SELF-EFFICACY AND ATHLETIC PERFORMANCE

OF 800 METRE RUNNERS

by

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SELF-EFFICACY AND ATHLETIC PERFORMANCE OF 800 METRE RUNNERS

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ABSTRACT

Self-efficacy has been shown to influence people's performance on a variety of tasks. The construct of self-efficacy refers to the cognitive judgements people make about their abilities to organize and execute the actions required to perform a specific task or activity successfully. This study examined the relationship between self-efficacy and the athletic performance of male 800 metre runners on competition and training tasks.

Fourteen male 800 metre runners and five coaches participated in the study. Following standard social learning methodologies, task-specific efficacy probes were administered to the athletes on four occasions over a 45-day period. Coaches' judgements of their athletes' capabilities were obtained on three occasions during the same time period. Athletic performance measures consisted of the coaches' ratings of training objectives and the athletes' overall training performance, and the official competition results from the competitive situations. Physical measures of each of the fourteen athletes (weight, height, heart rate, body fat estimate), were taken and recorded.

Results indicated that the athletes' efficacy judgements for competition predicted and were significantly related to competitive performance in the 800 metre track event. The athletes' average and absolute efficacy strength scores for competition and the coaches' absolute ratings of the efficacy probes for competition emerged as the best predictors of the athletes' competitive performances. The results also indicated that the athletes' efficacy judgements for training did not significantly relate to or predict the athletes' performance in the training situations.

Results of the study are discussed in terms of theoretical and practical implications for athletic training, and for the future development of self-efficacy theory and research.

DEDICATION

To Claudio, who has helped
me to realize this and all
other dreams.

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CHAPTER I

Introduction and Review of Related Literature

The purpose of this study was to investigate how the decisions or judgements which athletes make about their abilities to perform specific competitive and training tasks relate to the actual performance of those tasks. Considerable research has been done which examines the relationship between people's percepts of efficacy and their performance on a variety of clinical and academic tasks (Bandura, 1977; Bandura & Adams, 1977; Bandura, Adams, Hardy, & Howells, 1980; Bandura & Schunk, 1980; Schunk, 1979). However, few studies have examined the specific relationship between people's percepts of efficacy and their performance in motor or athletic situations (see Feltz, Landers, & Raider, 1979 for one notable exception). This study extends previous research, by directly examining the relationship between self-efficacy and athletic performance in both training and competitive situations.

This chapter begins with a discussion of the general social learning and self-efficacy theories of Albert Bandura. Following this theoretical discussion, the findings of empirical studies which have examined the relationships between self-efficacy judgements and performance on a variety of tasks are summarized. Finally, studies which specifically examine the role of cognitive expectancies in athletic performance are reviewed. The chapter concludes with a brief discussion of specific hypotheses and predictions for the present study.

Bandura's Theory of Self-Efficacy

Social learning theory incorporates and attempts to explain both cognitive and overt behavioural functioning (Bandura, 1977). Social learning theory represents a middle ground between behavioural and cognitive approaches to the study of human behaviour. Bandura (1977a) proposes that both cognitive processes and stimuli in the environment influence behaviour through a process of reciprocal determinism. Reciprocal determinism views human functioning as a continuous and reciprocal interaction among cognitive, behavioural, and environmental factors. The amount of influence which each of these factors exerts in any given situation depends upon a host of previous experiences and current circumstances. Because of the interlocking nature of these three factors, a change in any one factor will result in changes in the remaining two factors. Analysis of this reciprocal, tripartite relationship, as it exists at any given moment in relation to a particular performance, requires exacting methodologies which are tailored specifically to the performance being investigated. This study investigates the interaction between cognitive judgements of efficacy and performance in a middle distance athletic event.

Bandura (1977a) advances the construct of self-efficacy to explain how cognitive and behavioural factors interrelate. Self-efficacy theory conceptualizes the interaction between cognitive processes and behaviour as being very specific to individual performance tasks and to performing individuals. Self-efficacy is concerned with judgements about how well one can organize and execute courses of action required to deal with prospective situations which contain many unpredictable, ambiguous, and/or stressful elements (Bandura, 1980).

The construct of self-efficacy is differentiated from other global constructs of self, such as Rogers' (1951) notion of self-concept by the manner in which it conceptualizes self-percepts, and the ways in which these self-percepts affect behaviour. Self-concept is a composite view, which is composed of more global images of self. These images of self, involve individuals' attitudes towards themselves, and how these attitudes influence their perceptions of life. Bandura (1980) suggests that such global concepts do not explain the complexity and variability of individual percepts of efficacy across different situations and tasks. Bandura (1980) proposes that percepts of efficacy are complex because they are specific to individual performance tasks, the specific circumstances of the situation, and the performing individual.

The construct of self-efficacy is also differentiated from the construct of outcome expectations. Outcome expectations involve judgements made by an individual concerning the outcomes of a particular behaviour. In making outcome expectancies, an individual is simply judging that a given behaviour will lead to certain outcomes. When an individual makes an efficacy judgement, he/she is making a judgement about whether he/she successfully can execute the actions required by the activity or task (Bandura, 1977).

Functions of Self-Efficacy

Self-efficacy judgements perform the function of assisting people in making decisions about whether to engage in an activity and/or in making decisions about how long they will continue to expend energy in the activities they have undertaken. Accurate efficacy judgements contribute to successful functioning because they assist individuals in pursuing activities that are within their capabilities and potentialities. Individuals who tend to underestimate their capabilities usually restrain themselves from engaging in activities which they are in fact capable of pursuing. In addition, individuals who undertake a task, but who underestimate their capabilities to perform that task, will tend to focus on their deficiencies and view the task as being more formidable than it really is. Individuals who tend to overestimate their capabilities usually engage in activities that they are, in fact, incapable of performing successfully. Once engaged in these activities, they will tend to experience failure and frustration. It therefore is apparent that inaccurate efficacy judgements can restrict individuals' involvement in activities that may develop their capabilities and potentialities. Inaccurate efficacy judgements also may cause frustration and failure if people engage in activities which are beyond their capabilities to perform successfully (Bandura, 1977). [Note, in Bandura's (1980) discussion of people's tendencies to ovestimate or underestimate their abilities, self-efficacy judgements tend to be discussed in a more global sense and are generalized from one situation to another. This generalization is somewhat contradictory to Bandura's (1977a, 1980) discussion of the task specific nature of self-efficacy. See Lang (1978) and Teasdale (1978) for further discussion of this apparent inconsistency in Bandura's treatment of the construct of self-efficacy.]

Self-efficacy judgements also assist individuals in determining how much effort they will expend once they are engaged in an activity. The stronger an individual's judgement that s/he can perform the activity successfully, the more effort s/he will tend to expend. When individuals are confronted with difficulties or obstacles while engaged in an activity, the individuals who hold strong efficacy judgements will tend to be more persistent and expend more energy than the individuals who hold weak efficacy judgements (Schunk, 1979).

The perceptions which people hold about their capabilities influence their cognitive self-talk and level of emotional arousal as they anticipate and actually interact with their environments (Meichenbaum, 1977). People who conclude that they are inefficacious with respect to a certain task will tend to engage in negative, self-debilitating cognitions. In addition, these people tend to perceive the task as possessing insurmountable difficulties. Their preoccupations with such cognitions tend to result in high emotional arousal, which in turn impairs their performance of the tasks in question. Task performance is hindered because such individuals are not focusing on task demands and skills to be used; but instead, are focusing on their own deficiencies and negative evaluations of their performances (Dweck, 1975).

The individual who feels efficacious about performing a particular task will tend to assess the demands of the task, and select and use those skills which are necessary to perform the task successfully. When these individuals are confronted by obstacles, they tend to intensify their efforts. As a result, their cognitions and levels of emotional arousal facilitate performance success.

Sources of Efficacy Information

Individuals obtain information about their capabilities from four major sources. The four sources are performance accomplishments, vicarious experiences, verbal persuasion, and physiological arousal. Several studies have shown that *performance accomplishments* are the most powerful in producing changes in expectations of personal efficacy (Bandura et al., 1977; Bandura, Jeffrey, & Gajdos, 1975). Performance accomplishments are considered to be the most dependable and influential sources of efficacy information because they are based upon the individual's personal experiences. If an individual experiences success or mastery of an activity, strong efficacy expectations will likely develop. After strong efficacy expectations have been formed, they are likely to be maintained even when the individual faces occasional experiences of failure. If an individual experiences failure, particularly when s/he initially pursues the activity, weak or inefficacious expectations are likely to form. The pattern and timing of performance accomplishments therefore provide valuable efficacy information to the individual.

The efficacy information conveyed by performance accomplishments can exert more or less influence on efficacy judgements depending upon how the individual cognitively appraises this information. The efficacy information provided by performance accomplishments is appraised cognitively to assess the degree to which the difficulty of the task, the amount of effort expended, the amount of external assistance, and the temporal pattern of successes and failures contributed to performance success or failure. The degree to which performance accomplishments affect efficacy judgements will depend upon how the individual appraises each of these factors. When an individual experiences mastery of a task considered to be easy, the efficacy information conveyed is less influential in altering efficacy judgements, than when the individual succeeds at a more challenging and difficult task. The mastery of a task considered to be more difficult also provides novel efficacy information to the individual. If an individual fails to perform an easy or a moderately easy task, the individual will likely conclude that s/he is inefficacious in respect to that task. Yet, if an individual fails to perform a difficult task, the individual is more likely to attribute this failure to task difficulties than to insufficient capabilities. Individuals may also consider the amount of energy they expend when they cognitively appraise their performance attainments. If an individual has experienced success while expending minimal effort, such performance accomplishments will likely convey efficacy information that will enhance strong efficacy expectations. The more effort the individual has to expend to achieve mastery of the task, the less efficacious s/he will feel towards the task. Conversely, if an individual experiences failure while expending minimal energy s/he will likely attribute the failure to insufficient effort. However, if the individual expends a great deal of effort and fails to perform the task, s/he will likely feel inefficacious to that task. The less external assistance an individual receives while attaining mastery of a task, the more efficacious s/he will feel towards that task. Finally, the temporal pattern of success and failure affects the degree to which performance accomplishments affect efficacy expectations. Individuals who experience some failures, while generally improving, are more likely to raise their efficacy expectations, than are individuals who experience immediate success and then do not improve further.

A process of selective monitoring will also affect the degree to which performance attainments influence efficacy expectations. If an individual selectively attends to success or failure experiences, his/her efficacy expectations will be enhanced or lowered respectively.

Many efficacy expectations are derived or partially derived from *vicarious experiences*. Observing others achieve performance success will tend to result in the individual believing that s/he too can achieve performance success. In such a fashion, efficacy expectations can be raised. Observing others fail at an activity may lead an individual to believe s/he cannot perform the activity. In this case, percepts of efficacy are lowered. A study done by Brown and Innouye (1978) indicated that the greater the perceived similarity between the performance abilities of models and the observers, the greater the impact of the vicarious experience. Bandura (1977b) proposes that the greater the perceived similarity between the model's and observer's personality characteristics, the greater the influence of vicarious experiences.

In addition to social comparison information, vicarious experiences may also influence efficacy expectations by conveying strategies for engaging in, and coping with, a task, and by providing information concerning task demands and task difficulty. Knowledge of strategies, task demands, and the difficulty of the task can influence individual perceptions of efficacy. Such information is able to exert influence on self-efficacy judgements because it can make the observing individual more aware of the nature of the tasks and what skills and strategies are necessary to perform the tasks successfully. With such information, individuals can make decisions about their personal abilities to perform the observed tasks.

Verbal persuasion can also influence people's efficacy expectations and behaviour. Through suggestion or verbal persuasion, people can be led to believe that they possess the capabilities to perform tasks successfully (Bandura, 1980). Success expectations which are induced by verbal persuasion will likely be weaker than success expectations which are induced by performance attainments. The impact which verbal persuasion might exert upon efficacy expectations will depend upon whether the suggestions are supported or denied by the individual's performance attainments and vicarious experiences. If the verbal suggestions are substantially different from the individual's personal experiences, the information likely will be rejected. But, if the individual respects the persuader and considers her/him to be credible, the individual may be persuaded to undertake activities she/he may not have undertaken otherwise, and/or continue to expend effort on activities when she/he normally may have terminated them (Bandura, 1980).

Bandura (1977a) also suggests that verbal persuasion can contribute to performance successes achieved through corrective performance. Thus, if an individual is persuaded that she/he possesses the capabilities to perform a task successfully and is provided with conditions which facilitate effective performance, he/she likely will exert greater effort and will be more likely to achieve performance success.

Physiological arousal can also influence efficacy expectations depending upon the degree of arousal, the situation stimulating arousal, and how arousal has influenced the individual's performance in the past. People's judgements of their anxiety in relation to task performance are partially based upon their levels of physiological arousal. Situational circumstances will affect the level of physiological arousal experienced, depending on the difficulty and complexity of the task. The more challenging and complex a task, the more likely that an individual will experience higher levels of arousal. If an individual has performed successfully while highly aroused, she/he will tend to find arousal facilitative. But if an individual has previous experiences in which arousal was associated with failure, s/he will tend to interpret his/her arousal as a prelude to failure.

Dimensions of Efficacy Judgements

Efficacy judgements vary on the dimensions of magnitude, strength, and generality. All three dimensions may influence performance. Magnitude refers to the level of task difficulty which an individual feels s/he can perform. When tasks are broken down and ordered according to their level of difficulty, some people may limit their efficacious expectations to the lower or simpler levels of the tasks. Others may extend their efficacy expectations to include tasks which are of moderate levels of difficulty. Still others may include even the most difficult levels in their efficacy judgements. Efficacy judgements also can vary in terms of strength. Strength of an efficacy judgement refers to an individual's degree of certainty about her/his ability to perform a particular task. Thus, efficacy expectations can vary from weak (uncertainty) to strong (certainty). Finally, efficacy judgements may differ in terms of generality. Generality refers to whether the individual's efficacy judgements extend across a wide range of tasks or are peculiar to a specific task. Bandura (1977b) suggests that some experiences create efficacy judgements related to only a limited number of activities, while other experiences create more generalized efficacy expectations encompassing a considerably wider range of activities.

It should be noted that previous research has investigated other cognitive strategies in relation to athletic performance (Corbin, 1972; Mahoney, 1978; Suinn, 1972, 1976), and motor performance on various tasks (Martens & Peterson, 1971). However, these studies will not be addressed here, since the focus of this study is on the construct of self-efficacy, and how specific cognitive judgements relate to and predict athletic performance on training and competitive tasks.

Empirical Studies of the Relationship Between Self-Efficacy and Performance

Considerable research has been done which has investigated the relationship between self-efficacy and performance on a variety of tasks. These studies generally indicate that self-efficacy accurately predicts performance on various tasks, that performance accomplishments are the most powerful source of stronger and more generalized percepts of efficacy, and that enhancement or improvement of judged efficacy is correlated with degree of improvement in a variety of clinical and instructional treatments.

