STRESS AND SELF-EFFICACY : THE RELATIONSHIP OF EXPECTATIONS TO PERFORMANCE AND ANXIETY

by

David Patton

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A thesis submitted to the Faculty of Graduate Studies of the University of Manitoba in partial fulfillment of the requirements of the degree of

MASTER OF ARTS

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ABSTRACT

Recent conceptions (e.g. Mikhail, 1985) have suggested that stress may be elicited by perceived discrepancies between demands and capabilities, given the same incentive level. Within this conception there may be a role for self-efficacy as perceived capability. Bandura (1977) suggests that self-efficacy, defined as "the conviction that one can successfully execute the behaviors required to produce outcomes" (1977, p 193), may influence the initiation and persistence of coping. The present work examines the relationship between stress and performance at different levels of self-efficacy. Specifically, it evaluates whether self-efficacy can be integrated into a more comprehensive conception of stress. Ninety two male undergraduate psychology students completed standardized measures of physical self-efficacy, self-esteem, and anxiety. They were then asked to make self-efficacy ratings of their ability to hit a bull's-eye with a dart on successive trials. Half the subjects were offered the opportunity to win 10 dollars for a high performance level. The demand level of the task was manipulated by changing the distance from which subjects took their throws. Half the subjects began from the twelve foot distance (the descending condition), took their next

ten throws from the nine foot distance, and their last ten throws from the six foot distance. The other half, the ascending condition, began from the closer distance and finished from the furthest distance. The darts were thrown from three distances, six, nine and twelve feet. At the end of each set of ten trials the subjects completed a state-anxiety inventory, a short attribution questionnaire, and then predicted their performance on the next set of ten throws. At the end of three sessions of ten throws from each distance all subjects completed another form of the self-esteem scale, the state-anxiety questionnaire, and a post-experimental questionnaire. The hypotheses that self-efficacy would be inversely related to anxiety, and that anxiety would be higher in the high incentive condition were not upheld. The level of self-efficacy was positively correlated with performance, and was also more predictive of performance than either physical self-efficacy or self-esteem.

A second experiment was undertaken to evaluate the hypotheses in a more naturalistic setting. Two hundred and forty introductory psychology students completed the state subscale of the STAI and a self-efficacy questionnaire immediately before a quiz. The level of self-efficacy was positively related to both anxiety and performance, but the degree of accuracy of self-efficacy was not related to

anxiety. The importance of performing well on the test was positively correlated with both stress ($r = .44$) and anxiety ($r = .20$), and was also associated with how hard the students studied for the test ($r = .35$). Although the level of self-efficacy was positively correlated with the actual mark on the test, the mark itself was not correlated with how hard the students reported that they studied. The two experiments indicate that specific expectations about ability were predictive of performance in the two experiments, but other measures (i.e. self esteem and physical self-efficacy) were better predictors of anxiety.

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INTRODUCTION

The lack of a theoretical conception of stress has resulted in much confusion in the literature. Some authors have defined stress as a stimulus; that is, a discrete objective environmental event (e.g., Holmes and Rahe, 1967; Dohrenwend, 1978). Others have defined stress as a physiological (Selye, 1956) or psychological (Horowitz,1979) response to events. Accordingly, both Hinkle (1973) and Mason (1975) have suggested that the term "stress" be avoided. A valid stress conception may appear, however, with advances in theory and experimentation (Mikhail, 1985).

Selye's conception of stress is purely physiological. He defined stress as the non-specific response of the body to any demand. This definition was based on his observation of a non-specific response pattern to a variety of stressors in experimental animals. He called this response pattern the General Adaptation Syndrome.

The Psychological Approach to Stress

Lazarus and his associates (Folkman & Lazarus, 1980; Lazarus and Launier, 1978; Lazarus, DeLongis, Folkman, & Gruen, 1985) have suggested that no single variable can stand for stress. They state that,

> "stress is best regarded as a complex rubric consisting of many interrelated variables and processes rather than as a simple variable that can be readily measured and correlated with adaptational outcomes" (Lazarus et al., 1985, p 770).

This conception suggests that stress is a multidimensional process which is not readily quantified by simple unidimensional measurement techniques.

Lazarus' stress and coping paradigm suggests that cognitive appraisal mediates the relationship between potentially stressful situations and coping. Specific transactions with the environment can be appraised as either irrelevant, benign , or stressful. Stressful appraisals include harm or loss, threat, or challenge. If events are appraised as stressful, and coping is perceived as beyond available resources, psychological stress occurs. Because stress is a product of the person-environment transaction it cannot be objectively defined and separated from personality variables. Furthermore, since the person-environment relationship is recursive, the relationship between the person and the environment changes as the individual thinks

and acts, and the cognitive feedback from these thoughts and actions changes subsequent transactions.

Lazarus and Launier (1978) have also noted another way in which personality may affect the stress relationship. Various choices throughout the life cycle may be avoided because they are construed as threatening (i.e. beyond the coping resources of the individual). In this way stress can be minimized by avoiding potentially threatening situations.

Stress measurement is a formidable research problem. The scales of major life events (e.g. Holmes and Rahe's (1967) Schedule of Recent Events) have been suggested as a metric. However, the data relating life events to subsequent illness are neither as strong, nor as consistent as the hypothesis, 'life changes are stressful', would suggest. It has been shown that life event scales rarely account for more than 10% of the variance in indices of psychopathology (Rabkin and Streuning, 1976).

Self-efficacy

Bandura's (1977a) approach to personality has implications for a theory of stress. In noting the inability of existing theory to explain the behavioral change data, especially the effectiveness of participant modelling, Bandura suggested that psychological processes, when they

work, do so because they create and strengthen self-efficacy expectations. Self-efficacy is defined as "the conviction that one can successfully execute the behaviors required to produce outcomes" (Bandura, 1977b, p 193).

Efficacy expectations may be derived from four principle sources of information. Through performance accomplishments (personal mastery) expectations of efficacy are increased. The vicarious experience of seeing others perform without experiencing adverse consequences also increases efficacy expectations. Verbal persuasion can also be used to lead individuals into believing that they can successfully cope with previously overwhelming experiences. Finally, emotional arousal may also be a source of information that can affect perceived efficacy by feeding back visceral information during potentially stressful and taxing situations. According to Bandura (1977) performance accomplishments are especially influential, because they are based on personal mastery experiences. Verbal persuasion and vicarious experience are weaker methods of increasing efficacy, since they do not provide "an authentic experiental base" (p198).

The Development of Self-efficacy

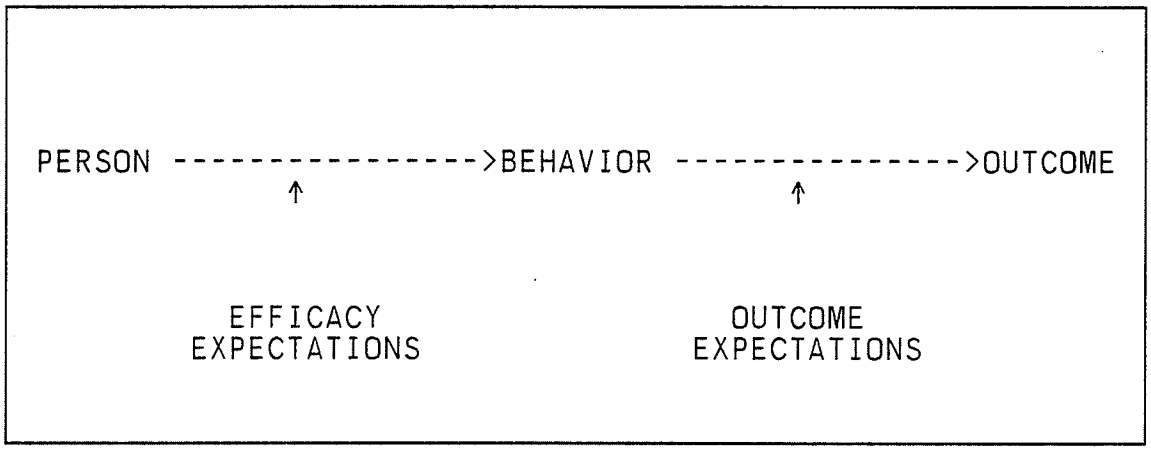
Bandura's cognitive social learning theory postulates that response patterns are learned and refined through self-corrective adjustments based on feedback following performance. That is, through self-observation, efficacy expectations develop, and are modified through perceived success or failure. Infants are sensitive to their environment, and quickly learn to control events and other's behavior. They also learn to attend to their own behavior, which is then used to form judgements about their ability to interact with the environment. A stable sense of self-efficacy develops as a child learns to discriminate and generalize self-knowledge of its interpersonal capabilities. The sense of self-efficacy is an important contributor to the attainment of success in adolescence and young adulthood. Without this stable sense,the transition to adulthood becomes difficult, and possibly maladaptive.

Efficacy expectations vary along three important dimensions. They differ in magnitude, generality, and strength. The magnitude of efficacy expectations refers to the number of tasks beyond a specified difficulty level which subjects believe they can successfully accomplish. Bandura, Reese and Adams (1978) measured the magnitude of efficacy expectations by asking snake-phobics to rate the degree of certainty with which they thought they could

perform a variety of tasks. The strength of expectations was determined in the same study by the confidence ratings assigned to each task. The generality of efficacy refers to the degree to which similar expectations are given for other situations. In general, this approach is more situationally-specific than a trait-oriented approach, in that expectations of performance on individual tasks are rated. It is through these "micro-analyses" that Bandura and his associates have been able to test the predictive validity of the self-efficacy construct.

An important aspect of self-efficacy theory is the distinction between efficacy expectations and outcome expectations. Outcome expectations are defined as the belief that a particular course of action will produce certain outcomes. Bandura's conception of efficacy and outcome expectations is represented in figure 1. Although this conception is controversial, that is, some authors suggest that it is impossible to separate outcome and efficacy expectations (e.g., Borkovec, 1978; Eastman and Marzillier, 1984; Kirsch, 1985), others have found that efficacy expectations account for a significant proportion of variance independent of that accounted for by outcome expectations (e.g., Godding and Glasgow, 1985; Devins, Binik, Gorman, Dattel, McCloskey, Oscar, & Briggs, 1982, Manning and Wright, 1983; Rollnick and Heather, 1982). The

Efficacy expectations mediate between the person and behavior and outcome expectations mediate between behavior and outcome. Efficacy and outcome expectations are differentiated because if self-efficacy is low outcome expectations will not influence behavior.


PERSON
BEHAVIOR
OUTCOME
EFFICACY EXPECTATIONS
OUTCOME EXPECTATIONS

concept of outcome expectancies refers more to the anticipated consequences of the behavior. In Bandura's scheme, the primacy of cognitive factors results in self-percepts of ability being seen as an over-riding influence, which determines which behaviors and tasks are attempted or avoided.

Literature has begun to appear concerning a self-efficacy conception of human behavior (e.g., Brown & Inouye, 1978; Devins et al., 1982; Lee, 1984; Manning and Wright, 1983; Nicki, Remington, & Macdonald, 1984). In Bandura's initial explorations into the use of the concept he was able to predict snake-phobic's response to therapy from self-reported efficacy ratings (Bandura and Adams, 1978). Consistent with the theory, higher levels of perceived self-efficacy were associated with greater performance accomplishments. Further, higher levels of self-efficacy were also associated with less experienced fear. As the strength of self-efficacy increased through participant modelling, fear arousal decreased. These findings have also been replicated on other types of phobias (Bandura et al., 1982). The data provide preliminary support for the hypothesis that perceived efficacy underlies aversion arousal, in addition to action. Data from other investigators, however, are necessary before any strong conclusions can be drawn about the validity of self-efficacy theory.

Efficacy investigations of chronically ill patients have also been undertaken to investigate various aspects of the theory. Ewart, Taylor, Reese, and DeBusk (1983) examined the relationship of efficacy expectations to exercise in myocardial infarction patients. They found that efficacy ratings of treadmill performance were related to a specific stressor (the treadmill task) and not to any other physical stressors such as intercourse or lifting (Ewart et al., 1983). Furthermore, efficacy expectations were modified by test performance, and these modified judgements were more accurate predictors of home activity than actual performance on the treadmill. In a study of end-stage renal disease patients Devins et al. (1982) found that efficacy and outcome measures were independently predictive of subsequent depression. In another study which examined the relative contribution of both efficacy expectations and outcome expectations in snake phobics, efficacy expectations were found to be more predictive of performance, and the combination did not account for any greater percentage of the variance than did efficacy expectations alone (Lee, 1982).

Efficacy expectations have also been used to predict academic performance and career selections. Although not specifically testing efficacy theory, Felson (1984) found that students with higher expectations of their ability

worked harder, which resulted in higher grades. Similarly, Schunk (1981) found that children who thought that they could solve more problems persisted longer, and achieved greater success than their less efficacious and less persistent counterparts. Lent, Brown, and Larkin (1984) assessed the relationship between self-efficacy beliefs and academic success among students entering science or engineering careers.They found that students with higher strength ratings of their ability achieved higher grades, and persisted longer in their major field. This research is consistent with previous research on ability perceptions and achievement (Hackett and Betz, 1981).

Efficacy ratings have also been used to predict athletic performance. For example, Lee (1982) found that ten-year old girls were able to accurately predict their score on a gymnastics routine before they performed it. Further, efficacy expectations were more accurate predictors of performance than either previous experience or motivation. In another study, high efficacy subjects, who thought they had a better chance of winning than low efficacy subjects, performed longer on a muscle-endurance task (Weinberg, Gould and Jackson, 1979). Moreover, high and low efficacy subjects did not differ in the degree of confidence in their ratings, that is, the strength of their expectations. Feltz, Landers and Raeder (1979) investigated the effects of

modelling on the learning of a high-avoidance springboard diving task. They found a significant correlation between self-efficacy and performance, and the participant modelling group, which experienced mastery, performed best at the end of the experiment.

In summary, it appears that there is predictive validity to the self-efficacy concept. Efficacy expectations have been shown to predict academic performance, athletic performance, phobic behavior and response to therapy, pain control (Manning and Wright, 1983), performance anxiety (Craske and Craig, 1984), quitting smoking (Nicki, Remington, and MacDonald, 1984, Godding and Glasgow, 1985), and abstinence from alcohol following treatment (Rollnick and Heather, 1982). A self-efficacy conception may also be applied to adjustment to stress. From the review of the literature it has been shown that higher levels of self-efficacy are associated with better performance on motor and academic tasks, and with reduced anxiety and behavioral avoidance. An efficacy model of stress, however, has not been specifically tested.

The Measurement of Self-efficacy

Bandura's studies of clinically phobic subjects have emphasized a "microanalytic" research strategy. Measurements of self-referent thought specific to the domain

being tested are taken close in time to the behavior under scrutiny. Subjects are generally presented with graduated self-efficacy scales which refer to tasks varying in difficulty, complexity and stressfulness on the domain of functioning being explored. Subjects are asked to designate tasks that they can do, and their degree of certainty about this judgement. For example, Bandura, Adams, Hardy and Howells (1980) asked snake-phobics whether they could perform a list of tasks involving approaching and handling snakes. All judgements were made privately, rather than publicly, in order to reduce any possible motivational effects of the assessment itself. The tasks had been previously ranked along a fear dimension, and the subjects checked off the ones that they thought that they could perform. The level of self-efficacy was the number of performance tasks which were not rated as "virtually impossible". Each subject was asked to rate the strength of self-efficacy. This was accomplished by a confidence rating which ranged from 10 (high uncertainty) to 100 (complete certitude). The strength score was computed by summing the magnitude scores across tasks, and dividing by the total number of performance tasks. The generality of self-efficacy was gauged by asking subjects to rate the level and strength of their expectations about coping with an unfamiliar snake (in addition to a snake similar to the one used in their treatment). In summary, the snake-phobics

in Bandura's studies were asked to rate whether they could perform a series of tasks of increasing difficulty (e.g. look at a snake, handle a snake etc.). For the tasks that they did think that they could do, they were asked to rate their confidence in their predictions. Finally, they were asked to rate their ability to handle a snake which was slightly different than the one used in the training program.

