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THE EFFECTS OF VISUO-MOTOR BEHAVIOR REHEARSAL
ON COMPETITIVE PERFORMANCE TASKS,
ANXIETY, AND ATTENTIONAL STYLE

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TO

Sue A. Miller

Doris M. Kilgore

Paul and Beverly Buckles

Whose constant support, encouragement and sacrifices
made this possible.

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ABSTRACT

This study was designed to investigate the effects of visuo-motor behavior rehearsal (VMBR), across a 5 month time period, on: (a) the competitive game performance of basketball skills with varied task demands; (b) the state and trait anxiety levels of highly skilled performers; and (c) the attentional, control, and interpersonal characteristics of highly skilled performers. Subjects consisted of 10 members from a nationally ranked, Division 1 women's basketball team and were assigned to either the VMBR group or the no treatment group. The competitive performance measures included both open and closed tasks. The closed task, free throw shooting, was measured by average free throw percentage. The open tasks were measured by: (a) average field goal percentage; (b) average points per minute played; (c) average rebounds per minute played; (d) average turnovers per minute played; and (e) average fouls per minute played. The Competitive State Anxiety Inventory-2 (CSAI-2) (Martens, Burton, Vealey, Bump, & Smith, 1983) was utilized to measure precompetition state anxiety. Martens' (1977) Sport Competition Anxiety Test (SCAT) provided the competitive trait anxiety measure. The Test of Attentional and Interpersonal Style (TAIS) (Nideffer, 1976) was utilized to measure the attentional, control, and interpersonal characteristics of the subjects.

A 2 x 3 (groups x blocks) repeated measures design was the underlying model utilized to investigate the effects of VMBR on the competitive performance measures and on the subscales of the CSAI-2 (Martens et al., 1983). A 2 x 2 (groups x blocks) repeated measures

design was the underlying model for the investigation of the effects of VMBR on trait anxiety, as measured by the SCAT (Martens, 1977), and the attentional, control, and interpersonal factors measured by the TAIS (Nideffer, 1976). The findings suggested that: (a) VMBR may contribute to performance improvement of a closed task in a competitive sport setting; (b) the somatic component of state anxiety as measured by the CSAI-2 (Martens et al., 1983) may be significantly improved with VMBR; (c) trait anxiety, as measured by the SCAT (Martens, 1977), is not readily influenced by VMBR; and (d) the attentional, control, and interpersonal factors of the TAIS (Nideffer, 1976) are not readily influenced by VMBR.

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CHAPTER I

INTRODUCTION

The constructs of arousal/activation, attention, and information processing and their relationship to performance have sustained substantial research in the area and study of motor skills (Duffy, 1962; Marteniuk, 1976; Nideffer, 1976; Yerkes & Dodson, 1908). Consideration of type of task and of task demands has also been essential in the learning and performance of motor tasks (Gentile, 1972; Higgins, 1972, 1973; Poulton, 1954). These relevant points, as well as several others, are the basic premise, from a theoretical viewpoint, underlying the phenomenon of mental practice.

The inverted-U theory, which conceptualizes the relationship between arousal/activation and performance, suggests that there exists an optimal degree of arousal that produces maximum performance for every type of behavior (Duffy, 1962; Yerkes & Dodson, 1908). Increased arousal levels are also associated with the attentional phase of information processing. Kahneman (1973) suggested that as arousal level increases beyond a moderate intensity, a narrowing of attentional focus as well as an increase in attentional switching occurs. Thus, the processing of relevant cues from the environment, which are necessary for optimum performance, is inhibited (Kahneman, 1973).

The physical practice of a motor task, which historically has dominated the time spent in acquiring or developing a skill, has been conceptualized as a process which reduces the uncertainty and attention demands of the skill (Marteniuk, 1976). Oxendine (1968) concluded that

physical performance may be enhanced through the addition of mental preparation techniques. Nideffer (1981) further suggested that attentional constructs could be used to "integrate mental and physical functions" (p. 23) required for motor performance. Since research has indicated a direct relationship between the ability to direct or control attention and arousal, mental training for athletes may act to improve or increase this control and thus, enhance performance (Nideffer, 1981).

The split-brain theory, which suggests that the right and left hemispheres of the brain process different types of information, has also been used to explain the effects of mental preparation techniques on the information processing system (Blakeslee, 1980). Blakeslee (1980) concluded that the right hemisphere of the brain is active in processing spatial tasks and that during active movements, this type of processing is needed. Stress, which is inherent in competition and which is directly related to increases in arousal, inhibits the necessary shifting back and forth between the left and right hemispheres (Hall & Hardy, 1982). Training in techniques for relaxation, meditation, and visual imagery enhances the balanced functioning and efficient shifting of the two hemispheres and even induces self-control of anxiety (Cade & Coxhead, 1979).

A mental training technique developed by Suinn (1976) to enhance sport performance is termed visuo-motor behavior rehearsal (VMBR) and utilizes relaxation combined with visual imagery. Visuo-motor behavior rehearsal consists of three basic steps: (a) relaxation, (b) the practice of imagery, and (c) the use of imagery to perform motor skills (Suinn, 1976). Suinn (1976) first used VMBR in a study with downhill

skiers but was unable to analyze the effectiveness of the treatment. During the study, the improvement of the skiers in the VMBR group resulted in the coach eliminating skiers in the control group from competition. Therefore, performance analysis of the two groups was impossible (Suinn, 1976).

Other investigators have also studied the effects of VMBR. These studies are cited below in chronological order with specific reference made to length of training period and tasks utilized as well as the reported results. Noel (1980) found no significant ($p < .05$) differences in performance on tennis serves between control and VMBR groups following a ten-day training period with tennis players. Weinberg, Seabourne, and Jackson (1981) compared karate performance of a relaxation group, an imagery group, a VMBR group, and a placebo group. Techniques were practiced daily for a six-week period. Results indicated: (a) a decrease in state anxiety for both the VMBR and relaxation group, and (b) an increase in performance for the VMBR group. Hall and Erffmeyer (1983) investigated the use of VMBR and its effectiveness on the free throw accuracy of female basketball players. The imagery phase of VMBR training consisted of mentally modeling of videotaped successful performances for a three-week period of time. The VMBR group showed significant ($p < .05$) improvement in free throw shooting performance (Hall & Erffmeyer, 1983).

Several factors across the previously mentioned studies (Hall & Erffmeyer, 1983; Noel, 1980; Weinberg et al., 1981) pose questions concerning the generalizability of visuo-motor behavior rehearsal to different competitive tasks. Some important factors considered when

reviewing the studies were: (a) environmental conditions, (b) task demands, and (c) skill level of the subjects. Researchers concluded that these factors are essential when analyzing, predicting, and structuring learning conditions for motor skills (Gentile, Higgins, Miller, & Rosen, 1975; Weinburg, Seabourne & Jackson, 1982). Following a meta-analysis of the mental practice research, Feltz and Landers (1983) also identified these factors as problems in identifying the effects and generalizability of mental practice. Another problem of past research in the particular area of sport psychology, as pointed out by Martens (1979), is that research should not only be conducted in controlled laboratories, but also in the competitive environment and on the playing fields.

The factors identified in this section: (a) arousal/activation and performance; (b) attentional control and performance; (c) consideration of task demands; and (d) skill level of subjects, are all variables which have not been controlled nor considered in previous research and have, therefore, left gaps and inconsistencies in the mental practice literature. By incorporating: (a) instruments which measure both state and trait competitive anxiety and which identify attentional focus characteristics relevant to performance, (b) a sport which contains both open and closed tasks in a competitive environment, and (c) subjects who have developed a high level of skill, it may be possible to move toward a better theoretical understanding of mental practice and mental preparation techniques for groups of individuals with a high level of skill. Thus, it was the purpose of this study to determine the effects of visuo-motor behavior rehearsal on: (a) the various performance tasks

involved in the sport of basketball during competition; (b) the state and trait anxiety levels of highly skilled subjects; and (c) attention, control, and interpersonal characteristics of highly skilled athletes. Because the research was an experimental study completed in a field setting, the results are evaluated both from: (a) a statistical perspective, and (b) the viewpoint of potential effects on team outcomes.

Statement of the Problem

The purpose of this study was to determine the effects of visuo-motor behavior rehearsal, across a time period on:

- (a) the competitive game performance of basketball skills with varied task demands,
- (b) the state and trait anxiety levels of highly skilled performers, and
- (c) the attentional, control, and interpersonal characteristics of performers.

The specific hypotheses concerning these effects are listed below.

1. The competitive performance of highly skilled subjects receiving visuo-motor behavior rehearsal (VMBR) would be significantly ($p < .05$) better at block 3 than that of highly skilled subjects in the no treatment group on the closed task of free throw shooting, measured by average free throw percentage. The VMBR and no treatment groups would not be

significantly ($p < .05$) different at blocks 1 and 2 average free throw percentage.

2. The change scores from block 1 to 3 in the closed task measure, average free throw percentage, would be significantly ($p < .05$) better for the VMBR group than the control group. There would be no significant ($p < .05$) difference between the groups on the change scores for blocks 2 to 3 for average free throw percentage.
3. The competitive performance of highly skilled subjects receiving visuo-motor behavior rehearsal (VMBR) would be significantly ($p < .05$) better at block 3 than that of highly skilled subjects in the no treatment group on the following measures which reflect open task performance: (a) average field goal percentage; (b) average points per minute played; (c) average rebounds per minute played; (d) average turnovers per minute played; and (e) average fouls per minute played. The VMBR and no treatment groups would not be significantly ($p < .05$) different at blocks 1 and 2 on the competitive open tasks listed above.
4. The change scores from block 1 to 3 would be significantly ($p < .05$) better for the VMBR group than the control group on the following measures which reflect open task performance: (a) average field goal percentage; (b) average points per minute played; (c) average rebounds per minute played; (d) average turnovers per minute played; and (e) average fouls per minute played.