Bandura and Adams (1977), in two studies involving adult snake phobics, investigated how clinical treatments influence efficacy expectations and behaviour change. In the first study, they investigated the hypothesis that systematic desensitization changes clients' approach behaviors to snakes through its intervening effects on the clients' efficacy expectations. The results of the study confirmed the hypothesis. Bandura and Adams (1977) found that the clients' efficacy expectations predicted the degree to which the clients would approach a snake following the systematic desensitization treatment. It appears that efficacy expectations accurately predicted subsequent approach behavior to the once feared objects (snakes). Bandura and Adams also found some support for the notion that perceived efficacy mediates anxiety arousal. Through correlational analyses, they found that strong percepts of efficacy tended to be associated both with weak levels of anticipatory arousal (arousal experienced while the tasks were described), and weak levels of anxiety arousal (arousal experienced during the execution of the "approach" tasks). Conversely, the clients' with weak percepts of efficacy tended to experience higher levels of anticipatory arousal, and higher level of anxiety arousal while performing the same tasks.

In a second study, Bandura and Adams (1977), investigated the process of change in the snake phobics' efficacy expectations and behaviour as it occurred during the course of participant modeling treatment. Throughout the course of treatment, and as the subjects moved through a hierarchy of tasks, the subjects were required to make efficacy judgements about their abilities to perform the remaining items on the hierarchy of tasks. Results indicated that self-efficacy was an extremely accurate predictor of subsequent behaviour on the tasks involving snakes, and of overall client improvement.

Bandura, Adams, and Beyer (1977), investigated the notion that therapy or treatment is effective because it alters the strength and magnitude of clients' percepts of efficacy. In this study, 33 adult snake phobics participated in treatments which were based on either performance mastery experiences (participant modeling treatment) or vicarious experiences (modeling treatment). A third group did not experience treatment. The participants' efficacy expectations and their performance (on tasks involving snake approach behaviours), were measured prior to and after treatment. The results of the study indicated that the participant modeling treatment, and the performance accomplishments of the people in this group were most influential in producing stronger and more generalized percepts of efficacy. Further, the results supported the authors' prediction that self-efficacy would accurately predict subsequent performance on tasks which varied with respect to difficulty and threat value, in both modes of treatment.

Two studies by Bandura, Adams, Hardy, and Howells (1980) are particularly noteworthy. These studies investigated the generality of self-efficacy theory to a modeling treatment and a treatment which involve enactive mastery experiences. In the first study, 17 adult snake phobics participated in cognitive modeling treatment. The participants were required to imagine or visualize scenes involving interactions with snakes. The scenes were arranged in hierarchical fashion, ranging from mildly threatening tasks, such as looking at a snake in a cage, to highly threatening tasks such as holding a snake. The participants' efficacy expectations were measured before and after treatment. Cognitive modeling significantly enhanced the phobics' percepts of efficacy in relation to designated "approach" tasks. Results also revealed that the higher the level of perceived efficacy, the greater the ability of the participants to approach the snakes on the behavioural posttest. These results support the notion that efficacy expectations predict specific performance accomplishments on a variety of tasks which may differ in relative threat value, and that various treatments enhance efficacy expectations. In the second study, 11 agoraphobics (people who have a fear of public places) participated in a treatment program that employed enactive mastery experiences. The initial sessions of the program focused on training the participants in skill areas such as self-relaxation and proximal goal setting, to prepare them for the field experiences. The field experiences moved the participants and therapists into the actual environments which the participants feared. The therapists assisted the participants with their coping efforts until the participants were able to exhibit mastery of the specific situational tasks. This treatment procedure continued as the participants worked through progressively more difficult tasks. Efficacy expectations were measured before and after treatment. The findings of the study indicated that enactive mastery treatment enhanced both the magnitude and strength of the participants' efficacy expectations. Self-efficacy was an accurate predictor of performance on tasks such as shopping in a large supermarket and driving on a crowded freeway. Finally, the results indicated that perceived efficacy mediated changes in coping behavior and fear arousal.

In summary, the series of studies presented provides evidence to indicate that various clinical treatment approaches can enhance relevant self-percepts of efficacy and that efficacy expectations can predict the level of behavioural change occasioned by various treatments. The studies also indicated that self-efficacy accurately predicted performance on a variety of different tasks. In all cases, the stronger the efficacy expectations, the greater the likelihood that related tasks would be performed successfully.

A study by Jaremeko (1980) and a study by Kazdin (1979), further support the findings that clinical treatments enhance clients' percepts of efficacy in relation to targetted treatment tasks. Jaremeko investigated the use of stress inoculation training with 62 subjects suffering from public speaking anxiety. His findings indicate that stress inoculation not only decreased the subjects' reported levels of anxiety, but also increased and improved the subjects' percepts of efficacy. Kazdin's (1979) study examined the effects of a covert modeling treatment on self-efficacy with 48 non-assertive clients. The participants received either the covert modeling treatment, or a variation of covert modeling treatment which included the additional component of imagery elaboration. In the latter treatment, the clients imagined the same situations on scenes as in the former treatment, but were instructed to elaborate or improvise the scene, as long as the response required by the situation remained assertive. Self-report measures and behavioral role-playing tests were used to assess the clients' assertive skills before and after the study. A questionnaire, designed to assess self-efficacy, required subjects to make judgements about whether or not they could respond assertively to several situations, and to indicate their certainty about performing or not performing assertively. The covert modeling treatment led to improvements on the self-report, behavioural, and efficacy measures. The results suggested that increases in self-efficacy were associated with improvements in assertive skills.

The notion that perceived efficacy accurately predicts subsequent performance is further supported by Brown and Innouye's (1978) study. Brown and Innouye examined the hypothesis that learned helplessness could be induced through modeling. Forty male college students were assigned to one of four groups -- one in which the subjects were led to believe that they were of similar competence to a model, one in which the subjects were led to believe that they possessed superior competence to the model, one in which the subjects were given no information regarding the model's competence, or one in which the subjects were not exposed to a model. Each participant worked alongside, and then observed the model fail at anagram tasks under the foregoing variations in perceived similarity. The subjects in the group which perceived the model as being of similar ability to themselves, and the subjects in the group which did not receive information about the model, exhibited less persistence on the anagram tasks, than did subjects in the remaining groups. The results also revealed that regardless of treatment condition, the higher or stronger the subjects' efficacy expectations, the longer they persisted on the anagram tasks.

Schunk's (1978) study, which investigated self-efficacy theory in the area of arithmetic achievement with young children, further extends empirical support for self-efficacy theory. Schunk found that providing children with training consisting of modeling, guided performance, corrective feedback, and self-directed mastery, or with didactic instruction resulted in enhancement of the children's percepts of efficacy in relation to arithmetic tasks such as division problems with one, two, three or four-digit divisors. Persistence and accuracy on the arithmetic tasks was also enhanced. Across the two treatments and two levels of task difficulty, efficacy expectations accurately predicted the children's subsequent performance on the arithmetic tasks.

Bandura and Schunk (1980) investigated the hypotheses that competencies, efficacy expectations, and intrinsic interest are nurtured through proximal goal setting and resultant self-motivation. The children in the self-directed learning group which set proximal subgoals developed stronger efficacy expectations and greater interest and competence in the arithmetic tasks than did children in a self-directed learning group which received no instruction about setting goals, or in a no treatment group. Further, children's efficacy expectations were related positively to performance accuracy on the arithmetic tasks.

Gauthier and Ladoucier (1980) examined the possibility that the act of making self-efficacy judgements can in itself affect subsequent performance, and that this effect could be further enhanced if the efficacy judgements were voiced publicly. Forty snake phobic adults were assigned to one of four treatment groups. Two of these groups were required to make judgements about how close they could approach a snake. These two groups differed only in how they made their efficacy judgements. Subjects in one of the groups voiced judgements publicly; subjects in the other group recorded judgements privately. To control for the effects of completing the self-efficacy questionnaire, subjects in two additional groups completed a semantic differential scale instead of the efficacy probes. Again, subjects in one of these groups voiced their answers publicly, while subjects in the other group privately recorded their answers. The findings of the study revealed that the act of making efficacy judgements, whether they were recorded privately or voiced publicly, did not affect the overall positive relationship between the subjects' task specific efficacy judgements and their performance on the behaviour tasks.

In summary, a growing body of research and literature indicates that cognitive events can influence and mediate human action. It is becoming apparent that people's percepts of efficacy are accurate predictors of their subsequent performance on a variety of tasks. Evidence also indicates that the stronger the perceived efficacy, the more persistent the individual will tend to be in attempts to ensure performance success. Findings also suggest that a variety of clinical and instructional treatments enhance self-efficacy, which in turn predicts the level of performance change resulting from treatment or instruction. This research, therefore, suggests that cognitive events can be modified to improve performance and to alter behaviour.

Empirical Studies of the Relationship Between Cognitive Expectancies and Athletic Performance

To date, there have been few studies specifically investigating the relationship between self-efficacy and performance in athletics. There is, however, an emerging research emphasis investigating the relationship between cognitive skills in general and athletic performance. The results obtained from these studies are preliminary, and the role of specific cognitive skills in athletics remains to be clarified. Research efforts in the area of cognition and athletics seem to be directed at three major foci. The first and second areas of interest are the elucidation of specific cognitive skills in athletics, and the evaluation of if, and how these cognitive skills exert influence on athletic performance. Third, research is now being directed towards investigating the methods which can be used to ensure the development and improvement of specific cognitive skills in athletics.

Although many studies have focused on athletes' cognitive attributions which follow upon successful and unsuccessful performance on a variety of athletic tasks, these studies will not be addressed here. The focus of this study is on cognitive expectancies in athletics, and this section of the literature review will be restricted to studies of cognitive processes prior to engaging in athletic events.

A study by Feltz, Landers, and Raeder (1979) focused specifically on the relationship between self-efficacy and athletic performance. Feltz et al. examined the effectiveness of participant, live, and videotaped modeling both on the learning of a difficult spring-board diving task and on the strength of self-efficacy in relation to this task.

Sixty college females recruited from physical education classes participated. The participants were required to complete a questionnaire called the "Diving Efficacy Scale", before and after the training period. The questionnaire contained eight diving-related items, which were presented in order of increasing difficulty. Each participant was required to rate her certainty about her ability to perform each of the eight diving-related tasks, on a 100-point scale ranging in 10-unit intervals, from complete uncertainty to complete certainty. The participants were assigned to one of three groups -- live, participant, or video-taped modeling. The participants in the live and participant-modeling groups observed a live model perform the dive, while participants in the video-taped modeling group observed the same model perform the dive from a video-tape. Each participant was allowed four practice dives with informational feedback provided after each dive, and then was required to perform four more dives which were judged according to set standards for correctness or incorrectness. The participant-modeling group was guided physically through the first four dives with the aid of the model. The results of the study confirmed the prediction that participant-modeling would be more effective than either the video-taped or live modeling approaches in teaching the back dive and in creating stronger efficacy expectations. The prediction that the participants in the live-modeling group would perform better behaviourally and show stronger efficacy expectations than participants in the video-taped modeling group was not confirmed. Feltz et al. concluded that the guidance component of the participant modeling approach was primarily responsible for the participant modeling effects. The resultsalso lend support to the notion of a reciprocal relationship between successful performance attainments and enhanced self-efficacy.

Evidence from Mahoney and Avener (1977), and Shelton and Mahoney (1978) indicates that patterns of thought and imagery may exert influence on athletic performance. Mahoney and Avener's (1977) exploratory study, involving 13 male American gymnasts competing in the 1976 United States Olympic trials, investigated the psychological factors and cognitive strategies which the athletes used in training and completion. The athletes completed a standardized questionnaire which inquired about various aspects of their personality, self-concept, and the strategies they employed in training and competition situations. The athletes also were interviewed at various stages of the competition. Correlational analysis was performed to assess the relationship between the psychological variables/cognitive strategies and gymnastic performance in the 1976 Olympic trials. Results indicated that cognitive patterns, such as self-verbalizations and some forms of mental imagery, differentiated those athletes making the Olympic team, from those athletes who failed to make the Olympic team. The athletes who were successful in obtaining a position on the Olympic team reported more extensive self-talk during both training and competitive situations, a higher occurrence of internal imagery, and had greater self-confidence. The findings also suggest that the two groups (successful and unsuccessful at making the Olympic team) experienced different patterns of anxiety, and employed different strategies in coping with anxiety. Results suggest that both the successful and unsuccessful athletes experienced anxiety prior to, and during the competitive situation. In fact, prior to competition the successful athletes rated their anxiety higher than did the unsuccessful athletes. However, during the competition, the roles reversed, and the unsuccessful athletes reported experiencing higher levels of anxiety. Information obtained through interviews with the athletes suggested that the successful athletes used their anxiety to stimulate themselves to better performance, and that the unsuccessful athletes, through negative and doubting self-statements and imagery, further increased their levels of anxiety.

Shelton and Mahoney (1978) in an investigation of the content and effect of psyching-up (making oneself psychologically prepared for performance) strategies with 30 male weight lifters at a weight-lifting meet, found that the athletes who had been instructed to psych themselves up for a hand dynamometer strength test showed greater improvement on the test than did the control group. In order to control for the possibility of spontaneous psyching-up in the control group, control athletes had to engage in a distracting cognitive task (counting numbers) prior to performance of the athletic task. Interviews with the athletes at the completion of this study indicated that four basic strategies had been used by athletes in the experimental group to prepare themselves for the strength test. These four strategies were (a) attentional focus (focusing on the action and muscular movement required by the task), (b) focus on self-efficacy and personal ability, (c) preparatory arousal (focusing on getting excited, getting the blood moving, etc.), and (d) imagery (visualization of themselves performing the task). Half of the athletes in the experimental group reported using a combination of these four strategies. These results appear to support the notions that cognitive skills relevant to athletics can be identified, and that these cognitive processes may exert influences on athletic performances.

Meyers, Cooke, Cullen, and Liles (1979) replicated Mahoney and Avener's (1977) study with national champions and collegiate racquetball players. As in the Mahoney and Avener (1977) study, the more successful racquetball players were more self-confident, reported more self-talk in training and competition situations, and produced a greater frequency of racquetball-related thoughts throughout the day. Another interesting finding in this study was that the more successful players reported a higher frequency of dreams involving racquetball prior to competitive situations. They further reported that they were more likely to be the principal actors in such dreams. It therefore appears that psychological factors and cognitive strategies may differentiate successful athletes from less successful athletes in a variety of training and competitive situations.

In two studies, Meyers, Schleser, Cooke, and Culliver (1979) examined cognitive contributions to the development of gymnastic skills. In order to examine the relative effectiveness of instructions on the acquisition of gymnastic skills, four different sets of instructions were used to teach a simple and a complex gymnastic skill to 40 female gymnasts. The participants were divided into one of four groups, each receiving a different set of instructions. The four sets of instruction were positive, coping, negative self-instructions, and neutral instructions. The study did not find differential instructional effects in the acquisition of the two gymnastic skills. Insufficient physical practice after each instructional session was proposed to explain the inconclusive results. A study by Richardson (1967) supports the contention that while cognitive practice does facilitate the learning of motor skills, a basic level of skill and/or physical practice is necessary before improvement will be shown in the performance of the skill.

