MANIPULATION OF EFFICACY INFORMATION
TO ENHANCE MUSCULAR
ENDURANCE PERFORMANCE

THESIS

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Fulfillment of the Requirements

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By

J. Dana Lerner, B.A.
Denton, Texas
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The present investigation was designed to examine the effects of the positive manipulation of information on self-efficacy and subsequent performance of 180 female subjects. High, moderate, and low self-efficacy subjects were randomly assigned to a treatment condition in a 3 x 4 x 3 (preexisting self-efficacy x efficacy information source x trials) factorial design. Information from the three efficacy sources of performance accomplishments, verbal persuasion, and vicarious experience was manipulated towards success after subjects completed a muscular leg endurance task. The results supported self-efficacy theory with high self-efficacy subjects extending their legs significantly longer than moderate and low self-efficacy subjects. However, subjects did not differentially respond to the manipulation of the efficacy information. Results are discussed in terms of efficacy as a mediator of performance on an endurance task as well as the lack of differential changes in efficacy based on the source from which that information is derived.
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CHAPTER 1

INTRODUCTION

It is widely recognized that confidence is an important aspect for achieving excellence in sports. Bandura's (1977) theory of self-efficacy which explores the relationship between efficacy and performance stimulated research in this area as it applies to sport psychology. Bandura argues that assuming one is capable of a response and appropriate incentives for performance are present, actual performance will be predicted by one's conviction that one can successfully execute a behavior required to produce a particular outcome (Bandura, 1977). Efficacy expectations induce initiation, effort, and persistence of performance in the face of obstacles and aversive experiences --the stronger one's efficacy expectations, the more active are one's efforts. These efficacy expectations, however, are situationally specific and may change according to the task, objective situation, and previous experience. Although Bandura uses self-efficacy to denote a situationally specific variable, self-confidence is often used as a trait measure in the personality literature. In the present paper, both self-efficacy and confidence are used interchangeably as a situationally specific measure.
In his theory, Bandura (1977) asserts that there are four main sources from which efficacy information may be derived: performance accomplishments, modeling, verbal persuasion, and physiological arousal. Several factors influence the cognitive processing of efficacy information derived from these four sources. These factors lend themselves to varying methods of providing one with information about one's capability for coping with aversive experiences (Bandura, 1977).

The first major source of efficacy information, performance accomplishments, enhances one's perception of personal efficacy by providing one with success experiences. Modes of induction with regard to this source include participant modeling, performance exposure, and self-instructed performance (Bandura, 1977). Several sport psychology studies provide evidence of the effectiveness of reinforcing self-efficacy especially through participant modeling (Bandura, 1976, Brody, Hatfield, & Spalding, 1988; Feltz, 1988, Feltz, Landers, & Raeder, 1979).

Another potent source of efficacy information is vicarious experience. Modeling is used extensively as a method for providing information about one's capabilities (Feltz, 1982; Feltz, Landers, & Raeder, 1979; Gould & Weiss, 1981; Kazdin, 1974; Landers & Landers, 1973; McCullagh, 1986). The expectations derived from vicarious experience are based on inferences from social comparison.
Expectations acquired from this second source of efficacy information may be less dependable and perhaps more fragile than information derived from direct evidence.

Verbal persuasion is the third major source of efficacy information. Positive self-talk, the term customarily used in the sport psychology literature, is frequently used due to its ease of use (Girodo & Wood, 1979; Gould & Weiss, 1981). One can be led through suggestion to expect personal mastery experience over aversive situations. A caution inherent in this method of efficacy induction is that "whatever mastery expectations are induced by suggestion can be readily extinguished by disconfirming experiences (Bandura, 1977, p. 198).

The fourth and final source of efficacy information which Bandura mentions in his theory is emotional arousal. Bandura (1977) implies that self-efficacy and arousal have an inverse relationship so that the lack of physiological arousal will increase one's sense of competency. In the field of sport psychology, however, several investigators have manipulated physiological arousal to enhance performance. In this case, increasing one's arousal level or "psyching up" has a positive relationship with performance. Bandura, however, does not refer to physiological arousal in this positive sense. Self-efficacy theory states that high aversive arousal usually debilitates performance (Bandura, 1977).
Therefore, people judge their level of self-efficacy based on enactive, vicarious, exhortative, and emotive sources of information. Several studies, psychological and sport psychological, have examined how one or perhaps two of these sources affect perceived efficacy and subsequent performance (Bandura, 1976; Feltz, 1982; Feltz, Landers, & Raeder, 1979; Girodo & Wood, 1979; Gould & Weiss, 1981; Landers & Landers, 1973; Weinberg, 1986; Weinberg, Gould, & Jackson, 1979; Weinberg, Gould, Yukelson, & Jackson, 1981; Weinberg, Hughes, Critelli, England, & Jackson, 1984; Weinberg, Yukelson, & Jackson, 1980). The general trend resulting from these various studies seems to support various aspects of Bandura's theory. Although it has been demonstrated that augmented performance accompanies perceptions of increased personal efficacy, it has yet to be concluded that any of these sources alone or in combination discriminatively enhance performance by affecting one's self-efficacy. Thus, one purpose of the present investigation is to test if information received from these efficacy sources differentially affects one's sense of self-efficacy thereby affecting one's performance.

As stated above, self-efficacy is situationally specific. However, information can be derived from the situation as well as from one's cognitive appraisal of the situation. Therefore, one can have high or low efficacy depending on the situation and/or how one perceives the
situation. Due to its malleability, self-efficacy can easily be manipulated in order to alter one's confidence in one's ability. Many experiments have successfully determined and/or manipulated subjects' level and strength of perceived efficacy for paradigmatic reasons thereby influencing performance (Brody, Hatfield, Spalding, 1988; Duncan & McAuley, 1987; Weinberg, Gould, & Jackson, 1979; Weinberg, Gould, Yukelson, & Jackson, 1981). In terms of athletic performance, it is optimal to have a strong sense of confidence in oneself in order to perform well. An interesting question arises based on this assumption: do these sources of information differentially affect self-efficacy and performance if one initially has either a high, moderate, or low level of perceived self-efficacy? This investigation will attempt to discern if the positive manipulation of information derived from three efficacy sources, performance accomplishments, verbal persuasion, and vicarious experience, differentially influences self-efficacy and subsequent performance of subjects with high, moderate, and low preexisting self-efficacy.

**Purposes of the study**

1. To determine if manipulating the information a subject receives from the efficacy sources of performance accomplishments, verbal persuasion, and modeling
differentially affects the subjects' efficacy expectations and subsequent performance.

2. To determine if the positive manipulation of information from these sources alters one's level and strength of self-efficacy based on one's preexisting self-efficacy (high, moderate, or low).

Hypotheses

1. On a strength endurance task, high preexisting self-efficacy subjects will produce significantly better performance scores than low preexisting self-efficacy subjects.

2. The experimental subjects in the performance based efficacy treatment group will exhibit a significantly better performance than the subjects in the other cognitive based efficacy treatment groups.

3. Subjects in the three efficacy treatment groups will have significantly higher performance scores than subjects in the group not receiving any information.

Delimitations of the study

The study is limited to the use of university females who are currently enrolled at the University of North Texas.
Definitions of terms

1. Self-efficacy: The strength of one's conviction that one can successfully execute a behavior required to produce a certain outcome (Bandura, 1977).

2. Performance accomplishments: Efficacy information that is based on personal mastery experiences (Bandura, 1977).

3. Vicarious experience: The tendency to generate expectations after observing others perform an activity based on inferences from social comparison (Bandura, 1977).