Lee (1984) also evaluated efficacy expectations in predicting performance on a snake-handling task. The efficacy scales she used were based on those used by Bandura and his colleagues. Eighteen items were arranged hierarchically. For each item, subjects were asked if they could perform the task (efficacy level) and, if yes, they were asked to give their confidence rating, from 0 to 100 (efficacy strength). In the data analysis efficacy strength was dichotomized at the scale centre for each item. Kirsch (1982) has also tested snake-phobics on a behavioral avoidance task, and measured skill-task efficacy. Again subjects were asked to check off whether they could do various tasks, and for each item checked they were asked to indicate their confidence on a scale ranging from 10 to 100.

Studies of other clinical populations have also measured efficacy expectations. Manning and Wright (1983) examined the role of efficacy expectations and outcome expectations

on pain control during childbirth. Self-efficacy expectations for each five-hour interval during labor were assessed by responses to a dichotomous statement (yes/no) about anticipated ability to control pain without medications. The strength of each response was assessed using a six-point Likert-type scale, ranging from 1 (complete uncertainty) to 6 (complete certainty). certainty). Although a dichotomous scale does not provide a continuous measure of self-efficacy, idiosyncratic scores were computed based on each subject's expected level of pain control during each segment of labor. That is, a summed score of expectation level, based on the strength ratings for "yes" responses, was used to indicate each subject's level of self-efficacy.

Efficacy expectations have also been used to predict smoking cessation. Nicki et al. (1984) compared the effects of different methods of quitting smoking. They developed a self-efficacy questionnaire based on a series of 25 situations in which subjects were asked to rate "the degree of certainty that you could avoid smoking in". The ratings for each statement ranged from (1) completely unsure to (7) completely sure. Each subject's mean self-efficacy score was computed by summing the ratings and dividing by the number of situations. In Bandura's terms, only the strength of self-efficacy was assessed in this study. Godding and

Glasgow (1985) evaluated efficacy and outcome expectations in predicting smoking cessation. Efficacy and outcome expectancies were measured in this study by constructing separate hierarchies for each of three dimensions of smoking behavior. Subjects indicated their level of efficacy by stating whether or not they could perform specified behaviors (e.g., smoking less than 15 cigarettes per day). Efficacy strength was obtained from confidence ratings of each item answered affirmatively. Outcome expectancies were assessed by including both positive and negative consequences resulting from successful completion of the controlled smoking program. A summary score of outcome expectancy was derived by subtracting negative item ratings from positive ratings. This score did not correlate with subsequent smoking behavior, and did not increase the predictability when added to the efficacy ratings.

Athletic performance has also been predicted from efficacy ratings. Lee (1982) measured efficacy by asking female gymnasts to estimate their score on five apparatus, in an upcoming competition. In this study there were no confidence ratings. The level of efficacy was obtained by summing the score for the five competitions. The results indicate that expectations are more accurate predictors of competition than previous performance levels. In an investigation of the effects of different procedures on the

learning of a springboard-diving task, Feltz et al. (1979) measured self-efficacy by asking inexperienced divers to rate eight diving-related items on a 100-point scale of certainty. Like Bandura (1977a), the items were presented in order of increasing difficulty. Not only did participant modeling produce more successful dives, it also increased expectations of personal efficacy more than did live or video-taped modeling. Weinberg, Gould, and Jackson (1979) manipulated self-efficacy by having subjects compete on a muscle endurance task against either a varsity track team member, or someone recuperating from a knee injury. Subjects were asked to rate their chance of winning, and their confidence in their ratings. Again, efficacy ratings were strongly predictive of performance.

In summary, the majority of studies have attempted to follow Bandura's method of defining the level and strength of self-efficacy. Subjects are generally asked to rate their ability to perform a hierarchy of tasks which vary in difficulty. The hierarchy is usually presented in order, with the easier tasks or behavior rated first. Efficacy level is determined by the point at which responses change from "yes", indicating that the behavior in question can be performed, to "no", that behavior cannot be performed by the subject, in their estimation. In addition, confidence ratings of responses are also obtained. The strength of

efficacy is usually quantified by averaging the ratings for behaviors which the subjects have endorsed with the "yes" alternative. Few studies have specifically attempted to examine the generality of efficacy ratings. It is difficult to hypothesize the extent to which efficacy ratings should generalize, since according to Bandura efficacy ratings are situation-specific. A high degree of generality might, therefore, suggest that something more general, such as a personality trait, is being assessed.

Stress and Self-efficacy

The problems with the definition of stress have already been detailed. Simple counts of life events, even when subjectively weighted, do not appear to be highly correlated with subsequent illness. Lazarus' transactional model, however, suggests that stress is more likely to occur when the demands of the environment threaten to exceed the perceived coping capabilities of the individual. McGrath (1976) has also developed a working definition of stress which suggests that there is a greater potential for stressful responding when demands are perceived as exceeding capabilities, and coping is important to the individual. This proposition, therefore, includes an importance or incentive factor as a potentially important mediating variable. Stress may also be elicited by an actual or

perceived disparity between environmental demands and the organism's ability to cope with these demands (Stokols, 1979; Sells, 1972). A definition of this sort is useful because it refers to stress as a discrepancy between demands and capabilities. That is, if coping with the demand/capability imbalance is not important to the individual, there is a reduced potential for stressful responding.

A model of occupational stress has been postulated which has implications for the present discussion. French, Rogers and Cobb (1974) have offered a conception of adjustment as "the goodness of fit between characteristics of the person and properties of his environment" (p 316). French et al. also distinguish between subjective and objective environment, implying, therefore, at least two conceptions of adjustment: the degree of <u>objective</u> fit between the objective person and the objective environment, and the degree of <u>subjective</u> fit between the subjective person and the subjective environment. Subjective fit is determined by self-report. French et al. quantified the person-environment (P-E) fit in terms of discrepancies between demands (both environmental and from within the individual), and supplies (again, from both the environment and from within the individual). Demands and supplies are <u>not</u> conceptualized as independent of one another, and are, in fact, only important in relation to one another.

The basic assumption of the French et al model is that a negative value of subjective fit indicates a lack of adjustment and will be associated with psychological strain. That is : Subjective P-E fit = Fs = Es -Ps, where :

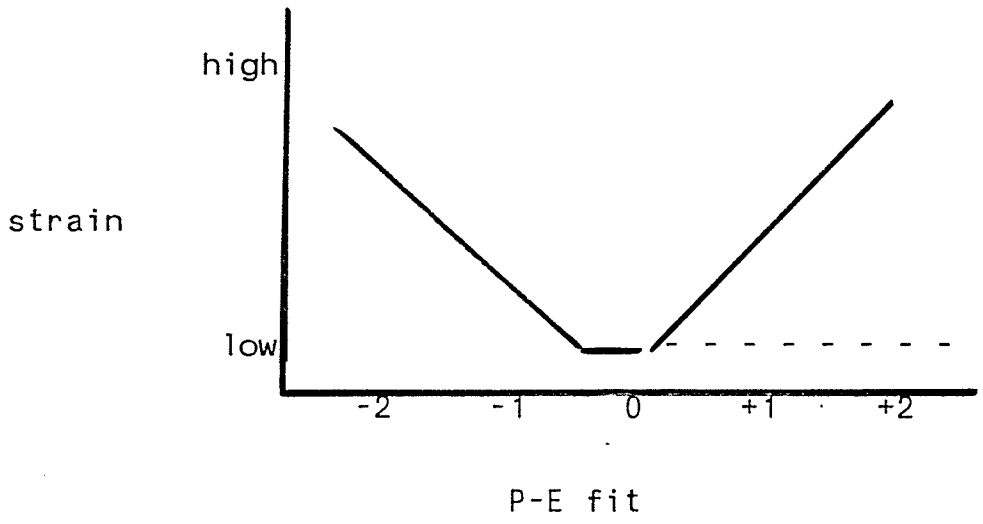
Es = the subjectively reported amount of supply from the environment available to this person, and

Ps = the subjectively reported amount of supply necessary to satisfy the person's subjective needs.

(From French et al., p 318)

However, hypotheses about the effects of excesses of supplies are not exactly clarified by French et al. (1974) At one point the relationship between P-E fit is suggested to be U-shaped (i.e. only where there is perfect fit will there be a lack of strain, and at other points the hypothesized relationship is as shown on figure 2. Although this model has not been extensively tested, it offers an operational definition of stress which is compatible with a self-efficacy conception. From a self-efficacy point of view, situations in which subjects rate themselves as highly efficacious should not be perceived as stressful. These are situations in which the subjective P-E fit is 0 or positive, therefore, there should not be an increased probability of behavioral or emotional responding (i.e. decrements in performance and increased anxiety), at high levels of self-efficacy.

Psychological strain is lowest where there is a high degree of fit between the perceived capability of the individual and the perceived demands of the environment.



Perfect fit = 0, and deficiencies are indicated by negative values.

Self-efficacy theory offers two important insights into an understanding of stress. Like Lazarus' stress and coping conception, self-efficacy suggests that individuals will avoid and fear situations in which they do not see themselves as able to execute the required behavior to successfully cope. Avoidance coping is not only associated with maladaptive responses to life events (Holahan and Moos, 1985), but may also be a maladaptive response alternative, for example, in achievement situations. Efficacy expectations are also hypothesized to influence the initiation and persistence of coping efforts. Stressful transactions in which individuals perceive themselves as efficacious are far less fear-inducing, and also promote greater persistence. According to Bandura (1978), it is "perceived inefficacy in coping with potentially aversive events that makes them fearsome" (p 255). The aversiveness of the environment is reduced when accurate perceptions of ability result in feelings of mastery and competence following successful experiences. When efficacy expectations inaccurately exceed ability, failure and psychological stress may occur. As a result, the situation may be avoided in the future, or, if it is inescapable, it may become aversive.

An Integrative Conception of Stress

The essence of the psychological models is that there are factors in both the individual and the environment which may relate to stress. The perception of the demands of the environment as threatening and the perception of the ability to cope with these threats are the basis of Lazarus' formulation of stress and coping. The views of Sells (1970), McGrath (1976) and French et al. (1974) are more or less derivatives of the physical stress model. In this model stress is conceptualized as the ratio of force over the area to which the force is applied. The equation S = F/A expresses the relationship among these variables mathematically. The psychological transformation of this equation (Mikhail, 1987) is a quantitative formulation of stress :

$S = D/C \times I$, where S = stress level
D = demand level of the task
C = capability of the individual to adjust to the demand
I = the importance of the demand to the well-being of the individual.

Stressful determinants in this transformation are based on an integrative stress conception proposed by Mikhail (1986). The importance factor indicates that the demand-capability

imbalance is stressful only if the demand is important to the well-being of the individual.

In Mikhail's conception the demand level can be experimentally manipulated by making a given task more difficult. The capability to adjust to this demand is similar to Bandura's notion of self-efficacy. By integrating the concept of self-efficacy into the stress equation S = D/C x I it is suggested that higher levels of self-efficacy will be associated with lower levels of stress. This integration also suggests that stress is minimal when there is a balance between demand and capabilities. The level of stress when demands are equal to capabilities will be primarily determined by the importance factor. However, hypotheses generated by the theory have yet to be empirically tested. This is one of the objectives of the present study.

EXPERIMENT 1

Since one of the cornerstones of cognitive social learning theory is that the potential aversiveness of the environment is reduced by cognitions of mastery, we should expect to find an inverse relationship between subjectively reported anxiety and self-efficacy. Although this anticipated relationship follows directly from the theory it has not been experimentally investigated within a stress and coping paradigm. The first hypothesis, therefore, suggests that self-efficacy will be negatively related to anxiety.

Bandura (1977a) has also suggested that self-efficacy is positively related to the degree of effort put into coping activities. That is, if individuals perceive themselves as efficacious in a given situation, then they will expend effort to succeed in that situation. Self-efficacy, therefore, generally results in increased performance attainments. The second hypothesis suggests that the level of self-efficacy will be positively related to performance, and the amount of effort expended.

The theories of stress reviewed in the introduction suggest that it may be useful to evaluate the effect of increasing task demand level on subsequent stress. If the

manipulation is effective, self-reported anxiety will be higher in an incentive condition than in a no-incentive condition. If this is the case it will also be possible to evaluate the quantification of stress suggested by Mikhail (1986).

With regard to the evaluation of self-efficacy theory, Bandura has repeatedly suggested that specific expectations about performance, taken immediately prior to the task in question, are the best predictors of behavior. The implication of this suggestion is that self-efficacy is not a generalized concept, and does not reflect a trait. Efficacy expectations, according to this conception, should be a better predictor of performance than either physical self-efficacy or self-esteem. The fourth hypothesis suggests that efficacy expectations will account for a greater proportion of the variance in performance than these other factors.

The fifth hypothesis suggests that subjects who over-estimate their own abilities, and therefore experience failure, will have lower self-esteem and higher anxiety at the end of the experiment. This hypothesis is consistent with Bandura (1977a), who has suggested that accurate appraisals of ability have "considerable functional value" (p 123) in the development of a stable sense of self.

Method

Subjects. The subjects were 92 male introductory psychology students who received partial course credit for their participation.

Self-report measures. The Texas Social Behavior Inventory (TSBI; Helmreich and Stapp, 1974) is a measure of self-esteem. Two forms are available, and are highly correlated (r=.89). Each form consists of 16 items which are responded to on a five-point scale, ranging from 0 (not at all characteristic of me) to 4 (very characteristic of me). Reversed scoring for negatively worded items results in high scores indicating high self-esteem (maximum score 64) and low scores indicating low self-esteem (minimum score 0). A comparison of these two short forms with the long form of the TSBI (Helmreich, Stapp, and Ervin, 1974) indicates that they are highly correlated (above .97). Although reliability and validity data are not available, the short forms of the TSBI have been widely used in research on self-esteem (McFarlin, Baumeister, and Blascovich, 1984). The TSBI focuses on the social aspects of self-esteem, and recent data suggest that this is the most important component of self-esteem among college students (e.g. McFarlin et al., 1984). The short forms of the TSBI appear to be especially useful for examining anticipated changes in self-esteem, and in situations where more than short assessment is required.

The State-trait Anxiety Inventory (STAI; Spielberger, Gorsuch and Lushene, 1970) is designed to measure state anxiety (A-state) and trait anxiety (A-trait). The A-trait instructions asK subjects to rate how they generally feel, whereas the A-state instructions emphasize rating how the subject feels at the moment. Both scales consist of 20 statements which are rated on a four-point scale. The categories for the A-trait scale are ; 1) almost never, 2) sometimes, 3) often, and 4) almost always. The A-trait scale is balanced for acquiescence, that is, 10 of the 20 items are reversed for scoring. The A-state categories are ; 1) not at all, 2)somewhat 3) moderately so, and 4) very much so. Thirteen items are scored directly, and seven are reversed. The total scores for each scale range from 20, indicating low anxiety, to 80, which indicates very high anxiety. Both scales have been shown to be valid and reliable measures of their respective constructs. The A-trait scale is valid for screening for anxiety-proneness, and the A-state scale has been shown to be a sensitive indicator of transient anxiety. Alpha reliabilities for college students are all above .80, and both scales have a high degree of internal consistency.