The second study by Meyer et al. (1979) examined and compared cognitive practice (cognitive rehearsal of positive self-instructions), physical practice, cognitive and physical practice, and a no-practice control, on the acquisition of three gymnastic skills. Findings suggested that both the physical/cognitive practice and the physical practice methods of practicing gymnastic skills were significantly better than the cognitive practice and no-practice groups in increasing the performance levels of the gymnasts. Explanations were offered for the apparent superiority of the physical practice component. First, the subjects in the physical group likely used cognitive practices of some sort spontaneously. Second, the self-instructions used in the study were not specifically tailored for each individual's ability level and/or the instructions did not include any affective component. Finally, it was proposed that the brief training periods may also have contributed to the physical practice group being superior to the other practice groups.

In summary, although the findings of these studies investigating the relationship between cognitive factors and athletic performance are somewhat preliminary, some apparent trends are emerging. The studies suggest that specific cognitions in athletics, such as self-efficacy judgements, may be elucidated and evaluated to determine the influence they may exert on athletic performance. The study by Feltz et al. (1979) provides optimism that there are methods available (such as participant modeling) which can be used to develop and enhance cognitive skills (such as self-efficacy) in athletics.

Hypotheses and Predictions for the Current Study

Using procedures similar to those employed by Bandura and Adams (1977) and Bandura et al. (1977), the present study investigates the relationship of self-efficacy and athletic performance in training and competitive situations. The central hypothesis is that athletes' percepts of efficacy and coaches' ratings of their athletes' abilities will relate to and predict the athletes' performance in 800 metre training and competitive situations. This prediction is consistent with the results of previous studies which investigated the relationship of self-efficacy and performance on various tasks. To this end, the study tested the following hypotheses:

A. Efficacy judgements reflecting higher magnitude and strength values will tend to be associated with more successful performance in 800 metre training and competitive situations. Efficacy judgements reflecting lower magnitude and strength values will tend to be associated with less successful performances in 800 metre training and competitive situations.

B. Physiological variables, past competitive performance attainments, training performance, and self-efficacy judgements will be analysed to determine which is the best predictor of athletic performance in the 800 metre track event. The hypothesis is that self-efficacy will most accurately predict subsequent performance in the 800 metre track event.

C. The athletes' efficacy judgements for competition and generality should be related strongly to the coaches' ratings of the athletes' capabilities on the efficacy probes for competition and generality.

This study extends previous research in that it elucidates and evaluates how self-efficacy relates to athletic performance in both training and competitive situations.

CHAPTER II

Method

Participants and Setting

Fourteen male 800 metre runners and five coaches participated in the study. The average age of the athletes was 22, with a range of 19 to 26 years. All participants were from either the Lower Mainland or Vancouver Island areas of British Columbia, Canada. The athletes were considered active because they were training a minimum of five days a week and intended to compete in the 1981 indoor track and field season.

The official results from all the competitions held in Canada and the United States in which British Columbia athletes had competed during the 1980 summer track season (May to September), were used to determine participant selection. All senior (19 years and older) male 800 metre competitive results were obtained and reviewed in the following manner. The names and performance times of all senior male 800 metre competitors were recorded. Each athlete's best performance time in 1980 was identified, and the athletes were ranked on this basis. From this ranking the athletes who placed in the top 20 positions were contacted and their participation in the study was requested.

Of the 20 athletes contacted, five athletes were unavailable to participate in the study because they were attending universities in the United States on athletic scholarships or had retired from competitive racing. Fifteen athletes agreed to participate in the study. One of these athletes did not complete the study because while training during the time period of the study, he incurred a physical injury.

There was one major reason for selecting only senior male 800 metre runners as subjects for this study. According to Bandura (1980), percepts of efficacy are specific to individual performance tasks. As a result, efficacy probes must correspond to the specific tasks which people will subsequently perform. In track and field, each event is like a distinct sport requiring specific skills and abilities for performance success. Specific performance expectations can be identified for each event, age, and sex category. If different sexes, ages, and/or events had been employed in the study, different efficacy probes would have been required for different levels of event, sex, and age factors. Comparisons across levels of these factors would have been impossible since efficacy data would have been generated from different efficacy items.

Once the 15 athletes had expressed their intent to participate in the study, their coaches were contacted and their participation in the study was requested. Every athlete's coach participated in the study. One coach was responsible for training six of the athletes, another coach was responsible for training five of the athletes, and the remaining three coaches worked with one athlete each.

The study took place over a 35 day period during which athletes participated in training seassions and at least one competition situation at various training tracks and competition sites throughout British Columbia, Canada, and northwest United States.

Variables and Their Measurement

Four major categories of variables were measured in this study. Physical, self report, performance, and other report variables are described below.

Physical Variables

Resting heart rate, percentage of body fat, height and weight, and general level of conditioning were the physical variables measured. These variables were measured to determine the conditioning level of each athlete, and were used in the correlational analyses investigating which of the variables in the study best predicted performances in the 800 metre competitive event. All of these measures, while assessing the conditioning of the athletes, did not require performance on the part of the athletes. It was considered critical that these measures did not require performance or behaviour during the assessment of conditioning level. It is possible that factors other than physiological conditioning per se, such as motivation or interest, might otherwise have influenced scores on the conditioning measures.

Resting heart rate. According to previous research (Morgan & Pollach, 1977; Astrand, 1976) conditioned individuals have more efficient circulatory systems than do less fit individuals. The heart of the conditioned individual is capable of beating more strongly and can pump more blood with each stroke than the heart of a less fit individual. Because the heart of a conditioned individual is strong and pumps more blood per stroke, the number of strokes necessary to circulate blood and oxygen is decreased. The result of this in the conditioned individual is a lower average resting heart rate (beats per minute while the body is relaxed and unstressed). Research indicates that an average person's heart beats approximately 70 to 75 beats per minute while relaxing (Astrand, 1976). The conditioned individual has a significantly lower heart rate than the heart rate of the unconditioned individual (Morgan & Pollach, 1977).

The resting heart rate (beats per minute while the body is unstressed and relaxed) of each athlete was taken and recorded at an initial contact session. In addition, the athletes took their own resting heart rate immediately upon waking one morning during the study. The two measures of heart rate were averaged to produce a heart rate per minute score for each participant.

Percent body fat estimate. Considerable research and literature focuses on the use of skinfold measures to determine the percentage of the body which is fat tissue (Haisman, 1971; Morgan & Pollach, 1977; Sinning, 1980). The percentage of the body which is composed of fat is one factor that must be considered when determining the conditioning level of any individual. The lower the percentage of body fat, in relation to total body weight, the greater the percentage of muscle. Greater percentages of muscle in a body is indicative of better conditioning. Morgan and Pollach (1977) have shown that average elite male distance runners are characterized by percentage of body fat ranging from five to seven percent. An average well conditioned male has a percentage of body fat ranging from 12% to 15% (Johnson & Nelson, 1974).

Many studies have dealt with the use and effectiveness of using skinfold measurement to estimate the percentage of body fat (e.g., Haisman, 1971). Various investigators have measured different body sites and then developed regression equations to estimate percentage body fat. The regression equations relate the thickness of the skinfold measures to a more detailed measure of percentage body fat (underwater weighing of an individual to establish total percentage of body fat).

The C. B. Corbin skinfold method was used in this study to obtain an estimate of percent body fat of the participants (Corbin, Dowell, Lindsey, & Tolson, 1981). This method employs three body sites (the abdomen, chest, and triceps) from which skinfold measures are taken. The Nomogram #2 (Crobin's nomogram for males) was used to convert the three skinfold measures to an estimate of percent body fat (Consolazio, Johnson, & Pecora, 1963).

Height and weight. Height and weight measures, used in conjunction with other data, provided additional physiological information on athletes' level of conditioning. Hubblelinck and Ross (1973) indicate that there are pronounced individual differences in respect to height and weight across various sports. Certain heights and weights tend to be most appropriate for successful performance in each sport. Owen (1970) further substantiates that athletes who are taller and heavier tend to perform better in some athletic events such as the 100 metres and throwing events; while athletes who are of average height and who are lighter, tend to perform better in athletic events such as long distance track events and gymnastics.

Coaches' objective evaluation. The well conditioned body is characterized by muscular firmness, compactness, leanness, prominent muscles, healthy skin tone, and good posture. Conversely, an unconditioned body is characterized by pale or unhealthy skin tones, a roundness and softness of the body, absence of evident muscles, underweight or overweight conditions, and poor posture (Falls et al., 1970; Hebbelinck & Ross, 1973).

Each coach was asked to provide an assessment of their athletes' general level of conditioning. This ranking (on a ten point scale) of the athletes' conditioning was based explicitly on the foregoing characteristics, and did not include consideration of performance attributes such as speed, endurance, or expectation of performance.

Self Report Variables

To investigate the relationship between the athletes' self-percepts of efficacy and athletic performance in competition and training, efficacy probes were used in this study. These efficacy probes related to both competitive and training performance. Generality items were also included. Of the 14 efficacy probes contained in the athletes' form eight were devoted to competitive tasks, three to generality items, and three to training tasks (see Appendix A).

The competitive and training probes were ordered according to level of task difficulty, ranging from simple tasks to extremely challenging and difficult tasks. The tasks were ordered according to their level of difficulty so that the athletes' responses would permit the calculation of a magnitude score. Magnitude refers to the level of task difficulty which each athlete judged he could perform, as revealed by his responses. Athletes' efficacy expectations may vary in terms of magnitude. Some athletes may limit their efficacious responses to the simple tasks, some may extend efficacious responses to include the tasks of moderate difficulty, and some athletes may include even the most difficult tasks.

Efficacy judgements also vary in terms of strength, from weak to strong indications of certainty. To permit the recording of efficacy strength, a scale, ranging from one to 10, was included with each efficacy probe. A response of one on this scale indicates high uncertainty about one's ability to perform the task, and thus is a very weak efficacy judgement. A response of five indicates moderate certainty about one's ability to perform the task, and thus is a moderate efficacy judgement. A response of 10 indicates strong certainty, and thus is a strong efficacy judgement. In this study, the athletes were required to circle one number on the 10-point scale accompanying each efficacy probe.

To assess whether or not the athletes' percepts of efficacy referred to a variety of behavioural domains or to only a select few, three generality items were included in the athletes' form. These three generality items assessed the generality of the athletes' percepts of efficacy by requiring the athletes to make judgements about their ability to perform three general, life tasks. The generality probes were similar to the competition and training probes in terms of general structure, and the types of responses required by the athletes (See Appendix A for a complete list of the training, competition, and generality probes which were employed in this study.)

Performance Variables

Performance measures in this study consisted of official competition results from the 1981 indoor track season, and the coaches' ratings of their athletes' performance in two training sessions.

Results from the 1981 indoor season (February to March) were obtained and reviewed. For each of the 11 athletes in this study who competed in at least one competition in the indoor season, a personal best indoor competitive time was identified. In addition, these athletes completed the probes a fourth time, prior to a competition of their choosing. The official competitive time of each athlete from this chosen competition was also obtained.

Coaches' ratings provided the performance measure for the two training sessions. Coaches were instructed to list the objectives of the particular training session on a coaches' form (See Appendix B) within one-half hour prior to the training session. At the completion of the training session, the coaches rated the extent to which each objective had been realized. A five-point scale, ranging from "this objective was not met", to "this objective was fully realized", was used to rate each objective (See Appendix B for the forms used to obtain the coaches' ratings of training objectives). These ratings were averaged to obtain an average rating for training performance. At the completion of the training session the coaches were instructed to rate their athletes' performance on a 10-point scale ranging from "poor" to "excellent". This second rating by the coaches was based on general impressions of the athletes' performance during training. In other words, the coach was required to make a judgement about the quality of performance which his athlete exhibited during that training session. No specific guidelines were provided to assist the coach in assessing his athlete's performance in training.

Other Report Variables

The "Coaches' Form" also provided a measure of each athlete's athletic potential and abilities. The coaches' form contained a modified version of the athletes' eight competitive self-efficacy probes and the three generality probes. The items on the coaches' form were the same competitive and generality items contained in the athletes' probes, but altered so as to be appropriately referenced to another's judgements. For example, an item such as "I will run..." was changed to "Athlete will run..." on the coaches' form.

The items were included on the coaches' form exactly as they had been ordered according to task difficulty on the athletes' form. Therefore, the tasks were ordered from simple to difficult, as they had been ordered on the athletes' form, so that the coaches' responses also could yield a magnitude score. Magnitude in this case refers to the level of task difficulty which each coach judged his athlete could perform, as revealed by his (the coach's) ratings of the efficacy probes.

As on the athletes' form, each probe was accompanied by a scale ranging from one to 10. The strength of a coach's judgement about his athlete's ability to perform a task is assessed by the number the coach circled on the scale accompanying that probe. A response of one would indicate that the coach is highly uncertain about his athlete's ability to perform the task. A response of 10 indicates that the coach is highly certain about his athlete's ability to perform the task.

The coaches' form included two additional items. First, the form required the coach to make a judgement about the maximum performance level he could expect from his athlete. Second, coaches were required to record the ways (if any) that they communicated their judgements to their athletes. (See Appendix B for copy of the coaches' form.)

Procedures

The initial contact session began with personal introductions and a description of the study (10 minutes). Following this, the Athletes' Forms and Coaches' Forms were administered for the first time. The coaches and athletes privately completed their respective forms (see Appendix A and B). The athletes completed only the efficacy probes for competition and the three efficacy probes for generality at the contact session. Therefore, the three efficacy probes for training (12, 13 and 14) were not answered the first time the probes were completed. The coaches only completed pages 2 and 3 of the coaches' form, which contained eight efficacy probes for competitive and the three efficacy probes for generality. Therefore, page 1 and 4, which pertained to training, were not completed at this initial time. Upon completion, these forms were collected.

The envelopes which contained additional athletes' and coaches' forms to be used for the rest of the study were then distributed. Each athlete received three envelopes. Every envelope contained one set of efficacy probes. Each coach was provided with two envelopes (each containing one set of coaches' probes for every athlete he coached).

Once the procedures were understood and before the initial contact session was over, the conditioning measures were taken. Two people measured and recorded all information (See Appendix C). One person was responsible for taking and recording the resting heart rate, height, and weight of each athlete. Another person, trained in the use of skinfold calipers, was responsible for measuring and recording the three body fat measures. All information was recorded on a standard form (See Appendix C).

At this time, each coach was instructed to provide an assessment of his athlete's physical conditioning. A standard form, which contained the instructions and guidelines for assessing the athlete's conditioning was provided for the coaches (See Appendix D).

Fourteen athletes completed the efficacy probes on two more occasions, prior to two training sessions. Within one-half hour prior to the training sessions, the 14 athletes completed the efficacy probes for competition, generality, and training. The five coaches completed the coaches' form on two more occasions at the same two training sessions which individual athletes under his tutelage completed the athletes' form. The coaches completed the entire four page form on these two occasions.