4. Verbal persuasion: Mastery expectations which are induced by suggestion (Bandura, 1977).

5. Physiological arousal: Derived from stressful and taxing situations which, depending on the circumstances, may have informative value regarding personal competency (Bandura, 1977).
CHAPTER REFERENCES


CHAPTER 2

REVIEW OF LITERATURE

Self-confidence is one of the most potent psychological factors believed to influence motor performance. Bandura's (1977) theory of self-efficacy stimulated research in this area as it applies to sport psychology. Specifically, Bandura (1977; 1982) argues that self-efficacy is a common cognitive mechanism mediating the relationship between thoughts and action. Assuming one is capable of a response and appropriate incentives for performance are present, actual performance will be predicted by one's conviction that one can successfully execute a behavior required to produce a particular outcome (Bandura, 1977). Efficacy expectations induce initiation, effort, and persistence of performance in the face of obstacles and aversive experiences -- the stronger one's efficacy expectations, the more active one's efforts are. In his theory, Bandura distinguishes between efficacy and outcome expectations (Bandura, 1977). An efficacy expectation is the belief that one can successfully perform a desired behavior. An outcome expectation, on the other hand, is the conviction that the behavior performed will lead to the appropriate outcome. This distinction is made
because although one may believe that a certain behavior will lead to a particular result, one may not believe that one is capable of producing the necessary behavior to produce that desired result. This differentiation should be considered when evaluating the self-efficacy literature. These efficacy expectations, however, are situationally specific and may change according to the task, environment, and previous experience.

Investigators have shown support for self-efficacy as an accurate predictor of diverse phobic behaviors (Bandura, Adams, & Beyer, 1977; Bandura, Adams, Hardy, & Howells 1980; Williams & Watson, 1985), self-control of weight loss (Weinberg, Critelli, England, & Jackson, 1984), and of motor performance (Brody, Hatfield, & Spalding, 1988; Feltz 1982; Feltz 1988; Feltz & Mugno 1983; Lee 1982; McAuley 1985; Weinberg et. al., 1979). These studies generally demonstrate the reciprocal relationship between self-efficacy and performance. As Bandura points out, self-efficacy is a key causal variable in performance. "Judgments of one's capabilities partly determine choice of activities and rate of skill acquisition, and performance mastery, in turn, can boost perceived self-efficacy in a mutually enhancing process" (Bandura, 1982, p.128). Thus, self-efficacy may be one of the most potent constructs available to explain behavior. In terms of sport, it is
highly desirable to research and discover methods of enhancing performance.

Early studies researched the relationship between expectations and athletic performance without using Bandura's specific ideas of self-efficacy. Namely, Nelson & Furst's (1972) study with arm wrestling, Mahoney & Avener's (1977) study with gymnasts during Olympic qualifying trials, and Ness & Patton's (1979) study weight lifting are samples of this early experimentation. Nelson & Furst (1972), for example, tested male subjects for arm strength and paired an objectively weaker subject versus an objectively stronger subject. Although both believed the stronger subject to be weaker, the objectively weaker subject won the arm wrestling competition 83% of the time. Mahoney & Avener (1977) also investigated the effects of confident feelings and gymnastics performance in a field investigation with the 1976 U.S. Men's Olympic team. The results revealed that there was a modest correlation between athletes' self-confidence before the meet and their performance during the meet.

Ness & Patton (1979) also conducted an experiment testing the effect of expectations on motor performance. Male subjects lifting weights were influenced by their perceptions of how much weight was being lifted rather than by the actual weight itself. Subjects pressed significantly more weight when they believed it to be less than its
objective value. These investigations, though correlational in nature, indicated that personal expectation can affect subsequent performance.

These findings related to general expectations were linked to self-efficacy and further explored in relation to sport settings. Feltz, Landers, & Raeder (1979) examined self-percepts of efficacy in a high avoidance diving task; Gould & Weiss (1981) studied self-efficacy expectations in relation to muscular endurance performance; and Weinberg and several colleagues (Weinberg, Gould, & Jackson, 1979; Weinberg, Gould, Yukelson, & Jackson, 1981; Weinberg, Yukelson, & Jackson, 1980) researched self-efficacy and muscular endurance performance in a competition.

The Feltz, Landers, & Raeder (1979) study was one of the first to investigate Bandura's ideas in a sport setting. They investigated the differing effects of live, participant and videotape modeling on the learning of a high-avoidance back dive task. Although this study was not designed to make causal inferences about self-efficacy and performance, it did result in the participant-modeling subjects completing more successful dives and expressing stronger percepts of self-efficacy than subjects in the other two treatment groups. Therefore, they found that self-efficacy theory is viable in a motor performance setting. This study had important implications for sport psychology since it not only was one of the first studies to test Bandura's self-
efficacy theory in a motor skills area, it also resulted in important findings regarding performance accomplishments and modeling and their relationship to self-efficacy and motor performance.

Another early example of self-efficacy theory and motor performance is a study by Gould & Weiss (1981). These experimenters examined the effects of model talk and model similarity on subjects' self-efficacy and ensuing muscular endurance performance. (Modeling, as a component aspect of self-efficacy theory will be discussed in full later.) The investigators found that subjects extended their legs significantly longer when viewing a similar model rather than a dissimilar model or no model at all. Results also revealed that model similarity was more important in affecting performance than was model talk (positive or negative.)

Weinberg and several colleagues (Weinberg, Gould, & Jackson, 1979; Weinberg, Gould, Yukelson, & Jackson, 1981; Weinberg, Yukelson, & Jackson, 1980) were the first to examine self percepts of efficacy and changes in motor performance in competitive situations. In the first of this series of studies (Weinberg, Gould, & Jackson, 1979) self-efficacy was manipulated so that subjects were assigned to either a high self-efficacy condition or a low self-efficacy condition. This manipulation was successfully achieved through the use of a confederate of the experimenter.
Subjects competed face-to-face on a muscular endurance leg lift task against a confederate who was said to be a varsity track athlete and who exhibited stronger leg strength on a related task (low self-efficacy condition) or against a confederate who was said to have sustained knee injuries and exhibited weaker performance on the similar leg strength task (high self-efficacy condition.) Results supported Bandura's contentions as well as Weinberg's predictions that subjects in the high self-efficacy condition would extend their legs significantly longer than subjects in the low self-efficacy condition.

Another investigation was conducted to extend and replicate Weinberg et al. (1979). This study (Weinberg, Yukelson, & Jackson, 1980) was designed to test the efficacy-performance relationship in a back-to-back competitive situation as well as to determine if solicitation of public versus private expectancy statements would affect performance. Subjects were assigned to either a high or low efficacy condition using the same manipulation as in the previous study (Weinberg, et al. 1979) and stated their expectancy of success publicly or privately. Results supported Bandura's theory as well as replicated Weinberg's previous study in that high self-efficacy subjects extended their legs on a muscular endurance task significantly longer than low self-efficacy subjects with these performance results reflecting changes in personal efficacy. The
public/private manipulation, however, produced no significant performance effects.

The third of this series of investigations (Weinberg, Gould, Yukelson, & Jackson, 1981) was designed to determine the effects of preexisting and manipulated self-efficacy on competitive motor performance. Subjects were classified as being either high or low in preexisting self-efficacy based on suggestions of Bandura and Adams (1977) on the measurement of self-efficacy (which will be discussed in full later.) The efficacy manipulation was based on the same procedures using the confederates of the experimenter as successfully used in the previous two experiments (Weinberg, et al., 1979; Weinberg, et al., 1980). The muscular endurance task was also the same. The findings from this experiment also supported Bandura's self-efficacy theory in that both preexisting and manipulated self-efficacy significantly influenced performance with preexisting self percepts of efficacy influencing performance on Trial 1 only and manipulated efficacy influencing performance on Trial 2 only.

Although Weinberg et al.'s findings (Weinberg, Gould, & Jackson, 1979; Weinberg, Gould, Yukelson, & Jackson, 1981; Weinberg, Yukelson, & Jackson, 1980) suggest a significant causal relationship between self-efficacy and performance, some authors (Taylor, 1986; Schleser, Graham, Catrone, & Meyers, 1986) suggest that their results cannot be taken as
confirmatory of self-efficacy theory. Due to Bandura's (1977) distinction between efficacy versus outcome expectations, it is indicated that Weinberg et al. were assessing outcome not efficacy expectations. Nevertheless, the majority of these investigations support or partially support Bandura's self-efficacy theory thus intimating that one's beliefs about competence determine performance consequences.