There would be no significant ($p < .05$) difference between the groups on the change score for blocks 2 to 3 on the open task performance measures.

5. The average cognitive scores on the Competitive State Anxiety Inventory - 2 (CSAI-2) for highly skilled subjects receiving visuo-motor behavior rehearsal (VMBR) would be significantly ($p < .05$) lower at blocks 2 and/or 3 than the scores for highly skilled subjects in the no treatment group. The VMBR and no treatment groups would not be significantly ($p < .05$) different at block 1 on the average cognitive scores of the CSAI-2.
6. The change in the average cognitive score on the Competitive State Anxiety Inventory - 2 (CSAI-2) for the VMBR group would be significantly ($p < .05$) better from block 1 to block 2 and/or block 3 than the control group. The change in the CSAI-2 average cognitive scores would show no significant ($p < .05$) difference between the groups from block 2 to block 3.
7. The average somatic scores on the Competitive State Anxiety Inventory - 2 (CSAI-2) for highly skilled subjects receiving visuo-motor behavior rehearsal (VMBR) would be significantly ($p < .05$) lower at blocks 2 and 3 than the scores for highly skilled subjects in the no treatment group. The VMBR and no treatment groups would not be significantly ($p < .05$) different at block 1 on the average somatic scores of the CSAI-2.
8. The change in the average somatic scores on the Competitive State Anxiety Inventory - 2 (CSAI-2) for the VMBR group would be significantly ($p < .05$) better than the control group from

- block 1 to block 2 and/or block 3. The change in the CSAI-2 average somatic scores would indicate no significant ($p < .05$) difference between the groups from block 2 and to block 3.
9. The average self-confidence scores on the Competitive State Anxiety Inventory - 2 (CSAI-2) for highly skilled subjects receiving visuo-motor behavior rehearsal (VMBR) would be significantly ($p < .05$) higher at blocks 2 and 3 than the scores for highly skilled subjects in the no treatment group. The VMBR and no treatment groups would not be significantly ($p < .05$) different at block 1 on the average self-confidence scores of the CSAI-2.
 10. The change in the average self-confidence scores on the Competitive State Anxiety Inventory - 2 (CSAI-2) for the VMBR group would be significantly ($p < .05$) better than the control group from block 1 to block 2 and/or block 3. The change in the CSAI-2 average self-confidence scores would indicate no significant ($p < .05$) difference between the groups from block 2 to block 3.
 11. The scores on the Sport Competition Anxiety Test (SCAT) for highly skilled subjects receiving visuo-motor behavior rehearsal (VMBR) would not be significantly ($p < .05$) different at block 1 or block 2 from the scores for highly skilled subjects in the no treatment group.
 12. The scores on the attentional, control, and interpersonal factors of the Test of Attentional and Interpersonal Style (TAIS) for highly skilled subjects receiving visuo-motor

behavior rehearsal (VMBR) would not be significantly ($p < .05$) different at block 1 or block 2 from those of highly skilled subjects in the no treatment group. The scales for the attentional factor of the TAIS include: (a) Broad External Attentional Focus (BET); (b) Overloaded by External Stimuli (OET); (c) Broad Internal Attentional Focus (BIT); (d) Overloaded by Internal Stimuli (OIT); (e) Narrow Attentional Focus (NAR); and (f) Reduced Attentional Focus (RED). The scales for the control factor of the TAIS include: (a) Information Processing (INFP); and (b) Behavior Control (BCON). The scales for the interpersonal factor of the TAIS include: (a) Control Scale (CON); (b) Self-Esteem (SES); (c) Physical Orientation (P/O); (d) Obsessive (OBS); (e) Extroversion (EXT); (f) Introverson (INT); (g) Intellectual Expression (IEX); (h) Negative Affect Expression (NAE); and (i) Positive Affect Expression (PAE).

Definition of Terms

The theoretical definitions of relevant terms are listed below to provide a better understanding of the literature which presents the theoretical framework for this research. Operational definitions are included for constructs evaluated in this study.

Activation. The state of excitation of the reticular formation of the brain and the resultant generalized cerebral cortical arousal (Fiske & Maddi, 1961; Marteniuk, 1976; Ursin, 1978). This state of

excitation is accompanied by behavioral signs of increased arousal (Ursin, 1978).

Anxiety. The uneasy feeling derived from a situation perceived as threatening or stressful (Spielberger, 1966). Spielberger (1966) identified two sub-categories of anxiety: state and trait. State anxiety is a temporary state of worry or stressfulness particular to a specific time and/or event (Spielberger, 1966) and was measured in this study by scores on the Competitive State Anxiety Inventory - 2 (CSAI-2). The CSAI-2 (Appendix A) is a self-reporting, paper-pencil instrument which measures an athlete's precompetition state anxiety level on three factors: (a) a cognitive component, (b) a somatic component, and (c) self-confidence (Martens, Burton, Vealy, Bump, & Smith, 1983). The cognitive component is concerned with thoughts while the somatic component is concerned with physiological responses (Martens et al., 1983). The items contained within each factor on the CSAI-2 are identified in the margin of Appendix A.

Trait anxiety is an individual's general tendency or predisposition to perceive an event or situation as worrisome or stressful (Spielberger, 1966) and was measured in this study by scores on the Sport Competition Anxiety Test (SCAT) (Martens, 1977). The SCAT is a self-reporting, paper and pencil instrument which measures an athlete's competitive trait anxiety (Martens, 1977).

Arousal. The degree of excitation of the reticular formation of the brain (Cox, 1978; Fiske & Maddi, 1961; Marteniuk, 1976). Arousal is often used interchangeably with activation (Cox, 1978).

Attention. The ability to concentrate on an object or a situation.

Attentional dimensions include width and direction of attentional processes (Nideffer, 1976b). Direction of attention refers to type of cues being processed i.e., an individual processing either external or internal cues; and width of attention refers to the amount of cues an individual can process (Nideffer, 1976b).

Attentional style. The predisposition of an athlete to concentrate on an event in a particular manner utilizing the dimensions of width and direction (Nideffer, 1976a), measured in this study by the Test of Attentional and Interpersonal Style (TAIS) (Nideffer, 1976b). The TAIS is a self-reporting, paper and pencil instrument which measures attentional, control, and interpersonal constructs relevant to performance (Nideffer, 1976b).

Blocks. In this study, three blocks of eight games each were utilized for the game performance and state anxiety measures. Block 1 was the pre-experimental block consisting of eight games during the initial part of the competitive season. Block 2 consisted of eight games during mid-season in which the experimental group was trained in relaxation and imagery. Block 3 consisted of eight games during the latter part of the season in which the experimental group continued VMBR. For the trait anxiety and attentional style measures, two blocks were utilized. Block 1 consisted of the pre-test measures which were taken at the beginning of the season. Block 2 consisted of the post-test measures which were taken at the end of the season.

Closed skill. A skill which is executed in a stable, unchanging, predictable environment (Gentile et al., 1975; Poulton, 1957). In this study, the closed competitive game performance task was free throw shooting, operationally defined as the average free throw percentage per block of eight games.

Competitive game performance. An assessment of how an athlete performs closed and open tasks in a game situation. The closed task in this study was free throw shooting, estimated by average free throw percentage. Operational measures used to estimate open task performance were: (a) average field goal percentage, (b) average points per minute played, (c) average turnovers per minute played, (d) average rebounds per minute played, and (e) average fouls per minute played. These were recorded for each game and averaged within each of the three blocks of eight games.

Imagery. A covert rehearsal technique in which an individual imagines him-/herself performing a skill (Schmidt, 1982).

Mental practice. "Repetition of a task, without observable movement, with the specific intent of learning" (Corbin, 1972, p. 94). "The symbolic rehearsal of a physical activity in the absence of any gross muscular movements" (Richardson, 1967, p. 95). The following terms have been used synonymously in research with mental practice: imagery rehearsal, symbolic rehearsal, implicit practice, mental rehearsal, conceptualizing practice, and imagery (Weinberg, 1982). Visuo-motor behavior rehearsal (VMBR) is mental practice combined with relaxation and was the technique utilized in this study.

Open skill. A skill which is executed in an environment which is unstable and/or changing, and in which movement is present or the environment is in motion (Gentile et al., 1975; Poulton, 1957). In this study, the open competitive game performance was measured by: (a) average field goal percentage, (b) average rebounds per minute played, (c) average points per minute played, (d) average turnovers per minute played, and (e) average fouls per minute played.

Progressive relaxation. A relaxation technique which involves the tensing and relaxing of the major muscle groups in order to experience a state of deep relaxation (Bernstein & Borkovec, 1973). In this study, progressive relaxation was used as the relaxation step in VMBR.

Stress. The nonspecific physiological or psychological response to a stimulus, either physical or emotional (Swogger, 1981). Selye (1956) identified stress as an alteration of homeostasis in response to certain situations. Stress is usually considered to be a negative emotional state (Schmidt, 1982).