The coaches completed a portion of their form (pages 1, 2, and 3) within one-half hour prior to the training sessions. This portion included the recording of the specific workout planned, objectives for the session. and the eight competitive and three generality probes. The coaches completed the remainder of the form immediately after the training session. This latter portion (page 4) of the coaches' form required the coaches to rate their athlete's training performance and to rate the degree to which the training objectives had been realized.

Eleven of the 14 athletes completed the efficacy probes on a fourth occasion, prior to an 800 metre competition of their choosing sometime during this 35 day period. The forms were completed just before the athlete began to warm-up prior to the 800 metre competition. On the fourth occasion, similar to the first occasion, the athletes completed only the eight efficacy probes for competition and the three efficacy probes for generality. Three athletes did not complete the efficacy probes a fourth time prior to a competition. Due to a variety of factors they did not partake in any 800 metre competition in the 1981 indoor season.

All the forms were completed within a 35 day period (February 3 to March 6, 1981).

At the completion of the indoor season, the official 1981 indoor competitive results were obtained and reviewed. Each of the 11 athletes' seasonal best competitive performance was identified. The competition time was identified for each athlete, from the specific competition before which the athlete had completed their final probe.

CHAPTER III

Results

In this chapter, means and standard deviations are presented for the experimental variables at each administration of the efficacy probes, and correlations among variables are reported. A microanalysis of the relationship between self-efficacy and performance is documented. Bandura's (1978) system of microanalysis was used to investigate whether or not self-efficacy predicts performance in competition and training situations. Finally, trends in individual data from the participating athletes are presented and discussed.

Descriptive Summary of Data

The descriptive statistics contained in Table 1 and illustrated in Figure 1 were derived in the following manner. Means were calculated for each participant on each group of efficacy items for every occasion on which the participant completed the efficacy probes. The means for each participant were calculated by summing all the participant's responses (number circled on 10 point scale accompanying each probe) on each group of items at each administration of the efficacy probes. These total strength scores were then divided by the number of probes contained in that particular group of efficacy items. In other words, the total competition efficacy strength scores per individual at each administration therefore were divided by eight, and similar total efficacy scores for generality and training were divided by three. Second order efficacy strength averages were then determined for each participant on each group of efficacy items by summing the previously obtained means for each group of efficacy items across efficacy probe administrations and then dividing

Table 1

MEANS AND STANDARD DEVIATIONS FOR MAIN VARIABLES

GROUPS OF ITEMS:	Contact $\bar{X}$	Contact SD	Training #1 $\bar{X}$	Training #1 SD	Training #2 $\bar{X}$	Training #2 SD	Competition $\bar{X}$	Competition SD
Athletes' Efficacy Probes for Training	----------		5.95	2.36	6.21	1.59	--------	
Coaches' Rating: Performance	----------		7.29	2.02	6.50	2.59	--------	
Coaches' Rating: Objectives	----------		8.57*	1.59	9.00*	1.16	--------	
Athletes' Efficacy Probestor Competition	4.82	1.93	4.54	1.21	4.73	1.67	5.02	1.05
Coaches' Ratings of Efficacy Probes for Competition	5.69	2.35	5.13	2.16	4.95	2.33	--------	
Athletes' Efficacy Probes for Generality	8.73	1.29	8.94	1.21	9.16	1.04	8.95	1.02
Coaches' Ratings of Efficacy Probes for Generality	8.45	0.90	8.33	0.86	8.14	1.08	--------	

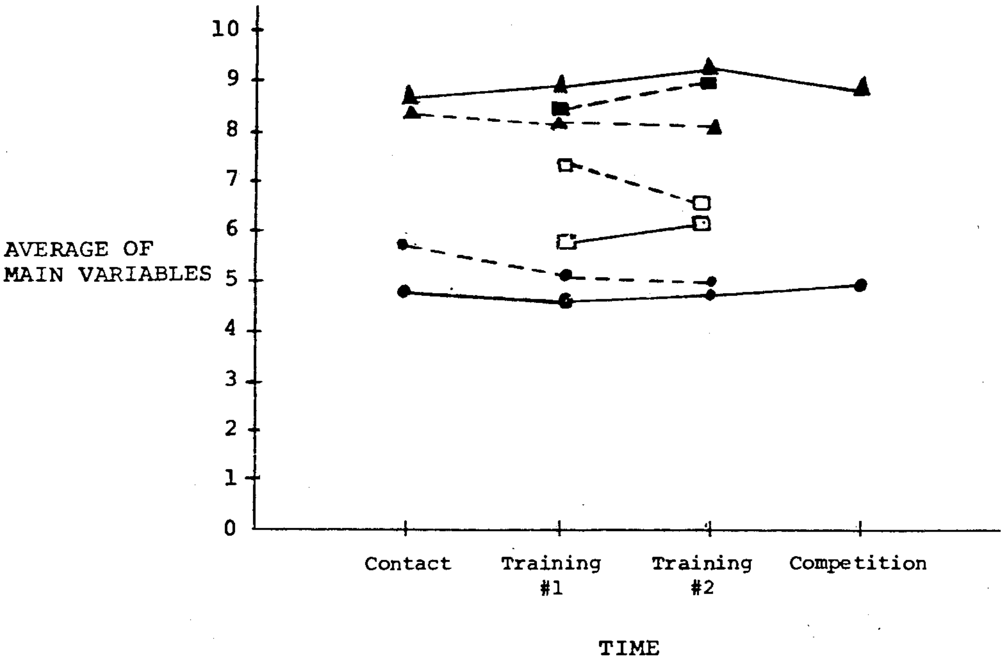
N = 14 for Contact, Training #1 and Training #2

N = 11 for Competition

(* Raw scores indicating coaches' ratings of training objectives were multiplied by two and then averaged across probe items and coaches to obtain the scores reported in this table.)

Figure 1

MEANS OF MAIN VARIABLES AT THE
VARIOUS ADMINISTRATIONS OF EFFICACY PROBES



Legend:

- □——□ Athletes' Average Efficacy Probe for Training
- □---□ Coaches' Average Rating: Training Performance
- ■---■ Coaches' Average Rating: Objectives
- ●——● Athletes' Average Efficacy Probes for Competition
- ●---● Coaches' Average Ratings of Efficacy Probes for Competition
- ▲——▲ Athletes' Average Efficacy Probes for Generality
- ▲---▲ Coaches' Average Ratings of Efficacy Probes for Generality

by the number of administrations. To obtain the means presented in Table 1 and illustrated in Figure 1, within each group of efficacy items, these second order means were summed and then divided by the number of participants.

Various general trends in the training and competition data become apparent when Table 1 and Figure 1 are examined. These trends are discussed here, without the aid of inferential statistics, simply to provide an overall description of the main variables at different times in the study. On the occasions on which the efficacy probes for training were completed, the athletes made similar judgements, with less variation among the judgements at the second administration. On both occasions, the athletes' efficacy judgements for training were lower than the average ratings which the coaches gave to the training performance. At both administrations, athletes' efficacy judgements for training and the coaches' ratings of training performance were considerably lower than the coaches' ratings of the training objectives. These trends indicate that the athletes may have experienced difficulty in predicting their training performance, and perhaps tended to underestimate their ability to perform the training tasks. Further discussion of this tendency, together with the discrepancies between coaches' ratings of overall training performances and their ratings of training objectives, will be discussed in Chapter IV. (Due to the apparent discrepancy existing between the coaches' ratings of the training objectives and the overall ratings of training performance, the coaches' average ratings of objectives were not used further in analyses of the training data. Justification for this decision is provided in Chapter IV.)

The athletes efficacy judgements for competition were fairly constant over time. Coaches' ratings of efficacy probes for competition were higher than the athletes' responses on these efficacy probes at all administrations of the efficacy probes. Coaches' ratings of efficacy probes for competition declined in magnitude over successive administrations of the efficacy probes. These trends suggest that although the athletes' and coaches' judgements were somewhat discrepant at all administrations of the probes, they become increasingly similar over the course of the study. Further discussion of these trends occurs in Chapter IV.

Both the coaches and athletes made strong judgements concerning the athletes' abilities to perform the generality items. Over the course of the study, the athletes' mean response on the efficacy probes for generality gradually increased over the first three administrations of the efficacy probes, and slightly decreased on the final administration of the efficacy probes. The coaches' ratings were lower than the athletes' ratings on the efficacy probes for generality at all administrations of the efficacy probes. The coaches' ratings of the athletes' abilities to perform the generality items decreased over successive administrations of the efficacy probes.

Correlational Analyses

A ten point scale accompanied each efficacy probe in the study. The athletes and coaches circled one number on each scale to indicate their certainty (strength of judgement) about the athletes' abilities to perform particular tasks. Two strength scores were calculated and used in the correlational analyses--average efficacy scores and absolute efficacy strength scores.

The efficacy probes in this study represented competitive, training, and generality tasks which varied in degree of difficulty. These probes were ordered according to level of difficulty, ranging from simple tasks to challenging and difficult tasks. Magnitude refers to the level of task difficulty each athlete and coach felt the athlete could perform, as revealed by responses of four or higher on the 10-point scale. In this study, magnitude scores equalled the number of probes on which ratings of four or more were obtained.

These efficacy strengths and efficacy magnitude scores for each of the three groups of efficacy items were correlated with the efficacy strength and magnitude scores obtained for other groups of efficacy items. The athletes' efficacy strength and magnitude scores for competition and for training were correlated with competition and training performance measures respectively. Coaches' ratings of efficacy probes for competition were correlated with the competitive performance results. (Due to the task specific nature of the efficacy probes, correlations were only performed between specific efficacy judgements and the specific tasks to which they were related, or among the three different groups of efficacy items.) The absolute scores were also used in a correlational analyses involving absolute efficacy strength scores, physiological variables, and competitive performance variables.

Correlations Involving Average Efficacy Strength Scores

An average efficacy strength score was calculated for each participant on each group of efficacy items at each administration of the efficacy probes. The average efficacy strength scores for each participant were calculated by summing all the participant's responses (number circled on 10point scale accompanying each probe) on each group of efficacy items at each administration of the efficacy probes. These total strength scores were then divided by the number of probes contained in that particular group of efficacy items. To obtain these average efficacy strength scores, the total competition efficacy strength scores per individual at each administration were therefore divided by eight, and similar total efficacy scores for generality and training were divided by three. Second order efficacy strength averages were then determined for each participant on each group of efficacy items by summing the previously obtained average efficacy scores for each group of efficacy items across efficacy probe administrations and then dividing by the number of administrations.

The higher the average efficacy strength scores in each group of efficacy items, the stronger the athletes' and/or coaches' judgements of the athletes' abilities to perform the tasks within that group of items. The lower or weaker the average efficacy strength scores in each group of efficacy items, the weaker the athletes' and/or coaches' beliefs in the athletes' abilities to perform the tasks within that group of efficacy items.

The average efficacy strength scores for each group of efficacy items were correlated with competition results, and with the average efficacy strength totals for the other groups of efficacy items. The efficacy strength scores for training were correlated with the coaches' average overall rating of training performance. These correlations are presented in Table 2.

Table 2

PEARSON PRODUCT CORRECTIONS INVOLVING
AVERAGE EFFICACY STRENGTH SCORES

		Athletes' Average Efficacy Strength Scores			Coaches' Average Ratings of Efficacy Probes
		Competition	Training	Generality	Competition
Athletes' Average Efficacy Strength Scores	Competition				
	Training	-.48 (n=11)			
	Generality	-.21 (n=11)	-.24 (n=11)		
Coaches' Average Ratings of Efficacy Probes	Competition	.73* (n=11)	---	---	
Performance Scores	1981 Indoor Personal Best	-.78** (n=10)	---	---	-.60 (n=10)
	1981 Criterion Performance	-.68* (n=10)	---	---	-.52 (n=10)
	Average Overall Ratings of Training Performance	---	-.25 (n=14)	---	---

* $p < .05$
** $p < .01$

--- Indicates correlations between variables are not meaningful and are therefore not reported

The correlational analyses investigating the relationship between the efficacy strength scores for each group of items with the other groups of efficacy items used only the data from the 11 athletes who completed the efficacy probes on four occasions, and competed during the course of the study. The correlations investigating the relationship of the efficacy strength scores for competition and competitive performance used only the 10 athletes (and their coaches) who fully completed the 800 metre competitive race. The analysis of the efficacy strength scores for training and training performance included all 14 athletes and their coaches.

No relationship was found between the athletes' average efficacy strength scores for training and the coaches' average overall training performance ratings. This finding suggests that the athletes were unable to predict accurately their performance in the training sessions.

No statistically significant trend emerged when the athletes' average efficacy strength scores for training were correlated with the athletes' average efficacy strength scores for competition. This finding suggests that the athletes tended to make judgements of varying strength on the efficacy probes for competition. These results indicate that statistically significant linear relationships do not exist among the foregoing variable combinations.

Negative and significant relationships emerged when the athletes' average efficacy strength scores for competition were correlated with their seasonal best competitive performance ($r = -.78$, $p < .01$). Further, the correlation between the athletes' average efficacy strength scores for competition and the criterion competition performance was also negative and significant ($r = -.68$, $p < .05$). The strong and negative relationships discovered between the athletes' average efficacy strength scores for competition and their competitive performance, indicates that the athletes' were able to judge accurately their abilities to perform the competitive tasks. (It should be noted that the better the 800 metre performance, the lower the performance score or time which was recorded. Consequently, higher efficacy judgements for competition associated with lower performance times yield negative correlations.)

No statistically significant results emerged when the coaches' average ratings of the efficacy probes for competition were correlated with the athletes' 1981 indoor personal best competitive performance, or with the athletes' criterion competitive performances.

A significant and positive correlation was obtained when the coaches' average ratings of the efficacy probes for competition were correlated with the athletes' average efficacy strength scores for competition ($r = .73$, $p < .01$). It appears that if the coach made strong or weak ratings on the efficacy probes for competition, the athlete tended to make similarly strong or weak judgements on the efficacy probes for competition.

Correlations Involving Absolute Efficacy Strength Scores

The second set of efficacy strength scores calculated and used in the correlational analyses were absolute efficacy strength scores. In the previous correlations, all of the athletes' and coaches' responses, including judgements of all strength values, were used to obtain average efficacy strength scores. In the following analyses, only the responses indicating efficacy judgements or ratings of moderate (4) to strong values (10) were used. It was thought that efficacy scores which excluded relatively uncertain responses to the efficacy probes might yield slightly different results from the average efficacy strength scores used previously. Since self-efficacy is theoretically a matter of judged certainty, perhaps these absolute efficacy scores might be more consistent with the theoretical description of the self-efficacy construct. These scores were used to investigate how the athletes' absolute efficacy scores in each group of items related to the absolute efficacy scores in the remaining groups of efficacy items. Athletes' absolute efficacy strength scores for competition were correlated with competitive performance. The athletes' absolute efficacy scores for training were correlated with the coaches' ratings of training performance, and the coaches' absolute ratings of efficacy probes for competition were correlated with competitive performances, and the athletes' absolute efficacy strength scores for competition. These correlations are presented in Table 3.