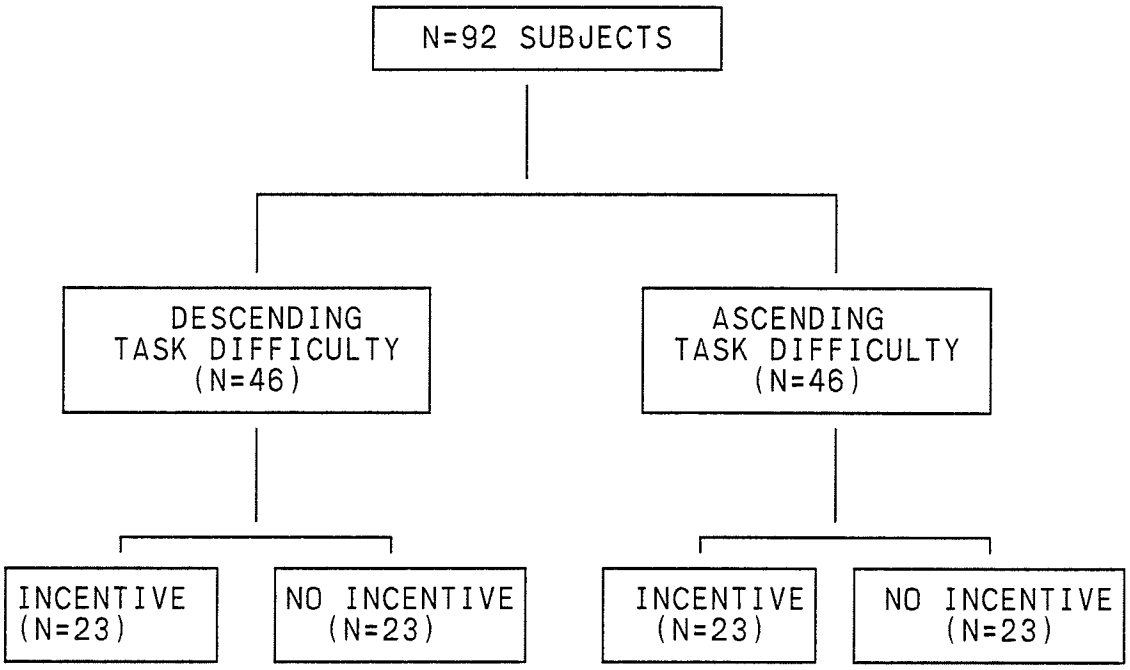
The Physical Self-Efficacy Scale (PSE) was developed to measure the physical self-concept. Ryckman et al. (1982) identified a meaningful cluster of 22 items which were free

from social desirability contamination. Two factors were identified from this cluster, a ten-item Perceived Physical Ability scale (PPA), and a twelve-item Physical Self Presentation Confidence scale (PSPC). Each item is responded to on a six-point scale ranging from 1) strongly agree, to 6) strongly disagree. Possible scores range from 10 to 60 for PPA, and from 12 to 72 for PSPC, with higher scores representing greater perceived ability and confidence. A series of studies reported in Ryckman et al. indicate that the test is stable. Test re-test reliabilities for the PPA subscale were .85, .89 for the PSPC subscale and .80 for the composite PSE scale. Internal consistencies, assessed via coefficient alpha, were also satisfactory, .85 for PPA, .75 for PSPC, and .82 for PSE. In addition, Ryckman et al. evaluated the convergent and predictive validity of the PSE. The total PSE score correlates with the Tennessee Physical Self-concept subscale (Fitts, 1968) (r=.58), and the TSBI self-esteem score (r=.41). In terms of predictive validity, subjects with higher PSE scores had faster reaction times (r=-.40) and performed better on a motor coordination task (r=.40) , than subjects with low PSE scores. The use of the PSE in the present study is to assess whether a more general sense of physical self-efficacy is related to performance and mood changes, and, if so, is it a stronger predictor than specific expectations about performance?

Design

The overall design is a 2 (order of difficulty) X 2 (incentive level of the task) factorial, with 23 subjects per cell, displayed in Figure 3. The outcome, or dependent, variables are stress, performance and state anxiety ratings. The predictor, or independent variables, are physical self-efficacy, specific self-efficacy, self-esteem, order of difficulty, task incentive. Half the subjects began with the easiest level of difficulty, and proceeded to the more difficult levels, whereas the other half performed the experimental tasks in the reverse order. These conditions are refered to as ascending and descending conditions, respectively. The potential importance of doing well on the task was manipulated by offering subjects $10 if they were able to perform above a certain criterion level (more than 25 throws inside the bull's-eye). This bull's-eye area was clearly marked on the dartboard by a black circle which was seven and a half inches in diameter, in the centre of the board. It was emphasized to the subjects that this was the area which was refered to in the prediction questionnaire as "the bulls-eye". The centre of the dart-board was 5 feet 6 inches from the floor.

Diagrammatic representation of the experimental design.


N=92 SUBJECTS
DESCENDING TASK DIFFICULTY (N=46)
ASCENDING TASK DIFFICULTY (N=46)
INCENTIVE (N=23)
NO INCENTIVE (N=23)
INCENTIVE (N=23)
NO INCENTIVE (N=23)

Procedure

Upon entering the testing room, each subject was informed that they would be asked to complete some short questionnaires, and to throw some darts and make predictions about their performance. They were also told that they were free to withdraw without losing credit. No subjects declined to participate. 92 subjects completed the Physical Self-efficacy Scale (PSE), the Texas Social Behavior Inventory (Form A), (TSBI-A) and the Trait subscale of the State-Trait Anxiety Inventory (STAI-T). Total time to complete these inventories was approximately 15 minutes.

The next phase of the study was then described to the subjects. They were shown the dart board and informed that they would be asked to throw 30 darts, 10 from each of the three distances marked on the floor. The subjects were also told that these distances were 6, 9 and 12 feet. Subjects assigned to the ascending condition were told that their first 10 throws would be taken from the nearest, that is, the six-foot line, whereas subjects assigned to the descending condition were told that their first ten throws would be taken from the furthest line, twelve feet away. The distances were marked in masking tape on the floor. After the explanation of the procedure the subjects were asked if they understood the instructions, and what was expected of them.

All subjects were next asked to complete the prediction questionnaire (Appendix A) which was developed to measure both the level and strength of self-efficacy. This questionnaire was based on the method of assessment of self-efficacy described by Bandura and others (Bandura, Reese and Adams, 1978; Bandura et al, 1980; Kirsch, 1982; Lee, 1984). Subjects were asked to predict exactly how many bulls-eyes they thought that they can hit from each of the three distances. The first item asks if they think they can hit <u>one</u> bulls-eye from the distance, and to assign a confidence rating to this prediction, ranging from 1 (not very confident) to 10 (very confident). The second item asks if they think they can hit <u>two</u> bulls-eyes, and so on, until all of the possibilities have been exhausted. The point at which responses change from "yes" (the subject thinks he can hit that number of bull's-eyes) to "no" (the subjects doesn't think he can hit that number of bull's-eyes), is what Bandura has called the <u>level</u> of self-efficacy. In order to be consistent with Bandura's definition, the point at which subjects responded "yes", but rated that they were "not very confident" about this prediction, was also considered the level of self-efficacy. The <u>strength</u> of efficacy expectations is determined by the average confidence rating assigned to each "yes" response. These operational definitions are consistent with the bulk of the self-efficacy literature. There was no attempt to

determine the generality of efficacy expectations in the present study.

After completing the efficacy questionnaire, the subjects were handed three darts, and shown the line from which they were to begin. The experimenter stood off to the side, and faced the dart-board. After the three darts had been thrown the experimenter removed the darts from the board, and repeated aloud the total number of bull's-eyes recorded from that distance. After all ten darts had been thrown, the experimenter repeated the total number of bull's-eyes from that distance. Subjects were then asked to complete the State Anxiety subscale of the State-Trait Anxiety Inventory (STAI-S) and a short attribution questionnaire. The attribution questionnaire (Appendix B) was designed to assess the extent to which effort, the difficulty of the task, the subject's perceived ability level, and luck, were considered as factors in the subjects performance from that distance. According to Bandura (1977a), higher levels of self-efficacy should be associated with increased effort. Low levels of self-efficacy should be more attributed to external factors such as the difficulty of the task and luck.

This procedure was repeated for the following two distances, 9 and 12 feet in the ascending condition, and 9 and 6 feet in the descending condition. When the last dart

had been thrown the subjects in the high incentive condition were informed whether or not they had won the $10. The subjects were then asked to complete the STAI-S and the attribution questionnaire, Form B of the Texas Social Behavior Inventory (TSBI-B), and a short post-experimental questionnaire. This post-experimental questionnaire was designed to assess reactions to the procedure, to evaluate the effect of the manipulations, and to check whether the subjects understood and were aware of the purpose of the study. It may be argued that some subjects might find the procedure frustrating, and give up (and therefore not report anxiety since they didn't care). For this reason, an item asking subjects if they found the procedure so difficult that they gave up was included. Last, an item about the amount of tension experienced during the procedure was included as a check on the incentive manipulation. After the questionnaires had been returned to the experimenter the subjects were given their experimental credit and debriefed.

Results and Discussion

Incentive Effects

The third hypothesis suggested that state anxiety should be higher in the incentive condition than in the no-incentive condition. This hypothesis was evaluated with analysis of of variance (ANOVA). Table 1 displays the data

TABLE 1

COMPARISON OF STATE ANXIETY LEVEL ACROSS INCENTIVE FOR EACH ORDER AND DISTANCE.

	DISTANCE		
	6 ft	9 ft	12 ft
Ascending Condition			
Incentive	42.57 (7.3)	43.22 (8.7)	40.70 (10.6)
No Incentive	38.00 (10.6)	39.35 (10.7)	38.91 (9.7)
Descending Condition			
Incentive	36.00 (9.2)	36.3 (6.7)	40.17 (11.3)
No Incentive	35.04 (7.3)	39.39 (8.8)	40.57 (8.8)

NOTE: The higher the score, the greater the state anxiety

which indicate that the incentive did not result in changes on state anxiety. There is no difference in state anxiety as a function of incentive, in either ascending or descending condition, or from any of the three distances.

A stress index was calculated for each session, based on Mikhail's formula, S = D/C x I, since the third hypothesis also suggested that stress will be higher in the incentive condition. D, the demand level, was operationally defined as the length of the throw (six, nine, or twelve feet), C, the perceived capability, was defined as the level of self-efficacy, and I, the importance of the task to the subject, was rated on a seven-point scale before each set of throws. The overall mean stress score for the incentive condition ($X = 8.88$, $sd = 4.4$) did not differ from the overall mean for the no incentive condition ($X = 7.99$, $sd = 4.4$) ($F(1,90) = 0.93$, n.s.). An examination of the mean stress score for each incentive and order condition over the three distances (Table 2) also indicates that the incentive did not result in increases in stress. In the ascending condition there was no difference in incentive from six feet ($F(1,90) = 1.14$, n.s.), nine feet ($F(1,90) = 0.01$, n.s.) or twelve feet ($F(1,90) = 0.00$, n.s.). Similarly, in the descending condition, there is no difference between incentive conditions on stress from six feet ($F(1,90) = 1.52$, n.s), from nine feet ($F(1,90) = 0.00$, n.s.), and from twelve feet ($F(1,90) = 2.93$, n.s.).

TABLE 2

MEAN AND STANDARD DEVIATION OF STRESS SCORES (S=D/C x I) FOR EACH INCENTIVE AND ORDER CONDITION, FROM THE THREE DISTANCES.

	DISTANCE		
	6 feet	9 feet	12 feet
Ascending Condition			
Incentive	4.78 (4.1)	7.59 (4.3)	13.68 (7.8)
No Incentive	6.30 (5.5)	7.42 (5.2)	13.83 (6.9)
Descending Condition			
Incentive	4.69 (3.3)	7.26 (4.4)	9.95 (5.7)
No Incentive	3.75 (1.5)	7.34 (3.0)	14.63 (11.8)

NOTE: Higher scores indicate greater stress.

On the post experimental questionnaire the incentive subjects did not report more tension ($\bar{X}$ = 2.22, sd = 1.09) than subjects in the no incentive condition ($\bar{X}$ = 2.12, sd = 1.09), $F(1,90) = 0.17$, n.s.. Furthermore, subjects in the incentive condition did not report that they were more motivated to try harder than subjects in the no incentive condition 2.7 (sd = 0.95) vs 2.98 (sd = 0.91), ($F(1,88) = 2.05$, n.s.). Taken together these results suggest that the incentive did not produce greater stress, tension, and anxiety, and did not motivate the subjects to try harder to perform well. As a result of the lack of incentive effect subsequent analyses are collapsed across incentive.

Ascending and Descending Order Effects

Order and self-efficacy.

Table 3 shows that before the first session the mean level of self-efficacy of subjects in the ascending condition, throwing from six feet, was 6.78 (sd = 2.70), whereas subjects in the descending condition, throwing from twelve feet, had a mean level of self-efficacy of 5.33 (sd = 2.88). Analysis of variance (ANOVA) indicated that this difference was statistically significant ($F(1,90) = 7.81$, $p < .01$). There was no difference between ascending and descending conditions on the level of self-efficacy before the second session, where both groups were throwing from

TABLE 3

MEAN LEVEL AND STANDARD DEVIATION OF SELF-EFFICACY FROM EACH DISTANCE.

	DISTANCE		
	6 ft	9 ft	12 ft
Ascending Condition			
	6.78 (2.7)	6.43 (2.3)	5.02 (2.2)
Descending Condition			
	7.35 (2.9)	6.00 (2.0)	5.33 (2.0)

NOTE: Higher scores indicate higher levels of self-efficacy.

nine feet. The mean level of self-efficacy was 6.43 (sd = 2.32) and 6.00 (sd = 2.04), respectively, ($F(1,90) = 0.91$, n.s.). Comparison of ascending and descending conditions on the third session is not valid because the ratings of self-efficacy from the different distances are also confounded with the effects of prior experience. That is, subjects in the descending condition scored fewer bulls'-eyes than subjects in the ascending condition, therefore differences in self-efficacy at this session could be a result of these performance differences, or they could be the result of differences in self-efficacy created by the different distances. With this design these two effects cannot be evaluated independently at the third session.