With experimental results in support of self-efficacy theory in general, researchers from several disciplines, psychological as well as sport psychological, were interested in exploring more specific aspects of self-efficacy. Bandura predicted that efficacy expectations influence performance because the stronger one's self percepts of efficacy, the more likely one will exert more effort and persist at a task (Bandura, 1977; 1982). These efficacy expectations are malleable and can be modified through information sources from which efficacy expectations are developed. In his theory, Bandura (1977) asserts that there are four main information sources from which efficacy expectations derive: performance accomplishments, vicarious experience, verbal persuasion, and physiological arousal. Many strategies based on these categories, which are not mutually exclusive, are employed in attempts to increase individuals' self-confidence. These information sources serve as the basis for various techniques used to provide
individuals with information about their capability for coping with aversive experiences (Bandura, 1977).

**Performance Accomplishments**

Efficacy information derived from successful performance accomplishments is particularly potent because it is based on personal mastery experiences (Bandura, 1977, Bandura & Adams, 1977, Bandura, Adams, & Beyer, 1977). Bandura postulates that the more dependable the source of efficacy information, the greater the changes in self-efficacy and persistence at a task in the face of obstacles and aversive experiences (Bandura, 1977; Bandura & Adams, 1977; Bandura, Adams, & Beyer, 1977). Performance accomplishments can be easily manipulated through the aid of participant modeling. Participant modeling has been successfully used in several efficacy experiments to test the hypothesis that changes in expectations of self-efficacy formulated by partial mastery experiences would accurately predict the level of subsequent behavior change (Bandura, 1976; Bandura, 1982; Bandura & Adams, 1977; Bandura & Cervone, 1983; Brody, Hatfield, Spalding, 1988; Feltz, 1982; Feltz, 1988; Feltz, Landers & Raeder, 1979; Feltz & Mugno, 1983; Locke, Frederick, Lee & Bobko, 1984).

Consistent with self-efficacy theory, in a series of experiments with severe snake phobics, treatments employing enactive mastery as the primary vehicle of change produced
the strongest increases in coping efficacy (Bandura, 1976; Bandura & Adams, 1977; Bandura, Adams, & Beyer, 1977; Bandura, Adams, Hardy, & Howells, 1980). Many of these experiments tested these ideas of effecting change through participant modeling as it applies to the treatment of behavioral deficits and defensive behavior.

In one such study, Bandura & Adams (1977) investigated the effect of a participant modeling treatment on the efficacy expectations and behavior change of snake phobias. They discovered that perceived self-efficacy formed through partial mastery experiences "predicted at an 84% level of accuracy performance on highly threatening tasks that the subjects had never done before" (Bandura & Adams, 1977, p.303). Locke, Frederick, Lee, & Bobko (1984) found that past performance is a key determinant of self-efficacy, corroborating results from Bandura (1982) and Feltz (1982).

Evidence supporting the superiority of performance-based (versus cognitive-based) procedures for influencing self-efficacy exists in the sport psychological as well as the psychological literature (Bandura, 1977; Brody, Hatfield, & Spalding, 1988; Feltz, 1982; Feltz, Landers, & Raeder, 1979; Feltz & Mugno, 1983). An early study involving the learning of a high-avoidance springboard diving task supported hypotheses of the strong influence of enactive procedures for enhancing self-efficacy and performance. The participant modeling treatment subjects
produced more successful dives and stronger expectations of personal efficacy than live modeling or videotaped modeling subjects (Feltz, Landers, & Raeder, 1979).

In a replication and extension of the diving study, Feltz (1982) verified that the more mastery experience one has, the stronger the basis on which to judge one's capabilities. In accord with Bandura's theory, successful achievements derived from the same task on which a subject will be tested provide a more dependable source of information than those procured from performance on a different task. Feltz's (1982) results indicated that diving performances were significantly predicted by each immediately preceding diving performance or by past performance accomplishments. The influence of previous diving performance on successive diving performance increased over trials whereas influence of self-efficacy on performance decreased over trials (Feltz, 1982).

An additional study involving diving tasks found support for Bandura's argument that one's past performance accomplishments were strong sources of efficacy information (Feltz & Mugno, 1983). These researchers found that self-efficacy significantly predicted diving performance for every trial except the last and immediately prior diving performance significantly predicted subsequent diving performance (Feltz & Mugno, 1983). Hence, self-efficacy is
a cognitive mediating mechanism at least for the performance accomplishment efficacy information source.

Although participant modeling can induce psychological and behavioral change, the resulting performance will not likely endure unless the behaviors repeatedly prove to be useful in procuring desired effects (Bandura, 1976). So, it is important to keep in mind that one must experience success in utilizing what they have learned to feel a sense of performance accomplishment and use this confidence when formulating future task expectancies. Thus, as Bandura (1982) argues, information gleaned from past accomplishments and comparative appraisals can be indicative of competency at a particular task.

Vicarious Experience

People may also derive their expectations concerning their level of self-efficacy from vicarious experience. Specifically, individuals rely on inferences from social comparison to make judgments about themselves and their own capabilities by persuading themselves that if others can do something, they should also be able to achieve some improvement in their own performance. Thus, modeling provides a potent technique for altering efficacy expectations and subsequent behavior (Bandura, 1977; Meichenbaum, 1977; Mahoney, 1978). Although modeling and its effects on self-efficacy have been studied in terms of
performance in clinical situations, little research has been done to examine if modeling effects are consistent in motor performance settings.

Recall that Feltz, Landers, & Raeder (1979) investigated the effectiveness of participant, live, and videotaped modeling on the learning of a back dive. Their findings that subjects in the participant modeling group exhibited better diving performances and stronger efficacy expectations sparked other investigations examining the effects of modeling on self-efficacy and subsequent motor performance.

Another such study is that of Gould & Weiss (1981). Their premise was that the merit of modeling as a source of efficacy information depends upon the type of model that is observed. This experiment determined if observing a similar or dissimilar model making assorted self-statements influenced a subject's efficacy expectations and subsequent muscular endurance performance. Model similarity was manipulated in terms of gender and athletic ability. Gould & Weiss (1981) employed four levels of model talk: positive self-talk, negative self-talk, irrelevant-talk, and no-talk. After assessing efficacy expectations and measuring muscular endurance performance, they found that "similar model subjects extended their legs significantly longer than dissimilar model and control subjects" (Gould & Weiss, 1981, p.17). However, subject self-efficacy was not found to be
the significant variable affecting performance changes thus lending limited support for the contention that self-efficacy mediates the modeling-performance changes.

Model-observer similarity is a potent determinant of observational learning (Gould & Weiss, 1981; Kazdin, 1974). Model similarity seems to increase the personal relevance for the observer of the modeled performance by heightening the social comparison process, increasing observer motivation, and increasing self-efficacy (Gould & Weiss, 1981). Sex, age, race, and competence are important characteristics influencing perceived similarity between model and observer. Model-observer similarity is an important variable for enhancing the effectiveness of symbolic modeling (Kazdin, 1974; McCullagh, 1986).

Although findings from these modeling studies do not completely fit Bandura's (1977) self-efficacy model, they do impart important information regarding the effectiveness of model-observer similarity as a potent determinant of observational learning (Gould & Weiss, 1981; Kazdin, 1974; McCullagh, 1986). A more recent study concerning modeling as it imparts self-efficacy information in a sport setting also resulted in partial support for this aspect of the theory (McAuley, 1985). This study contrasted the effects of unaided participant modeling, aided participant modeling, and a control condition on expectations of self-efficacy and the acquisition of a gymnastic task. Supporting previous
research, results indicated that "subjects in the modeling groups expressing stronger efficacy expectations ... perform(ed) better on a gymnastic task than the control group" (McAuley, 1985, p. 292). Consistent with the theory, this study suggested that self-efficacy was an instrumental determinant of motor skill acquisition. Self-percepts of efficacy significantly predicted performance of a motor skill and mitigated the effects of modeling treatments and performance.

As a source of efficacy information, vicarious experience can enhance observers' perceptions of their own capabilities by means of a social comparison process. Perhaps all it takes is the idea that "Well, maybe I can do it!" sparked by seeing another person perform a task to prompt an individual into expecting that performance success is obtainable. In light of the previous research, modeling should be a valuable source of efficacy information necessary to enhance behavior.