Visuo-motor behavior rehearsal (VMBR). A mental training technique which utilizes relaxation and visual imagery. It consists of three basic steps: (a) relaxation, (b) the practice of imagery, and (c) the use of imagery to perform motor skills (Suinn, 1976). In this study, VMBR was used as the mental training technique for highly skilled, female basketball performers.

Assumptions Underlying the Research

The following assumptions were made in reference to this study:

1. Nideffer's (1976b) Test of Attentional and Interpersonal Style provides valid and reliable measures of attentional, control, and interpersonal variables.

2. Martens' (1977) Sport Competition Anxiety Test is a valid and reliable measure of competitive trait anxiety.

3. The Competitive State Anxiety Inventory - 2 (Martens et al., 1983) is a valid and reliable measure of precompetition state anxiety.

4. Team members of a nationally ranked Division I team are highly skilled.

Scope of the Study

The subjects utilized in the study were members of a National Collegiate Athletic Association (NCAA), Division I, nationally ranked women's basketball team. All subjects freely consented to participate in the study. The time period encompassing collection of the data was the 1983-84 regular season NCAA games.

Significance of the Study

Even though numerous investigations concerning the effects of mental practice have been conducted during the last decade, the results have yielded inconclusive and contradictory evidence (Feltz & Landers, 1983). As one solution, Feltz & Landers (1983) suggested that future research examine the effects of mental practice as a function of task type and experience level of subjects. Schmidt (1982) further suggested that one of the remaining relevant questions is whether mental practice

is an effective technique for improving and/or stabilizing the performance of the highly skilled athlete.

Martens (1979) suggested that laboratory research has been used too much in sport psychology before adequately identifying relevant variables. Martens (1979) identified the following inadequacies of sport psychology laboratory study:

1. The external validity of laboratory studies is at best generalizable to predicting behavior in other laboratories.
2. The populations sampled are unrepresentative of those to whom we wish to make application.
3. Laboratory research reduces a multivariate universe to a bivariate or trivariate model usually factorial in design.
4. Laboratories usually impose a directional change and do not consider that both variables in a natural setting may cause changes in each other.

With these specific inadequacies in mind, Martens (1979) suggested asking more sport relevant questions and attempting to answer them through field research. This study was designed to concentrate on the variables which: (a) have been previously omitted and/or uncontrolled, i.e., skill level of subjects, type of task, attentional control, and performance, and (b) are essential, from a theoretical viewpoint, to the understanding of mental preparation techniques in a field situation.

CHAPTER II

REVIEW OF LITERATURE

Introduction

The relationship between arousal and motor performance has been an important concept underlying much of the research in the areas of motor behavior and sport psychology. In order to understand the premises on which this research has been based, it is necessary to review certain relevant theoretical constructs. These constructs include arousal, activation, stress, anxiety, and attention. The material presented in this chapter will be focused on these constructs and their relationship to performance. The existent relationship of these constructs to performance is the rationale for the development and use of the psychological techniques utilized in the performance studies presented in this review. The research under consideration has been organized into the following sections: (a) task demands, including discussion of the nature of the task and environment; (b) attentional demands in movement, including subsections which discuss arousal/activation, anxiety, selective attention, width and direction of attention, stress response, and stress response management; and (c) practice and performance, including a review of the mental practice literature relevant to this study.

Task Demands

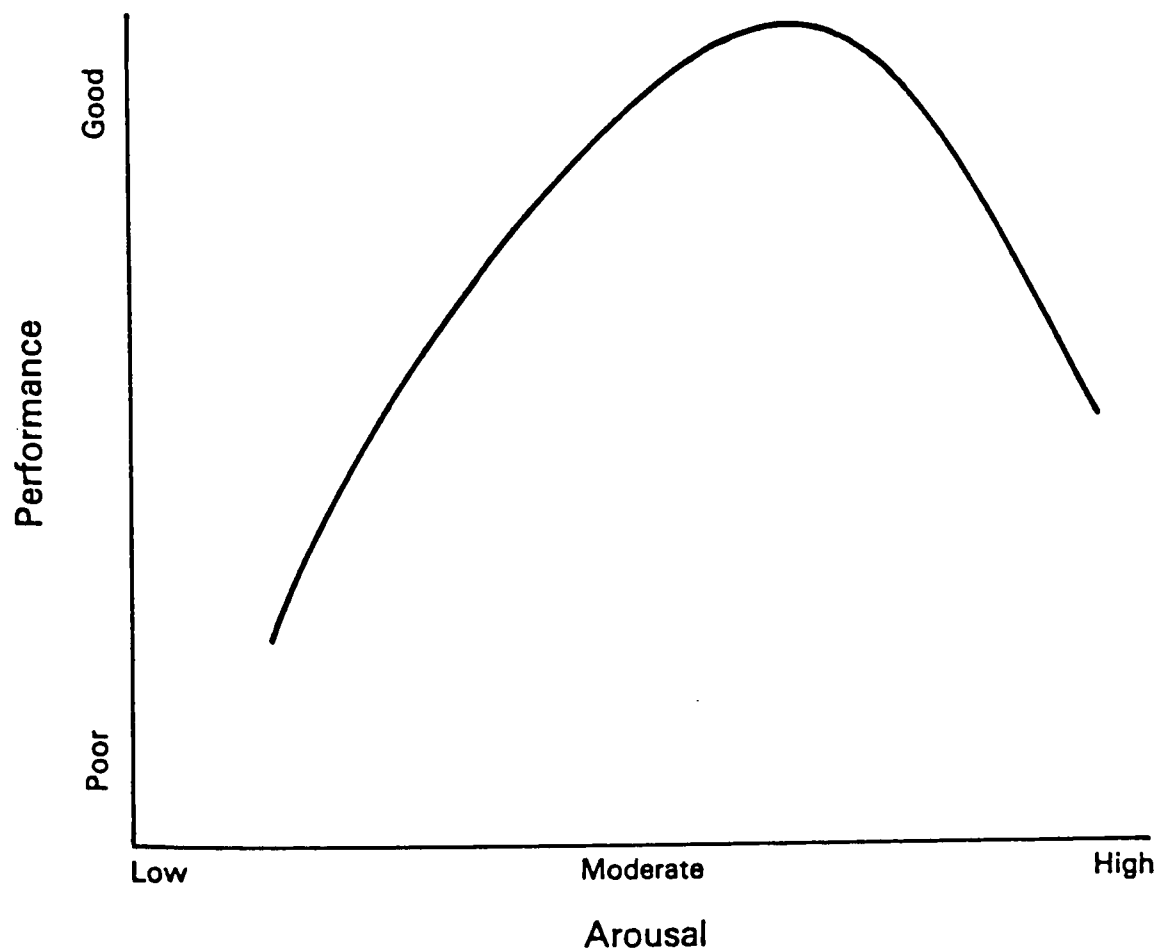
Important factors in the understanding of the performance of a skill are the demands of the task and/or the environment. One procedure which is used to classify skills is the determination of the extent to which the environment, along a continuum, is predictable during performance (Poulton, 1957). Closed skills are on one end of the continuum where the environment is predictable because it is stable. On the other end of the continuum are skills classified as open in which the environment is constantly changing (Poulton, 1957). In order to be successful in open skills, the performer must be able to adapt performance to a rapidly changing environment; while closed skills require consistent and stable performance to meet the unchanging environmental conditions (Gentile, 1972; Schmidt, 1982).

Tasks may also be classified according to the nature of the movement required of the performer (Gentile, Higgins, Miller, & Rosen, 1975; Higgins, 1972; & Gentile, 1972). The movement required may involve either total body stability or total body transport (Gentile et al., 1975). The complexity of a task would thus be determined by considering both the nature of the environment and the nature of the movement required of the performer. This information must be utilized by central nervous system operations which interpret the information so that it may be processed and used to execute a movement (Marteniuk, 1976).

Attentional Demands in Movement

Arousal/activation

In order to process the various task requirements, attention demands are placed on the mechanisms of the central nervous system (Mareniuk, 1976). Posner and Boies (1971) suggest that attention is comprised of three different aspects: (a) alertness; (b) the idea of a limited central processing capacity; and (c) selective attention. The aspect of alertness can be conceptualized as a "state of the central nervous system such that it is 'ready' to receive and process information at an optimal rate" (Marteniuk, 1976, p. 40). Marteniuk, (1976) suggested that the concept of alertness is similar to that of activation theory. Ursin (1978) describes activation as electroencephalogram desynchronization in the brain stem reticular formation which is accompanied by behavioral signs of increased arousal. Cox (1978) further stated that activation and arousal are often used interchangeably. Yerkes and Dodson (1908) first suggested that for every type of performance there is an optimal level of arousal and/or degree of activation which is related to maximum performance. This inverted-U relationship between activation and performance (Figure 1) was further investigated by Duffy (1962) who stated that the activation or arousal level of an individual varies along a continuum of low levels during deep sleep to high levels during extreme excitement or anxiety. As arousal increases along the continuum, low to high, there is a positive effect on performance up to a point, usually of moderate



Schmidt, T. A. (1982). Motor control and learning: A behavioral emphasis. Champaign, IL: Human Kinetics Publishers. p.182.

Figure 1. The inverted-U relationship between arousal/activation and performance.

intensity (Duffy, 1962). Once arousal increases beyond this point, there is a progressive decrease in performance. This optimal point of arousal/activation is a "balanced" or optimal state and varies among individuals (Klavora, 1978; Klavora & Daniel, 1979).