Paired t-tests were used to compare changes in self-efficacy over the course of the experiment, within each order condition. In the ascending condition there was no difference in self-efficacy from six feet to nine feet ($t(45) = 1.00$, n.s.). However, self-efficacy from the twelve foot distance was lower than both the six foot distance ($t(45) = 4.23$, $p < .001$) and the nine foot distance ($t(45) = 4.58$, $p < .001$). In the descending condition the level of self-efficacy from the twelve foot distance was higher than the level of self-efficacy from both the six foot ($t(45) = 6.39$, $P < .001$) and the nine foot distance ($t(45) = 2.5$, $p < .02$). Self-efficacy from the six foot

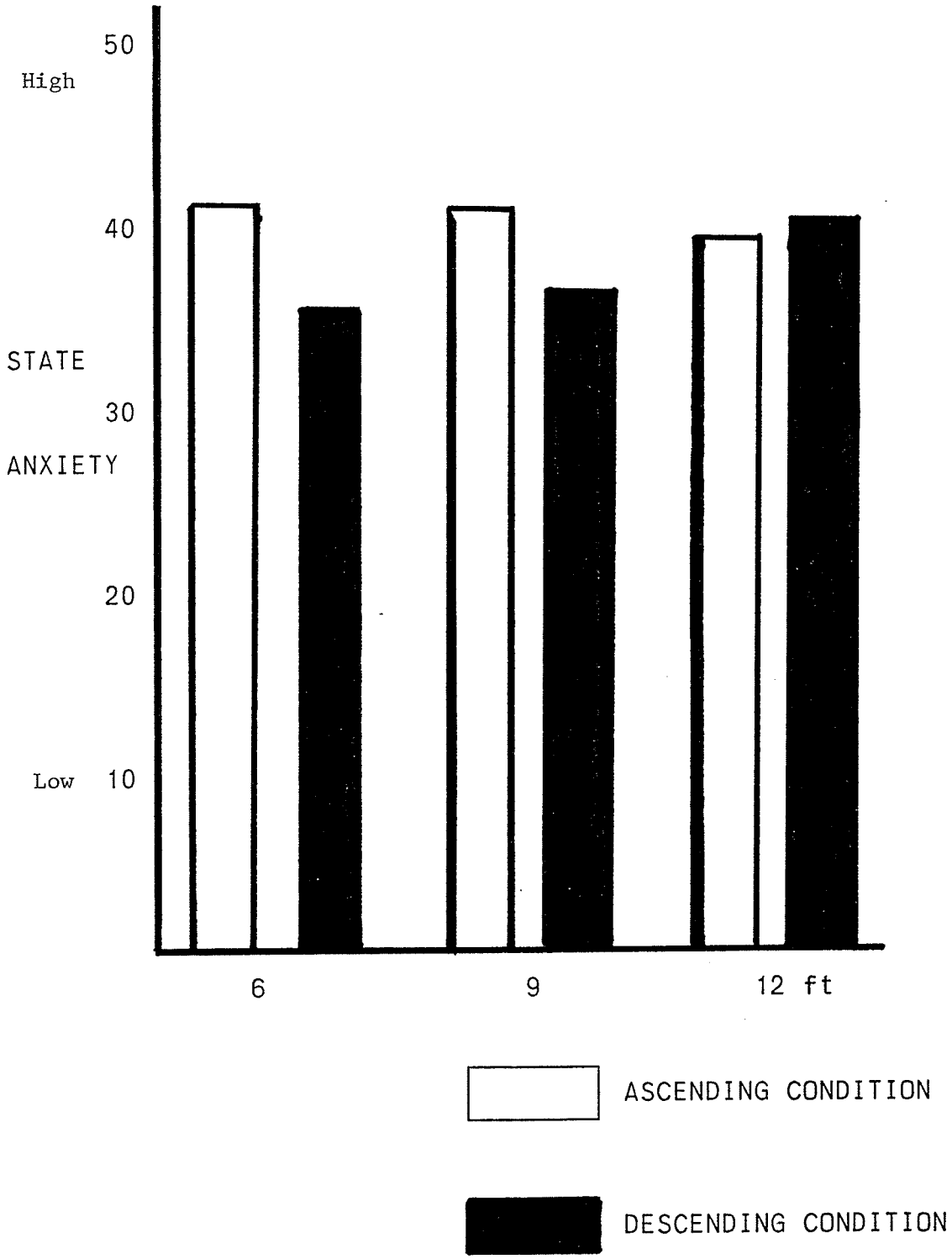
distance is higher than from the nine foot distance ($t(45) = 6.12$, $p < .001$). These data suggest that by changing the demands of the task, in this case by decreasing the distance from which subjects took their throws, self-efficacy is increased. This was anticipated, since the objectively closer distance should result in higher expectations of ability.

The strength of self-efficacy was also associated with the order in which subjects took their throws. The mean strength of self-efficacy over the three sessions was 41.65 (15.4) in the ascending condition, and 49.1 (17.8) in the descending condition. Subjects who began from the furthest distance were more confident, overall, in their ratings of self-efficacy ($F(1,90) = 4.58$, $p < .05$).

Order effects and state anxiety.

The effect of task difficulty and order on state anxiety was examined next (Figure 4). Within each order condition comparisons were made across sessions on state anxiety. In the ascending condition there were no differences. The first and second anxiety scores were not different, ($t(45) = 0.87$, n.s.), nor were the second and third ($t(45) = 1.36$, n.s.), or the first and third anxiety scores different ($t(45) = 0.31$, n.s.) from one another. In the descending condition, however, all three groups were different from one

The mean state anxiety for each order condition from each of the three distances. In the ascending condition anxiety was not affected by increasing task demands from six feet to twelve feet. In the descending condition the first anxiety score is higher than the second, and both are higher than the third. As the distance increased anxiety also increased.


50
High
40
STATE
30
ANXIETY
20
Low 10
6
9
12 ft
ASCENDING CONDITION
DESCENDING CONDITION

another. The first anxiety score (before subjects had thrown from the twelve foot distance) was higher than the second ($t(45) = 2.25$, $p < .05$) and higher than the third anxiety score ($t(45) = 5.14$, $p < .001$). The second anxiety score was higher than the third ($t(45) = 2.88$, $p < .01$). These data suggest that in the descending condition the task difficulty manipulation resulted in higher levels of state anxiety from the furthest distance. On the other hand, in the ascending condition there were no changes in state anxiety as the difficulty of the task increased.

Order effects and stress.

A comparison of the overall mean stress score, based on the integrative conception of stress ($S = D/C \times I$), suggests that the ascending condition mean ($X = 8.93$, $sd = 4.75$) tended to be higher than the overall mean in the descending condition ($X = 7.29$, $sd = 3.38$) ($F(1,90) = 3.63$, $p < .06$). However, this probability is beyond an acceptable level of statistical significance (e.g. $p < .05$).

Comparisons across distances on the stress score (Table 4) indicate that in the ascending condition the stress score ($X = 5.54$, $sd = 4.8$) from six feet is lower than both the stress score from nine feet ($X = 7.5$, $sd = 4.7$) ($t(45) = 3.92$, $p < .002$) and the stress score from twelve feet ($X = 13.75$, $sd = 7.3$)($t(45) = 8.21$, $p < .001$). The nine foot

TABLE 4

MEAN LEVEL AND STANDARD DEVIATION OF STRESS FROM EACH DISTANCE.

	DISTANCE		
	6 ft	9 ft	12 ft
Ascending Condition	5.54 (4.8)	7.5 (4.7)	13.75 (7.3)
Descending Condition	4.22 (2.6)	7.3 (3.7)	12.29 (9.5)

NOTE: Higher scores indicate higher levels of stress

stress score is also lower than the twelve foot stress score ($t(45) = 7.38$, $p < .001$). Stress decreased as the demand level decreased. The manipulated demand level, distance of the throw in this case, is a variable used in the computation of the stress score, therefore the change in demand produces a concomitant change in the stress score. In the descending condition, the stress score from twelve feet ($X = 12.29$, $sd = 9.5$) is higher than both the stress score ($X = 7.3$, $sd = 3.7$) from nine feet ($t(45) = 3.64$, $p < .001$) and the stress score ($X = 4.22$, $sd = 2.6$) ($t(45) = 5.72$, $p < .001$) from six feet. The nine foot stress score is higher than the six foot stress score ($t(45) = 7.61$, $p < .001$). As the demand level increased, stress also increased, and as the demand level decreased stress also decreased.

Self-efficacy

The first hypothesis suggested that self-efficacy is negatively related to anxiety. This hypothesis was evaluated by examining the linear correlations at each session for the ascending and descending conditions separately.

First Session. Pearson correlations between self-efficacy, score, anxiety, and stress for the first session (Table 5) indicate that the level and strength of

TABLE 5

FIRST SESSION CORRELATIONS AMONG IMPORTANCE, SELF-EFFICACY, PERFORMANCE, STRESS AND ANXIETY

	Strength of Self-Efficacy (FCON)	Performance (PERF)	First State Anxiety (FANX)	Stress Score D/CxI (STRESS)	Importance (IMPORT)
Ascending Condition					
(6 ft)					
FSE	.84**	.23	-.01	-.74**	-.05
FCON	---	.23	.01	-.66**	-.08
PERF		---	-.08	-.31*	-.07
FANX			---	-.09	.22
STRESS				---	.54**
Descending Condition					
(12 ft)					
FSE	.86**	.22	.06	-.61 **	.19
FCON	---	.22	.10	-.47 **	.36**
PERF		---	-.30*	.01	.11
FANX			---	-.02	.16
STRESS				---	.37**

* p < .01

** p < .001

NOTE : FSE = First Self-efficacy Level

self-efficacy are highly correlated ($r = .84$, $p < .001$ in the ascending condition, $r = .86$, $p < .001$ in the descending condition). Higher ratings of the level of self-efficacy are made with greater confidence.

In the first session, in both ascending and descending conditions, performance, defined as the number of bull's-eyes in 10 throws, was not significantly correlated with either the level or strength of self-efficacy. Performance correlated with stress in the ascending condition only ($r = -.31$, $p < .01$). When subjects took their first set of throws from six feet higher scores were associated with lower levels of stress. In the descending condition performance was negatively correlated with state anxiety ($r = -.30$, $p < .01$), but not with stress ($r = .01$). Both the level and strength of self-efficacy were negatively correlated with the stress score ($r = -.74$ and $r = -.66$) in the ascending condition, and ($r = -.61$ and $r = -.47$) in the descending condition, respectively. All of these correlations are significant at the $p < .001$ level. However, since the level of self-efficacy is included as a factor in the computation of the stress score, these correlations are expected. Likewise, the significant correlations between the importance of the performance level and stress ($r = .54$ in the ascending condition, and $r = .37$ in the descending condition) were also expected, because

importance is also a variable used in the computation of the stress index. There was no correlation between self-efficacy and state anxiety, therefore the first hypothesis is not supported in the first session.

Second Session. Pearson correlations for the second session show a similar pattern to that found for the first session (Table 6). In both ascending and descending conditions the level and strength of self-efficacy are highly correlated ($r = .84$ and $r = .90$, respectively). Both the level and strength of self-efficacy are correlated negatively with the stress score ($r = -.65$ and $r = -.55$ in the ascending condition, and $r = -.65$ and $r = -.57$ in the descending condition. Performance did not correlate with self-efficacy, anxiety or stress, and again self-efficacy was not significantly correlated with state anxiety.

Third Session. At the third session the level and strength of self-efficacy are again highly correlated ($r = .85$ and $r = .89$ in the ascending and descending conditions, respectively) (Table 7). Both correlate negatively with stress, $r = -.68$ and $r = -.65$ in the ascending condition, and $r = -.65$ and $r = -.51$ in the descending condition. In the ascending condition performance and state anxiety are negatively correlated ($r = -.29$, $p < .01$), however, in the descending condition this correlation failed to reach statistical significance ($r = -.25$, n.s.).

TABLE 6

SECOND SESSION CORRELATIONS AMONG IMPORTANCE, SELF-EFFICACY, PERFORMANCE, STRESS AND ANXIETY

	Strength of Self-Efficacy (SCON)	Performance (PERF)	Second State Anxiety (SANX)	Stress Score D/CxI (STRESS)	Importance (IMPORT)
Ascending Condition					
(9 ft)					
SSE	.84 **	.17	.17	-.64 **	-.06
SCON	---	-.23	.12	-.55**	-.05
PERF		---	-.10	-.16	.00
SANX			---	.21	.31*
STRESS				---	.59**
Descending Condition					
(9 ft)					
SSE	.90**	.21	-.27	-.65 **	.01
SCON	---	.25	-.24	-.57 **	.10
PERF		---	-.01	.02	.32*
SANX			---	.14	.06
STRESS				---	.65**

* p < .01

** p < .001

NOTE : SSE = Second Self-efficacy Level

TABLE 7

THIRD SESSION CORRELATIONS AMONG IMPORTANCE, SELF-EFFICACY, PERFORMANCE, STRESS AND ANXIETY

	Strength of Self-Efficacy (TCON)	Performance (PERF)	Third State Anxiety (TANX)	Stress Score D/CxI (STRESS)	Importance (IMPORT)
Ascending Condition (12 ft)					
TSE	.85 **	.04	.19	-.68 **	.17
TCON	---	- .06	.15	-.65 **	.08
PERF		---	-.29 *	.10	.03
TANX			---	-.03	.33 *
STRESS				---	.49 **
Descending Condition (6 ft)					
TSE	.89 **	.44 *	.06	-.65 **	.01
TCON	---	.28	.03	-.51 **	.07
PERF		---	-.25	-.32 *	.01
TANX			---	-.02	.09
STRESS				---	.66 **

* $p < .01$

** $p < .001$

NOTE : TSE = Third Self-efficacy Level

Summary.

From all three testing distances, and in both ascending and descending conditions, the level and strength of self-efficacy were strongly positively correlated. High ratings of self-efficacy were made with greater confidence. Confidence in low ratings was weak. Although this finding seems reasonable, there is little empirical data on the strength of the expected association between the level and strength of self-efficacy.

The positive correlations between stress and self-efficacy were expected because the level of self-efficacy is part of the functional definition of stress. The positive correlations between the importance of a high performance level and stress were also expected, and found.

The hypothesis that self-efficacy is negatively related to state anxiety was not supported. In both ascending and descending conditions neither the level or strength of self-efficacy was correlated with anxiety in any of the experimental sessions.

Importance and state anxiety

Pearson correlations between the importance of a high performance level and state anxiety were computed for each session. In the ascending condition the correlation between importance and state anxiety was $r = .22$ (n.s.) from 6 feet, $r = .31$ ($p < .01$) from 9 feet, and $r = .33$ ($p < .01$) from 12 feet. In the descending condition the correlation between importance and state anxiety was $r = .09$ (n.s.) from 6 feet, $r = .06$ (n.s.) from 9 feet, and $r = .16$ (n.s.) from 12 feet. Only in the ascending condition is there some support for the hypothesis that importance level of the task is related to state anxiety.

Performance and state anxiety

Pearson correlations were also computed between actual performance, or throwing score, and state anxiety before each session. Significant correlations were found when subjects were throwing from the furthest distance, 12 feet. The correlation between performance and anxiety in the descending condition in the first session was $r = -.30$ ($p < .01$). Performance and state anxiety were correlated $r = -.29$ ($p < .01$) in the ascending condition in the third session. All other correlations between performance and state anxiety were not statistically significant.

Self-efficacy and Performance

Both the second and the fourth hypotheses refer to the relationship between self-efficacy and performance. The second hypothesis was evaluated with Pearson correlation coefficients. This hypothesis states that self-efficacy is positively related to performance. In the ascending condition the correlation between self-efficacy and throwing score was $r = .23$ (n.s.) for the first testing distance (Table 3), $r = .04$ (n.s.) for the second testing distance (Table 4), and $r = .04$ (n.s.) for the third testing distance (Table 5). The second hypothesis was not supported in the ascending condition. In the descending condition the correlation between self-efficacy and throwing score was $r = .22$ (n.s.) for the first testing, $r = .21$ (n.s.) for the second testing, and $r = .44$ ($p < .05$) for the third testing. Only when the subjects took their last set of throws from the closest distance was there a significant relationship between the level of self-efficacy and performance. In neither ascending or descending conditions was there a significant correlation between the strength of self-efficacy and throwing score on any of the the sessions.

Attributions and state anxiety

Correlations between attributions for performance and state anxiety were computed (Table 8). In the ascending condition there was a positive correlation between luck and anxiety from the nine foot distance ($r = .34$, $p < .05$). All other correlations were not statistically significant, in the ascending condition. In the descending condition, from the twelve foot distance, anxiety was negatively correlated with ability attributions ($r = -.33$, $p < .05$) and was positively correlated with the perceived task difficulty ($r = .43$, $p < .01$). From the closest distance anxiety was positively associated with luck ($r = .31$, $p < .05$).