**Verbal Persuasion**

In addition to observing a model perform, repeating positive self-statements such as "I can do it," "I can make it," can build confidence in one's ability to achieve success at a task. Research indicates that positive self-talk can enhance performance (Girodo & Wood, 1979; Weinberg, Smith, Jackson, & Gould, 1984). Increases in perceived
self-efficacy may result from believing that one can successfully execute a required behavior to achieve a particular task (Bandura, 1982).

Although verbal persuasion, widely used to affect behavior, is easy to use and readily available to everyone, efficacy expectations induced via this method are weaker than those developed from one's own performance accomplishments (Bandura, 1977). Although one can be led through suggestion to expect personal mastery over aversive situations, a caution in using verbal persuasion to enhance efficacy expectations is that a subject may not necessarily believe induced suggestions especially when they contradict the subject's personal experience (Bandura, 1977). Verbal persuasion alone as a means of instilling a sense of personal efficacy may be limited, but in conjunction with other sources of information, it will likely facilitate feelings of confidence and performance success.

Few experiments have studied the effects of verbal persuasion alone as a means of encouraging efficacy expectations. It is generally reported that self-statements to build confidence are used in conjunction with other techniques to enhance performance such as "psyching strategies" (Ness & Patton, 1979; Shelton & Mahoney, 1978).

Feltz and Doyle (1981) note "that persuasive techniques are effective only if the heightened appraisal is within realistic bounds" (p.92). Weinberg (1986)
investigated the relationship between self-efficacy and cognitive strategies in enhancing endurance performance. Positive self-talk was one of the variables assessed in this study. Although results supported self-efficacy predictions with subjects in the high self-efficacy condition extending their legs significantly longer than low self-efficacy subjects, no significant cognitive strategy by efficacy interaction was found (Weinberg, 1986). Perhaps believing in the effectiveness of the strategy is more important than the self-talk itself to influence efficacy expectations (Girodo & Wood, 1979).

Williams (1986) reports that since thoughts influence self-concept, self-confidence, and behavior, it is important to recognize and control thoughts. This regulation can be readily realized through positive verbal persuasion. Affirmations reflecting positive thoughts about oneself and one's capabilities "promote confidence in the ability to do whatever action is being affirmed" (Williams, 1986, p.241).

Consequently, if people have a reason to believe that their actions can produce specific desired effects, persuasive techniques used to alter efficacy expectations can provide a definite impact (Bandura, 1982). Verbal persuasion as a source of efficacy information is a viable component to study in relation to attempting to enhance endurance performance by manipulating self-percepts of efficacy.
Physiological Arousal

People also rely on their physiological state to judge their capabilities. One is more apt to expect success when one is not beset by aversive arousal, because high arousal usually impairs performance (Bandura, 1977; Bandura, 1982). Bandura (1977) postulates that the cognitive appraisal of one's arousal affects performance because one may interpret physiological arousal as an indication that the skill cannot be performed successfully. Although Bandura (1977) specifies arousal as a source of efficacy information, Feltz (1982) notes that he fails to designate the physiological component used in his tests of self-efficacy theory. Feltz (1982), however, does incorporate heart rate as the measure to assess physiological arousal in her test of self-efficacy theory. Conflicting with predictions, arousal was not a significant source of efficacy nor a significant effect of efficacy (Feltz, 1982; Feltz & Mugno, 1983). Since cognitions following physiological reactions determine the interpretation of the meaning of those reactions, it is difficult to study physiological arousal as a source of efficacy information. Investigations that did attempt to study arousal as it relates to self-efficacy theory revealed that no consistent reciprocal relationship exists between these two elements (Feltz, 1982; Feltz & Mugno, 1983). In lieu of these concerns, this experiment will not endeavor to ascertain the effects of manipulating physiological arousal.
as a source of efficacy information on subsequent muscular endurance performance.

Summary

In conclusion, it is evident that one's feelings of confidence can importantly impact one's subsequent performance. Self-efficacy, a situationally specific variable, is the mechanism of manipulation to alter one's performance via one's expectations. Because self-efficacy theory asserts that an individual's belief in personal competence predicts actual performance, it is paramount to ascertain methods of enhancing those beliefs. This study attempts to specify the relationship between endurance performance and self-efficacy from two perspectives. First, how does information from three efficacy sources, performance accomplishments, vicarious experience, and verbal persuasion, affect efficacy expectations and subsequent performance? Second, does the positive manipulation of information from these sources differentially modify the level and strength of efficacy expectations based on high, moderate, or low preexisting self-efficacy?
CHAPTER REFERENCES


CHAPTER 3

METHODS

Subjects & Design

Subjects were approximately 180 female students from the University of North Texas ranging in age from 18 to 24 years. High, moderate, and low self-efficacy subjects were randomly assigned to one of three treatment conditions or a control condition in a 3 x 4 x 3 (preexisting self-efficacy x efficacy information source x trials) mixed design.

Research Design

Conditions

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The muscular endurance task was a modified version of the leg-holding task developed by Martens & Landers (1969) and successfully used by Weinberg et. al. (1979; 1980; 1981); Taylor & Boggiano (1985); Taylor (1986); and Schleser, Graham, Catrone, & Meyers (1986). Subjects sat in a wooden chair 16 inches high and extended one leg in a horizontal position parallel to the floor over an identical wooden chair and maintained this position for as long as was possible. A cord ran horizontally across the second chair and was attached to a light which was triggered when a subject contacted the cord when she could not hold the leg up any longer. The total time (in seconds) from when the leg was raised until it contacted the cord was the performance measure.

Efficacy Classification

Subjects were classified as being high, moderate, or low in preexisting self-efficacy according to measurements of level and strength of self-efficacy as suggested by Bandura & Adams (1977). (See Appendix A.) Level of self-efficacy was assessed by asking subjects to approximate the length of time they could extend their leg over the cord. Subjects, who received a sense of the difficulty of the task from a thirty second pre-trial, answered "yes" or "no" to time estimates ranging from 30 seconds to 5 minutes with
each successive estimate question increasing by 30 seconds. An overall level of efficacy was determined by summing the total number of "yes" responses.

Subjects' preexisting self-efficacy (PSE) was determined based on their answers to a pre-experimental questionnaire (see Appendix A) designed to assess the level and strength of that self-efficacy (Bandura, 1977). Subjects were considered low in PSE if they were certain they could hold their leg over the cord for only thirty seconds (answering one "yes") despite the strength of that certainty. Subjects were rated as moderate in PSE if they felt they could hold their leg over the cord for a minimum of one minute (answering two "yes's") to a maximum of two minutes (answering four "yes's") with at least an average strength of 50% of the certainty for the amount of time indicated. Subjects were considered to have high PSE if they denoted they could extend their leg over the cord for at least 2 1/2 minutes (answering five "yes's") with a minimum of 60% certainty they could hold their leg up for 2 1/2 minutes.

Self-efficacy Manipulation

Subjects's self-efficacy for the leg-lift task was positively manipulated towards success in one of three treatment conditions based on Bandura's (1977) theory of sources from which efficacy information is derived. These
three sources were successful performance accomplishments, modeling, and verbal persuasion. It should be noted that physiological arousal as a source of efficacy information was excluded from this investigation for reasons stated earlier. A control condition was also included in this experiment. When presenting the treatment to the subjects, the experimenter explained that the specific strategy had been shown to enhance performance on this type of endurance task. To influence expectations, the belief in the effectiveness of the strategy may be rather important (Girodo & Wood, 1979; Weinberg, 1986).

Performance Accomplishments

Each subject completed one practice trial (with the left leg) of the leg-lift task. The experimenter informed subjects that their performance was in the 82nd percentile for college-aged students of their same sex based on bogus norms. The experimenter conveyed these false comparisons so as to enhance the potency of the efficacy information. This feedback was designed to allow the subject to experience success with this type of task in order to enhance the subject's self-efficacy regarding leg-lift type exercises.
Vicarious Experience

After performing one practice trial (with the left leg) of the leg-lift task, each subject watched a videotape of a similar model performing the same task very well. The silent model was the same sex as the subject and exerted an "honest" effort at this leg strength task. The subject in this experimental condition was told to focus on the model's technique paying particular attention to how the model extended the leg and how much the model concentrated on the task. It was suggested that this performance was an excellent example of how to execute this exercise, hence the subject should attempt to ascertain any information to aid in her own performance. The tape was stopped after five minutes, with the model's leg still extended.