The inverted-U theory is directly related to information processing. Marteniuk (1976) stated that high arousal is characterized by a state of excitation of the reticular formation of the brain stem. The neural activity sent out from the reticular formation sets up a generalized cortical arousal and the subsequent level of efficiency of processing information is related to this arousal level (Cox, 1978; Marteniuk, 1976).

Nideffer (1976a) suggested that the three constructs of stress, anxiety, and arousal exist under controlled conditions in a predictable relationship to each other: "stressful conditions always lead to an increase in arousal (physiological-emotional changes)" (p. 71). Thus, arousal may be conceptualized as physiological, psychological, or both. From a physiological basis, Schmidt (1982) characterized high arousal as shifts in heart rate, perspiration, resistance to the passage of electric current over the surface of the skin (GSR), and pupil dilation. From a psychological basis, Spielberger (1966) divided the anxiety which results from high arousal into two dimensions: trait anxiety and state anxiety. Trait anxiety (A-trait) refers to a stable personality disposition and state anxiety (A-state) refers to momentary or situational anxiety which accompanies situations over changes in time (Martens, 1977; Spielberger, 1966). A-state is thus a consciously perceived feeling of apprehension and is accompanied by arousal of the

autonomic nervous system (Martens, 1977; Spielberger, 1966).

Spielberger, Gorsuch, and Lushene (1970) developed self-report inventories which measure both trait and state anxiety; the State-Trait Anxiety Inventory (STAI).

Sport specific inventories have also been developed for both state and trait anxiety. The Sport Competition Anxiety Test (SCAT) was developed by Martens (1977) to measure competitive trait anxiety. Martens, Burton, Rivkin, and Simon (1980) developed version one of the Competitive State Anxiety Inventory (CSAI) which measures competitive state anxiety. The use of and research on the CSAI led to the recent development of the CSAI-2 (Competitive State Anxiety Inventory - 2) (Martens, Burton, Vealey, Bump, & Smith, 1983). These inventories, as well as the research pertaining to the validity and reliability of each, are discussed later in this chapter.

Nideffer (1976) suggested that the external conditions or situations that result in increases in an individual's physiological level of arousal and/or psychological level of anxiety are inherent in competition. One example of a condition which might cause these increases would be an athlete's anticipation of the game just prior to competition (Nideffer, 1976a). Feltz and Landers (1981) included other stressors such as fear of losing a contest, becoming injured, or being rejected by fans, coaches, and/or teammates. Any or all of these fears may cause the athlete to experience undue anxiety or stress, which, if uncontrolled, usually have a deteriorating effect on performance (Feltz & Landers, 1981).

Selective Attention

The idea of a limited capacity to process information is another aspect of attention (Posner & Boies, 1971). Schmidt (1982) specifically defined attention as "a limited capacity to process information" (p. 182) and emphasized that this limited capacity is a major characteristic of attention. Another characteristic of attention is the ordered or serial process of attending to stimuli which requires that attention must be switched to various stimuli during activities in order to process all of the relevant information (Schmidt, 1982). Selective attention is the mechanism which directs this attention switching (Marteniuk, 1976). Although many stimuli are constantly being received, selective attention is the process which allows cues to continue to be processed, with perception the end result (Marteniuk, 1976). The efficiency of selective attention (in processing the relevant information from a situation) varies according to the level of experience or learning stage of the individual (Marteniuk, 1976). Marteniuk (1976) further suggested that "Without an optimal level of arousal, efficient information processing could not take place in terms of selecting certain types of information over other types" (p. 75). Kahneman (1973) stated that as arousal increases, a progressive narrowing of cues takes place as well as the increased occurrence of attentional shifts to various stimuli. Thus, the possibility exists that many relevant stimuli will be excluded when arousal levels are too high.

Width and direction of attention

Nideffer (1981) suggested that attention should be viewed as having two dimensions: width and direction. Width involves a continuum from broad to narrow focus while direction involves a continuum from external to internal focus (Nideffer, 1981). Nideffer (1981) pointed out that arousal affects both the width and the direction of attention.

Initial increases in arousal levels may influence individuals differently, with direction of attention for some becoming externally focused and for others, internally focused (Nideffer, 1981). Nideffer, Wolfe, and Wiens (1979) found that further increases in arousal bring about a narrowing in the width of attention. Complex and rapidly changing situations, such as those encountered in open skills, require broader attention (Nideffer, 1981). Therefore, narrowing of attention due to increased anxiety has a detrimental effect on performance, particularly in the case of open skills (Nideffer, 1981).

In order to assess the dimensions of attention as well as the control and the interpersonal variables of individuals, Nideffer (1976b) developed the Test of Attentional and Interpersonal Style (TAIS). The TAIS was developed to profile individual attentional, control, and interpersonal constructs relevant to performance. The TAIS is recommended for use in the identification of an athlete's attentional strengths and weaknesses. These strengths and/or weaknesses, when identified, may also be used as guides in the development of training programs to improve ability to control mental and physical processes (Nideffer, 1981). Research has indicated that: (a) the instrument has test-retest reliability and good construct, predictive, and concurrent

validity for general college age groups (Nideffer, 1979); and (b) the TAIS has validity, internal consistency, and stability for sport oriented groups (Beitel, Buckles, & Richards, 1984; Buckles & Beitel, 1984).

Stress response

Because arousal level has such an important effect on attention and information processing, it is important to understand the actual responses of individuals to stress. Selye (1956) describes stress as an individual's response to certain situations which causes an alteration of homeostasis. Nideffer (1976a) reported that in order to help athletes control anxiety during stressful situations, there must be an understanding of how individuals and their stress responses differ. Lang (1968) suggested that each individual has a slightly different stress response depending on their learning background and experience and the particular situation encountered. Stress responses can be divided into three general categories: (a) cognitive, (b) physio-logical, and (c) behavioral. Lang (1968) specified that these three domains support and maintain one another and that each individual's response to stress may include one or more of these components.

Borkovec (1981) indicated that most responses which occur in athletics are usually considered to fall into the cognitive and physiological domains. The behavioral domain is assumed to be eliminated through the familiarization with a skill which accompanies the physical training and practice required to become a skilled athlete.

The cognitive and physiological domains are primarily concerned with how thoughts, images, and physiological reactions interfere with information processing and physical performance (Borkovec, 1981).

The techniques used to focus on one domain generally indirectly influence the other, or, procedures can be combined to affect both categories simultaneously (Borkovec, 1981). Borkovec (1981) when reviewing cognitive procedures, specified that: (a) because stress is a subjectively defined event, a stressful situation for one person may not be viewed as stressful to another; (b) once a stressful event has been experienced, thoughts and images of the event sustain the response; and (c) worrying about events before and/or after they occur can be disruptive between events. In the case of an athlete, worry can even affect one's general attitude and response to competition (Borkovec, 1981).

In order to assess individual cognitive responses in the competitive setting, Martens (1977) developed a sport specific competitive trait anxiety inventory; the Sport Competition Anxiety Test (SCAT). Martens (1977) also suggested the need for a specific competitive state anxiety inventory and proposed a ten-item short form of the Spielberger (1966) State Anxiety Inventory (SAI). Gruber and Beauchamp (1979) investigated the relevancy of the Competitive State Anxiety Inventory in a sport environment: women's collegiate varsity basketball. It was demonstrated that the CSAI detected changes in competitive A-state of college women basketball players and that it was suitable for repeated use in a competitive sport environment (Gruber & Beauchamp, 1979)

Other studies have also been conducted using SAI, SCAT, and CSAI. The effects of the stress response and the inverted-U theory on performance have been investigated using Martens' (1977) SCAT (A-trait) and CSAI (A-state). Weinberg and Genuchi (1980) studied the relationship among competitive trait anxiety, state anxiety, and golf performance in a field setting. The SCAT (Martens, 1977), which is a trait inventory, was used to assess state anxiety prior to performance events. The results (Weinberg & Genuchi, 1980) indicated that the instrument was also a good predictor of precompetitive state anxiety. Weinberg and Genuchi (1980) further concluded that: (a) low A-trait subjects displayed lower state anxiety than moderate or high A-trait subjects; and (b) low A-trait subjects displayed higher levels of performance than moderate or high A-trait subjects. Weinberg and Genuchi (1980) concluded that sports requiring fine muscle coordination and precision, such as golf, are performed best at low levels of anxiety.

Powell and Verner (1982) conducted an experiment examining the relationship between anxiety and performance using well-practiced parachute trainees experiencing their first parachute jump. The first parachute jump was considered a realistic threat sufficiently stressful to produce increases in physiological and psychological arousal. Physiological arousal was measured by taking subjects' heart rates 20 seconds before jumping and psychological arousal was estimated by scores on the Spielberger et al. (1970) State Anxiety Inventory which was administered to each subject immediately prior to boarding the aircraft. The results of Powell and Verner (1982) supported the hypotheses that:

(a) individuals with lower arousal levels would perform more adeptly under stress than those who were highly aroused, and (b) higher levels of anxiety negatively influenced performance.

Sonstroem and Bernardo (1982) tested the inverted-U hypothesis by examining individual levels of pregame state anxiety, players' composite performances, and total points per game across three games of a basketball tournament. Players completed the SCAT (Martens, 1977) before a practice session early in the season to measure trait anxiety and completed the CSAI (Martens, 1977) 20-30 minutes before each game of the tournament to measure state anxiety scores. Results (Sonstroem & Bernardo, 1982) revealed that: (a) A-state had a significant ($p < .01$) relationship to both game performance as assessed by the coach and total points, and (b) high A-state scores were associated with poorest performances in high, moderate, and low A-trait groups.