TABLE 8

PEARSON CORRELATIONS BETWEEN STATE ANXIETY AND ATTRIBUTIONS FOR PERFORMANCE.

	ATTRIBUTION			
	Luck	Ability	Effort	Task Difficulty
Ascending Condition				
First Session (6′)	-.06	-.10	-.04	-.01
Second Session (9′)	.34*	-.16	-.04	.24
Third Session (12′)	.23	-.16	.07	.05
Descending Condition				
First Session (12′)	.02	-.33*	.32	.41**
Second Session (9′)	.28	-.21	.04	.21
Third Session (6′)	.31*	-.24	-.16	.19

NOTE: * $p < .05$
** $p < .01$

Attributions and Self-efficacy

Pearson correlations were also computed between attributions and the level of self-efficacy before each session (Table 9). In the ascending condition, from the closest distance, self-efficacy was positively correlated with luck ($r = .35$, $p < .05$) and negatively correlated with the perceived difficulty of the task ($r = -.36$, $p < .05$). In the second session, ability was negatively correlated with self-efficacy ($r = -.29$, $p < .05$). In the descending condition self-efficacy was negatively correlated with ability ($r = -.31$, $p < .05$), and the perceived difficulty of the task ($r = -.34$, $p < .05$). from twelve feet, and is also negatively correlated with the difficulty of the task from the other two distances, $r = -.42$ ($p < .01$) and $r = -.41$, ($p < .01$) from nine and six feet, respectively. Subjects in the descending condition with high levels of self-efficacy were less likely to attribute their performance to the difficulty of the task.

TABLE 9

PEARSON CORRELATIONS BETWEEN SELF-EFFICACY AND ATTRIBUTIONS FOR PERFORMANCE.

	ATTRIBUTION			
	Luck	Ability	Effort	Task Difficulty
Ascending Condition				
First Session (6′)	.35*	-.16	-.17	-.36*
Second Session (9′)	-.06*	-.29*	-.10	.13
Third Session (12′)	-.18	.03	-.14	-.17
Descending Condition				
First Session (12′)	-.09	-.31*	-.04	-.34*
Second Session (9′)	.11	-.06	-.01	-.42**
Third Session (6′)	.02	-.03	-.20	-.41**

NOTE: * $p < .05$
** $p < .01$

The generality and specificity of self-efficacy

Correlations were also computed among the levels of self-efficacy from each distance. Examination of these correlations indicate the specificity of the concept. That is, correlations from different demand levels may indicate the extent to which self-efficacy is pervasive. In the ascending condition self-efficacy from six feet was correlated with self-efficacy from nine feet ($r = .57$, $p < .001$), and with self-efficacy from twelve feet ($r = .35$, $p < .02$). The level of self-efficacy from nine feet was also correlated with the level of self-efficacy from twelve feet ($r = .51$, $p < .001$). In the descending condition all three self-efficacy scores were also correlated with each other. The level of self-efficacy from twelve feet was correlated with self-efficacy from nine feet ($r = .65$, $p < .001$) and six feet ($r = .51$, $p < .001$). The level of self-efficacy from nine feet was correlated with the level of self-efficacy from six feet ($r = .73$, $p < .001$).

The fourth hypothesis also refers to the generality of self-efficacy. Although some authors have implied that self-efficacy may be associated with more stable traits such as self-esteem (e.g. Ryckman et al., 1984), Bandura (1982) emphasizes that self-efficacy refers to specific convictions about abilities to perform specific tasks. Nevertheless, in a test of the generality of self-efficacy theory, Bandura et

al. (1980) found that self-efficacy predicted performance on tasks which varied in their threat value to their subjects.

Correlations between self-efficacy at one demand level and performance at another level may also be used to evaluate the generality of the efficacy concept. In the ascending condition none of the correlations between the level of self-efficacy at one distance and throwing score from another distance were statistically significant. In the descending condition there were significant correlations between throwing score form one distance and self-efficacy from another distance. For example, the level of self-efficacy before the second session was correlated with the score on the first session ($r = .59$, $p < .001$). The level of self-efficacy from six feet, the third session in this case, was correlated with both the score on the first session (12 feet) ($r = .41$, $p < .01$) and the second session ($r = .64$, $p < .001$). It appears that in the descending condition past performance is correlated with the next self-efficacy rating, suggesting that it may have been used as a criterion to help make subsequent predictions. This only occurred when the task got easier, since the correlations between efficacy and performance from other distances were not significant in the ascending order condition.

- It is also important to evaluate whether self-efficacy is a distinct concept which is not simply measuring self-esteem. The lack of a correlation between self-efficacy and self-esteem $r = .02$, $r = .06$, and $r = .10$ for the three sessions, respectively, suggests that self-efficacy and self-esteem <u>are</u> conceptually distinct from one another. Self-efficacy also did not correlate with physical self-efficacy, $r = .04$ for the first session, $r = .12$ for the second session, and $r = .17$ for the third session. Self-esteem and physical self-efficacy, on the other hand, are highly correlated ($r = .66$, $p < .001$), suggesting that they are measuring somewhat similar concepts.

The suggestion that efficacy is a stronger predictor of anxiety and performance than the more global constructs of self esteem and physical self efficacy is what formed hypothesis 4 of this experiment. Specifically, this hypothesis stated that the level of self-efficacy is more predictive of anxiety and performance than either physical self-efficacy, or self-esteem. The evaluation of this hypothesis was undertaken by using backward stepwise regression to help identify the "best" set of predictors of both performance and anxiety. The subjects' actual scores and the self-reported state anxiety levels before each trial of ten throws were the dependent variables, and their

self-efficacy (both level and strength), self-esteem, and physical self-efficacy are the predictors, or independent variables. The hypothesis suggests that self-efficacy is a better predictor of performance and anxiety than either physical self-efficacy or self-esteem, and will therefore be included in the "best" linear model.

The backward procedure begins with all variables included in the model. This method is preferred by statisticians because the equation with the full variable set is calculated and available for inspection (Chatterjee and Price, 1977). The backward elimination procedure is also better able to handle problems with multicollinearity than the more popular forward procedures. In backward stepwise regression the first variable which is dropped from the model is the one with the smallest F value. This indicates that the variable has only a small contribution towards reducing the error sums of squares. The variable is also dropped only if it is below a specified critical value. In the present study the critical value used is one whose probability level is less than 0.1. This is the default value in the S.A.S. (1985) statistical package. After the first variable has been dropped (assuming that at least one variable does not reach the critical value), the model is re-evaluated, and the variable with the smallest remaining F value is checked, and dropped if it is below the critical

value. This procedure continues until no more independent variables can be dropped. The models can be evaluated at each step for the amount of variance in the dependent variable that they can account for, and a model can be selected on the basis of the maximum amount of variance accounted for by the fewest number of predictors.

Six stepwise regressions were evaluated in the following analyses. The actual score on each trial and the state anxiety level before each trial are the dependent variables. Physical self-efficacy, self-esteem, level of self-efficacy and strength of efficacy are the independent variables.

Self-efficacy and Anxiety

The steps in the evaluation of the contribution of the independent variables in predicting the first anxiety score are shown in Table 10. The full model, with all of the dependent variables included, accounts for 21.8% of the variance, and this is a significant proportion ($F(4,91) = 6.07$, $p < .001$). In the first step the level of self-efficacy is removed, and the model still accounts for 21.8% of the variance. In the second and final step, the strength of efficacy is removed, and the model accounts for 21.4% of the variance. With the default level of significance at 0.10 no more variables are dropped. It would appear that the level and strength of efficacy are not

TABLE 10

STEPWISE REGRESSION PREDICTING THE FIRST ANXIETY SCORE

All variables included in the model, R square = 0.218

Variable	Partial Sum of Squares	Beta Weight	F	p
Physical Self-efficacy	253.182	-2.27	3.46	0.066
Self-esteem	348.662	-2.62	4.76	0.032
First efficacy level	3.489	0.20	0.05	0.828
First efficacy strength	24.423	0.55	0.33	0.565

Step 1 , First Efficacy Level Removed. R square = 0.218

Physical Self-efficacy	253.454	-2.27	3.5	0.065
Self-esteem	348.523	-2.62	4.81	0.031
First efficacy strength	31.552	0.60	0.44	0.51

Step 2 , First Efficacy Strength Removed. R square = 0.214

Physical Self-efficacy	229.411	-2.12	3.19	0.077
Self-esteem	361.298	-2.67	5.02	0.028

necessary to predict the first anxiety score if both self-esteem and physical self-efficacy are included in the model. A potential problem exists, however, since physical self-efficacy and self-esteem are highly correlated ($r = .66$, $p < .001$). In order to evaluate the effects of this pairwise collinearity a variance inflation factor (VIF) was calculated for this model. VIFs measure how much of the variance of the estimated regression coefficients account for, compared to when the variables are <u>not</u> linearly related. The VIF for the present model, predicting the first anxiety score from self-esteem and physical self-efficacy was 1.67, suggesting that the pairwise collinearity is not a problem, statistically speaking.

The backward stepwise procedure was also undertaken to help select a model which would predict the second state anxiety score (Table 11). The full model accounts for 33.7% of the variance, which is also a significant proportion ($F(4,87)=11.07$, $p < .001$) However, only physical self-efficacy appears to be a significant contributor at this point. This suggestion is substantiated by the subsequent dropping of all other variables on the next steps, until only physical self-efficacy remains. This model still accounts for a significant proportion of the variance, 31.9% ($F(1,91) = 42.45$, $p < .0001$).

TABLE 11

STEPWISE REGRESSION PREDICTING THE SECOND ANXIETY SCORE

Variable	Partial Sum of Squares	Beta Weight	F	p
All variables included in the model, R square = 0.337				
Physical Self-efficacy	893.222	-4.29	15.77	0.0001
Self-esteem	85.629	-1.3	1.51	0.22
Second efficacy level	43.615	0.69	0.77	0.38
Second efficacy strength	3.784	-0.21	0.07	0.79
Step 1 , Second Efficacy Strength Removed. R square = 0.337				
Physical Self-efficacy	945.183	-4.33	16.87	0.0001
Self-esteem	84.642	-1.29	1.51	0.22
Second efficacy level	42.293	0.68	0.75	0.38
Step 2 , Second Efficacy Strength Removed. R square = 0.331				
Physical Self-efficacy	913.961	-4.24	16.53	0.0001
Self-esteem	86.939	-1.31	1.56	0.21
Step 3, Self-Esteem Removed. R square = 0.319				
Physical Self-efficacy	2375.603	-5.11	42.25	0.0001

The data which show the steps of the search algorithm-for the third state anxiety score are displayed on Table 12. The full model accounts for 21.7% of the explained variance, and again the physical self-efficacy score is the only significant predictor ($F(1,87)=11.13$, $p < .001$). The other variables are dropped from the model one at a time, until only physical self-efficacy remains. The model with only physical self-efficacy as the lone predictor still accounts for over 21% of the variance, and is statistically significant ($F(1,90)=24.51$, $p < .0001$).

In summary, physical self-efficacy appears to be the most powerful predictor of state anxiety. When both self esteem and self-efficacy (both the level and strength) are added to the model, they account for a very small percentage of the explained variance.

The next set of analyses involve the assessment of these same independent variables, in terms of their ability to predict performance on each session.

TABLE 12

STEPWISE REGRESSION PREDICTING THE THIRD ANXIETY SCORE

Variable	Partial Sum of Squares	Beta Weight	F	p
All variables included in the model, R square = 0.217				
Physical Self-efficacy	805.599	-4.2	11.13	0.001
Self-esteem	1.199	-0.15	0.02	0.89
Third efficacy level	18.405	0.47	0.25	0.61
Third efficacy strength	8.411	-0.34	0.12	0.73
Step 1 , Self-Esteem Removed. R square = 0.217				
Physical Self-efficacy	1451.573	-4.31	20.28	0.0001
Third self-efficacy	18.509	0.47	0.26	0.61
Third Efficacy Strength	8.129	-0.33	0.11	0.73
Step 2 , Third Efficacy Strength Removed. R square = 0.216				
Physical Self-efficacy	1722.021	-4.41	24.30	0.0001
Third Self-efficacy	13.272	0.38	0.19	0.66
Step 3, Third Efficacy Level Removed. R square = 0.214				
Physical Self-efficacy	1721.572	-4.35	24.51	0.0001

Self-efficacy and Performance

The stepwise procedures for the first performance level are presented on Table 13. The full model accounts for 14.7% of the total explained variance ($F(4,87) = 3.76$, $p < .01$), however only the level of self-efficacy contributes significantly ($F(1,87) = 13.54$, $p < .001$). This significant contribution persists as each of the remaining variables is dropped from the equation, until the final model, which accounts for 12.7% of the variance ($F(1,90) = 13.04$, $p < .001$), contains only the level of self-efficacy.

The same procedure was used to evaluate models which are predictive of performance on the second session (Table 14). The percentage of variance accounted for by the full model is 14.3% ($F(4,87) = 3.63$, $p < .01$). It can be seen from the F ratios of this model that the strength of self-efficacy is the significant predictor ($F(1,87) = 11.78$, $p < .001$). By the third step of the backward elimination procedure only the strength of self-efficacy remains as a contributor. The model with this rating as the lone predictor accounts for 10.2% of the explained variance ($F(1,90) = 10.19$, $p < .002$).

Finally, the backward stepwise algorithm was used to help to identify a prediction model for the third score. The step-by-step procedure is displayed on Table 15. The full model accounts for 31% of the variance in performance scores ($F(4,87) = 9.77$, $p < .001$). Self-esteem is removed on the

TABLE 13

STEPWISE REGRESSION PREDICTING THE FIRST TRIAL SCORE

Variable	Partial Sum of Squares	Beta Weight	F	p
All variables included in the model, R square = 0.147				
Physical Self-efficacy	2.43	-0.22	0.27	0.60
Self-esteem	1.97	-0.20	0.22	0.64
First efficacy level	122.17	1.20	13.54	0.0004
First efficacy strength	3.5	-0.21	0.39	0.53
Step 1 , Self Esteem Removed , R square = 0.145				
Physical Self-efficacy	11.02	-0.35	1.23	0.27
First Self Efficacy Level	122.11	1.2	13.65	0.0004
First efficacy strength	3.23	-0.19	0.36	0.55
Step 2 , First Efficacy Strength Removed, R square = 0.142				
Physical Self-efficacy	13.93	-0.39	1.57	0.21
First Efficacy level	120.1	1.15	13.52	0.0004
Step 3, Physical Self-Efficacy Removed, R Square = 0.127				
First Efficacy Level	116.49	1.13	13.04	0.0005

TABLE 14

STEPWISE REGRESSION PREDICTING THE SECOND TRIAL SCORE

Variable	Partial Sum of Squares	Beta Weight	F	p
All variables included in the model, R square = 0.143				
Physical Self-efficacy	27.33	0.75	2.44	0.12
Self-esteem	25.84	-0.17	2.3	0.13
Second Efficacy level	12.01	0.37	1.07	0.30
Second Efficacy strength	132.12	-1.23	11.78	0.001
Step 1 , Level of Self-Efficacy Removed , R square = 0.132				
Physical Self-efficacy	31.01	0.79	2.76	0.1
Self Esteem	26.5	-0.72	2.36	0.13
Second Efficacy Strength	128.01	-1.12	11.4	0.001
Step 2 , Self Esteem Removed, R square = 0.109				
Physical Self-efficacy	8.37	0.31	0.73	0.39
Second Efficacy strength	123.94	-1.19	10.87	0.001
Step 3, Physical Self-Efficacy Removed, R Square = 0.102				
Second Efficacy Strength	115.82	-1.12	10.19	0.002

TABLE 15

STEPWISE REGRESSION PREDICITNG THE THIRD TRIAL SCORE

All variables included in the model, R square = 0.31

Variable	Partial Sum of Squares	Beta Weight	F	p
Physical Self-efficacy	0.61	0.11	0.09	0.76
Self-esteem	0.01	-0.01	0.00	0.96
Third Efficacy Level	146.8	1.34	21.16	0.0001
Third Efficacy Strength	33.43	0.68	4.82	0.03

Step 1 , Self Esteem Removed, R square = 0.31

Physical Self-efficacy	0.84	0.10	0.12	0.73
Third Efficacy Level	146.8	1.34	21.41	0.0001
Third Efficacy Strength	33.57	0.68	4.89	0.03

Step 2 , Physical Self Efficacy Removed, R square = 0.309

Third Efficacy Level	148.73	1.35	21.9	0.0001
Third Efficacy Strength	42.05	0.72	6.19	0.01

first step, and physical self-efficacy is removed on the second step, without any appreciable loss in the amount of explained variance (30.9%). The final model selected includes both the level of self-efficacy ($F(1,89) = 21.9$, $p < .0001$) and the strength of self-efficacy ($F(1,89) = 6.19$, $p < .02$).