The absolute efficacy strength scores were calculated by summing only those responses which indicated moderate (4) to strong (10) judgements about the athletes' abilities to perform the tasks. Such absolute efficacy totals were determined for each athlete and coach on each group of efficacy items at each administration of the efficacy probes. These totals were then summed across administrations to yield the absolute efficacy scores used in the correlations in Table 3.

Table 3

PEARSON PRODUCT MOMENT CORRELATIONS
INVOLVING ABSOLUTE EFFICACY STRENGTH SCORES

		Athletes' Absolute Efficacy Strength Scores			Coaches' Absolute Ratings of Efficacy Probes
		Competition	Training	Generality	Competition
Athletes' Absolute Efficacy Strength Scores	Competition				
	Training	-.44 (n=11)			
	Generality	-.41 (n=11)	-.23 (n=11)		
Coaches' Absolute Ratings of Efficacy Probes	Competition	.72* (n=11)	---	---	
Performance Scores	1981 Indoor Personal Best	-.79** (n=10)	---	---	-.79** (n=10)
	1981 Criterion Performance	-.65* (n=10)	---	---	-.65* (n=10)
	Average Overall Ratings of Training Performance	---	.01 (n=14)	---	---

* $p < .05$
** $p < .01$

--- Indicates correlations between variables are not meaningful and therefore not reported

The cut-off value of four was used because it indicates a moderate degree of assurance or certainty that the task can be performed successfully, and therefore should be considered an efficacious response.

No patterns emerged when the athletes' absolute efficacy strength scores for competition were correlated with the athletes' absolute efficacy strength scores for generality and training. No statistically significant relationships were found when the athletes' absolute efficacy scores for training were correlated with the coaches' average ratings of training performance. These results indicate that statistically significant linear relationships do not exist among the foregoing variable combinations.

The correlation between the athletes' absolute efficacy strength scores for competition and the 1981 indoor seasonal best competitive performance was negative and significant ($r = -.79$, $p < .01$). Further, the athletes' absolute efficacy strength scores for competition correlated negatively and significantly with the criterion competitive performance ($r = -.65$, $p < .05$). These results indicate that the absolute efficacy strength scores for competition predicted the athletes' success in the competitive situations.

The correlations between the coaches' absolute ratings of efficacy probes for competition and the athletes' 1981 indoor personal best performance ($r = -.79$, $p < .01$) and the athletes' criterion performance ($r = -.65$, $p < .05$) were both negative and significant. These results indicated that the coaches' absolute ratings of efficacy probes for competition accurately predicted the athletes' abilities to perform the competitive tasks.

When the athletes' absolute efficacy strength scores for competition were correlated with the coaches' absolute ratings of efficacy probes for competition, a significant and positive correlation emerged ($r = .72$, $p < .05$). These results suggest that coaches and athletes exhibited similar degrees of certitude about the athletes' abilities to perform the competitive tasks.

Correlations Involving Efficacy Magnitude Scores

Efficacy judgements vary on several dimensions. The two previous correlational analyses focused on the strength of efficacy judgements. The following correlations are concerned with the magnitude of efficacy judgements. Magnitude refers to the level of task difficulty which each athlete feels he can perform. In this study, magnitude was defined operationally as the number of tasks to which the athlete responded four or higher on the scales accompanying the efficacy probes. Again, a cut-off value of four was used because it indicates a moderate amount of assurance that the task can be performed successfully. Magnitude scores were calculated on each group of efficacy items for every participant at each administration of the efficacy probes. Second order totals for each group of efficacy items were then calculated across the various administrations of the efficacy probes. The correlations involving efficacy magnitude are presented in Table 4.

The correlational analyses involving efficacy magnitude scores did not include efficacy magnitude scores for generality, because both the coaches and athletes indicated that they felt the athletes were capable

Table 4

PEARSON PRODUCT CORRELATIONS INVOLVING EFFICACY MAGNITUDE SCORES

		Athletes' Efficacy Magnitude Scores			Coaches' Ratings of Efficacy Magnitude Scores
		Competition	Training	Generality	Competition
Athletes' Efficacy Magnitude Scores	Competition				
	Training	-.15 (n=11)			
	Generality	---	---		
Coaches' Ratings of Efficacy Magnitude Scores	Competition	.65* (n=11)	---	---	
Performance Scores	1981 Indoor Personal Best	-.74** (n=10)	---	---	-.41 (n=10)
	1981 Criterion Performance	-.52 (n=10)	---	---	
	Average Overall Ratings of Training Performance	---	-.25 (n=14)	---	---

* $p < .05$
** $p < .01$

--- Indicates correlations between variables are not meaningful and are therefore not reported of performing all the generality tasks. As a result, all participants had the same magnitude scores for generality, and no variance was associated with this measure.

When the athletes' efficacy magnitude scores for competition were correlated with their 1981 personal best competitive performance time, a significant and negative relationship emerged ($r = -.74$, $p < .01$).

No discernable patterns emerged when the athletes' efficacy magnitude scores for competition were correlated with the athletes' efficacy magnitude scores for training, or the criterion performance times. No significant trends appeared when the coaches' ratings of efficacy magnitude scores were correlated with either the athletes' 1981 seasonal best performance times, or the athletes' criterion performance times. When the athletes' magnitude scores for training were correlated with the coaches' average ratings of training performances no statistically significant relationship emerged. These findings indicate that there is no statistically significant relationship among any of the foregoing combined variables.

The correlational data on magnitude scores suggest a positive and significant relationship between the athletes' judgements about the competitive tasks which he believes he can accomplish, and his coaches' judgements about the competitive tasks which he can accomplish ($r = .67$, $p < .05$).

<u>Additional Correlations Among Absolute Efficacy Strength Scores, Physiological Variables, Training and Competitive Performance Variables</u>

A number of additional correlations among absolute efficacy strength scores, physiological variables, and training and competitive performance variables were calculated to investigate which of these variables were the best predictors of competitive performance in the 800 metre event. All these variables were correlated with the 1981 indoor personal best competitive times. The correlations are presented in Table 5.

Absolute efficacy strength scores were used in this correlational analyses because they were equal to, or more highly correlated with performance measures, than were average efficacy strength scores.

When the athletes' 1980 outdoor personal best 800 metre competitive times were correlated with the 1981 indoor personal best competitive times, no pattern appeared. This suggests that the previous personal best performance times, and the resulting rankings obtained through these performances, are not accurate in predicting how the athletes will perform and be ranked in the following indoor season.

When each of the physiological variables, height, weight, percent body fat estimate, and resting heart rate, were correlated with the athletes' 1981 indoor personal best performance times no statistically significant relationships emerged. It appears that none of these physiological variables were significantly related to the athletes' performances in the 800 metre event. Further, it also appears that these physiological variables are not accurate predictors of performance in the 800 metre competitive events.

Table 5

PEARSON PRODUCT MOMENT CORRELATIONS OF PERSONAL BEST TIMES WITH ABSOLUTE EFFICACY SCORES FOR COMPETITION, COACHES' RATINGS, PREVIOUS PERSONAL BEST TIMES, AND PHYSIOLOGICAL VARIABLE

(N = 10)

	1981 Indoor Personal Best Performance
Athletes' Absolute Efficacy Scores for Competition	-.79**
Coaches' Absolute Ratings of Efficacy Probes for Competition	-.79**
1980 Outdoor Personal Best Performance	.23
Heart Rate (beats per minute)	-.05
Estimate of Body Fat (%)	.08
Height	.48
Weight	.08
Average Overall Ratings of Training Performance	-.53
Coaches' Ratings of Athletes' Conditioning	-.70*

* $p < .05$
** $p < .01$

When the average overall training performance ratings were correlated with the athletes' 1981 indoor competitive performances no significant relationship emerged. It therefore appears that the athletes' performances in training do not predict how the athletes will perform during the competitive season.

The coaches' ratings of the athletes' level of conditioning related signifificantly with the 1981 personal best competitive times ($r = .-70$, $p < .05$). This indicates that the coaches' ratings of their athletes' level of conditioning predicted the athletes' performances in the 800 metre competitive event. It appears that the athletes which the coaches judged to be well conditioned, performed better than those athletes whom the coaches judged to be at a lower level of conditioning.

When both the athletes' absolute efficacy scores for competition and the coaches' absolute ratings of the efficacy probes for competition were correlated with the athletes' 1981 indoor personal best performance times negative and significant relationships emerged ($r = .-78$, $p < .01$). This finding suggests that both coaches and athletes were able to accurately judge the athletes' performance in the 800 metre competitive event.

The foregoing correlational analyses indicate that the athletes' absolute efficacy strength scores for competition and the coaches' absolute ratings of the efficacy probes for competition are the best predictors of the athletes' performance in the 800 metre competitive event. The coaches' absolute ratings of the efficacy probes for competition and the athletes' absolute efficacy strength scores for competition were superior to the training performance measure, the four physiological variables, coaches' ratings of conditioning, and previous performance results, in predicting the athletes' performance in the 800 metre competitive event.

Microanalysis of Self-efficacy and Performance

The foregoing correlational analyses attempted to determine the general linear relationships among self-efficacy and performance variables. To provide a more precise analysis of these relationships, microanalytic methodologies (see Bandura, 1980; Bandura & Adams, 1977; Bandura & Schunk, 1980; Schunk, 1978) were used. Bandura (1978) suggests that microanalytic methodologies provide more precise information on how efficacy judgements relate to performance, because they examine the congruence between efficacy judgements and performance at the level of individual tasks. Correlational analyses, in contrast to the microanalytic procedures, are based upon aggregate measures, and therefore do not reveal the congruence between specific efficacy judgements and specific performance.

Bandura's (1978) microanalytic methodology involves the analysis of congruence between self-efficacy and performance at the level of individual tasks. The level of congruence is determined by comparing the athletes' efficacy judgements with their actual performance. Congruence occurs when there is a match between efficacy judgement and performance. This occurs in the two cases where the athlete judges he is capable of performing a task and then successfully performs that task, or when the athlete judges he cannot perform the task and is then unsuccessful at performing the task. Incongruence occurs when there is a mismatch between the athletes' judgements and performance. Incongruence occurs in the two cases where the athlete makes a judgement that he cannot perform the task and then proceeds to perform it, or when the athlete judges himself capable of performing the task and then fails to perform the task.

Congruence indices are computed by partitioning each athlete's judgements and performances into a 2 x 2 table, consisting of performance ("Did" and "Didn't" perform task) and efficacy judgement ("Can" and "Can't" perform task) dimensions. Two of the cells are congruent cells, and two of the cells are incongruent cells (see Figure 2).

		SELF-EFFICACY	
		+ (can)	- (can't)
PERFORMANCE	+ (did)	++ congruence	-+ incongruence
	- (didn't)	+- incongruence	-- congruence

Figure 2. 2x2 matrix used in microanalytic methodology.

To dichotomize the athletes' judgements into "can" perform and "can't" perform cells, a cut-off value of four was used. An efficacy judgement of four or higher was therefore considered an efficacious response, and was placed in either of the "can" perform cells. A judgement of three or below is therefore considered an inefficacious response and was placed in either of the "can't" perform cells.

A cut-off value of four was used for two reasons. First, other studies previously have used a cut-off value of four in their micro-analytic methodologies (Bandura, 1977; Bandura & Schunk, 1980). Second, a cut-off value of four was considered the most appropriate because a response of four indicates a moderate amount of assurance that the task can be performed, and therefore should be considered an efficacious response.

To dichotomize the athletes' performances into "did" perform and "didn't" perform cells, the coaches' average ratings of training performance and the athletes' seasonal best competitive performances were used. Coaches' ratings of training objectives were not used in this analysis. Justification for this will be discussed in Chapter IV.

Generality self-efficacy judgements were not analysed in this manner, because no generality performance measure was used in this study.

Intra-individual Data

To determine the proportion of congruence existing between the athletes' efficacy judgements and their performance, the following procedures were used. First, the frequencies in the two congruent cells were summed. This total was then divided by the total number of data points in the 2x2 matrix and multiplied by 100 to obtain an obtained congruence percentage. To determine the chance level of congruence, (the degree of chance that the frequencies would be distributed in the cells in such a fashion) the following procedures were used. First, row and column sums were calculated for the data in each 2x2 matrix. The row and column sums to which one of the congruent cells contributed were then multiplied. This figure was then divided by the total number of data points in the matrix to obtain a chance frequency for that particular congruent cell. A chance frequency for the remaining congruent cell was calculated in a similar fashion. The two chance frequencies of the congruent cells were summed and then divided by the total number of data points in the matrix to obtain a chance congruent proportion. This proportion was multiplied by 100 to yield a chance congruence percentage.

No apparent patterns emerged when microanalysis was performed on the training data. In all cases, there was no difference between the obtained congruence and chance congruence percentages. Possible explanations for these findings are presented in Chapter IV.

The 2x2 matrices in Table 6 are concerned with the athletes' efficacy judgements for competition and their 1981 personal best 800 metre competitive performances. This table reports, for each of the 10 athletes who completed the efficacy probes and fully completed the competition situation, the frequencies in each cell of an individualized 2x2 matrix, the percentage of obtained congruence, and the percentage of chance or expected congruence. Data from the eleventh athlete who completed the efficacy probes on four occasions but did not complete the 800 metre competition could not be used in this analysis. This athlete could not be included because he did not fully complete the competition performance, and therefore no performance basis was available for dichotomizing his efficacy judgements into the appropriate "did" and

Table 6

MICROANALYSIS OF INTRA-INDIVIDUAL DATA:
INVOLVING ATHLETES' EFFICACY RESPONSES
FOR COMPETITION ACROSS ADMINISTRATIONS
AND
PERSONAL BEST COMPETITION PERFORMANCE

ATHLETE #1

800Metre Performance	Self Efficacy +	Self Efficacy −
+	8 (3.75)	0 (4.25)
−	7 (10)	17 (12.75)

Congruence

Chance = 51.56%
Obtained = 78.13%

ATHLETE #2

800Metre Performance	Self Efficacy +	Self Efficacy −
+	4 (1.63)	0 (2.37)
−	9 (3.5)	19 (16.63)

Congruence

Chance = 57.03%
Obtained = 71.86%

ATHLETE #3

800Metre Performance	Self Efficacy +	Self Efficacy −
+	20 (16.25)	0 (3.75)
−	6 (9.75)	6 (2.25)

Congruence

Chance = 57.81%
Obtained = 81.25%

ATHLETE #4

800Metre Performance	Self Efficacy +	Self Efficacy −
+	18 (13.75)	2 (6.25)
−	4 (8.25)	8 (3.75)

Congruence

Chance = 54.69%
Obtained = 81.25%

ATHLETE #5

800Metre Performance	Self Efficacy +	Self Efficacy −
+	8 (6)	0 (2)
−	16 (18)	8 (6)

Congruence

Chance = 37.50%
Obtained = 50.00%

ATHLETE #6

800Metre Performance	Self Efficacy +	Self Efficacy −
+	4 (1.5)	0 (2.5)
−	8 (10.5)	20 (17.5)

Congruence

Chance = 59.38%
Obtained = 75.00%

− Indicates "Can't" efficacy judgements and "Didn't" achieve competitive performance task.