The Competitive State Anxiety Inventory - 2 (CSAI-2) is a multidimensional assessment instrument which measures both cognitive and somatic anxiety, as well as self-confidence (Martens et al., 1983). Martens et al. (1983) found the CSAI-2 to have good reliability and construct validity. Gould, Petlichkoff, and Weinberg (1984) examined the CSAI-2 in two studies using intercollegiate wrestlers and female high school volleyball players, respectively. The results verified that (a) the CSAI-2 did, in fact, assess three separate components of state anxiety; and (b) somatic anxiety increased prior to competition, while cognitive anxiety and self-confidence were unchanged.

Although the tasks varied from open to closed skills (golf being closed and basketball and parachute jumping being open) across the

studies, all concluded that higher levels of anxiety were related to poorer performance. In view of this, it may be hypothesized that: (a) high levels of anxiety have a debilitating effect on the performance objectives of both open and closed skills, (b) stress management techniques are needed and may be useful in the enhancement of competitive performance (Feltz & Landers, 1983).

Stress response management

Even though there are various stress management techniques offered, both the cognitive and physiological procedures have a two-fold effect in mitigating stress responses. Relaxation procedures attempt to sustain attention to reduce physiological activity, which in turn, decrease cognitive activity (Borkovec, 1981). The relaxation procedures which are most commonly used include progressive, hypnotic, autogenic, and meditational techniques (Borkovec, 1981; Nideffer, 1981).

Research has revealed the positive effects of these cognitive and physiological procedures for stress management, specifically with athletic populations (DeWitt, 1980; Suinn, 1976; Weinberg, Seaborne, & Jackson, 1980). Suinn (1976) introduced a technique which combines relaxation and practice by mental imagery called visuo-motor behavior rehearsal (VMBR). Subjects used in his study were members of a collegiate downhill ski team. Subjects were divided into two groups matched equally for ski-racing ability, with one group receiving visuo-motor behavior rehearsal and the other acting as a control group. Suinn (1976) was unable to draw statistically based conclusions due to the fact that the coach was so impressed with the VMBR group that he

discontinued racing subjects from the control group. Suinn (1976) was able to suggest that the technique had positive effects.

DeWitt (1980) investigated the usefulness of cognitive and biofeedback training for stress reduction with university athletes. The goals of both the biofeedback (EMG) and cognitive training were to have subjects become aware of their responses in stressful situations and then to substitute more adaptive ways of responding. DeWitt (1980) hypothesized that after training, these techniques would not only reduce competitive stress reactions, but also improve competitive performance. The cognitive training program included mental rehearsal, relaxation exercises, and cognitive restructuring techniques. As an indicator of performance, the coaching staffs of both open and closed sports rated the respective subjects' performances on a ten-point scale after each game. This ongoing assessment included: (a) overall level of performance, (b) consistency of performance, (c) effort, (d) errors, and (e) execution. Results (DeWitt, 1980) indicated that physiological activity could be reduced with biofeedback training and that performance ratings increased after cognitive training. The treatment subjects also reported feeling that they: (a) had a general improvement in attitude about themselves, (b) were emotionally more relaxed, and (c) were in greater control of tension during games.

Weinberg, Seabourne, and Jackson (1981) compared the effects of visuo-motor behavior rehearsal, relaxation, and imagery on performance in karate, an open sport. The Spielberger et al. (1970) TAI was administered at the beginning and end of a six-week test period to assess A-trait. Performance tests were administered at the end of the

testing period along with precompetitive A-state. Results (Weinberg et al., 1981) indicated that: (a) all subjects displayed a reduction in trait anxiety, and (b) relaxation and VMBR groups exhibited better performance for sparring than all other groups.

The studies conducted by Suinn (1976) and DeWitt (1980) utilized the sport environment, but performance ratings were based on the subjective ratings and opinions of coaches. Weinberg et al. (1981) utilized a contrived competitive environment for performance and subjective performance ratings. These factors still leave a question in the research regarding the effectiveness of cognitive and physiological stress management techniques in a real competitive setting using empirical performance data. Since the responses to stress and arousal levels have such an impact on attention and information processing required for successful performance, this question is critical when considering the usefulness of stress management techniques across various types of tasks.

Practice and Performance

The effects of physical practice on the enhancement of learning and performing motor skills is a positive and accepted method of practice. The phenomena which draws interest is the effect of mental practice on performance. Although mental practice has not been reported to be more effective in the learning of a task than physical practice, Marteniuk (1976) documented the greater effectiveness of using mental practice over no physical practice. It is also suggested that combining physical

and mental practice possibly produces the greatest improvements in performance (Marteniuk, 1976).

Marteniuk (1976) and Schmidt (1982) suggested that the positive effects of mental practice may possibly be due to the emphasis on the cognitive nature of the task, i.e., attention and information processing. Therefore, mental practice allows the individual to practice a motor skill and attend properly to the various environmental cues and task demands without dealing with the movement nature of the task (Marteniuk, 1976). In other words, the performer is allowed to practice a component of a task rather than the entire process.

Schmidt (1982) reported that the use of mental practice seems to be more effective in the learning stages of a skill and that there is less evidence of its effectiveness for individuals at high levels of skill. A review of the relevant mental practice literature which deals with either the performance or acquisition of a motor task follows, with description of subjects, skill level, and type of task are noted for later comparisons.

Smith and Harrison (1962) compared the effects of visual, motor, mental, and guided practice upon the speed and accuracy of performance of a simple, closed, eye-hand coordination task; a punchboard learning task. Subjects consisted of 60 male volunteer university students ranging in age from 17 to 27 years with a mean age of 20 years. Each of the treatments consisted of six 10-second practice periods with 10 seconds of rest between each period. Results indicated that visual and mental practice groups reduced their total number of errors and also significantly ($p < .05$) improved their performance on the punchboard

task. It was concluded that visual practice and mental practice were effective in accuracy enhancement on a punchboard learning task, a closed skill (Smith and Harrison, 1962).

In a review of studies investigating the mental practice of a perceptual motor skill, Richardson (1967) suggested that most research had focused on enhancing the initial acquisition of a perceptual motor skill, retention of such a skill, or the immediate performance of a skill. In addition, most studies indicated that mental practice procedures are associated with: (a) improved task performance, (b) improved immediate performance, and (c) enhanced retention when used in conjunction with physical practice (Richardson, 1967). The results of studies further suggested that: (a) mental practice can lead to bilateral transfer effects; (b) task familiarity is related to the efficiency of mental practice; and (c) if concentration is to be maintained, mental practice sessions should not exceed five minutes (Richardson, 1967).

Surburg (1968) studied the effectiveness of mental practice when combined with: (a) audio, (b) visual, and (c) audio-visual instruction in developing the forehand tennis drive, an open task. Subjects consisted of 183 male junior college students. The practice program consisted of three practice sessions each week for a period of eight weeks. Each of the mental practice groups had the practice sessions divided into two parts: (a) listening to, watching, or listening to and watching a filmstrip entitled "Forehand Drive", and (b) conceptualizing on mentally practicing all the movements involved in the execution of the forehand drive for ten minutes. Results (Surburg, 1968) indicated

that the three experimental groups using mental practice showed a significant ($p < .05$) improvement in the execution of the forehand drive. Of these groups showing significant ($p < .05$) improvement, the audio instruction combined with mental practice experimental group showed the most improvement.

The effects of mental practice on the learning of motor skills of varied difficulty was studied by Phipps and Morehouse (1969). A pilot study had been conducted prior to this experiment which indicated that the hock swing to a horizontal bar, a closed skill; the jump foot, a closed skill; and the soccer hitch kick, an open task; varied in degree of difficulty from simple to more complex, respectively (Phipps & Morehouse, 1969). Subjects consisted of 80 male, university volunteer students. The investigation consisted of the subjects meeting three days per week for three weeks with a different motor skill used during each week. Results indicated that: (a) the soccer hitch kick, the most complex skill, was the only skill in which performance was significantly ($p < .05$) improved; and (b) mental practice in conjunction with physical practice produced significant ($p < .05$) improvement in learning the more simple skills; the hock swing and the jump-foot (Phipps & Morehouse, 1969).

Schick (1970) conducted three substudies using volleying and serving skills in volleyball to determine the effects of mental practice on performance improvement. Substudy 1 compared the performance of a mental practice group to a no practice group using college women volunteers ($n=10$). The mental practice group participated daily in six-minute sessions, subdivided into a three-minute session on the serve

and a three-minute session on the wall volley. The group practiced over a two-week time period. Schick (1970) found that the mental practice group performed significantly ($p < .025$) better than the no practice group on the serve test, a closed task; while no significant difference ($p < .05$) was found for the wall volley, an open task.

In Substudy 2 (Shick, 1970) physical and mental practice were conducted over a five-week period. Subjects consisted of 68 female college students. The treatment groups received either one-minute practice sessions or three minute sessions on both skills. The three-minute practice group performed significantly ($p < .05$) better on the serve test than the one-minute group, while there was no significant difference ($p < .05$) between groups on the wall volley skill.