In summary, the level of self efficacy appears to be predictive of performance only. By itself, the level of self-efficacy is able to account for a significant proportion of the explained variance in performance in all three sessions. The inclusion of physical self-efficacy, self-esteem and strength of self efficacy adds little to the predictive power of the models which already have the level of self efficacy included. On the other hand, physical self-efficacy appears to be the important predictor of anxiety, with the inclusion of the other three independent variables adding very little to the proportion of explained variance in state anxiety.

Accuracy and Anxiety

The fifth hypothesis was that the accuracy of self-efficacy is related to state anxiety and to changes in self-esteem. Accuracy was operationally defined as a prediction which was within 2 of the actual number of

bulls'-eyes obtained in each session. Overestimation was defined as predictions which were 2 or more than the actual score, and underestimation was defined as 2 or less than the actual score. It was hypothesized that subjects who were inaccurate in their estimation of their ability would report higher state anxiety.

The means and standard deviations for each accuracy level over each session for ascending and descending conditions are shown on Table 14. Within-session comparisons do not suggest that there is any effect of accuracy on state anxiety. The critical F value with 2 and 23 degrees of freedom, at alpha = .05, in approximately 3.23. None of the F values reported on Table 16 are beyond this value. This finding is consistent in both ascending and descending conditions, and form each distance. The first part of the fifth hypothesis is not supported, there does not appear to be a relationship between the accuracy of self-efficacy and changes in state anxiety.

TABLE 16

MEAN CHANGE IN STATE ANXIETY AS A FUNCTION OF ORDER AND ACCURACY, OVER THE THREE DISTANCES.

	DISTANCE		
	6 feet	9 feet	12 feet
Ascending order			
Accurate	40.68 (8.3)	42.50 (9.8)	38.06 (9.4)
Overestimate	41.45 (8.6)	42.65 (9.2)	41.79 (10.9)
Underestimate	39.00 (10.4)	35.00 (4.7)	35.75 (6.9)
	F = 0.27	F = 2.06	F = 1.06
Descending order			
Accurate	36.63 (9.8)	39.72 (8.2)	39.17 (8.4)
Overestimate	37.67 (8.8)	35.56 (7.6)	41.39 (10.8)
Underestimate	33.90 (6.4)	38.57 (7.4)	34.67 (6.8)
	F = 0.77	F = 1.05	F = 0.72

Accuracy and Self-esteem

The second part of the fifth hypothesis was that the accuracy of expectations is related to observed changes in self-esteem. It was hypothesized that subjects who were more accurate in their self-perceptions would have less change in their self-esteem. The change in self-esteem was computed for each subject by subtracting the second TSBI score from the first. This score was then compared across the three accuracy groups using ANOVA. Accuracy was operationally defined identically as before (i.e. within 2 of the actual score).

The mean changes in self-esteem for each session in each order condition are presented on Table 17. The mean self esteem score at the begining of the experiment was 48.3 (sd = 7.3), and at the end of the experiment the mean self esteem score was 50.6 (sd = 9.0). This difference (2.33, sd = 5.08) was statistically significant, using paired t-test to compare the means ($t(91) = 4.41$, $p < .001$). Comparison across accuracy conditions, however, do not suggest an association with the observed increase in self esteem. Again, the critical F value, at alpha = .05, with 2 and 23 degrees of freedom, is 3.23. None of the computed F ratios presented on Table 15 exceed this value. Regardless of the session or order, there is no difference on state anxiety.

TABLE 17

CHANGE IN SELF-ESTEEM AS A FUNCTION OF ORDER AND ACCURACY, OVER THE THREE DISTANCES

	DISTANCE		
	6 feet	9 feet	12 feet
Ascending order			
Accurate	3.42 (3.6)	4.58 (5.3)	1.72 (4.3)
Overestimate	2.82 (5.6)	1.88 (3.3)	3.50 (4.3)
Underestimate	2.38 (4.0)	3.75 (4.7)	4.75 (2.6)
	F = 0.26	F = 1.95	F = 1.35
Descending order			
Accurate	2.89 (4.4)	1.22 (6.6)	5.08 (3.5)
Overestimate	0.17 (7.2)	2.81 (4.3)	0.61 (6.0)
Underestimate	1.19 (6.6)	1.14 (6.5)	0.33 (8.3)
	F = 0.68	F = 0.39	F = 2.88

NOTE: Higher scores indicate a greater increases in self-esteem.

Summary of the Results of Experiment 1

Overall, the findings of the first study support the hypothesis that efficacy expectations are predictive of performance on the dart-throwing task. By increasing the distance from which subjects took their throws self-efficacy and performance decreased. Although the linear correlation between self-efficacy and performance was not significant, regression analyses indicated that the level of self-efficacy was a significant predictor of the score from each distance when physical self-efficacy and self-esteem were accounted for. A stepwise analysis consistently identified the level of self-efficacy as the best predictor of performance, although it only accounted for about 4% of the variance.

Self-efficacy was not predictive of anxiety before any of the sessions. Neither linear correlations nor regression analyses revealed an association between the level of self-efficacy and anxiety. Although self-efficacy increased as the distance increased, there was no change in anxiety in the asending condition. In the descending condition anxiety dereased as the distance decreased, but the correlations between anxiety and self-efficacy were not statistically significant. At each of the three testings stepwise regression analyses revealed that more general constructs such as generalized self-efficacy and self-esteem were better predictors of anxiety.

The hypotheses that accuracy of self-efficacy is associated with anxiety and changes in self-esteem were not supported. There was no difference in anxiety as a function of the accuracy of the subjects's level of self-efficacy, nor were changes in self-esteem associated with accuracy level.

In both ascending and descending conditions there was no difference between the incentive and no incentive means on any of the sessions. Increasing the incentive level by offering ten dollars for a high performance did not result in changes in stress, anxiety or motivation to perform well. Additional items on a post-experimental questionnaire suggest that this may not be a problem of the theory but may reflect the lack of effect of the experimental manipulation.

Correlations between performance and stress, where stress is defined as a demand/capability imbalance, times the importance of the demand to the subject, indicated that only when subjects were throwing from the closest distance is a low performance level associated with higher stress.

Finally, significant correlations between anxiety and importance of a high score in the ascending condition suggest that this may be a relevant variable in the situation where the task becomes progressively more difficult. Correlations between importance and anxiety were not significant in the descending condition.

EXPERIMENT 2

Since the generalizability of the findings of the first study may be limited due to the setting, a second experiment was designed to examine the effects of self-efficacy on anxiety and academic performance. Bandura (1982) suggests that people will avoid and fear situations in which they do not see themselves as efficacious. Conversely, individuals who are high in self-efficacy will approach a situation as another opportunity to demonstrate their mastery of their environment.

An in-class test is a situation which may be used to evaluate self-efficacy theory in a field setting. According to Bandura (1982), high self-efficacy in this situation is associated with an increased study effort and a reduction in anxiety, whereas low self-efficacy is associated with an increase in anxiety and less study effort. The literature on academic achievement suggests that high self-efficacy is associated with greater effort, which results in higher performance attainments in college (c.f. Felson, 1984). For example, Lent, Brown, and Larkin (1984) found that efficacy expectations, which may have been based, in part, on past experience, were generally related to academic achievement

and performance. Subjects with higher strength ratings of their ability achieved higher grades and persisted longer in their major field than those with low ratings. The first hypothesis of the second experiment, therefore, suggests that self-efficacy will be inversely related to anxiety, and positively associated with study effort and objective performance.

It is also possible in this context to evaluate the integrative stress conception suggested by Mikhail (1986) by looking at the relationship between this stress function and state anxiety. The conception S = D/C x I suggests that the perceived or actual demand of the task be assessed. Although all of the subjects receive the same test, the perceived demands of the test may be very different across individuals. D, the demand level, refers to the perceived difficulty of the task to the subject, and can be evaluated by self-report. C again refers to the individual level of self-efficacy and the I refers to the importance of a high performance level on this test to the subject. As C increases, that is, as the level of self-efficacy increases, the overall value of the stress function decreases. Consistent with self-efficacy theory, this conception suggests that the level of self-efficacy is negatively associated with signs of stress, for example, increases in state anxiety. As the subjective importance of the task

increases, the value of the stress function will also increase. There should be a positive relationship between importance and anxiety. Where the demand level of the test is close to the perceived level of capability or self-efficacy, the theory suggests that stress will be minimal. The second hypotheses, generated by the integrative conception of stress, is that stress is positively correlated with anxiety, and that there is a positive relationship between the importance of a high performance and anxiety.

It is implicit in self-efficacy theory that accurate perceptions of abilities result in undertaking tasks which are within capabilities. In this way feelings of mastery and competence are reinforced, and potentially aversive situations may be avoided. Inaccurate self-efficacy may result in failure and feelings of incompetence. The third hypothesis of the second experiment is that inaccurate estimates of ability will be associated with higher levels of anxiety.

Method

Subjects

The subjects were 245 male and female introductory psychology students who received partial course credit for their participation. One hundred and one males and one

hundred and forty females completed the questionnaires fully. The data for 4 other subjects was omitted due to missing information.

Measures

A short "expectation questionnaire" (Appendix C) was completed immediately before an in-class quiz. Included in this questionnaire was the state subscale of the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch and Lushene, 1970). The expectation questionnaire also asked subjects to respond to a number of items. The first item refers to the anticipated mark out of ten that the subject expected to receive on the quiz. This item was used to measure the level of self-efficacy. Other items refer to the difficulty of the course, stressfulness of the quizzes, and attributions for past performance, including the amount of effort put into studying for this quiz. Each item was responded to on a five-point scale.

In accordance with the integrative conception of stress a stress score was computed for each subject, based on the formula S = D/C x I. D refers to the demand level, which in this experiment was the response, on a five point scale, to the item " How difficult have you found the tests in this course so far ? ". C, the capability level, again refers to the level of self-efficacy, and I the importance of the

task, was operationalized as the response, on a five point scale, to the item " How important is it for you to do well on this test ? ".

Procedure

The responses to the STAI and the expectation questionnaire were placed on an IBM sheet which accompanied the test. All subjects were informed that they would receive partial course credit for their participation, and that all data gathered would be confidential. The subjects were also told that their participation was voluntary, and failure to complete the questionnaire would in no way influence their grade on the quiz. The questionnaire was then distributed, along with the quiz, to the class.

Results

The linear correlations between self-efficacy, state anxiety, effort, stress and performance (Table 18) are modest which is consistent with the experimental hypotheses. The level of self-efficacy was associated with both the amount of effort put into studying for the test ($r = .23$, $p < .001$), and performance, or the mark on the quiz that the student received ($r = .26$, $p < .001$). Higher levels of self-efficacy were associated with more study effort and higher marks, however, the mark on the test was not

TABLE 18

CORRELATIONS BETWEEN SELF-EFFICACY, STRESS IMPORTANCE, ANXIETY AND PERFORMANCE

	Strength of Efficacy (ESTR)	How hard Studied (HARDST)	Mark out of 10 (MARK)	Stress (D/CxI) (STRESS)	State Anxiety (ANX)	Subjective Importance (IMPORT)
SE	.38**	.23**	.26**	-.73**	-.20*	-.05
ESTR	____	.15	.14	-.25**	-.29**	.02
HARDST		____	.03	.04	.02	.35**
MARK			____	-.17	-.03	.08
STRESS				____	.09	.44**
ANX					___	.20*

** p < .001

* P < .01

NOTE : SE = The level of self-efficacy.

significantly correlated with how hard the subjects reported that they studied ($r = .04$, n.s.). The level of self-efficacy was also negatively correlated with both state anxiety ($r = -.20$, $p < .01$) and stress ($r = -.73$, $p < .001$) (1). The high correlation between the level of self-efficacy and stress is a result of the use of the self-efficacy score in the functional definition of stress. The strength of self-efficacy was negatively correlated with both stress ($r = -.25$, $p < .001$) and state anxiety ($r = -.29$, $p < .001$). Greater confidence in the level of self-efficacy was associated with less stress and lower state anxiety. There was no correlation between stress and state anxiety ($r = .09$, n.s.). Anticipated correlations with the importance variable were also found. For example, importance was positively correlated with how hard the student studied ($r = .35$, $p < .001$), and with state anxiety ($r = .20$, $p < .01$). The correlation between importance and stress ($r = .44$, $p < .001$) was also expected because importance is a variable used in the computation of the stress score.

In order to evaluate the hypotheses more completely, regression analyses were used. The predictors were standardized in order to reduce potential problems due to rounding errors.

Self-efficacy and Anxiety

The first hypothesis states that self-efficacy and effort are associated with state anxiety. A backward regression model with the level of self-efficacy as the lone predictor accounted for a small (4%), but significant proportion of the variance in state anxiety ($F(1,239) = 10.06$, $p < .002$). The negative correlation suggests that as the level of self-efficacy increased, state anxiety decreased. When the strength of self-efficacy was added as a predictor in the regression equation the level of self-efficacy no longer contributed significantly. The strength score was also negatively associated with state anxiety, $F(2,238) = 12.09$, $p < .001$), and a much larger percentage of the adjusted variance was accounted for by this model, 8.5%. A plot of residuals against the independent variables and expected values suggested that the general linear model was a good choice, that is, the data were randomly scattered around the regression line. Similar to the findings in the first experiment, the strength of self-efficacy appears to be more closely associated with state anxiety than the level of self efficacy.

Self-efficacy and Effort

The hypothesis that self-efficacy is positively related to effort was also evaluated with regression analysis. Effort attributions were positively related to the level of self-efficacy ($F(1,234) = 113.11$, $p < .001$). Higher ratings of self efficacy were associated with higher ratings of the amount of effort put into studying for the quiz. Self-efficacy was able to account for about 4% of the explained variance in study effort. Unfortunately the correlational design of the study does not permit a unidirectional causal statement. It is plausible that increased effort has resulted in higher levels of self-efficacy. Nevertheless, the hypothesized relationship has been demonstrated.

Self-efficacy and Academic Performance

The third part of the first hypothesis was that self-efficacy and performance are positively related. Subjects were divided into pass/fail categories on the basis of their mark. A mark above 50% was considered a pass, and a mark below 50% was considered a fail. The mean level of self-efficacy of the subjects who passed was 3.29 (sd = 0.87), and the mean level of self-efficacy of the subjects who failed was 2.96 (sd = 0.95). This difference was statistically significant ($F(1,243) = 5.43$, $p < .05$).

