knowledge of score on performance. American Journal of Psychology, 81(3), 398-406.

Locke, E. A., & Bryan, J. F. (1969). Knowledge of score and goal level as determinants of work rate. Journal of Applied Psychology, 53(1), 59-65.

Locke, E. A., Bryan, J. F., & Kendall, L. M. (1968). Goals and intentions as mediators of the effects of monetary incentives on behavior. Journal of Applied Psychology, 52(2), 104-121.

Locke, E. A., & Latham, G. P. (1990). A theory of goal setting & task performance. Englewood Cliffs, NJ: Prentice Hall.

Lord, R. G., & Hanges, P. J. (1987). A control system model of organizational motivation: Theoretical development and applied implications. Behavioral Science, 32(3), 161-178.

Matsui, T., Okada, A., & Inoshita, O. (1983). Mechanisms of feedback affecting task performance. Organizational Behavior and Human Performance, 31, 114-122.

Pinder, C. (1984). Work motivation. Glenview, IL: Scott, Foresman & Company.

Podsakoff, P. M., & Farh, J. (1989). Effects of feedback sign and credibility on goal setting and task performance. Organizational Behavior and Human Decision Processes, 44, 45-67.

Powers, W. T. (1973). Behavior: The control of perception. Chicago: Aldine.

Saavedra, R., & Earley, P. C. (1991). Choice of task and goal under conditions of general and specific affective inducement. Motivation and Emotion, 15(1), 45-65.

Sandelands, L., Glynn, M. A., & Larson, J. R., Jr. (1991). Control theory and social behavior in the workplace. Human Relations, 44(10), 1107-1129.

SAS Institute Inc. (1985). SAS user's guide: Statistics (Version 5 ed.). Cary, NC: Author.

Seligman, C., & Darley, J. M. (1977). Feedback as a means of decreasing residential energy consumption. Journal of Applied Psychology, 62(4), 363-368.

Strang, H. R., Lawrence, E. C., & Fowler, P. C. (1978). Effects of assigned goal level and knowledge of results on arithmetic computation: A laboratory study. Journal of Applied Psychology, 63(4), 446-450.

Taylor, M. S., Fisher, C. P., & Ilgen, D. R. (1984). Individual's reactions to performance feedback in organizations: A control theory perspective. In K. M. Rowland & G. R. Ferris (Eds.), Research in Personnel and Human Resource Management (Vol. 2, pp. 81-124). Greenwich, CT: JAI Press Inc.

Tubbs, M. E., Boehne, D. M., & Dahl, J. G. (1993). Expectancy, valence, and motivational force functions in goal-setting research: An empirical test. Journal of Applied Psychology, 78(3), 361-373.

Weiner, N. (1948). Cybernetics: Control and communication in the animal and machine. Cambridge, MA: MIT Press.

Williams, K. J., Williams, G. M., & Ryer, J. A. (1990). The relation between performance feedback and job attitudes among school psychologists. School Psychology Review, 19(4), 550-563.

APPENDIX A

SUBJECT INSTRUCTIONS

In a moment a series of arithmetic problems will appear on the computer screen in front of you. Each of these problems will consist of seven numbers from 2 to 9. Try to add these numbers as quickly and as accurately as possible. Use the horizontal row of numbers on the keyboard to type in your answer. After you have added these numbers and typed your answer, press ENTER. As soon as you press ENTER another series of seven numbers will appear. You should try to add these numbers and give your answer in the same manner. This procedure will go on for 3 minutes. After 3 minutes you will have a 30 second break in which you can relax. After the 30 seconds are up another set of arithmetic problems will appear for 3 minutes. Again you are to answer these as quickly and as accurately as possible. You will have a total of eight 3 minute trials of problems with a 30 second rest between each trial.

After some of the trials, during the 30 second rest, the screen will display the number of problems you answered correctly during the last trial. Use this information to help you pace yourself.

You will be asked to correctly answer a certain number of problems during each trial. If you answer this number of problems (or more) you will win a certain number of raffle tickets. For every trial you answer this certain number of problems you will win this number of tickets. Some people may win 1 ticket per trial; some may win 10 tickets per trial. At the conclusion of this study all raffle tickets will be placed together and one ticket will be chosen; the subject who has that ticket will win $50. The more tickets you have won, the greater your chance of winning the $50.

Before this procedure takes place you will have a practice trial of four problems. I will answer any questions before and after this practice trial. Good Luck!!!!

APPENDIX B

SUBJECT PRE-QUESTIONNAIRE

1. How many problems will you attempt to answer correctly during each trial?

On the following questions please circle the number that is next to the statement you most agree with. If you can not decide between two statements, circle the number between them.

2. How hard will you try to correctly answer the number of problems you have specified in question 1?

1 I will not try hard at all
2
3 I will try fairly hard
4
5 I will try very hard

3. How important is it for you to correctly answer the number of problems you have specified in question 1?

1 It is very important to me
2
3 It is fairly important to me
4
5 It is not important to me at all

4. What do you think is the chance that you will correctly answer the number of problems you have specified in question 1?