In Substudy 3 (Schick, 1970), the treatment groups were the same as in Substudy 2 with three rather than five weeks of practice, and the subjects consisted of 36 female college students. In this study, no significant differences ($p < .05$) were found between the two groups.

The skills utilized by Schick (1970) involved different task demands. A serving skill is a closed task, while the wall volley is an open skill. Using this classification, the results suggested that the mental practice was more effective on the less complex, or closed task, during the initial stages of learning.

Smyth (1975) conducted two experiments. In the first experiment, mirror drawing was used to determine the effects of mental practice on a previously experienced, symbolic task. In the second experiment, the pursuit rotor was used to investigate the effect of mental practice in varied amounts on a less symbolic task. Subjects for both the

experiments were 70 volunteer college students. It was found that mental practice was not effective for the initial learning of a mirror drawing task and Smyth (1975) suggested that mental practice may have been more effective if subjects had first been allowed at least one physical practice of the task.

In Experiment 2, Smyth (1975) investigated the effects of varying amounts of active practice and the use of mental practice on the performance of a pursuit-rotor task. The results from this experiment indicated mental practice alternated with active or physical practice was not more effective than physical practice and rest. Again, the differences in the complexity of the tasks utilized in Experiment 1 and Experiment 2, a closed and an open skill, should be noted. As with Schick's (1970) tasks, the latter is a more complex task because of the moving target. This complexity change was not noted by the researcher and may be the primary factor affecting the results. Smyth (1975) also suggested that subjects be taught to mentally practice before being tested in an experiment requiring mental practice.

Minas (1980) investigated mental practice effects on a motor skill which consisted of learning and performing a complex form of hopscotch along a matrix of squares; a gross motor, closed skill. Subjects consisted of 36 college female students. The research revealed that: (a) guided mental practice before actual experience of the task improves learning, speed, and quality of performance; (b) initial guided practice can be more effective than comparable physical practice in terms of speed and quality of performance; and (c) the effect of guided mental

practice is most effective if administered before experience with the task.

Epstein (1980) examined the relationship of mental imagery and mental rehearsal to the performance of a dart-throwing task; a closed skill. It was hypothesized that the perspective of the subject during imagery, internal versus external, would influence the effectiveness of the mental rehearsal. External imagery was described as watching oneself perform from a third person perspective while internal imagery was described as seeing only what an individual would see if actually performing the skill (Epstein, 1980). Subjects were male and female undergraduate college students. Results revealed no significant main or interaction effects involving the mental rehearsal factor. Males performed significantly ($p < .01$) better than females and imagery groups had more variability in improvement scores than the female control group. Epstein (1980) concluded that external imagery is associated with lower performance than internal imagery in dart throwing and suggested that this may be caused by the imager's lack of ability to use kinesthetic cues.

Noel (1980) studied the effects of visuo-motor behavior rehearsal (VMBR) on tennis service performance, a closed task, measured during a tournament. Subjects consisted of 14 volunteer male tennis player with a mean age of 28.57 years. Noel (1980) found that, following VMBR, high-ability tennis players improved in tennis service performance, while low-ability tennis players deteriorated in performance. It was suggested (Noel, 1980) that the instructions for mental rehearsal, which described an advanced service motion much like that of the high-ability

players, but unlike that of low-ability players, may have interfered with the VMBR effectiveness for the less advanced players.

Weinberg (1982) provided a review of the mental practice literature as well as a compilation of the more current research which deals with the effects of specific mental preparation strategies and techniques on skilled performance. He found that the majority of the studies reviewed indicated that mental practice enhanced performance although some studies reported no significant effects for mental practice. Weinberg (1982) also concluded that mental practice should be used along with physical practice since mental practice is not as effective when substituted for physical practice. Other variables identified as possibly influencing the effectiveness of mental practice were: (a) ability level of subjects, (b) type of task, (c) conceptualizing ability of the subject, and (d) duration of the practice sessions. Specific mental preparation strategies which were reviewed included proper attentional focus, imagery, relaxation training, confidence building, and preparatory arousal, as well as combinations of the above. Weinberg (1982) indicated that while these techniques have indicated positive effects on performance, more research is needed to fully examine their influence.

Feltz & Landers (1983) conducted a meta-analysis of mental practice studies which utilized mental practice and also used either pretest scores or a control group. This eliminated the relationship of mental practice to physical practice. Sixty studies were obtainable which met the criteria for the meta-analysis. Results revealed (Feltz & Landers, 1983) that mentally practicing a motor skill resulted in improved

performance that was slightly better than that with no practice. The only significant comparisons ($p < .01$) were between: (a) cognitive and motor tasks, (b) cognitive and strength tasks, and (c) published and unpublished studies. Polynomial regression analysis revealed no significant linear or curvilinear relationships between number of practice sessions and effect size. The largest mental practice effects were produced by practice sessions that were under one minute or between 15 and 25 minutes, and that were less than six trials or between 36 and 46 trials per practice session. Feltz & Landers (1983) suggested that the type of task dictated the amount of mental practice, with cognitive or mental tasks requiring few mental practice trials (less than six) and motor, or movement, and strength tasks requiring many more mental practice trials to achieve large effect sizes. The following four theoretical propositions were offered (Feltz & Landers, 1983, pp. 45-50):

1. Mental practice effects are primarily associated with cognitive-symbolic rather than motor elements of the task.
2. Mental practice effects are not just limited to early learning - they are found in early and later stages of learning and may be task specific.
3. It is doubtful that mental practice effects are produced by low-gain innervation of muscles that will be used during actual performance.
4. Mental practice functions to assist the performer in psychologically preparing for the skill to be performed.

Summary

Although the literature reviewed has somewhat conflicting results, it is evident that mental practice has been shown to have a positive effect on the learning and performance of a motor task (Feltz & Landers, 1983; Weinberg, 1982). The conflicting results may be attributed to: (a) the many uncontrolled and unconsidered variables, and (b) attempts to generalize the effects to all types of motor tasks rather than only to the types of tasks used in each specific study. By classifying skills according to the nature and demands of the task (Gentile et al., 1975), it may be possible to determine more specific effects of mental practice techniques.

As mentioned by Noel (1980), mental practice is an individual phenomena and the techniques used in mental practice must be specific to the individual to maximize effectiveness. Consideration should also be given to the individual's natural style of imagery (Epstein, 1980), with guided group mental practice sessions being avoided.

The demands of the sport environment are also specific to the individual due to varying trait characteristics. As indicated earlier, the need for individual control of the arousal/activation balance, as well as the need for control of focus of attention are both imperative for optimal performance under stressful conditions. Visuo-motor behavior rehearsal, which is a combination of cognitive and physiological training, addresses both of these elements. Utilization of a sport which contains both open and closed skills would allow more of the specific effects of mental preparation to be determined. Thus,

the purpose of this study was to determine the effectiveness of visuo-motor behavior rehearsal (VMBR) on: (a) the performance of specific open and closed skills eliminated by empirical data collected during actual games within the sport of basketball; (b) the A-state and the A-trait levels of the players; and (c) the attentional style (attention, control, and interpersonal) of highly skilled performers.

CHAPTER III

PROCEDURES

A specific description of procedures used while in conducting this research is presented within the following sections: (a) selection of subjects; (b) description of the attentional, state anxiety, and trait anxiety assessment instruments; (c) visuo-motor behavior rehearsal description and schedule; (d) data collection schedule; and (e) design and data analysis. Each area is discussed separately.

Selection of Subjects

The subjects were 10 members of a National Collegiate Athletic Association (NCAA) Division I nationally ranked women's basketball team. Assignment of the subjects to two groups, i.e., treatment or no-treatment, was based on the following two requisites: (a) permission to be included in the treatment group from the head coach, and (b) adequate playing time during the season to provide the necessary data for performance analysis. The assignment of subjects to the treatment group was a limiting factor set forth by the coach based on her personal preference to exclude particular team members from the VMBR treatment.

The basketball team used in this study consisted of 13 members, two of whom were non-scholarship players and one who was injured during pre-season practice. These latter three players were predicted by the

coach to receive little playing time and were, therefore, eliminated from the selection process for inclusion in the study. The head coach requested that two of the remaining 10 players not be placed in the VMBR group. Five players were randomly selected from the group of eight eligible subjects and placed in the treatment group, with the no-treatment group consisting of the two players eliminated by the coach and three players remaining after the random selection process. There was an equal number of subjects ($n=5$) in the two groups. The treatment group consisted of two starters, plus one alternating starter, with players primarily designated for the following positions: (a) two guards; (b) two posts, and (c) one wing. The no-treatment group consisted of two starters and one alternating starter with players occupying the following positions: (a) two wings, and (b) three posts.

None of the subjects were paid for participating in the study. Each subject was given a letter of explanation and asked to sign an informed consent statement before participating in the study (Appendix A). One copy of the letter and informed consent was kept by the subject and one copy was kept by the investigator.

Selection of Behavioral Assessment Instruments

The behavioral measurement scales used in this study were selected based on two criteria. Each instrument was required to have: (a) a history of use by sport psychological researchers, and (b) established validity and reliability for adult groups in a sport environment. The measurement scales used in this study included: (a) the Test of

Attentional and Interpersonal Style (TAIS) (Nideffer, 1976b); (b) the Sport Competition Anxiety Test (SCAT) (Martens, 1977); and (c) the Competitive State Anxiety Inventory - 2 (CSA-2) (Martens, Burton, Vealey, Bump, & Smith, 1983).