Verbal Persuasion

After the subject completed the practice trial (with the left leg) of the leg-lift task, the experimenter verbally persuaded the subject to do better on the ensuing trials. Statements such as, "I know you can do it!" "Stay tough!" "This is not that hard!" "Keep it up!" "Go for it!" "Be strong!" and "You're doing great, but I know you can do better!" were designed to lead the subject into expecting successful performance on this type of task to enhance her self-efficacy relating to leg-lift type exercises. This subject was told to tacitly repeat these positive statements.
during the subsequent trials in order to internalize these persuasive suggestions.

Control

The subject performed the practice trial (with the left leg) of the leg-lift task and did not receive any feedback whatsoever.

Procedure

Two subjects participated in two practice trials, an efficacy manipulation trial, followed by a competition trial in each testing session. Subjects were told that they would perform a leg-lift task which involved muscular strength and endurance in the quadriceps muscles of the leg. The experimenter demonstrated and explained the leg-lift task indicating that subjects would, upon completion of an informed consent, first practice this activity and then perform the same task using certain strategies to enhance their performance. Prior to executing the practice test, subjects practiced the task by extending the leg for thirty seconds in order to get a sense of the difficulty of the task. The pre-performance questionnaire designed to measure preexisting self-efficacy was completed, within three minutes, after this information and demonstration of the task. An additional question was included to assess the
subject's perceived expectation of beating an opponent in competition.

Upon completion of the questionnaire, subjects were involved with one practice trial of the leg-lift task (using their left leg) in a back-to-back setting to avoid competition. The experimenter revealed that the back-to-back setting was designed so that subjects would exert their best effort because it had been shown that people have a tendency to drop their leg after the other person has dropped their leg rather than extending the leg for as long as possible. Following the practice trial, subjects were randomly assigned to a control condition or one of three experimental conditions in which self-efficacy for the leg-lift task was manipulated by giving subjects information from these sources to influence their efficacy expectations. The same self-efficacy questionnaire was again completed after the manipulation and before the performance trial in order to assess changes in self-efficacy as a manipulation check. Again, subjects were allowed three minutes to complete the questionnaire and rest their muscles before performing on the next trial. Subjects proceeded with one performance trial of the leg-lift task, using their right leg, following the manipulation. After this performance trial, subjects were given a three minute rest and executed a competition trial using the left leg. The setting remained back-to-back so that subjects would exert their
best effort. They were told that whoever held the leg out longer would be declared the winner. This competition condition was included to evaluate any relationships among the efficacy manipulation, outcome expectations, and performance. After one competition trial, subjects completed a post-experimental questionnaire in order to assess their application of the efficacy manipulation treatments.

**Post-experimental Questionnaire**

A post-experimental questionnaire was administered after the final competition trial. These questions were particular to each of the three treatment conditions. In essence, they assessed the perceived effectiveness of the strategies offered for each condition. (See Appendix B.) Subjects were then debriefed and informed of the details of the experiment.
CHAPTER REFERENCES


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CHAPTER 4

RESULTS

Manipulation checks

To determine if there were any initial ability or strength differences between the experimental groups, a one way ANOVA comparing performance scores on Trial 1 for all conditions was conducted revealing no significant differences among groups. This finding confirmed that assignment to conditions was truly random with no initial ability differences existing among subjects in different conditions.

To assess the success of the efficacy manipulation, further analysis was conducted on subjects' reported self-efficacy before and after experimental manipulation. Initially, groups were formed based on the three levels of self-efficacy previously discussed with 60 subjects each in high, moderate, and low categories of PSE for each condition. These efficacy ratings as operationally defined in this study changed however (after subjects received experimental information per condition) indicating that efficacy expectations changed. As Figure 1 displays, 14 subjects retained a low efficacy assignment, but 9 subjects increased their expectations placing them in the moderate
category, and the high efficacy expectation group increased by 11. It should be noted that 26 subjects changed their estimation of expected efficacy for the task deviating from their initial category, but not enough to put them in the next higher level as operationally defined in this study. Chi square evaluation was used to analyze subjects' ratings of self-efficacy after receiving experimental information from the different sources of efficacy expectations. This statistic was used due to the nominal nature of the data to offer "a generalized expression between an actual and a theoretical distribution (if groups remained equal in terms of efficacy categories)" (Clarke & Clarke, 1984, p.220). Results were significant $\chi^2 = 40.77$, ($p < .001$) indicating that subjects' self-efficacy after receiving information from experimental conditions was significantly higher than self-efficacy was before manipulation.
Figure 1. Frequencies: PSE & MSE.
To further test if the information offered in the experimental conditions increased subjects' self-efficacy, additional evaluation was conducted on the raw data from self-efficacy judgments. Subjects provided information regarding their level and strength of efficacy for the task both before and after manipulation as gleaned from the pre-experimental questionnaire. Based on Bandura's suggestions, level of self-efficacy was determined from the number of "yes" responses a subject indicated whereas strength of self-efficacy was established from the average percentage of certainty for those "yes" responses (Bandura, 1977). Differences in self-efficacy before and after experimental manipulation were examined in two different ways.

First, paired t tests were calculated separately for each condition on both the level and strength of efficacy before and after receiving experimental information. For the performance accomplishments condition, there was a significant difference between the level of efficacy before and after manipulation, $t(36) = 5.43$, $p < .001$, with levels of self-efficacy after receiving experimental information ($M = 4.97$) being higher than before ($M = 3.89$). For this condition, there were no significant differences between measurements of strength of efficacy. For the verbal persuasion condition, differences in the level of self-efficacy were significant, $t(36) = 6.34$, $p < .001$, increasing from before ($M = 4.40$) to after experimental
condition (M = 5.89), as well as increases in the strength of efficacy from prior to receiving experimental information, $t(36) = 2.16, p < .05$, (M = 86.75%) to after receiving the information (M = 91.35%). Results for both the modeling, $t(39) = 4.77, p < .001$, and control, $t(39) = 4.16, p < .001$, conditions mirrored those of the performance accomplishments condition. The level of reported efficacy increased significantly from before receiving experimental information (M = 3.52 for the modeling condition and M = 3.60 for the control condition) to after receiving this information (M = 4.48 and M = 4.75 respectively). For these two conditions, the strength of reported efficacy did not significantly change.

The second way to determine differences in efficacy involved examining differences among conditions for both level and strength of efficacy as estimated after experimental manipulation. To achieve this end, one way ANOVAs were conducted on the level and strength scores by experimental condition. Results reached significance only for the strength measurement, $F(3, 150) = 5.97, p < .001$, with post hoc Newman Keuls tests indicating that in terms of the average certainty for "yes" responses, the verbal persuasion condition (M=91%) was significantly better than the performance accomplishments (M=82%), modeling (M=85%), and control (M=83%) conditions. Thus, subjects' beliefs in personal efficacy for the leg-lift task were generally
enhanced based on information received from hypothesized sources of efficacy expectations with the verbal persuasion group increasing level of efficacy more than the other experimental conditions. However, it should be noted that the control group had similar increases in efficacy as all experimental conditions.

**Performance**

Performance results from the leg-extension task were analyzed by a 3 (Preexisting Self-efficacy) x 4 (Experimental Condition) x 3 (Trials) analysis of variance with repeated measures on the last factor to determine if significant differences existed among the treatment groups and levels of preexisting self-efficacy. Results from the ANOVA indicated a significant overall main effect for preexisting self-efficacy, $F(2,168) = 20.03, p < .001$. Post hoc Newman Keuls tests revealed that subjects with high preexisting self-efficacy consistently produced significantly better performance scores ($M = 206.33$ seconds) than subjects moderate ($M = 153.33$ seconds) and low ($M = 133.33$ seconds) in preexisting self-efficacy. (See Figure 2). The three way ANOVA also uncovered a significant trials main effect $F(2,336) = 29.08, p < .001$, with performance scores on Trials 2 ($M = 170.36$ seconds) and 3 ($M = 173.78$ seconds) significantly better than Trial 1 ($M = 148.63$ seconds) performance measures.
Figure 2. Performance and preexisting self-efficacy.
Despite expectations, no significant main effects for experimental condition were found nor were any significant interactions between preexisting self-efficacy, condition, and trials found, although a condition x trials interaction approached significance $F(6,336) = 1.80, p = .09$.