+ Indicates "Can" efficacy judgements and "Did" achieve competitive performance task.

. . . /continued

Table 6 -- Continued

ATHLETE #7

800Metre Performance	Self Efficacy +	Self Efficacy -
+	8 (4)	0 (4)
-	8 (12)	16 (12)

Congruence

Chance = 50.0 %
Obtained = 75.0 %

ATHLETE #8

800Metre Performance	Self Efficacy +	Self Efficacy -
+	12 (6)	0 (6)
-	4 (10)	16 (10)

Congruence

Chance = 50.0 %
Obtained = 87.50%

ATHLETE # 9

800Metre Performance	Self Efficacy +	Self Efficacy -
+	4 (3)	0 (1)
-	20 (21)	8 (7)

Congruence

Chance = 31.35%
Obtained = 37.5 %

ATHLETE #10

800Metre Performance	Self Efficacy +	Self Efficacy -
+	8 (3.5)	0 (4.5)
-	6 (10.5)	18 (13.5)

Congruence

Chance = 53.13%
Obtained = 81.25%

"didn't" cells.

From an examination of Table 6, it is apparent that the actual or obtained congruence exceeds the chance value of congruence for every athlete. The trend suggests that the athletes were capable of predicting their competitive performance. To determine if this level of predictiveness was significant, and thus better than what might be expected by chance, a matched group t-test and a sign test were calculated. To calculate the matched group t-test the chance and obtained congruence proportions for each of the 10 athletes were used. The differences between the obtained congruence proportions and the chance congruence proportions were obtained, and then treated as one set of differences from a random sampling distribution of such differences. A matched group t-test determined that a significant difference existed between the obtained and a chance congruence proptions ($t(10) = 8.159$; $p \leq .0005$). To calculate the sign test, the chance and obtained congruence proportions for each of the 10 athletes were used. The chance congruence proportions were subtracted from their paired obtained congruence scores, to obtain the differences between the two sets of scores. These differences were ranked according to their numerical value, beginning with the smallest difference. All difference values which were negative were summed, and all difference values which were positive were summed. The smaller of the two sums was used to check for significance in Wilcoxon's signed-rank probabilities' table (Bruning & Kintz, 1977). The results of the sign test further substantiated that a significant difference existed between the obtained and chance congruence proportions ($p < .01$).

Inter-individual Data

An additional microanalysis was performed on data furnished by the eight competitive probes across individuals and over the four administrations of the efficacy probes. This analysis was performed to obtain specific information on the congruence existing between the group's efficacy judgements on each efficacy probe and each of the performance tasks represented by the eight efficacy probes. The responses of the 11 athletes who completed the probes on four occasions were used to obtain inter-individual data on each of the efficacy probes for competition.

The 2x2 matrices in Table 7 were constructed for each of the eight efficacy probes for competition, for each administration of the efficacy probes. Therefore, there were four 2x2 matrices for each efficacy probe for competition, one for each time the probes were administered.

The frequencies for each cell of the matrix were obtained in the following manner. Each of the 11 athletes' responses on the particular efficacy probe were used as the basis for the efficacy judgement ("can"-"can't" perform on the task) classification. The athletes' 1981 personal best competitive performance was used as the basis for the performance ("did"-"didn't" perform task") classification. Once the frequencies for each cell of the matrices had been determined, chance and obtained congruence proportions and percentages were calculated for each matrix.

On four of the eight efficacy probes for competition, the obtained and chance congruence proportions were exactly the same across all administrations of the efficacy probes. Therefore, on probes four,

Table 7

MICROANALYSIS OF INTER-INDIVIDUAL DATA:
INVOLVING ATHLETES' RESPONSE PER EFFICACY PROBE AND PERFORMANCE
OF THE SPECIFIC COMPETITIVE PROBE TASK OVER THE ADMINISTRATIONS OF THE PROBES

(N = 11)

<u>Probe #1:</u> "I am going to run 2:02.0 or faster in the 800 metre during this indoor season".

<u>CONTACT SESSION</u>

800metre Performance	Self Efficacy +	Self Efficacy -
+	11 (11)	0 (0)
-	0 (11)	0 (0)

Congruence

Chance = 100%
Obtained = 100%

<u>TRAINING #1</u>

800metre Performance	Self Efficacy +	Self Efficacy -
+	11 (11)	0 (0)
-	0 (0)	0 (0)

Congruence

Chance = 100%
Obtained = 100%

<u>TRAINING #2</u>

800metre Performance	Self Efficacy +	Self Efficacy -
+	11 (11)	0 (0)
-	0 (0)	0 (0)

Congruence

Chance = 100%
Obtained = 100%

<u>COMPETITION</u>

800metre Performance	Self Efficacy +	Self Efficacy -
+	11 (11)	0 (0)
-	0 (0)	0 (0)

Congruence

Chance = 100%
Obtained = 100%

<u>Probe #2:</u> "I am going to make the British Columbia Provincial team this indoor season in the 800 metre".

<u>CONTACT SESSION</u>

800metre Performance	Self Efficacy +	Self Efficacy -
+	2 (1.27)	0 (.72)
-	5 (5.72)	4 (3.27)

Congruence

Chance = 41.32%
Obtained = 54.55%

<u>TRAINING #1</u>

800metre Performance	Self Efficacy +	Self Efficacy -
+	2 (1.45)	0 (.55)
-	6 (6.5)	3 (2.45)

Congruence

Chance = 35.27%
Obtained = 45.45%

<u>TRAINING #2</u>

800metre Performance	Self Efficacy +	Self Efficacy -
+	2 (1.27)	0 (.72)
-	5 (5.73)	4 (3.27)

Congruence

Chance = 41.32%
Obtained = 54.55%

<u>COMPETITION</u>

800metre Performance	Self Efficacy +	Self Efficacy -
+	2 (1.27)	0 (.72)
-	5 (5.73)	4 (3.27)

Congruence

Chance = 41.32%
Obtained = 54.55%

Table 7 -- Continued

Probe #3: "I am going to run my personal best indoor time in the 800 metre during the 1981 indoor season".

CONTACT SESSION

800metre Performance	Self Efficacy +	Self Efficacy -
+	7 (7)	0 (0)
-	4 (4)	0 (0)

Congruence
Chance = 63.64%
Obtained = 63.64%

TRAINING #1

800metre Performance	Self Efficacy +	Self Efficacy -
+	6 (5.45)	0 (.55)
-	4 (4.55)	1 (.45)

Congruence
Chance = 53.72%
Obtained = 63.64%

TRAINING #2

800metre Performance	Self Efficacy +	Self Efficacy -
+	6 (5.45)	0 (.55)
-	4 (4.55)	1 (.45)

Congruence
Chance = 53.63%
Obtained = 63.64%

COMPETITION

800metre Performance	Self Efficacy +	Self Efficacy -
+	6 (5.45)	0 (.55)
-	4 (4.55)	1 (.45)

Congruence
Chance = 53.63%
Obtained = 63.64%

Probe #4: "I am going to run faster than 1:57.0 in the 1981 indoor season".

CONTACT SESSION

800metre Performance	Self Efficacy +	Self Efficacy -
+	4 (4)	0 (0)
-	7 (7)	0 (0)

Congruence
Chance = 36.36%
Obtained = 36.36%

TRAINING #1

800metre Performance	Self Efficacy +	Self Efficacy -
+	4 (4)	0 (0)
-	7 (7)	0 (0)

Congruence
Chance = 36.36%
Obtained = 36.36%

TRAINING #2

800metre Performance	Self Efficacy +	Self Efficacy -
+	4 (4)	0 (0)
-	7 (7)	0 (0)

Congruence
Chance = 36.36%
Obtained = 36.36%

COMPETITION

800metre Performance	Self Efficacy +	Self Efficacy -
+	4 (4)	0 (0)
-	7 (7)	0 (0)

Congruence
Chance = 36.36%
Obtained = 36.36%

Table 7 -- Continued

Probe #5: "I am going to have the fastest indoor time in B.C. this year in the 800 metre".

CONTACT SESSION

800metre Performance	Self Efficacy +	Self Efficacy -
+	1 (0.27)	0 (.73)
-	2 (2.73)	8 (7.27)

Congruence

Chance = 68.55%
Obtained = 81.82%

TRAINING #1

800metre Performance	Self Efficacy +	Self Efficacy -
+	1 (.36)	0 (.64)
-	3 (3.64)	7 (6.36)

Congruence

Chance = 61.09%
Obtained = 72.73%

TRAINING #2

800metre Performance	Self Efficacy +	Self Efficacy -
+	1 (.36)	0 (.64)
-	3 (3.64)	7 (6.36)

Congruence

Chance = 61.09%
Obtained = 72.73%

COMPETITION

800metre Performance	Self Efficacy +	Self Efficacy -
+	1 (.36)	0 (.64)
-	3 (3.64)	7 (6.36)

Congruence

Chance = 61.09%
Obtained = 72.73%

Probe #6: "I am going to place in the top three at the Canadian Indoor Championships in the 800 metre this year".

CONTACT SESSION

800metre Performance	Self Efficacy +	Self Efficacy -
+	0 (.27)	1 (.73)
-	3 (2.72)	7 (7.27)

Congruence

Chance = 68.55%
Obtained = 63.64%

TRAINING #1

800metre Performance	Self Efficacy +	Self Efficacy -
+	0 (.27)	1 (.73)
-	3 (2.72)	7 (7.27)

Congruence

Chance = 68.55%
Obtained = 63.64%

TRAINING #2

800metre Performance	Self Efficacy +	Self Efficacy -
+	1 (.36)	0 (.64)
-	3 (3.64)	7 (6.36)

Congruence

Chance = 61.09%
Obtained = 72.73%

COMPETITION

800metre Performance	Self Efficacy +	Self Efficacy -
+	1 (.27)	0 (.73)
-	2 (2.73)	8 (7.27)

Congruence

Chance = 68.55%
Obtained = 81.82%

Table 7 -- Continued

<u>Probe #7</u>: "I am going to win the Canadian Indoor Championships this year in the 800 metre".

<u>CONTACT SESSION</u>

800metre Performance	Self Efficacy +	Self Efficacy -
+	0 (0)	0 (0)
-	2 (2)	9 (9)

Congruence
Chance = 81.82%
Obtained = 81.82%

<u>TRAINING #1</u>

800metre Performance	Self Efficacy +	Self Efficacy -
+	0 (0)	0 (0)
-	1 (1)	10 (10)

Congruence
Chance = 90.91%
Obtained = 90.91%

<u>TRAINING #2</u>

800metre Performance	Self Efficacy +	Self Efficacy -
+	0 (0)	0 (0)
-	2 (2)	9 (9)

Congruence
Chance = 81.82%
Obtained = 81.82%

<u>COMPETITION</u>

800metre Performance	Self Efficacy +	Self Efficacy -
+	0 (0)	0 (0)
-	0 (0)	11 (11)

Congruence
Chance = 100%
Obtained = 100%

<u>Probe #8</u>: "I am going to obtain the Canadian Indoor record of 1:49.5 during the 1981 indoor season".

<u>CONTACT SESSION</u>

800metre Performance	Self Efficacy +	Self Efficacy -
+	0 (0)	0 (0)
-	1 (1)	10 (10)

Congruence
Chance = 90.91%
Obtained = 90.91%

<u>TRAINING #1</u>

800metre Performance	Self Efficacy +	Self Efficacy -
+	0 (0)	0 (0)
-	0 (0)	11 (11)

Congruence
Chance = 100%
Obtained = 100%

<u>TRAINING #2</u>

800metre Performance	Self Efficacy +	Self Efficacy -
+	0 (0)	0 (0)
-	2 (2)	9 (9)

Congruence
Chance = 81.82%
Obtained = 81.82%

<u>COMPETITION</u>

800metre Performance	Self Efficacy +	Self Efficacy -
+	0 (0)	0 (0)
-	0 (0)	11 (11)

Congruence
Chance = 100%
Obtained = 100%

seven, and eight, there was no difference between what was actually obtained and what might be expected by chance. On the remaining four efficacy probes for competition, probes two, three, five, and six, differences were found between the obtained and chance congruence proportions at most administration points.

To determine if the differences between the obtained and chance congruence proportions on probes two, three, five, and six were significant, matched group t-tests and sign tests were calculated. To calculate the matched group t-test, the chance and obtained congruence proportions for each of the administrations of the particular efficacy probe were used. The differences between the obtained congruence proportions and the chance congruence proportions were obtained for each administration of the efficacy probe, and then treated as one set of differences from a random sampling distribution of such differences.

There were positive differences between the obtained and chance congruence proportions on all administrations of the second efficacy probe, "I am going to make the British Columbia provincial team this indoor season in the 800 metres". The matched group t-test determined that there was a significant difference for this probe over the four administrations of the probe ($t(4) = 16.254$; $p \leq .005$).

The first occasion on which probe three, "I am going to run my personal best indoor time in the 800 metres during the 1981 indoor season", was completed there was no difference between the obtained and chance congruence proportions. The remaining three occasions on which probe three was completed, differences were found between the obtained and chance congruence proportions on probe three over the four adminitrations of the efficacy probes (t(4) - 2.9134 at $p \leq .10$).

There were positive differences between the obtained and chance congruence scores at all administrations of the fifth efficacy probe, "I am going to have the fastest indoor time in B. C. this year in the 800 metres". These differences were found to be significant when the matched group t-test was performed ($t(4) = 2.16$, $p \leq .005$).

The first two occasions on which efficacy probe six, "I am going to place in the top three at the Canadian Indoor Championships in the 800 metres this year", was completed, the chance congruence proportions were numerically greater than the obtained congruence proportions. The last two occasions on which probe six was completed, the obtained congruence proportions were greater than the chance congruence proportions. When these four differences were used to perform the matched group t-test and sign test, the results indicated that these differences were statistically non-significant.

The findings obtained through the microanalysis of inter-group data indicate that on probes two and five, statistically reliable congruence existed between the athletes' judgements about their abilities to perform that specific competitive task, and their actual performance of that task. On probes one, three, four, six, seven, and eight there was no significant difference between the chance and obtained congruence proportions.

Trends in Individual Data

Additional insights into the general relationship between the efficacy judgements for competition and competitive performance in this study can come from the observation of patterns in the data furnished by individual athletes.

Athletes #8 and #10 were extremely accurate at predicting their competitive performance. When these two athletes made judgements that they could perform certain competitive tasks, they successfully performed a large majority of those tasks. When they made judgements that they could not perform certain tasks, they in fact failed to perform those tasks. As a result of the high level of accuracy with which they predicted their competitive performance, there was a substantial spread between their obtained congruence and chance congruence proportions. It is interesting to note that both these athletes train together under the same coach.