Students with higher levels of self-efficacy were more likely to pass the test.

A backward stepwise regression was used to help identify the best set of predictors of academic performance. The mark out of ten on the test was the dependent variable, and the level and strength of self-efficacy, importance of a high score, and the amount of effort put into studying for the test were the independent variables. The model which included all the variables accounted for a total of 7.9 % of the variance ($F(4,236) = 5.09$, $p < .001$). The individual steps in the backward procedure are shown on Table 17. The strength of self-efficacy is removed on the first step, without much loss in the amount of variance explained (7.7%, $F(3,239) = 6.63$, $p < .0003$). Next, how hard the student studied is removed, and the amount of variance explained is 7.4% ($F(2,238) = 9.55$, $p < .0001$). Finally, the importance of a high mark to the subject is removed and the model with the level of self-efficacy as the lone predictor accounted for 6.9% of the variance ($F(1,239) = 17.75$, $p < .001$). As in the first experiment, the level of self-efficacy is the best predictor of performance, in this case, academic performance.

TABLE 19

STEPWISE REGRESSION TO PREDICT MARK

Variable	Partial Sum of Squares	Beta Weight	F	p
All variables included in the model, R square = 0.079				
Efficacy level	64.1	0.599	13.68	0.0003
Efficacy strength	2.48	0.12	0.53	0.47
Importance	9.31	0.21	1.99	0.16
Study effort	4.13	-0.14	0.88	0.35
Step 1 , Strength of self-efficacy removed, R square = 0.079				
Efficacy Level	84.32	0.64	18.03	0.0003
Importance	9.03	0.21	1.93	0.17
Study effort	3.67	-0.14	0.78	0.38
Step 2 , Study effort removed, R square = 0.074				
Efficacy level	80.66	0.62	17.26	0.0001
Importance	6.23	0.16	1.33	0.25
Step 3, Importance removed, R square = 0.069				
Efficacy level	83.05	0.62	17.75	0.0001

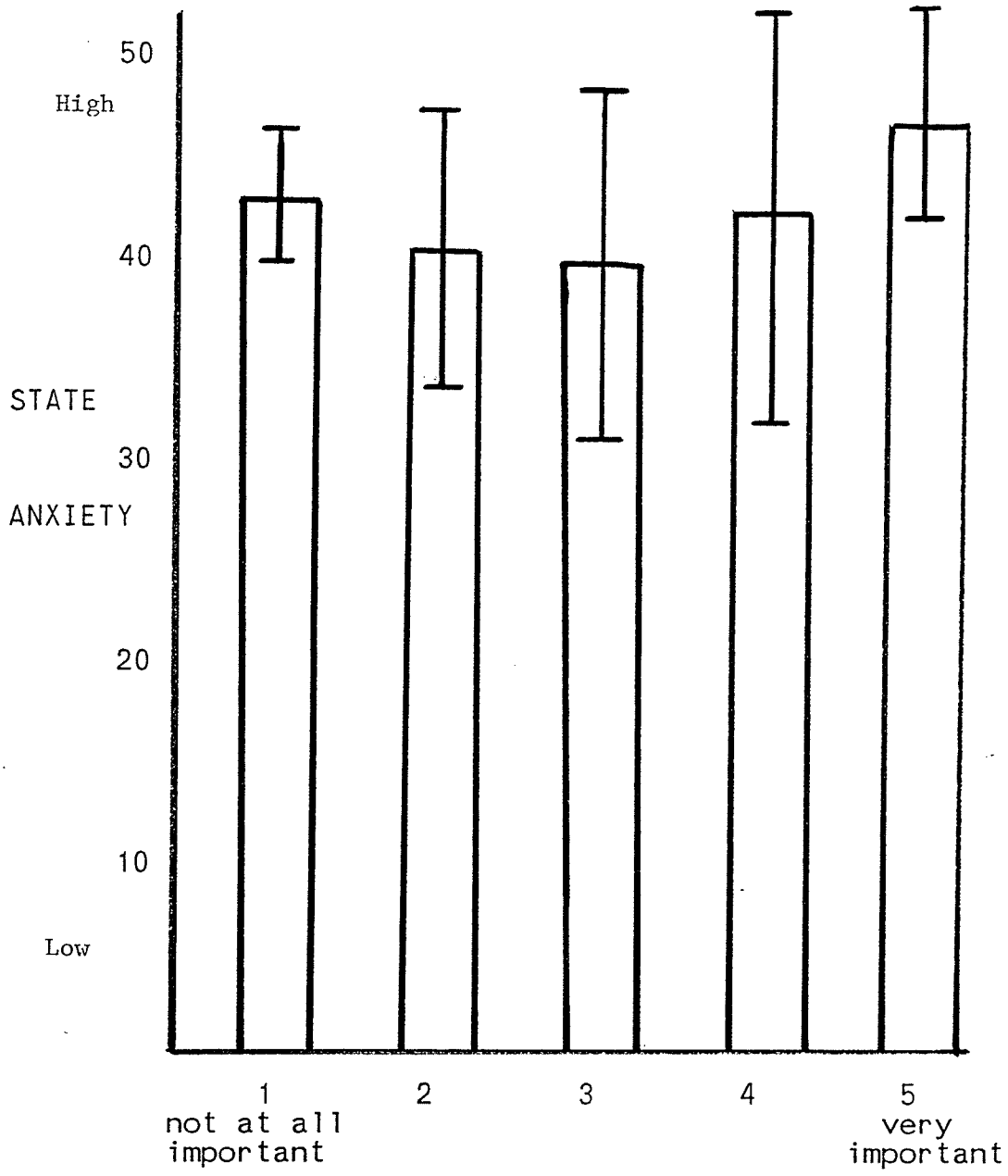
Stress and Anxiety

The second hypothesis of this experiment was that a stress score based on the integrative model (Mikhail, 1986) is correlated with anxiety. A stress score was computed for each subject, based on the formula S = D/C x I, where D, C, and I were all measured on five-point rating scales which were included in the questionnaire. The stress score was not correlated r = .09 (n.s.) with the state anxiety score, therefore the second hypothesis was not supported.

The second part of the second hypothesis suggests a positive association between the importance of a high performance level and anxiety. The linear correlation between importance and state anxiety was r= .20 ($p < .01$). There were five categories of importance, ranging from (1) not at all important, to (5) very important. The means and standard deviations for each group are displayed on Figure 5. Analysis of variance indicated that there is a significant relationship between importance and anxiety $F(4,236) = p < .01$).

Post-hoc comparison of the means with the Scheffe test (to control for the experiment-wise Type I error) revealed that group 5 has higher anxiety than group 3. Students who reported that it was important for them to do well on the test had higher levels of anxiety than students who were ambivalent about their need for a high performance level.

The mean and standard deviation of state anxiety for each level of importance. Anxiety and the importance of a high score on the test were related. Students who reported that it was very important to do well were significantly more anxious than students who were ambivalent about their mark.


50
High
40
STATE
30
ANXIETY
20
10
Low
1
not at all
important
2
3
4
5
very
important

Accuracy and anxiety

The third hypothesis of the second experiment was that under-estimation of ability is related to state anxiety. Under-estimation suggests that the task demands are beyond the perceived capabilities of the individual and will therefore produce higher levels of anxiety. Subjects were considered accurate in their self-efficacy if their expected mark was within two points of their actual mark. Above and below this criterion was considered over and under-estimation, respectively. Analysis of variance did not indicate any group differences as a function of accuracy level ($F(2,238) = 1.75$, n.s.). As in the first experiment, the accuracy of self-efficacy was not related to anxiety.

Summary of the findings of the second experiment

Self-efficacy level before an in-class test was correlated with the amount of study effort, and the actual mark received on the test. The level of self-efficacy correlated with anxiety, although the strength of the correlation was relatively weak ($r = .20$, $p < .01$). There was also a significant relationship found between the importance of a high performance level and anxiety. Support for the other hypotheses was lacking. The correlation between stress and anxiety was low, and there was no relationship found between the accuracy of self-efficacy and anxiety.

GENERAL DISCUSSION

Self-efficacy

The main findings of these experiments indicate that the level of self-efficacy is predictive of performance. Self-efficacy was related to both the score on a simple motor task (the dart throwing) and a more complex cognitive task (the class test). In the first experiment the level of self-efficacy changed as the demand level changed. By increasing the objective demands of the task, efficacy level decreased and these changes in self-efficacy were associated with changes in performance. In the second experiment students with higher levels of self-efficacy were more likely to pass the test, and also received higher marks. The association between self-efficacy and performance suggests that efficacy expectations are useful predictors of behavior.

The utility of self-efficacy theory, however, rests not only in its ability to predict behavioral performance, but also in its association with emotional responding. The clinical literature suggests that this is the most important aspect of the theory. One of the central tenets of efficacy

theory postulates that perceptions of capabilities effect emotional reactions in taxing situations. According to Bandura this is the mechanism through which anxiety is reduced by participant modelling. In the first experiment the correlations between self-efficacy and anxiety were not significant, from any distance, in both orders of task presentation. Regardless of the demands of the task, and regardless of previous experience in the experimental situation, the level of self-efficacy was not associated with anxiety.

In the second experiment, however, there was a significant, albeit relatively small, correlation between self-efficacy and state anxiety before the test (Table 18). Beside the obvious differences between the two experiments, there is a difference in the importance of the task to the subject, which may have relevance to the present discussion. That is, a high performance level on an experimental task may be less relevant to the subjects, and therefore less fear-producing, than a high level of performance in an academic testing situation.

Efficacy expectations do not simply reflect the ability to physically perform a given task, according to Bandura (1977). The snake-phobics in his experiments were not simply rating whether they could make a grasping movement with their hand, but whether they could cope with the

consequences of handling a snake. Efficacy expectations refers not only to whether behaviors can be executed, but also to coping with the potential aversive consequences of the failure to adequately execute the behavior. The snake-phobics fear what may happen to them if they are unable to grasp the snake in such a manner that the snake does not become agitated. In this sense the distinction between efficacy and outcome expectations becomes blurred. In the first experiment the level of self-efficacy was operationalized as the number of bull's-eyes that the subjects thought that they could make in ten throws, from a given distance. This is a rating of perceived motor ability. In the second experiment there was a significant correlation between the level of self-efficacy and state anxiety before the test. As in the clinical literature, in previous studies of athletic performance and self-efficacy (e.g. Lee, 1982), there were negative consequences for a poor performance level. The subject could be removed from the diving, or gymnastics team. Outcome expectations, therefore, were also not conceptually separate from efficacy expectations. It may be more useful, therefore, to consider the concept of self-efficacy within a broader theoretical framework which includes characteristics of the task (e.g. the demand level required by the subject and motivation to perform well).

Self-efficacy theory has been criticized by Kirsch (1982) who argued that the meaning of efficacy expectations can change with changes in the characteristics of the task. In his experiment subjects were asked to make self-efficacy ratings of their ability to hit wastebasket with a wad of paper, under various levels of incentive. He found that self-efficacy increased with a very high reward level (hypothetically $1,000,000). The differences found between these experiments on the strength of the association between self-efficacy and state anxiety may therefore be a function of the characteristics of the task. In the first experiment the task was not psychologically threatening. The stressfulness of the task was not increased by offering money for a high performance. At the most, some subjects lost the opportunity to win $10, and some may have experienced some failure by not meeting their expectations. On the other hand, in the second experiment, the consequences of not doing well on the test may have been more threatening, and therefore may be more likely to produce anxiety. As a result, expectations of a low performance level may have increased state anxiety.

The level of self-efficacy was also positively correlated with how hard the subjects reported that they studied for the quiz. However, study effort was not related to the actual mark obtained. It is also possible that greater

study effort also results in increased self-efficacy and higher performance achievements. However, the mechanism by which Bandura (1977) suggests that efficacy expectations effect performance was not substantiated. Individuals who have high levels of self-efficacy expend greater effort to cope with potentially aversive situations, according to Bandura (1977). This suggests that efficacy expectations increase effort, which in turn, is responsible for changes in performance. An association between efficacy and performance was found here, but there was no significant relationship between the mark on the test and the amount of time spend studying. The level of self-efficacy must effect performance through some other means.

The operational definition of the level of self-efficacy in this case was the student's expected level of performance. These expectations, were partly based on previous performance accomplishments, since the study was run near the end of the school term. It is possible that the self-reporting of study effort may be affected by ability. Students who usually perform well may not need to study as hard as students who do not perform well, therefore their study effort may not be related to their mark. Their expectations may be high and their anxiety low because they have scored high on previous tests and generally get good marks in university.

There may also be an alternative explanation as to why the data from the first experiment do not show the correlation between self-efficacy and anxiety which has been reported by Bandura, among others. Lane and Borkovec (1984) have suggested that therapeutic outcome research on self efficacy may be influenced to some extent by demand characteristics. That is, the clients in Bandura's research may have determined the hypotheses of the studies, and therefore changed their cognitions and behavior in order to "help" the experimenter/therapist. This explanation would also be consistent with Kirsch's (1982) findings. In the first experiment of the present study a post experimental questionnaire was used to evaluate subjects' perceptions of the purpose of the experiment, and therefore asssess a demand characteristic explanation of the results. Most subjects reported that they thought that the experiment had something to do with self confidence, which is partially correct since self confidence was measured before and after the experimental task. However, hypotheses about self confidence were not central to the thesis. It could be said therefore, that the subjects in the first experiment were blind as to the major hypotheses of the study. These subjects were not aware that the purpose of the study was to evaluate the relationship between their level of self-efficacy and their degree of state anxiety. This difference in subject awareness may help to explain some of

the discrepancies between these results and Bandura's observations of an association between self-efficacy and anxiety.

The level and strength of self-efficacy

In both experiments the level and strength of self-efficacy were correlated. In the first experiment these correlations were very high, i.e. above r = .80. It seems reasonable that high ratings of the level of self-efficacy are made with greater confidence, and low ratings are made with less confidence. However, there is little empirical data on this point. For example, although Bandura, Adams, Hardy and Howell (1980) report that both the level (r = .78) and strength (r = .70) of self-efficacy are correlated with coping behavior, there is no report of the correlation between the two. It is important to know the distinction between the conviction to successfully execute behavior and the degree of confidence with which these convictions are made. For example, which is more closely associated with fear arousal and coping ? Furthermore, the literature is often unclear as to whether the level or strength of self-efficacy is being measured. In Bandura's (1977) snake-phobic experiments, it is assumed that the level of self-efficacy is being measured, because the tasks are rated on a gradient of "fearsomeness". However, data on the

association between the level and strength of self-efficacy are lacking. The conceptual overlap between the strength of self-efficacy with the level of self-efficacy may lead to conceptual confusion.

The generality of self-efficacy

One area of research in self-efficacy which has also been over-looked concerns the generality of efficacy expectations. If efficacy expectations are designed to measure convictions about specific behaviors, it may be reasonable to expect correlations with other similar behaviors. However, the size of these correlations may prove troublesome. If they are too high, how specific to the behaviors in question are the ratings? On the other hand, if they are too low the theory may be suggesting too much specificity to be useful, except in cases where there is a clearly identified fear-producing precipitant, such as a snake.