1 There is a very low chance (about 0%)
2
3 There is a fair chance (about 50%)
4
5 There is a very high chance (about 100%)

APPENDIX C

SUBJECT POST-QUESTIONNAIRE

1. How many problems did you attempt to answer correctly during each trial?

On the following questions please circle the number that is next to the statement you most agree with. If you can not decide between two statements, circle the number between them.

2. How hard did you try to correctly answer the number of problems you have specified in question 1?

1 I did not try hard at all
2
3 I did try fairly hard
4
5 I did try very hard

3. How important was it for you to correctly answer the number of problems you have specified in question 1?

1 It was very important to me
2
3 It was fairly important to me
4
5 It was not important to me at all

4. What did you think was the chance that you would correctly answer the number of problems you have specified in question 1?

1 There was a very low chance (about 0%)
2
3 There was a fair chance (about 50%)
4
5 There was a very high chance (about 100%)

APPENDIX D

MATHEMATICAL ABILITY MEASURE

4+4+2+7+4+9+8=

8+4+4+5+9+6+6=

9+6+3+4+7+2+6=

6+2+8+8+2+8+9=

8+2+7+2+6+5+3=

5+7+8+7+8+7+7=

2+9+4+5+4+2+6=

7+8+7+6+6+2+5=

7+2+2+5+4+4+9=

8+2+7+7+4+4+7=

9+5+2+4+8+3+6=

7+8+4+8+4+7+4=

5+6+2+7+5+6+5=

6+5+3+2+2+9+2=

4+7+2+4+2+7+3=

3+4+5+7+5+3+8=

8+4+7+4+9+7+4=

4+4+8+8+3+3+5=

9+8+6+7+4+8+4=

3+5+4+3+4+7+5=

6+7+9+9+2+8+8=

3+7+8+7+5+8+6=

5+8+2+6+6+9+3=

5+2+9+6+3+3+8=

6+6+8+9+5+8+2=

9+5+9+6+7+9+4=

4+8+4+4+5+9+5=

6+5+3+3+2+3+9=

2+2+9+7+2+3+9=

6+2+7+5+3+4+3=

4+8+3+3+6+2+8=

3+4+7+2+2+8+9=

6+3+7+4+4+5+2=

2+4+3+2+7+3+9=

2+5+3+7+3+6+3=

9+8+6+9+2+6+3=

6+4+5+6+6+4+4=

5+8+7+5+6+7+7=

6+2+8+2+9+3+8=

4+2+9+6+5+9+6=

7+9+8+6+5+8+3=

5+9+6+2+5+7+6=

4+7+4+2+8+2+8=

2+4+6+4+2+7+9=

8+2+4+3+3+9+6=

2+3+4+6+9+2+9=

7+6+8+8+2+9+6=

5+3+6+8+6+8+5=

APPENDIX E

AFFECT MEASURE

The following statements refer to how you feel about your performance on the arithmetic task. Please circle the <u>one</u> number that most represents how much you agree or disagree with each statement.

1. I feel like a failure.

1	2	3	4	5	6	7	8	9	10
Disagree Strongly Strongly									Agree

2. I feel discouraged.

1	2	3	4	5	6	7	8	9	10
Disagree Strongly Strongly									Agree

3. I feel satisfied with myself.

1	2	3	4	5	6	7	8	9	10
Disagree Strongly Strongly									Agree

4. I feel disappointed with myself.

1	2	3	4	5	6	7	8	9	10
Disagree Strongly Strongly									Agree

5. I feel frustrated.

1	2	3	4	5	6	7	8	9	10
Disagree Strongly Strongly									Agree

6. I feel successful.

1	2	3	4	5	6	7	8	9	10
Disagree Strongly Strongly									Agree

7. I feel inadequate.

1	2	3	4	5	6	7	8	9	10
Disagree Strongly Strongly									Agree

VITA

JONATHAN MICHAEL BALCEREK

EDUCATION

Old Dominion University, Norfolk, VA - August 1996
Master of Science - Psychology

St. Lawrence University, Canton, NY - May 1988
Bachelor of Science - Liberal Arts
Major: Psychology

PROFESSIONAL EXPERIENCE

UNISYS CORPORATION, Rochester, NY 1/93 - Present

- Managed the development and execution of direct marketing programs.
- Supervised Tele-sales representatives performing multiple programs
- Coordinated training programs for a marketing department.
- Development of a training manual for telemarketers.

MUTUAL OF OMAHA, Rochester NY 9/91 - 10/92

- Managed lead generation projects for health insurance sales.

OLD DOMINION UNIVERSITY, Norfolk VA 9/88 - 5/90

- Psychology lab instructor/teaching assistant.