To ascertain the relationship between preexisting self-efficacy (PSE), previous experience (Trials 1 & 2), and performance of the task, correlations were computed. Although PSE did correlate with the first ($r = .422$, $p < .001$), second ($r = .419$, $p < .001$), and third ($r = .333$, $p < .001$) performance scores, previous experience was related more strongly. Specifically, performance 1 was significantly related to performance 2 ($r = .781$, $p < .001$) and performance 3 ($r = .777$, $p < .001$); and performance 2 was significantly associated with performance 3 ($r = .856$, $p < .001$).

Analysis involving $r^2$ considered the predictive power of these variables on performance scores by examining the percent of variance accounted for. Results revealed that PSE accounted for 17.81% of the variance of performance 1, 17.56% of the variance of performance 2, and 11.09% of the variance of performance 3. Calculations involving performance scores were more predictive of future performance on the leg-lift task. Performance 1 accounted for 61.00% of performance 2, 60.37% of performance 3; and performance 2 accounted for 73.27% of performance 3.
Post-experimental questionnaires

To assess compliance with experimental instructions regarding the task, statistical analysis was conducted on the post-experimental questionnaires. (See Appendix B). Possible replies to these questions ranged from 1 "not at all" to 11 "extremely so" on a Likert scale. Subjects in the control condition did not complete a post-experimental questionnaire. For the three experimental conditions, however, six of the questions were identical while an extra question was added to two of these conditions -- verbal persuasion: "How often did you repeat positive statements to yourself?" and modeling: "How similar were you to the model?". Note that the difference between "practice," "performance," and "competition" trials was clearly delineated prior to subjects' completing the questionnaires.

A 3 (PSE) x 4 (experimental condition) ANOVA was performed on each of the post-experimental questions to test the differences between the answers supplied by the individuals in the experimental conditions, as well as those with different levels of initial self-efficacy. Table 1 presents the means and standard deviations of answers (as scored on a Likert scale from 1 "not at all" to 11 "extremely so") to the post-experimental questions. The data from the post-experimental questions revealed numerous significant main effects.
Table 1
Means & Standard Deviations for Post-experimental Questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Experimental Condition</th>
<th>Preexisting Self-efficacy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PA</td>
<td>VP</td>
</tr>
<tr>
<td>How important were the practice trials to your performance trial?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>9.0*</td>
<td>8.1</td>
</tr>
<tr>
<td>SD</td>
<td>2.0</td>
<td>2.5</td>
</tr>
<tr>
<td>How important were the practice trials to your competition trial?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>8.8</td>
<td>7.9</td>
</tr>
<tr>
<td>SD</td>
<td>2.1</td>
<td>2.7</td>
</tr>
<tr>
<td>How often did you use the information the experimenter gave you after your practice trials during your performance trial?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>8.9*</td>
<td>8.8*</td>
</tr>
<tr>
<td>SD</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>How often did you use the information the experimenter gave you after your practice trials during your competition trial?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>8.5*</td>
<td>8.3*</td>
</tr>
<tr>
<td>SD</td>
<td>2.1</td>
<td>1.7</td>
</tr>
</tbody>
</table>
Table 1 (cont.)

<table>
<thead>
<tr>
<th>Question</th>
<th>Experimental Condition</th>
<th>Preexisting Self-efficacy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PA</td>
<td>VP</td>
</tr>
<tr>
<td>How much of your performance on your performance trial was due to the strategy you used?</td>
<td>8.2 8.5 7.4</td>
<td>9.3** 7.7 7.1</td>
</tr>
<tr>
<td>M</td>
<td>2.3 2.1 2.3</td>
<td>1.6 2.4 2.1</td>
</tr>
<tr>
<td>How much of your performance on your competition trial was due to the strategy you used?</td>
<td>8.4* 8.3* 7.2</td>
<td>8.8** 7.8 7.2</td>
</tr>
<tr>
<td>M</td>
<td>2.5 2.2 2.3</td>
<td>1.8 2.6 2.4</td>
</tr>
<tr>
<td>How often did you repeat positive statements to yourself?</td>
<td>--- 8.3 ---</td>
<td>9.7* 8.3 6.7</td>
</tr>
<tr>
<td>M</td>
<td>--- 2.5 ---</td>
<td>1.6 2.8 2.2</td>
</tr>
<tr>
<td>How similar were you to the model?</td>
<td>--- --- 7.1</td>
<td>9.3** 6.7 5.4</td>
</tr>
<tr>
<td>M</td>
<td>--- --- 2.3</td>
<td>1.8 2.5 3.0</td>
</tr>
</tbody>
</table>

*p < .05; **p < .001.

Note. Answers measured on a Likert Scale from 1 (not at all) to 11 (extremely so).
A significant experimental condition main effect existed \(F(2,132) = 3.03, p < .05\) for the question, "How important were the practice trials to your performance trial?" Newman Keuls post hoc analysis revealed that subjects in the performance accomplishment (PA) condition \((M = 9.02)\) indicated they felt practice trials were significantly more important than subjects in the verbal persuasion (VP) condition \((M = 8.09)\). A significant condition main effect was also found for the question, "How often did you use the information the experimenter gave you after your practice trials during your performance trial?" \(F(2,132) = 5.03, p < .05\). Newman Keuls tests revealed that the PA group \((M = 8.91)\) and the VP group \((M = 8.82)\) felt they used the information significantly more than the modeling (VE) group \((M = 7.71)\). Results revealed significant condition main effects for questions regarding the use of experimenter information from practice trials during the competition trial \(F(2,132) = 5.05, p < .05\), with post hoc analysis revealing that PA subjects \((M = 8.47)\) and VP subjects \((M = 8.31)\) used information significantly more than VE subjects \((M = 7.124)\). These results were analogous for the question, "How much of your performance on the competition trial was due to the strategy you used?" \(F(2,132) = 3.55, p < .05\), with PA subjects \((M = 8.38)\) and VP subjects \((M = 8.29)\) reporting that significantly more of the
competition performance was due to strategy utilized than VE subjects \( (M = 7.20) \).

Significant PSE main effects were also found for several post-experimental questions. For example, results revealed a significant PSE main effect for the question, "How important were the practice trials to your performance trial?" \( F(2,132) = 3.27, p < .05 \). Post hoc Newman Keuls tests disclosed that high PSE subjects \( (M = 9.02) \) felt practice trials were more important than low PSE subjects \( (M = 7.87) \). Evaluation of the question, "How often did you use the information the experimenter gave you after your practice trials during your performance trial?" indicated a significant PSE main effect \( F(2,132) = 7.21, p < .001 \), with Newman Keuls tests revealing that high PSE subjects \( (M = 9.33) \) used information significantly more than low PSE subjects \( (M = 7.78) \) and moderate PSE subjects \( (M = 8.3) \).

Significant PSE main effects were also found for questions regarding use of experimenter information from the practice trial to the competition trial, \( F(2,132) = 4.56, p < .05 \), with post hoc analysis demonstrating that high PSE subjects \( (M = 8.73) \) used information significantly more than low PSE subjects \( (M = 7.56) \) and moderate PSE subjects \( (M = 7.73) \); amount of performance on the performance trial due to the strategy used, \( F(2,132) = 13.59, p < .001 \), with Newman Keuls tests indicating that high PSE subjects \( (M = 9.29) \) gave significantly more credit of their performance to the
strategy utilized than low PSE subjects (M = 7.09) and moderate PSE subjects (M = 7.71); and for the question, "How much of your performance on the competition trial was due to the strategy you used?" F(2,132) = 5.65, p < .05, with high PSE subjects (M = 8.84) crediting competition performance to strategy significantly more than low PSE subjects (M = 7.24) and moderate PSE subjects (M = 7.78). Finally, PSE main effects were found for the questions, "How often did you repeat positive statements to yourself?" F(2,42) = 6.79, p < .05, with the high PSE group (M = 9.73) repeating statements significantly more than the low PSE group (M = 6.73); and "How similar were you to the model?" F(2,42) = 9.37, p < .001, with high PSE subjects (M = 9.27) reporting significantly more similarity than low PSE subjects (M = 5.40) and moderate PSE subjects (M = 6.73). Overall, subjects in all conditions were generally adhering to the experimenter's guidelines with performance accomplishment subjects using information more positively than those in other conditions and with high preexisting self-efficacy subjects using information more positively than those with lower levels of efficacy.