The degree to which self-efficacy should generalize is unclear from the research literature. Bandura has been emphatic in his microanalyses of the relationship between self-efficacy and behavior that the measurement of self-efficacy be as task-specific as possible. The degree to which such measures should be correlated with apparently

unrelated constructs (e.g. other behaviors which are peripherally related to the expectations in question), is unknown. In an evaluation of the generality of self-efficacy theory, Bandura, Adams, Hardy and Howells (1980) found that by increasing the self-efficacy of agoraphobics other fears were also reduced. They hypothesized that the reductions in anxiety were a function of self-efficacy generalization. However, Bandura has often stated that self-efficacy refers to specific expectations about micro-analytic aspects of behavior, therefore the extent to which self-efficacy should generalize is unclear.

In the present study the generality and specificity of self-efficacy was evaluated in Experiment One by comparing the correlations between levels of efficacy from the three distances. These correlations indicated that the level of self-efficacy from one distance was associated with self-efficacy from different distances. Further, in the descending order condition the level of self-efficacy was correlated with actual score from other distances. There is a suggestion of a pattern of relationships whereby efficacy expectations for similar tasks with slightly different demand levels are related to one another.

Evaluation of the relative predictability of self-efficacy, physical self-efficacy, and self esteem was also undertaken. The physical self-efficacy scale is

designed to measure physical ability and physical self confidence, and the measure of self esteem, the Texas Social Behavior Inventory, is designed to measure self esteem in a general social context. Both scales refer to more global constructs than that defined by self-efficacy, which, in this case, refered to specific expectations about abilities to hit a bull's-eye with a dart. The physical self-efficacy and self-esteem scales were compared with the level and strength of self-efficacy in terms of their ability to predict performance and state anxiety over the three sessions. The data consistently suggested that self-efficacy is the best predictor of performance, although it only accounted for about 4% of the variance. However, in terms of predicting state anxiety, physical self-efficacy was the strongest predictor of anxiety before the second and third trials, and both physical self-efficacy and self esteem were significant predictors of the first anxiety score. Predicitions of performance on a novel task (none of the subjects had experience throwing darts) was based more on stable and enduring traits such as self-esteem and perceived physical ability, than on specific self-efficacy. Once the subjects had completed the first trial of the task, the more general construct, physical self-efficacy, is most closely associated with state anxiety than either specific self-efficacy or self-esteem. Neither the level or strength of self-efficacy were able to account for much of the

variance in state anxiety at any of the sessions, once physical self-efficacy and self-esteem were included in the regression models.

The second study, which examined the relationship between self-efficacy, academic performance and effort, produced results which were compatible with previous studies. Self-efficacy was positively correlated with both performance and effort. However, more complete causal statements cannot be made. A longitudinal design, with repeated measurements over the course of the academic term, would be better able to identify the underlying causal pattern. No doubt greater study effort is associated with higher performance attainments, but previous research has not established the "causal predominance" of self-efficacy or previous performance (Felson, 1984). In terms of practical implications this is an important issue. If self-efficacy underlies the amount of effort put into studying, and also mediates the deleterious effects of state anxiety on test performance, then participant modelling may be an effective intervention in students with academic difficulties who feel that their performance is impaired by high pre-test anxiety. However, if self-efficacy simply reflects the effects of previous performance, perhaps a course in study-time management may be more effective for reducing pre-test anxiety.

In the first experiment none of the subjects withdrew from the experiment. In the second experiment the date for withdrawing from the course without academic penalty had already passed. Avoiding the situation through withdrawal was an option in both studies which was not used. In future experiments in an academic setting it may be more useful to evaluate self-efficacy early in the term, and observe whether those students who are low in self-efficacy persist until the end of the term. It may also be possible to evaluate the hypothesis that low levels of self-efficacy are associated with avoidance, by comparing the level of self-efficacy of students who drop out of the course with students who persist until the end.

The accuracy of self-efficacy

The correspondence between objective and subjective fit has been called the accuracy of self-assessment and may also be refered to as "accessibility of the self" (French et al., p 318). In the current context this correspondence was called the accuracy of the level of self-efficacy. In the first experiment there was little support for the hypothesis that accuracy of self-efficacy is related to state anxiety and changes in self esteem. Only subjects who under-estimated their capabilities on the third trial were more likely to report higher levels of state anxiety than

subjects who over-estimated their capabilities. In the second experiment, there were no differences on anxiety between subjects who over-estimated their ability, subjects who under-estimated their ability, and those who were accurate in their predictions about their performance.

Hypotheses about the P-E fit model could not be directly evaluated, since French et al. suggest that it is important to measure demands and capabilities on commensurate dimensions. In the first experiment demands were defined as the task difficulty, measured in feet. Capability was defined as the level of self-efficacy from that distance. In the second experiment demands were operationally defined as the subjective rating of how difficult the tests in the course had been. Again the level of self-efficacy was the operational definition of capability. Current measurement of P-E fit requires the use of pairs of items where both the ability and demand components are phrased with commensurate content (Caplan, 1983). Caplan (1983) also cautions that low strain and high mental health are not necessarily associated with the "accuracy of self assessment", which is simply intended to be a descriptive label. Lazarus (1979), for example, has reported data which are consistent with the hypothesis that the ability to distort the potentially harm-producing nature of a stressor is beneficial in terms of reducing psychological strain.

The accuracy of self-efficacy may be more important during development. Accurate appraisals of capabilities during childhood are essential for effective functioning. Overestimation of ability is not only physically dangerous during childhood, but will also result in numerous experiences with failure. On the other hand, underestimation of abilities may result in not undertaking new and challenging tasks.

Stress

The manipulation of the demand level of the task in the first experiment produced changes in anxiety in the descending condition. Manipulation of demand level also produced changes in self-efficacy, but these changes were not related to changes in state anxiety. It may not be useful, therefore, to include self-efficacy in an integration of stress until some of the conceptual confusion is clarified. The degree of overlap between efficacy and outcome expectations needs to be identified, and the role of task characteristics in self-reports of expectations also needs to be clarified. If efficacy expectations refer to coping abilities they cannot be considered conceptually distinct from outcome expectancies, which also refer to the consequences of action, or inaction.

Mikhail (1986) has suggested that the importance of the demand to the well being of the individual is a concept which needs to be included in the functional definition of stress. In the first experiment the importance factor was operationally defined as the importance of a high performance level to the subjects. Although incentive was manipulated in the first experiment, the manipulation did not produce changes in state anxiety or stress. The data suggest that the manipulation was not effective. The results from the post experimental questionnaire indicated that the subjects in the incentive condition were not more likely to report feelings of tension and stress, nor were they motivated to try harder, than subjects in the no incentive condition. For each subject the importance of a high performance was measured in the first experiment. Importance was correlated with state anxiety in the last two sessions in the ascending condition. In other words, from the nine and twelve foot distances, when subjects began from up close, higher ratings of importance were associated with higher anxiety. Given the nature of the experiment this seems reasonable. The subjects in the ascending condition scored more bull's-eyes on their first set of throws, because they were throwing from much closer. Half of these subjects were also aware that they could still win $10 if they scored high from the other two distances. The subjects in the descending condition began from the twelve foot

distance. If they scored less than five of ten bulls'-eyes, then they would already be eliminated from winning the $10. In the last two sessions, therefore, the task may not be important to them, and the association between importance and state anxiety was weak.

By using the objective demand of the task and the self-efficacy rating as the perceived capability, a composite stress score was computed at each session based on the formula S = D/C x I. The stress score increased as the demand of the task increased. However, stress did not correlate in either experiment with state anxiety. Individual differences in motivation to perform well may need to be taken into account in order to more fully evaluate this conception of stress. Mikhail (1986) has also suggested that the score based on the stress index be multiplied by a factor 1/K, where K is a constant which is based on some relevant personality variable. Eysenck's concept of neuroticism may be such a relevant variable.

CONCLUSIONS

Two experiments were conducted to look at the relationship between the level of self-efficacy and anxiety. In the laboratory, subjects made efficacy judgements about their dart-throwing ability under different demand conditions, and with different levels of incentive. In the second experiment, prior to an in-class quiz, subjects made efficacy judgements of their abilty to perform well on the quiz. Ratings of state anxiety were also taken.

The level of self-efficacy was a useful predictor of dart performance, however, it was not associated with changes in anxiety. This lack of association in the laboratory reflects the fact that this experimental context was not sufficiently anxiety-producing. For example, although a monetary incentive was offered to some subjects it was not effective in increasing anxiety. A more salient incentive needs to be found in order to better induce anxiety within this experimental context. This would be the purpose of future experimentation.

The importance of a high performance level to the subject was related to anxiety when subjects still had the opportunity to score high, that is, in the last two sessions

in the ascending condition of the first experiment. In the classroom experiment, the importance of doing well on the quiz was also associated with anxiety. Although importance has relevance for a general conception of stress, it is also neccessary to evaluate individual differences in the motivation to perform well which may mediate the potential effect of this factor.

The conception of stress as a demand/capability imbalance times importance may be useful, but the specific nature of incentives and variables which may moderate the potential effects of incentive should be identified. For example, Eysenck's concept of neuroticism is probably a relevant personality characteristic which mediates stress. This suggestion could be evaluated in subsequent research.

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Appendix A

EFFICACY RATINGS

The following questionnaire asks you to predict how many bull's-eyes that you think you can hit from each of the three distances. You are asked to read each choice carefully, and to circle either "YES", or "NO". We are also asking you to rate your confidence in each prediction by circling the number from one to ten which corresponds to your degree of confidence in this rating.

Do you think you can hit <u>one</u> bull's-eye from this distance?

YES NO

How confident do you feel with this prediction?

1	2	3	4	5	6	7	8	9	10
NOT VERY CONFIDENT									VERY CONFIDENT

Do you think you can hit <u>two</u> bull's-eyes from this distance?

YES NO

How confident do you feel with this prediction?

1 2 3 4 5 6 7 8 9 10

NOT VERY VERY

CONFIDENT CONFIDENT

Do you think you can hit <u>three</u> bull's-eyes from this distance? YES NO

How confident do you feel with this prediction?

1 2 3 4 5 6 7 8 9 10

NOT VERY VERY

CONFIDENT CONFIDENT

Do you think you can hit <u>four</u> bull's-eyes from this distance? YES NO

How confident do you feel with this prediction?

1 2 3 4 5 6 7 8 9 10

NOT VERY VERY

CONFIDENT CONFIDENT

Do you think you can hit <u>five</u> bull's-eyes from this distance? YES NO

How confident do you feel with this prediction?

1 2 3 4 5 6 7 8 9 10

NOT VERY VERY

CONFIDENT CONFIDENT

Do you think you can hit six bull's-eyes from this distance?

YES NO

How confident do you feel with this prediction?

1	2	3	4	5	6	7	8	9	10
NOT VERY CONFIDENT									VERY CONFIDENT

Do you think you can hit seven bull's-eyes from this distance? YES NO

How confident do you feel with this prediction?

1	2	3	4	5	6	7	8	9	10
NOT VERY CONFIDENT									VERY CONFIDENT

Do you think you can hit eight bull's-eyes from this distance? YES NO

How confident do you feel with this prediction?

1	2	3	4	5	6	7	8	9	10
NOT VERY CONFIDENT									VERY CONFIDENT

Do you think you can hit nine bull's-eyes from this distance? YES NO

How confident do you feel with this prediction?

1	2	3	4	5	6	7	8	9	10
NOT VERY CONFIDENT									VERY CONFIDENT

Do you think you can hit ten bull's-eyes from this distance? YES NO

How confident do you feel with this prediction?

1	2	3	4	5	6	7	8	9-	10
NOT VERY CONFIDENT									VERY CONFIDENT

Appendix B

ATTRIBUTIONS FOR PERFORMANCE

To what extent did your ability determine your performance from this distance ?

NOT AT ALL ENTIRELY

1 2 3 4 5 6 7

To what extent did luck determine your performance from this distance ?

NOT AT ALL ENTIRELY

1 2 3 4 5 6 7

To what extent did how hard you tried determine your performance from this distance ?

NOT AT ALL ENTIRELY

1 2 3 4 5 6 7

To what extent did the difficulty of the task determine your performance from this distance ?

NOT AT ALL						ENTIRELY
1	2	3	4	5	6	7

How important was it for you to do well from this distance ?

NOT AT ALL IMPORTANT						VERY IMPORTANT
1	2	3	4	5	6	7

How stressful did you find this task ?

NOT AT ALL STRESSFUL						VERY STRESSFUL
1	2	3	4	5	6	7

Appendix C

SPIELBERGER INVENTORY

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and choose the appropriate response. Answer using the IBM sheet which has been provided. Please indicate how you feel right now, that is, at this moment. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	not at all	somewhat	moderately so	very much so
(1) I feel calm	a	b	c	d
(2) I feel secure.....	a	b	c	d
(3) I am tense.....	a	b	c	d
(4) I am regretful.....	a	b	c	d
(5) I feel at ease.....	a	b	c	d
(6) I feel upset.....	a	b	c	d
(7) I am presently worrying over possible misfortunes.....	a	b	c	d
(8) I feel rested.....	a	b	c	d
(9) I feel anxious.....	a	b	c	d

(10) I feel comfortable.....	a	b	c	d
(11) I feel self-confident.....	a	b	c	d
(12) I feel nervous.....	a	b	c	d
(13) I am jittery.....	a	b	c	d
(14) I feel "high-strung".....	a	b	c	d
(15) I am relaxed.....	a	b	c	d
(16) I feel content.....	a	b	c	d
(17) I am worried.....	a	b	c	d
(18) I feel over-excited and "rattled"..	a	b	c	d
(19) I feel joyful.....	a	b	c	d
(20) I feel pleasant.....	a	b	c	d

Please answer the following questions on the IBM sheets, using the coded alternatives provided.

Appendix D

(21) On this quiz I expect to get less than 5 answers right

(fill in choice e)

On this quiz I expect to get five or six answers right

(fill in choice d)

On this quiz I expect to get seven or eight answers right

(fill in choice c)

On this quiz I expect to get nine answers right

(fill in choice b)

On this quiz I expect to get perfect (all ten right)

(fill in choice a)

(22) How confident are you with this rating ?

(a) not at all confident

(b) a little confident

(c) moderately confident

(d) fairly confident

(e) very confident

(23) How important is it for you to get a high mark on this quiz ?

(a) not at all important

(b) a little important

(c) important

(d) fairly important

(e) very important

(24) How hard did you study for this quiz ?

(a) not hard at all

(b) I studied a little

(c) about average

(d) I studied a lot

(e) I studied very hard

(25) How much does university require you to use a lot of intelligence ?

(a) very much

(b) quite a bit

(c) some

(d) a little

(e) not at all

(26) Relative to other students in the class, how would you rate your intelligence level ?

(a) far above average
(b) above average (next 15%)
(c) about average (middle 50%)
(d) below average (next lowest 15%)
(e) far below average (lowest 10%)

(27) How difficult have you found the tests in this class so far ?

(a) not at all difficult
(b) slightly difficult
(c) about average
(d) difficult
(e) very difficult (28) How important is it for you to get the grade that you would like to receive in this class ?

(a) not at all important
(b) a little important
(c) important
(d) fairly important
(e) very important

(29) How stressful do you find the tests in this class ?

(a) not at all stressful
(b) slightly stressful

(c) stressful

(d) quite stressful

(e) very stressful

(30) How much is your performance in this class is due to how hard you tried ?

(a) not at all

(b) a little

(c) an average amount

(d) a lot

(e) very much so

(31) How much is your performance in this class is due to the difficulty of the course ?

(a) not at all

(b) a little

(c) an average amount

(d) a lot

(e) very much so

(32) How much is your performance in this class is due to luck ?

(a) not at all

(b) a little

(c) an average amount

(d) a lot

(e) very much so

(33) How much is your performance in this class is due to your ability ?

(a) not at all

(b) a little

(c) an average amount

(d) a lot

(e) very much so