Test of Attentional and Interpersonal Style (TAIS) (Nideffer, 1976b)

The TAIS (Nideffer, 1976b) is a 144 question, paper and pencil inventory which measures attentional, control, and interpersonal constructs which have been related to performance in the following areas: (a) competitive athletics; (b) emergency situations; and (c) business and sales. The test takes approximately 25 minutes to complete. The TAIS was developed to: (a) provide a conceptual base for determining abilities necessary to be effective in particular job or performance situations; (b) allow predictions, based on those abilities, to be made concerning how a respondent would be expected to behave when in a particular situation; and (c) provide information useful in the development of programs to improve an individual's ability to control mental and physical processes, especially in pressure situations (Nideffer, 1976a).

The TAIS measures three major areas which have been separated into 17 scales (Figure 2). Scores from the 144 items provide component information for the 17 subscales (Appendix B). The attentional area consists of six scales which are associated with width and direction of attention as well as the ability to shift attentional focus. The control area contains two scales which concern the amount of information

The Test of Attentional and Interpersonal Style Scales

ATTENTIONAL	BET	(Broad external attention): High scores on this scale are obtained by individuals who describe themselves as being able to effectively integrate many environmental stimuli at one time.
	OET	(External overload): The higher the score the more mistakes due to being confused and overloaded by environmental information.
	BIT	(Broad internal attentional focus): High scores see themselves as effectively integrating ideas and information from several different areas, as being analytical.
	OIT	(Internal Overload): The higher the score, the more mistakes individuals make because they think about too many things at once.
	NAR	(Narrow attention): The higher the score, the more effective individuals describe themselves in terms of ability to narrow attention (e.g., to study or read a book).
	RED	(Reduced attention): A high score indicates individuals make mistakes because they narrow attention too much, failing to include all of the task-relevant information.
CONTROL	INFP	(Information processing): High scores think a lot and process a great deal of information.
	BCON	(Behavior control): A high score indicates a tendency to be impulsive and/or to engage in behavior that could be considered antisocial.
INTERPERSONAL	CON	(Control): A high score indicates the individual sees him/herself as being in, and needing, control over most interpersonal situations.
	SES	(Self-esteem): The higher the score, the more positive the self-image.
	P/O	(Physical orientation): High scores indicate the person participated in, and enjoys, competitive athletics and physical activity.
	OBS	(Obsessive): High scores indicate a tendency to ruminate and worry about one particular thing without any resolution or movement. This scale provides an indication of the person's speed of decision making.
	EXT	(Extroversion): Individuals who score high are warm, outgoing, need to be with other people, and tend to be the life of the party.
	INT	(Introversion): High scores indicate the person enjoys being alone with thought and ideas. They have a need for personal space.
	IEX	(Intellectual expression): A high score indicates the person expresses thought and ideas to other people.
	NAE	(Negative affect expression): High scores are associated with a tendency to be confrontive, to express anger and negative feelings to others.
	PAE	(Positive affect expression): A high score indicates the person expresses feelings of affection to others in both physical and verbal ways. These individuals tend to be emotionally supportive.

Nideffer, R. M. (1981). The ethics and practice of applied sport psychology. Ithaca, New York: Movement Publications. pp. 78-79.

Figure 2. The Test of Attentional and Interpersonal Style scales.

an individual can effectively process and the amount of control they have over their own behavior. The third area, interpersonal, consists of nine scales which provide information about the individual and how he/she interacts with others. Nideffer (1976b) suggested it is important to consider the interaction of the three areas when interpreting the results or scores. Research has provided evidence for test-retest reliability and construct, predictive, and concurrent validity (Nideffer, 1976b; Beitel, Buckles, Richards, 1984; Buckles & Beitel, 1984).

The Sport Competition Anxiety Test (SCAT) (Martens, 1977)

The SCAT is a 15-item, paper and pencil inventory which measures an athlete's competitive trait anxiety (Martens, 1977). The test usually takes less than five minutes to complete. Of the 15 items included, only 10 items are considered when scoring. Five spurious statements are included to diminish the response bias of the actual test items (Martens, 1977). The respondent is instructed to answer according to how he/she generally feels in competitive sport situations. Possible answers to each item include: (a) hardly ever; (b) sometimes; and (c) often. Scores on the SCAT range from 10 (low competitive A-trait) to 30 (high competitive A-trait). Research has indicated the reliability and validity of the instrument as a measure of competitive trait anxiety (Martens, 1977).

The Competitive State Anxiety Inventory - 2 (CSAI-2) (Martens, Burton, Vealey, Bump, & Smith, 1983)

The CSAI-2 is a 27-item paper and pencil inventory which measures an athlete's competitive state anxiety (Martens et al., 1983). The test contains items which measure cognitive and somatic anxiety as well as self-confidence (Appendix C). Each of the subscales, cognitive anxiety, somatic anxiety, and self-confidence, consist of nine items each. The respondent is instructed to indicate how he/she feels "right now, at this moment" (Martens et al., 1983, Table 8) by responding to the items with one of the following four answers: (a) not at all; (b) somewhat; (c) moderately so; or (d) very much so. The CSAI-2 is scored by determining a separate total for each of the subscales. Scores range from a low of nine on each of the subscales to a high of 36. Research has indicated that the CSAI-2 is reliable and has substantial evidence for construct validity (Martens et al., 1983).

Data Collection Schedule

Data were collected during the 1983-84 regular season of basketball games, for approximately five months. The TAIS and SCAT were administered to each member of the team at the beginning and at the end of the basketball season. The CSAI-2 was given to each member approximately 30 minutes before each home and away game in the locker room just prior to the team taking the floor for warm-up. The investigator administered the CSAI-2 at all home games and an assistant coach administered the CSAI-2 at all away games.

The athletes were informed that their answers would not be shared with anyone except the investigator in order to assure honest answers as recommended by Martens (1983). The completed CSAI-2 questionnaires were placed in an envelope and sealed after being completed by the athletes when administered by the assistant coach.

Performance data were collected for each athlete for all games. Game statistics and play-by-play readouts were used to gather the data for each game. Information concerning the closed task (free throw percentage) and the open task (field goal percentage, rebounds per minute played, total points per minute played, turnovers per minute played, and fouls per minute played) was recorded as a function of point spread for each game and as a total for each game. Even though the reliability of the former technique was determined in a previous study (Buckles & Beitel, 1983), the data collected as a function of point spread during this study were too sparse to statistically analyze. Therefore, the total performance scores for each game were recorded and the block averages for each were used for the open and closed task data analysis.

Visuo-motor Behavior Rehearsal (VMBR) Schedule

Subjects (n=5) in the treatment group began meeting with the investigator immediately after returning from Christmas break, which was approximately one-third of the way through the season. This time schedule allowed multiple observations both before and after the onset of treatment.

Subjects met with the investigator four times per week with each meeting lasting at least 15 minutes and not more than 25 minutes. These meetings were conducted within the athletes' dressing room with the investigator being the only other person present. During the training phase, information was presented to the subjects in three basic steps: (a) 4 sessions of relaxation training; (b) 4 sessions of imagery training; and (c) VMBR or relaxation followed by imagery of specific skills during the remainder of the training meetings. This training phase lasted approximately four weeks. Eight games occurred during this time which provided the performance and CSAI-2 average scores for block 2.

The first step, relaxation training, occurred during sessions 1-4. The relaxation technique employed was progressive relaxation training as suggested by Suinn (1976). Progressive relaxation instructions (Appendix D) followed the specific procedures and sequence outlined by Bernstein and Borkovec (1973). Achievement of a relaxed state was determined and charted according to verbal feedback from the subject.

The second step, imagery training, occurred during sessions 5-8. During these four sessions, the subjects were first instructed to achieve a relaxed state on their own and to verbally cue the investigator when this was achieved. Suinn (1976) suggested this state of being relaxed can be achieved in less than one minute once the subject has practiced relaxation. The subjects were then instructed (Appendix E) to image different objects in their dressing room, which was considered a familiar setting (DeMille, 1975). Once these images were clearly achieved, as indicated verbally by the subject, the

subjects were then asked to move the objects to various locations in the room in their imagination. This phase is recommended as a progression when training individuals in the use of imagery (DeMille, 1975). The achievement of these images was charted following verbal feedback from the subject.

The third step, VMBR training, comprised sessions 9-12 in the training block. During these sessions, the subjects were instructed (Appendix F) to: (a) achieve a relaxed state; (b) visualize different objects in the dressing room; and (c) visualize themselves successfully performing one of the specific performance tasks utilized in this study. The subjects were asked to image this task as if they were actually performing it (internal imagery) rather than seeing themselves from an external perspective or third person's perspective. The performance tasks included: (a) free throws; (b) field goals; (c) rebounds; (d) turnovers; and (e) fouls. Again achievement of successful imagery was recorded according to verbal feedback from the subject. On the negative open task behaviors, fouling and turnovers, the subject was asked to image themselves performing in a controlled manner such that these infractions would not occur (e.g. better position on defense to avoid fouling their opponent). Once the VMBR training was completed (sessions 9-12) VMBR was continued throughout the remainder of the season. This remaining time period contained the eight games for block 3. Each of the five performance tasks was focused on during the four VMBR sessions.