On the other hand, Athlete #9 was somewhat inaccurate when predicting his competitive performance. On 24 of the 32 items, Athlete #9 said he was able to perform the competitive tasks and then failed to perform those tasks. As a result, there was little difference between his obtained congruence score and the chance congruence score. Through a discussion with his coach, it was learned that Athlete #9 had sustained a minor physical injury while training at some point during the course of the study. Although the injury had not been serious enough to force the cessation of training, it had seriously hampered the amount of training the athlete had been able to do. It is possible that the athlete's inaccuracy in predicting his performance occurred as a result of this minor, yet significant, physical ailment. The fact that Athlete #9 responded in a similar fashion on all administrations of the probes suggests that he was having difficulty in accepting the degree to which the injury had hampered his ability to perform. When Athlete #9 completed the probes for the first time, he was in excellent health and well prepared for competition, as evidenced by his physiological measures, coach's report and self-report. At this time, he made efficacious responses on even the most difficult competitive tasks. Yet, despite the fact he had been hampered by an injury and was less physically fit due to the effect of the injury on his training, Athlete #9 continued to make efficacy judgements of similar strength and magnitude when he completed the efficacy probes on the last three occasions.

In contrast, the coach of Athlete #9 was much more accurate in predicting his athlete's ability to perform the competitive tasks. On the first completion of the probes, the coach made judgements of strength and magnitude similar to the judgements his athlete had made. Yet the last three times the probes were completed, the coach was more accurate in assessing the athlete's present ability to perform, as evidenced by judgements of lowered strength and magnitude. It is possible that the coach altered his ratings of the efficacy probes because he recognized the degree to which the athlete had been affected by the injury.

Athlete #5 also was inaccurate in predicting his competitive performance. Athlete #5 (similar to Athlete #9), tended to overestimate his ability to perform the competitive tasks. But, unlike Athlete #9, Athlete #5 was healthy and physically well prepared for competition throughout the course of the study, according to coach and self-reports. It therefore appears that Athlete #5 highly and consistently overestimated his ability to perform the competitive tasks.

Bandura (1980) suggests that a tendency to overestimate one's abilities tends to result in extreme and needless frustration. It was therefore possible that Athlete #5 might experience frustration because he was aiming for goals clearly beyond his reach, and consistently falling short of his standards and efficacy expectations. This hypothesis was substantiated somewhat through a follow-up discussion with the coach of Athlete #5. The coach reported that Athlete #5 had a tendency to make judgements about his abilities in his conversations with other athletes and the coach, which often exceeded his present potential as perceived by these other people. Further, the coach reported that Athlete #5 frequently expressed frustration and anger concerning his inability to realize the performance standards he sets for himself.

In contrast to Athlete #5's problem of overestimation, Athlete #4 exhibited a tendency to underestimate his ability to perform the competitive tasks. Athlete #4 tended to make efficacy judgements which revealed his uncertainty about his ability to perform the more difficult competitive tasks. His uncertainty is evidenced by the number of responses (11 out of 32 responses) made which were either of moderate strength or were inefficacious. Though Athlete #4 made efficacy judgements of only moderate or inefficacious values, he then proceeded to perform those tasks consistently. Bandura (1980) suggests that the individual who tends to underestimate his ability to perform certain tasks is limiting his expansion of his competencies. It may be that Athlete #4 was hindering the expansion of his athletic competencies through his assumption of self-limiting judgements.

It is interesting to note that on all occasions, the coach of Athlete #4 made judgements of higher strength and magnitude concerning his athlete's ability to perform the competitive tasks. In addition, the coach's judgements were more accurate in predicting Athlete #4's competitive performance than were the athlete's own judgements. The fact that the coach and athlete held such discrepant views about the athlete's ability to perform the competitive tasks suggests a lack of communication and understanding. The coach likely could have exerted greater persuasive influence to assist the athlete in making more accurate efficacy judgements, which in turn may have resulted in superior performance.

Athlete #4's efficacy judgements gradually increased in strength value over the four administrations of the efficacy probes. On the final administrations, his efficacy judgements were more accurate in predicting his performance than previously had been. It is possible that Athlete #4's performance attainments, from the series of competitive track meets in which he competed over the course of the study, provided him with powerful efficacy information which in turn altered his efficacy judgements.

The remaining six athletes who completed the efficacy probes on four occasions were not specifically addressed in the foregoing discussion because the patterns of their responses were not as unique as the five athletes who were discussed. These remaining six athletes were basically very accurate in predicting their personal performance, and therefore a similar trend appeared between their efficacy judgements for competition and their competitive performance.

Summary

In summary, the athletes' efficacy judgements for competition and the coaches' absolute ratings of the efficacy probes for competition predicted the athletes' competitive performance in the 800 metre track event. The training results, regardless of the type of analyses, were not statistically significant, and the athlete's efficacy judgements for training did not predict their performance in the training situation. Both athletes and coaches, regardless of the athletes' efficacy judgements and coaches' ratings of the efficacy probes for training and competition, and/or the athlete's performance levels in training and competition, were extremely certain about the athlete's abilities to perform the generality tasks. The results also indicated that both the athletes' absolute efficacy strength scores for competition and the coaches' absolute ratings of the efficacy probes for competition were superior to training performances, heart beat, estimate of body fat, height, weight, coaches' ratings of conditioning, and previous performance results, in predicting the athletes' performances in the 800 metre competitive event.

CHAPTER IV

Discussion

This chapter discusses the results of the study and examines the practical and theoretical implications of these findings.

Discussion of Major Findings

Competition Results

The competition results confirmed the hypothesized relationship between the athletes' percepts of efficacy for competition and their competition performance in the 800 metre event. The athletes' efficacy judgements correlated significantly and negatively with their performance attainments in the competitive situation. Results of the microanalysis further confirmed that the athletes were able to predict accurately their performances in the 800 metre competitive event.

Although, both the coaches' average ratings of the efficacy probes for competition, and the coaches' ratings of efficacy magnitude scores for competition were correlated negatively (as expected) with the athletes' 1981 indoor personal best competitive times, these relationships were statistically non-significant. However, a negative and statistically significant relationship was found when the coaches' absolute ratings of the efficacy probes for competition were correlated with the athletes' 1981 indoor personal best competitive times. These latter results confirmed the hypothesized relationship between the coaches' ratings of efficacy probes for competition and the athletes' competitive performances in the 800 metre event. The coaches were able to predict accurately their athletes' performances in the 800 metre event.

These general competition results are consistent with self-efficacy theory, which proposes that it is the individual who is most aware of, and certain about his/her capabilities of executing and performing various tasks. Further, these competition results are consistent with Bandura and Schunk's (1980) findings which confirmed that the efficacy judgements held by children concerning their abilities to perform mathematical tasks predicted their subsequent performance on mathematical tasks. These results also concur with the results of a series of studies which focused on altering phobic behaviours, where the efficacy judgements made by the participants in the studies predicted their subsequent approach behaviour to feared objects (Bandura & Adams, 1977; Bandura et al., 1977; Bandura et al., 1980). There thus appears to be some consensus in the literature about the general relationship between self-percepts of efficacy and subsequent performance on the specific tasks described in the efficacy probes.

As previously mentioned, the competition results in this study indicated that the athletes' absolute efficacy strength scores for competition and the coaches' absolute ratings of the efficacy probes for competition were better predictors of subsequent competitive performance, than were training performance, previous past performance, and physiological variables (height, weight, body fat estimate, and resting heart rate).

Training Results

The training results did not confirm the hypothesized relationship between the athletes' percepts of efficacy for training and their performance during training sessions. No statistically significant trends emerged in the training data, and it therefore appears that the athletes were unable to predict accurately their performance in the training situations. These findings do not concur with the competition findings of this study, or with findings of previous studies (Bandura & Adams, 1977; Bandura et al., 1977; Bandura et al., 1980; Bandura & Schunk, 1980).

Bandura (1980a) discusses a variety of sources that may influence self-efficacy judgements. First, he (1980a) proposed that discrepancies between efficacy judgements and performance will occur if the task is unclear or complex. If the task's demands are ill-defined, an individual likely will find it difficult to make judgements about his/her ability to perform the task. Perhaps the difficulty which the athletes in this study experienced in predicting their performance in training may have resulted from an insufficient or an unclear understanding of the demands of the training tasks. If the coaches did not communicate specific objectives and performance requirements of the training sessions to the athletes, the training tasks would be very ambiguous to the athletes.

Second, Bandura (1980a) suggests that discrepancies between efficacy judgements and performance often occur as a result of misjudgements of self-efficacy. A variety of sources can contribute to inaccurate efficacy judgements. When individuals are confronted with a new experience, they typically have had insufficient related experiences from which they can draw efficacy information to assist them in making an accurate efficacy judgement in relation to the new task. Thus, the act of estimating one's abilities to perform novel tasks can result in misjudgements. Coaches structure training sessions to develop the physical attributes of the athletes. The quality (time component) and/or quantity (distance and duration component) requirements of the training exercises are altered constantly to challenge and prepare the athlete for the competitive situations. Because of the ever-increasing and varied demands of the training sessions, the athletes frequently face essentially novel and/or altering demands during training.

It is also possible that the coaches were ineffective in communicating their assessments of the athletes' abilities to perform the training performance requirements, and to realize the specific training objectives which had been set. If the coaches were ineffective in using verbal persuasion to assist the athletes in making accurate efficacy judgements for training, a valuable source of efficacy information was withheld from the athletes. The possibility that the coaches did not make concentrated and effective use of verbal persuasion may have been a contributing factor to the athletes' faulty efficacy judgements for training.

Bandura (1977a) also proposes that vicarious experiences can provide valuable efficacy information. Individuals will persuade themselves after observing others who have successfully performed a task, that they (from their assessment of how their abilities relate to those of the observed models) also are able to perform, or are not able to perform, the task. In training, unlike the competitive situations, the athletes seldom are provided with vicarious experiences. It is unlikely that prior to engaging in training sessions, the athletes had any opportunity to observe other athletes performing the exact same workout. Thus, the lack of vicarious experiences in the training situation also may contribute to faulty efficacy judgements with respect to the training performance.

Generality Results

The 14 athletes involved in the study made efficacy judgements that were of high values (ranging from seven to 10), on all the efficacy probes for generality. These strong efficacy judgements for generality indicate that no matter how the athletes judged themselves on the efficacy probes for training and competition, and no matter how they performed in the training and competitive situations, they made efficacy judgements of high strength values on the efficacy probes for generality. It appears that the athletes were extremely certain about their abilities to perform the generality tasks.

Although the coaches' ratings of the athletes' abilities to perform the generality tasks were slightly lower than the athletes' own efficacy judgements on these items, the coaches' judgements also reflected a strong certainty about the athletes' abilities to perform the generality tasks.

The fact that both the athletes and coaches made judgements of different strength values on the various groups of efficacy items, supports the notion that efficacy judgements relate to a specific activity or task (Bandura, 1980). It therefore appears that efficacy judgements on one group of items do not necessarily reflect, or generalize, to efficacy judgements on other groups of items which contain different task descriptions.

Correlational Data on Variables Predicting Competitive Performance

The correlational results confirmed the superior ability of the athletes' efficacy judgements for competition and the coaches' absolute ratings of the efficacy probes for competition as predictors of subsequent competitive performance. The results indicated that the athletes' efficacy judgements for competition and the coaches' absolute ratings of the efficacy probes for competition, were superior to the coaches' average ratings and efficacy magnitude scores on the efficacy probes for competition; physiological variables such as height, weight, percentage body fat, and resting heart rate; training performance, coaches' ratings of athletes' conditioning; and previous best competitive performance results, in predicting subsequent performance in the 800 metre competitive event.

Bandura (1978) proposes that self-efficacy is one influential determinant of behavior and performance. Further, studies such as those done by Brown and Innouye (1978), Bandura and Adams (1977), and Bandura and Schunk (1980) suggest that perceived efficacy is a good predictor of subsequent performance on a variety of tasks. It therefore appears that self-efficacy judgements may provide a level of predictiveness that is not available through other sources. Self-efficacy thus may offer a unique potential for the estimation of future performance. The results of this study may be viewed as providing support for previous empirical findings and theoretical statements, in that self-efficacy judgements were better predictors of subsequent performance than even the athletes' 1980 personal best performance times or the athletes' performances in the training sessions. If athletes' efficacy judgements are an accurate means of predicting subsequent competitive performance, knowledge and understanding of the athletes' efficacy judgements could be utilized to assist coaches and athletes in making more appropriate training and competitive program decisions.

It should be noted that no immediate past performance measure was used in this study. The only past performance measure used was the athletes' 1980 outdoor personal performance results, which were recorded six months previous to this study and the 1981 indoor season. Because no immediate past performance measure was used in the correlational analysis, it was not possible to conclude whether or not self-efficacy or immediate past performance measure were better predictors of the athletes' 1981 personal indoor best performance in the 800 metre event.

Research Concerns

The following discussion focuses on four research concerns of this study.

Training Performance Measures

The procedure designed to obtain training performance measures were the coaches' overall training performance ratings and the training objective ratings. Three assumptions were made whenthese measures were designed. First, it was assumed that the coaches had specific objectives for training sessions; and second, that the coaches communicated these specific objectives to the athletes. Yet, when the coaches were required to record and rate the specific objectives for the training sessions on the Coaches' Form, they did not do so. The coaches, rather than recording specific objectives, recorded objectives that were very general in nature such as "working on endurance" or "working on speed". These general objectives precluded the coaches' ratings of the training objectives from becoming valid and reliable measures of specifically-stated training performance. With such general objectives, the athletes were able to achieve the objectives of the training sessions regardless of the quality of their performance during training. For example, despite the fact that an athlete may have performed at a mediocre level in a training session, he may have received a high performance measure on the ratings of the objectives because he had "worked on endurance". Future studies should ensure that coaches are trained in setting and recording specific objectives for the training seassions, and in communicating these expectations to the athletes.

A third assumption which was made was that coaches were able to make valid and reliable assessments of their athletes' training performance. It is possible that the coaches' were not able to make valid and reliable assessments of their athletes' performance in training due to factors such as observer bias or selective memory. In future studies, the addition of an independent observer, equipped with specific observational criteria, would enhance the validity and reliability of the ratings of training performance.

Administration of Efficacy Probes

The athletes and coaches involved in this study completed the efficacy probes at different times due to the individual nature of track and field training and competitive schedules. The study's validity would have been enhanced if all the athletes and coaches had completed the forms in the same situations and at the exact same times. From a research design point of view, the ideal situation would have been to have had the athletes complete the efficacy probes prior to engaging in identical competitive and training situations. A team sport, such as volleyball and/or basketball, would allow for this, because as members of a team, athletes and their coaches train and compete at the same times and places.

Limitation of Correlational Analyses

Any correlational analysis is limited in that it only provides information on relationships, and does not necessarily imply the existence of a causal link between two variables. A limitation of the correlational analyses in this study is therefore the inability of those analyses to imply or conclude that causal relationship exists between self-efficacy judgements and subsequent performance on the competitive and training tasks. In order to determine if there is a causal relationship between the athletes' efficacy judgements and their subsequent training and competitive performances, future studies will have to control for, or separate out the effects of self-efficacy from performance through the use of more exacting and controlled experimental designs. Such designs would need to allow for the manipulation of self-efficacy judgements independent of, and antecedent to, the performance to which they refer.