A question was asked prior to and following experimental manipulation to ascertain any carryover value of expectation efficacy to outcome efficacy. This question, "If you were to compete against a college student of your same sex, how certain are you that you would win?" revealed
a significant PSE main effect $F(2,177) = 71.03$, $p < .001$, with Newman Keuls tests revealing that high PSE subjects ($M = 70.00$) more certain of winning than moderate ($M = 40.83$) and low ($M = 30.50$) PSE subjects.
CHAPTER REFERENCES


The present investigation was designed to determine if subjects with differing levels of preexisting self-efficacy for a task would perform differentially by using different methods to enhance their self-efficacy for that task. The methods used to manipulate subjects' self-efficacy were derived from sources in which efficacy expectations are secured (Bandura, 1977). It was hypothesized that high preexisting self-efficacy subjects (PSE) would produce significantly better performance scores than low PSE subjects on a muscular endurance task.

Efficacy and Performance

As expected, those subjects classified as high in initial self-efficacy (PSE) as well as those classified as high in self-efficacy after receiving experimental information (MSE) differed from those categorized into moderate and low self-efficacy initially and after the manipulation. For example, results indicated that subjects with high as compared to moderate and low self-efficacy (as measured both before and after receiving information specific to experimental condition) consistently extended
their legs over the cord for significantly longer periods of time. This finding supports previous research regarding self-efficacy and motor performance thus continuing the conviction that confidence is a powerful psychological variable related to performance (Barling & Abel, 1983; Feltz, 1982; Feltz & Doyle, 1981; Nelson & Furst, 1972; Ness & Patton, 1979; Weinberg, Gould, & Jackson, 1979; Weinberg, Gould, Yukelson, & Jackson, 1981; Weinberg, Yukelson, & Jackson, 1980). Results regarding levels of PSE and MSE indicated that subjects performed better on this novel leg-lift task when their efficacy was high (versus low or moderate) initially as well as when their efficacy became high after performing the task once.

In support of the efficacy-performance relationship, results of the post-experimental questionnaires revealed significant differences between self-efficacy groups. Specifically, subjects with high levels of preexisting self-efficacy answered a majority of questions significantly more positively than subjects with moderate and low levels of self-efficacy. For example, subjects with high preexisting self-efficacy (as compared to low and moderate self-efficacy) indicated that practice trials were important to performance trials; they used experimenter information for both performance and competition trials; their performance on both performance and competition trials was due to the strategy used; and they repeated positive statements more
often and felt more similarity to the model. In view of performance differences between these groups, these findings were not surprising. Subjects with high preexisting self-efficacy performed consistently better on the leg-lift task and reported using information gleaned from their practice trials and from the efficacy manipulation significantly more than other subjects. Thus, the post-experimental questionnaires provided corroborative data that help explain the differences between high, moderate, and low efficacy groups.

An additional question was asked prior to and following the experimental manipulation to assess the subject's perceived expectation of beating an opponent in competition. Bandura makes a distinction between efficacy and outcome expectations because "individuals can believe that a particular course of action will produce certain outcomes, but if they entertain serious doubts about whether they can perform the necessary activities such information does not influence their behavior" (Bandura, 1977, p.193). Thus, this question was included to discover if expectation efficacy had any bearing on outcome efficacy. Results revealed significant differences between groups with high-efficacy subjects also expressing higher certainty about beating an opponent than subjects in the low and moderate efficacy groups. These findings suggest carryover value in the relationship between efficacy and outcome expectations.
Specifically, subjects with high efficacy expectations concerning the leg-lift task also expected to beat their opponent significantly more often than moderate or low efficacy subjects.

Sources of Efficacy and Performance

Results did not reveal a significant main effect for experimental conditions despite the hypotheses that subjects in the performance accomplishments treatment group would exhibit a significantly better performance than subjects in other experimental groups, and that subjects in the three efficacy treatment groups would perform significantly better than subjects in the control group. These hypotheses were gleaned from the self-efficacy literature (Bandura, 1977; Bandura & Adams, 1977; Meichenbaum, 1977; Gould & Weiss, 1981; Girodo & Wood, 1979; Weinberg, Smith, Jackson, & Gould, 1984). That is, Bandura argues that the more dependable the source of efficacy information, the greater the change in self-efficacy and perseverance at a task (Bandura, 1977; Bandura & Adams, 1977; Bandura, Adams, & Beyer, 1977). Based on the literature, one would thus expect performance-based procedures (i.e. performance accomplishments condition) to positively influence self-efficacy and perseverance at a task significantly more than cognitive-based procedures (i.e. verbal persuasion and

The sport psychology literature, however, also advocates the use of verbal persuasion and modeling modalities to build confidence in one's ability to achieve success at a task (Bandura, 1982; Feltz & Doyle, 1981; Feltz, Landers, & Raeder, 1979; Girodo & Wood, 1979; Gould & Weiss, 1981; McAuley, 1985; Weinberg, Smith, Jackson, & Gould, 1984). So, although all performance scores should have increased after subjects received experimental information, the literature suggests that there should have been a main effect for experimental condition with performance accomplishment scores higher than verbal persuasion and vicarious experience scores.

The lack of a significant main effect for experimental conditions, however, was not surprising when considered in context of the self-efficacy findings. If, as proposed, self-efficacy mediates motor performance, one would expect performance differences among subjects in the three experimental groups only if self-efficacy increased differentially for subjects in these groups. Results indicated that the self-efficacy manipulation was successful in that subjects' efficacy after receiving information from experimental sources of efficacy expectations was significantly higher than self-efficacy before the manipulation for all groups. However, no differences were
found between groups with the exception of changes in the strength of efficacy for the verbal persuasion group.

**Experience with Task and Performance**

The question that still remains is why didn't information from the three sources of efficacy expectations differentially enhance self-efficacy? Perhaps due to the relative novelty of the exercise, a certain amount of experience with the task is necessary prior to experimental manipulation to get reliable efficacy estimates. Without any exposure to the leg-lift task, subjects had little idea about how well or poorly they could perform on this activity. Due to the experimental design, subjects did not receive any feedback as to the number of seconds they extended their leg on Trial 1 so as to not confound success with experimental condition. Thus, subjects may have had difficulty with initial and subsequent efficacy estimates due to the lack of performance feedback and limited experience with the leg-lift task. It has been noted that "discrepancies (between efficacy expectations and performance) will ... occur when tasks or circumstances are ambiguous or when one has little information on which to base efficacy expectations" (Feltz, 1988, p.427). Results from the present study indicated that Trials 2 and 3 were significantly better than Trial 1. The increase in
performance across trials may have been due to learning over time and having had exposure to this task.

Correlational analyses were conducted to investigate how self-efficacy and previous performance related to later performances. Results indicated that initial efficacy accounted for only about 18% of the variance of the first two trials, and as little as 11% of the variance of performance three. However, Trial 1 accounted for approximately 61% of the variance of Trial 2; and Trial 2 accounted for 74% of the variance of Trial 3. These results support the literature regarding expectations and capabilities in that previous performance is a better predictor of future self-efficacy than previous self-efficacy. Specifically, Bandura argues that "expectations alone will not produce desired performance if the component capabilities are lacking." (Bandura, 1977, p.192). In related studies, Feltz and others used a path analysis technique to investigate the influences of self-efficacy and previous experience on a motor performance task. Their findings indicated that self-efficacy was the major predictor of performance on Trial 1 of a high-avoidance back-dive; after this first trial, performance on a previous trial was the major predictor of performance on the next trial (Feltz, 1982; Feltz & Mugno, 1983). Furthermore, they found a reciprocal relationship between self-efficacy and performance over trials with "the strength of self-efficacy
as an effect of performance increas(ing) while its strength
as a causal influence decreas(ing)" (Feltz & Mugno, 1983,
p.276). Although these causal relationships were not
directly examined in the present investigation, the findings
of the present study support the strong predictive value of
prior performance on subsequent performance.

Although it was hypothesized that performance
accomplishments would be the most effective technique in
enhancing self-efficacy, the strength of this manipulation
may have been attenuated by the nature of the feedback.
That is, to these individuals, manipulation may not have
been as powerful as success against another individual.
Hearing that they scored in the 82nd percentile of normative
standards for this particular task may not have constituted
real and meaningful success; their bogus "success" cannot be
seen in the same manner one can interpret beating an
opponent or seeing a ball go in a basket as "real" success.
Thus, subjects in this experimental condition did not
increase their efficacy for the task significantly more than
subjects in the other conditions. As noted by Feltz (1988)
subjects' perceptions of their performance may diminish any
influence that a treatment variable may have on self-
efficacy due to the potency of personal experiences.

In the present study, subjects' reported that efficacy
for the task increased significantly from before to after
efficacy manipulation for all groups including the control
group. Why did individuals in the control group also increase their efficacy expectations? Again, the answer may exist in having exposure to this novel task. Being familiar with the task may have given subjects a better perception of what to do. Consider too that initial efficacy estimates may have been unreliable (as previously discussed). Again, having exposure and practice with the leg-lift task was important and may have been a type of performance accomplishment for all subjects. With this novel task, subjects' own experience at holding their legs extended over the cord allowed for more dependable estimates of subsequent performances than did any manipulated source of efficacy information. It appears that some experience with a novel task is necessary for all groups so that a measurement of initial efficacy, taken after this exposure, will be accurate. Thus, in terms of the present study, experience and familiarization with the task were potent determinants of subsequent performance.

**Future Directions**

The limitations concerning lack of experience with a novel task, limited performance feedback, and a somewhat compromised performance accomplishments condition, need to be addressed in future studies. For example, future research should include two sessions per subject: one to become familiar with the task and get an idea of one's own
performance standard by gaining experience and receiving performance feedback, and another to actually conduct the experiment.

Also, utilizing a confederate in order to create a controlled competition (Weinberg, et al, 1979, 1980, 1981) would enable subjects in a performance accomplishment condition to experience "real" success and have a performance standard which to relate self-efficacy information. In a study designed to measure changes in self-efficacy, it is necessary to actually manipulate efficacy. The present study only provided efficacy information and compared two measurements of existing efficacy rather than comparing preexisting and manipulated efficacy. With this type of design involving actual manipulations, perhaps effective comparisons can be measured between the use of information designed to enhance self-efficacy and ensuing efficacy and performance.

Conclusions
1. Preexisting self-efficacy was significantly related to performance with subjects measuring high in preexisting self-efficacy performing significantly better on the leg-lift task than subjects with moderate and low preexisting self-efficacy.
2. There were no significant efficacy differences among all conditions although all subjects significantly increased their level of efficacy from Trial 1 to Trial 2.

3. There were no significant performance differences among experimental groups which corresponds to the lack of efficacy differences among these groups.

4. Experience and familiarization with the task were potent determinants of subsequent performance and efficacy estimates for subsequent performance.
CHAPTER REFERENCES


APPENDIX A

EFFICACY QUESTIONNAIRE
EFFICACY QUESTIONNAIRE

1. Do you think you can hold your leg above the cord for 30 seconds?  Yes ____  No ____

2. How certain are you that you can hold your leg above the cord for 30 seconds?  (Circle one.)
   0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
   Not at all  Moderately  Extremely
   Certain       Certain       Certain

3. Do you think you can hold your leg above the cord for 1 minute?  Yes ____  No ____

4. How certain are you that you can hold your leg above the cord for 1 minute?  (Circle one.)
   0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
   Not at all  Moderately  Extremely
   Certain       Certain       Certain

5. Do you think you can hold your leg above the cord for 1 1/2 minutes?  Yes ____  No ____

6. How certain are you that you can hold your leg above the cord for 1 1/2 minutes?  (Circle one.)
   0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
   Not at all  Moderately  Extremely
   Certain       Certain       Certain

7. Do you think you can hold your leg above the cord for 2 minutes?  Yes ____  No ____

8. How certain are you that you can hold your leg above the cord for 2 minutes?  (Circle one.)
   0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
   Not at all  Moderately  Extremely
   Certain       Certain       Certain

9. Do you think you can hold your leg above the cord for 2 1/2 minutes?  Yes ____  No ____
10. How certain are you that you can hold your leg above the cord for 2 1/2 minutes? (Circle one.)

Not at all 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Moderately Certain

Extremely Certain

11. Do you think you can hold your leg above the cord for 3 minutes? Yes ___ No ___

12. How certain are you that you can hold your leg above the cord for 3 minutes? (Circle one.)

Not at all 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Moderately Certain

Extremely Certain

13. Do you think you can hold your leg above the cord for 3 1/2 minutes? Yes ___ No ___

14. How certain are you that you can hold your leg above the cord for 3 1/2 minutes? (Circle one.)

Not at all 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Moderately Certain

Extremely Certain

15. Do you think you can hold your leg above the cord for 4 minutes? Yes ___ No ___

16. How certain are you that you can hold your leg above the cord for 4 minutes? (Circle one.)

Not at all 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Moderately Certain

Extremely Certain

17. Do you think you can hold your leg above the cord for 4 1/2 minutes? Yes ___ No ___

18. How certain are you that you can hold your leg above the cord for 4 1/2 minutes? (Circle one.)

Not at all 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Moderately Certain

Extremely Certain
19. Do you think you can hold your leg above the cord for 5 minutes?  Yes ___  No ___

20. How certain are you that you can hold your leg above the cord for 5 minutes? (Circle one.)
   0%  10%  20%  30%  40%  50%  60%  70%  80%  90%  100%
   Not at all  Moderately  Extremely
   Certain    Certain    Certain

21. If you were to compete against a college student of your same sex, how certain are you that you would win? (Circle one.)
   0%  10%  20%  30%  40%  50%  60%  70%  80%  90%  100%
   Not at all  Moderately  Extremely
   Certain    Certain    Certain
POST-EXPERIMENTAL QUESTIONNAIRE

Performance Accomplishments Condition

1. How important were the practice trials to your performance trial? (Circle one.)
   
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   not at all | extremely so

2. How important were the practice trials to your competition trial? (Circle one.)
   
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3. How often did you use the information the experimenter gave you after your practice trials during your performance trial? (Circle one.)
   
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4. How often did you use the information the experimenter gave you after your practice trials during your competition trial? (Circle one.)
   
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   not at all | extremely so

5. How much of your performance on the performance trial was due to the strategy you used? (Circle one.)
   
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   none at all | extremely so

6. How much of your performance on the competition trial was due to the strategy you used? (Circle one.)
   
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   none at all | extremely so
### Vicarious Experience Condition

1. How similar were you to the model? (Circle one.)
   - 1  2  3  4  5  6  7  8  9  10  11
   - not at all

2. How important were the practice trials to your performance trial? (Circle one.)
   - 1  2  3  4  5  6  7  8  9  10  11
   - not at all

3. How important were the practice trials to your competition trial? (Circle one.)
   - 1  2  3  4  5  6  7  8  9  10  11
   - not at all

4. How often did you use the information the experimenter gave you after your practice trials during your performance trial? (Circle one.)
   - 1  2  3  4  5  6  7  8  9  10  11
   - not at all

5. How often did you use the information the experimenter gave you after your practice trials during your competition trial? (Circle one.)
   - 1  2  3  4  5  6  7  8  9  10  11
   - not at all

6. How much of your performance on the performance trial was due to the strategy you used? (Circle one.)
   - 1  2  3  4  5  6  7  8  9  10  11
   - none at all

7. How much of your performance on the competition trial was due to the strategy you used? (Circle one.)
   - 1  2  3  4  5  6  7  8  9  10  11
   - none at all
### Verbal Persuasion Condition

1. How often did you repeat positive statements to yourself? (Circle one.)
   
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BIBLIOGRAPHY