Limitation of Microanalysis

A limitation of microanalysis is that it tends to be a very liberal method with which to analyse data. In microanalysis, only the congruent cells in relevant 2x2 matrices are considered when calculating the obtained percentage and chance percentage scores. As a result, congruence percentage will exceed chance congruence percentage even when there are as many or more frequencies in the incongruent cells than in the congruent cells. In such cases, one could conclude that an individual is as inaccurate at least as frequently as she/he is accurate. But the microanalysis still would show that the individual is accurate in predicting his/her performance of the particular task in question.

Competition Performance Data

The competitive performance results which were collected in this study were the athletes' 1980 outdoor personal best performance results, the 1981 indoor personal best performance results, and the criterion performance results. The study would have been enhanced if the athlete and/or coaches had been required to keep a log or diary of all the athletes' competitive performances which occurred over the course of the study. Such a log would have provided information on more immediate past performance. It would have been most interesting to have compared the relative degree to which self-efficacy judgements and immediate past performance were predictors of future performance attainments.

Practical Implications

A number of points should be noted concerning the practical implications for athletes stemming from the present study. This study offers preliminary information concerning how self-efficacy relates to athletic performance. Further investigation of how efficacy judgements relate to athletic performance in training and competition is required before athletes' efficacy judgements can be used or altered in an effective and appropriate manner to promote superior training and competitive performance. Nevertheless, the study does provide a number of practical implications. The training data obtained in this study suggest that coaches should be setting specific objectives for the training sessions, and then discussing these objectives with their athletes prior to the training session. Bandura (1977) and Bandura and Schunk (1980) indicate that it is the properties of these goals, their specificity, level, and proximity, which will motivate the individual to perform, and will stimulate the individual to more accurate judgements and evaluations of his/her performance.

The findings of this study also suggest that athletes and coaches should share and discuss their mutual judgements about the athletes' abilities to perform competitive and training tasks. Communicative exchanges of efficacy information likely would increase the similarity between the coaches' and athletes' judgements about the athletes' abilities to perform the competitive and training tasks. This would likely increase the probability that the coaches and athletes would be working together with common goals and objectives.

The results of this study indicate that the athletes tended to be as accurate or more accurate than coaches in predicting their subsequent competitive performance. Regardless of how the data were treated (whether average, absolute, or magnitude scores), statistically significant results were obtained when the athletes' efficacy scores were analysed in relation to their performance of the 800 metre competitive tasks. Although trends emerged when the coaches' average and magnitude ratings of efficacy probes for competition were correlated with the athletes' 800 metre performance, a statistically significant relationship emerged only when the coaches' absolute ratings of efficacy probes were correlated with the athletes' 800 metre performance. This finding suggests that the athletes possess an awareness or knowledge of their capabilities to perform competitive tasks that is in some ways superior to the knowledge possessed by the coaches. Perhaps coaches should begin to place greater emphasis on, and trust in, their athletes' judgements and knowledge, and to use the athletes' knowledge as a supplementary source of information. Coaches may be able to draw upon this source of information to assist them in making accurate judgements, and in develop ing and monitoring competitive and training programs. As a result, the coaches and athletes would be working together in a more collaborative fashion.

When the 1980 outdoor personal best performances were correlated with the 1981 indoor personal best performances, no statistically significant relationship emerged. It therefore appears that it is hard to predict from one year to the next year, how an athlete will perform in the competitive situation. This is an intriguing finding when one considers that decisions made concerning athletes' selection to teams and/or the awarding of financial assistance to athletes frequently is based upon the athletes' past performance accomplishments. Such a practice becomes somewhat questionable with findings, such as those provided by this study, which indicate that past performances are not significantly related to performance in the following competitive season. Perhaps psychological factors, such as the athletes' efficacy judgements, should be considered in making decisions relating to selection and financial support.

Future Research

Further research replicating the present study with various individual and team sports should be undertaken. Additional research would clarify and generalize the relationship between athletes' percepts of efficacy and athletic performance. Investigations with athletes involved in both team and individual sports would reveal whether or not, and perhaps how, training and competing as a team or as an individual affects an athletes' percepts of efficacy.

Research which is similar to the present study, but which includes an intervention component should be undertaken. The intervention component might involve teaching athletes and coaches appropriate goal setting strategies and communication skills, which would increase the precision and clarity of training and competitive tasks, thus permitting superior congruence between efficacy judgements and athletic performance. This intervention component might be included after the athletes and coaches had completed the efficacy probes on a number of occasions, and several competitive and training measures had been obtained.

After this first phase, the athletes and coaches could receive training in appropriate goal setting strategies and communication skills. The final phase of the study might require the athletes and coaches to complete the efficacy probes on a similar number of occasions as they had in the first phase of the study, and to engage in a similar number of competitive and training situations. A study which included such an intervention strategy, would reveal whether or not such a training component would enhance the congruence between efficacy judgements and athletic performance, and whether or not such enhanced congruence led to superior performance.

Bandura (1980) discusses the effects of self-efficacy judgements on thought processes and emotional arousal when an individual anticipates, and then actually interacts with the environment. Individuals who feel inefficacious about their ability to perform an activity generally experience high emotional arousal, and tend to become preoccupied with their deficiencies and what they perceive to be formidable aspects of the activity. Research could be undertaken to investigate whether or not the athletes who make inefficacious judgements in respect to training and competitive tasks experience high emotional arousal and/or engage in self-depreciating cognitions. Initially, those athletes who make inefficacious versus efficacious judgements concerning training and competitive tasks would have to be identified. Once two groups of athletes (one group consisting of athletes tending to make efficacious responses, and the other group consisting of athletes tending to make inefficacious responses) were identified, research could investigate whether or not the athletes who tend to make inefficacious responses in respect to athletic tasks experience higher levels of arousal and/or engage in more negative and self-depreciating cognitions than those athletes tending to make efficacious judgements in respect to the same tasks. If research established that different arousal and cognitive patterns existed between athletes who tend to make inefficacious and efficacious judgements, further research might be directed towards how best to train athletes to make more accurate efficacy judgements and to use specific coping strategies to manage resulting levels of arousal.

Summary

To summarize the results of the study, the athletes' efficacy judgements for competition predicted the athletes' competitive performance in the 800 metre event. An anticipated trend appeared when the coaches' average ratings and efficacy magnitude scores for the efficacy probes for competition were correlated with the athletes' competitive performance in the 800 metre event. This trend was not statistically significant. However, a statistically significant relationship did emerge when the coaches' absolute ratings of the efficacy probes for competition were correlated with the athletes' 800 metre performance. The training results of the study were not significant. The athletes' efficacy judgements for training did not predict the athletes' training performance. Both athletes and coaches, regardless of their judgements on the efficacy probes for training and the athletes' performance in training and competition, were extremely certain about the athletes' abilities to perform generality tasks.

The results of the study also indicated that the athletes' efficacy judgements for competition and the coaches' absolute ratings of the efficacy probes for competition were the best predictors (of all the variables employed in the study) of subsequent performance in the 800 metre event. The athletes' efficacy judgements for competition and the coaches' absolute ratings of the efficacy probes for competition were better than the athletes' height, weight, body fat, resting heart rate;

the athletes' training performance; the coaches' ratings of the athletes' conditioning level; or the athletes' 1980 outdoor performance results, in predicting the 1981 indoor personal best competitive results.

A number of research concerns were identified and discussed. Future research concerns should give consideration to the limitations of correlational analysis. In future studies, coaches should be trained to set and record specific objectives and to communicate these objectives to their athletes. Future investigations should, as much as possible, also insure that athletes complete the efficacy probes on the exact same dates and places. Finally, coaches and athletes should be instructed to record immediate past performance in a log for the duration of the study, thus permitting a measure of immediate past performance to be compared with self-efficacy measures vis-a-vis predicting future performance.

A number of practical implications which stemmed from the present study were identified and discussed. The study suggests that coaches and athletes should engage in frequent communicative exchanges of efficacy information, that coaches should be trained in setting specific training objectives and communicating these to their athletes prior to the training session, that the coaches should place more trust in their athletes' abilities to accurately judge their subsequent performance, and that decisions involving selection to teams and/or financial awards might include consideration of psychological factors such as the athletes' self-efficacy judgements.

APPENDIX A

ATHLETES' FORM:

DATE: ______________________ EVENT: __________ (Training or Competition)

NAME OF ATHLETE: ____

NAME OF COACH: ____

Make a judgement about whether or not you can do these things. Indicate your judgement by circling one number from 1 to 10 in the row of numbers coming right after each statement. Use the three numbers (1, 5 and 10) in the scale following, to guide you in selecting one number from 1 to 10 as you rate your certainty about your ability to do these things.

1 - I am uncertain about my ability to do this.

5 - I am moderately sure I can do this.

10 - I am certain about my ability to do this.

1. I am going to run 2:02 or faster in the 800 metres during this indoor season.

   1 2 3 4 5 6 7 8 9 10

2. I am going to make the British Columbia provincial team this indoor season in the 800 metres.

   1 2 3 4 5 6 7 8 9 10

3. I am going to run my personal best indoor time in the 800 metres during the 1981 indoor season.

   1 2 3 4 5 6 7 8 9 10

4. I am going to run faster than 1:57.0 in the 1981 indoor season.

   1 2 3 4 5 6 7 8 9 10

5. I am going to have the fastest indoor time in B.C. this year in the 800 metres.

   1 2 3 4 5 6 7 8 9 10

APPENDIX A (continued)

6. I am going to place in the top three at the Canadian Indoor Championships in the 800 metres this year.

1 2 3 4 5 6 7 8 9 10

7. I am going to win the Canadian Indoor Championships this year in the 800 metres.

1 2 3 4 5 6 7 8 9 10

8. I am going to obtain the Canadian Indoor Record of 1:49.5 during the 1981 indoor season.

1 2 3 4 5 6 7 8 9 10

9. I am able to accomplish things I want to accomplish in life.

1 2 3 4 5 6 7 8 9 10

10. If I don't know how to do something, I am able to learn how to do it.

1 2 3 4 5 6 7 8 9 10

11. Whatever I do later in my life I will succeed at it.

1 2 3 4 5 6 7 8 9 10

12. I will meet the objectives set for the workout today.

1 2 3 4 5 6 7 8 9 10

13. I will surpass the objectives set for the workout today.

1 2 3 4 5 6 7 8 9 10

14. Today's workout will be the best I've had all year.

1 2 3 4 5 6 7 8 9 10

APPENDIX B

COACHES' FORM:

DATE: ______________________________

NAME OF COACH: ____

NAME OF ATHLETE: ____

BEFORE THE WORKOUT FILL OUT THE FOLLOWING QUESTIONS ON THE FIRST THREE PAGES, AND AFTER THE WORKOUT FILL OUT THE QUESTIONS ON THE LAST PAGE.

PLEASE FILL OUT THE FOLLOWING QUESTIONS PRIOR TO WORKOUT:

A. Record the athlete's workout for Tuesday, February ___. Indicate how you would rate this workout in terms of difficulty (easy, medium, hard, or extremely hard) for your athlete.

B. What are your objectives for this practice? In other words, what are the purposes or reasons for your athlete doing this workout? (Please write one objective per line).

APPENDIX B (continued)

DATE: ____________________ NAME OF COACH: ____________________

C. Rate your athlete on the following areas, using the following scale. Make a judgement about whether or not you think your athlete can do these things. Indicate your judgement by circling one number from 1 to 10 in the row of numbers coming right after each statement. Use the three numbers (1, 5 and 10) in the scale following to guide you in selecting the number from 1 to 10 as you rate your certainty about your athlete's ability to do these things.

1 - I am uncertain about my athlete's ability to do this.

5 - I am moderately sure about my athlete's ability to do this.

10 - I am certain about my athlete's ability to do this.

1. Athlete is going to run 2:02 or faster this year in the 800 metres during the 1981 indoor season.

   1 2 3 4 5 6 7 8 9 10

2. Athlete is going to make the British Columbia provincial team this indoor season in the 800 metres.

   1 2 3 4 5 6 7 8 9 10

3. Athlete will run their personal best indoor time this 1981 indoor season.

   1 2 3 4 5 6 7 8 9 10

4. Athlete will run faster than 1:57.0 in the 1981 indoor season.

   1 2 3 4 5 6 7 8 9 10

5. Athlete will have the fastest indoor time this year in B.C. in 800 metres.

   1 2 3 4 5 6 7 8 9 10

6. Athlete will be in the top three at the Canadian Indoor Championships this year in the 800 metres.

   1 2 3 4 5 6 7 8 9 10

APPENDIX B (continued)

7. Athlete will run the 800 metres at the Canadian Indoor Championships this year.

1 2 3 4 5 6 7 8 9 10

8. Athlete will obtain the Canadian Indoor Record of 1:49.5 during the 1981 indoor season.

1 2 3 4 5 6 7 8 9 10

9. Athlete will be able to accomplish things in life that he wants to accomplish.

1 2 3 4 5 6 7 8 9 10

10. If athlete doesn't know how to do something, he is able to learn how to do it.

1 2 3 4 5 6 7 8 9 10

11. Whatever athlete will do later in life he will succeed at it.

1 2 3 4 5 6 7 8 9 10

APPENDIX B (continued)

DATE: ________________________ NAME OF COACH: ____________________

<u>AFTER</u> THE WORKOUT ANSWER THE FOLLOWING QUESTIONS:

A. Record the workout that the athlete actually completed today.

B. Go back to page one and look at the objectives you had for this workout. Rate each objective for the degree to which it was met during this workout, according to the following scale. Place the number from 1 to 5 that you select beside each objective.

1 - This objective was <u>not</u> met.

3 - This objective was partially met.

5 - This objective was met.

C. Rate the overall performance of athlete in this workout.

D. What do you think is the MAXIMUM level that your athlete can ever obtain?

E. Write down some of the ways (if any) that you communicate this to your athlete.

APPENDIX C

CONDITIONING MEASURES:

NAME OF ATHLETE: ______________________ DATE: __________________

1. RESTING HEART RATE:

   - number of beats per 15 seconds __________
   - multiple by 4 to obtain beats per minute ________

2. HEIGHT: (record to the nearest mm.) __________

3. WEIGHT: (record to the nearest kg.) __________

4. PERCENTAGE BODY FAT FIGURE: _________________
   (after calculations)

APPENDIX D

COACH'S EVALUATION OF THE ATHLETE'S LEVEL OF CONDITIONING

NAME OF COACH: ______________________ DATE: __________________

NAME OF ATHLETE TO BE EVALUATED: ______________________________

Make a judgement about your athlete's physiological conditioning. Indicate your judgement by circling one number from 1 to 10 in the row of numbers below. Use the numbers 1, 5, and 10 in the scale following to guide you in selecting one number from 1 to 10, as you rate your athlete on his level of conditioning.

1 - out of condition

5 - average conditioning

10 - optimally conditioned

1 2 3 4 5 6 7 8 9 10

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