Design and Data Analysis

A 2 x 3 (groups x blocks) repeated measures design was utilized for the A-state and performance measures. Planned comparisons utilizing simple main effects were used to identify differences between groups to test the specific directional hypotheses (Kirk, 1968). A 2 x 2 (groups x blocks) repeated measures design was utilized for the A-trait and TAIS measures. Since this study was designed to utilize a field setting, the results were discussed from: (a) a strictly statistical standpoint, and (b) a real world perspective.

CHAPTER IV

ANALYSIS OF DATA

This study was designed to investigate the effects of visuo-motor behavior rehearsal (VMBR) on: (a) the various performance tasks involved in the sport of basketball during competition; (b) the state and trait anxiety levels of highly skilled subjects; and (c) attentional, control, and interpersonal characteristics of performers. Data were collected on members of a Division I, nationally ranked, women's basketball team during the 1983-84 regular season.

A 2 x 3 (groups x blocks) repeated measures design was the underlying model providing the sum of squares information to investigate the effects of VMBR on the competitive performance measures and on the three subscales of the Competitive State Anxiety Inventory - 2 (CSAI-2) (Martens et al., 1983). The average scores on each of the performance measures and CSAI-2 subscales were calculated for each subject and utilized for the statistical analyses for the following blocks:

- (1) Eight games which occurred prior to the experimental treatment;
- (2) Eight games which occurred during the training in relaxation, imagery, and VMBR; and
- (3) Eight games which occurred during the continued VMBR.

A test of simple main effects (Kirk, 1968) was used on the averages of the competitive performance measures and the CSAI-2 (Martens et al., 1983) subscale scores to investigate the existence of any significant ($p < .05$) within block main effect. A test of simple main effects

(Kirk, 1968) was also calculated on the change scores of the performance and state anxiety measures from (a) blocks 1 to 2; (b) blocks 2 to 3; and (c) blocks 1 to 3. Schmidt (1972) suggested this approach is plausible when: (a) a study is investigating the effects on performance rather than on learning, and (b) the treatment groups do not differ initially on the performance tasks. Both premises apply to this study. This analysis was conducted to determine: (a) which group exhibited a greater change and (b) if the change occurred in each respective hypothesized direction.

The effects of VMBR on attentional, control, and interpersonal factor items on the Test of Attentional and Interpersonal Style (TAIS) (Nideffer, 1976a) and the Sport Competition Anxiety Test (SCAT) (Martens, 1977) were evaluated with planned comparisons using simple main effects procedure (Kirk, 1968). A 2 x 2 (group x blocks) repeated measures design was the underlying design providing the sum of squares information for the statistical contrasts. The two blocks represent the pre- and post-test scores on the TAIS and SCAT.

The results of the planned comparisons analyses, a 2 x 3 (group x blocks) repeated measures design, are presented in the following sections: (a) performance measures; and (b) state anxiety. The results of the 2 x 2 (group x blocks) repeated measures design are also presented in two sections: (a) trait anxiety; and (b) attentional style characteristics.

Performance Measures

The performance measures included both closed and open tasks as exhibited during competition. Closed task performance was estimated by average free throw percentage. The open task measures included:

(a) average field goal percentage; (b) average points per minute played; (c) average rebounds per minute played; (d) average turnovers per minute played; and (e) average fouls per minute played.

Closed Task

Data from the closed task, average free throw percentage, indicated no significant ($F_{2,8} = .76, p < .05$) differences between the VMBR and no treatment groups at blocks 1 and 2. It was predicted that as a result of visuo-motor behavior rehearsal (VMBR), the experimental group would perform significantly ($p < .05$) better than the no treatment group at block 3 on the closed competitive task measure, average free throw percentage. The simple main effects analysis of the block 3 scores indicated that the VMBR group was significantly ($F_{4,8} = 10.01, p < .01$) better than the no treatment group on average free throw percentage. Therefore, hypothesis 1 was supported. The means, standard deviations, and directional changes across time for average free throw percentage are presented (Figure 3).

For the change scores, it was predicted that there would be a significant ($p < .05$) difference between the groups from block 1 to block 3 in the average free throw percentages. The test of simple main effects on the change scores revealed a significantly ($F_{2,8} = 7.70, p < .05$) better change for the VMBR group than the control group from

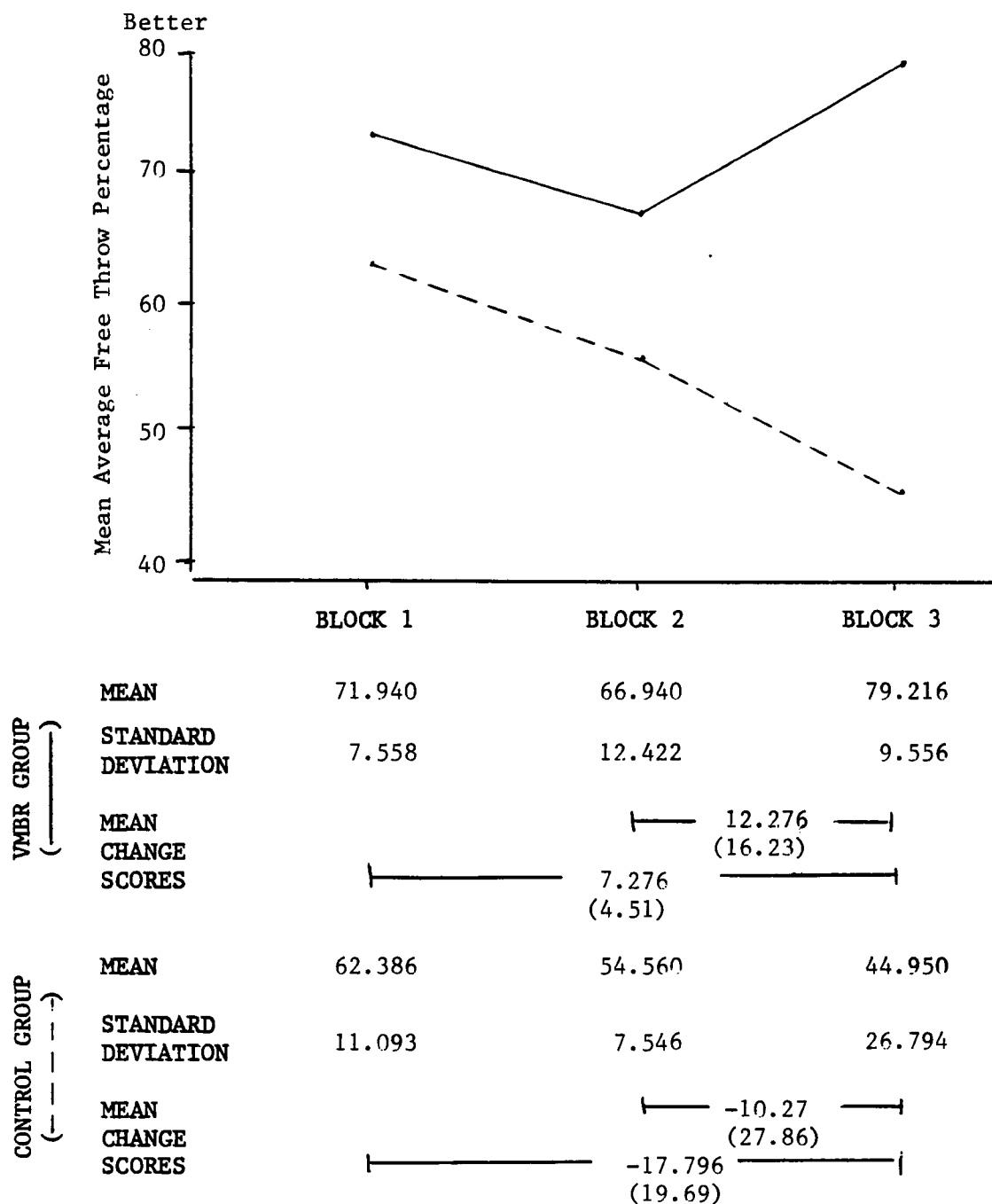


Figure 3. Average free throw percentage. The standard deviations for the change scores are given in parentheses.

block 1 to block 3 for average free throw percentage. Therefore, hypothesis 2 was supported. The change scores for average free throw percentage are indicated (Figure 3).

Open Tasks

The simple main effects procedure on block 1 scores revealed no significant ($p < .05$) differences on any of the pre-experimental open tasks except average fouls per minute played. For this measure the VMBR group was significantly ($F_{2,8} = 8.75$, $p < .01$) lower than the no treatment group.

The simple main effects procedure on block 2 scores indicated no significant ($p < .05$) differences between groups on the scores for any of the open task measures: (a) average field goal percentage ($F_{3,8} = .30$, $p > .25$); (b) average points per minute played ($F_{3,8} = .014$; $p > .25$); (c) average rebounds per minute played ($F_{3,8} = .65$, $p > .25$); (d) average turnovers per minute played ($F_{3,8} = .15$, $p > .25$); and (e) average fouls per minute played ($F_{3,8} = .09$, $p > .25$). At block 3, which included the eight games during continued visuo-motor behavior rehearsal (VMBR), it was predicted that the VMBR group would perform significantly ($p < .05$) better than the no treatment group on the open tasks. The statistical contrast at block 3 revealed no significant ($p < .05$) differences between groups on the scores for any of the open tasks. As a result, hypothesis 3 was not supported. The means, standard deviations, and directional changes for each of the following open task measures were calculated: (a) average field goal percentage (Figure 4); (b) average points per minute played (Figure 5); (c) average rebounds per minute played

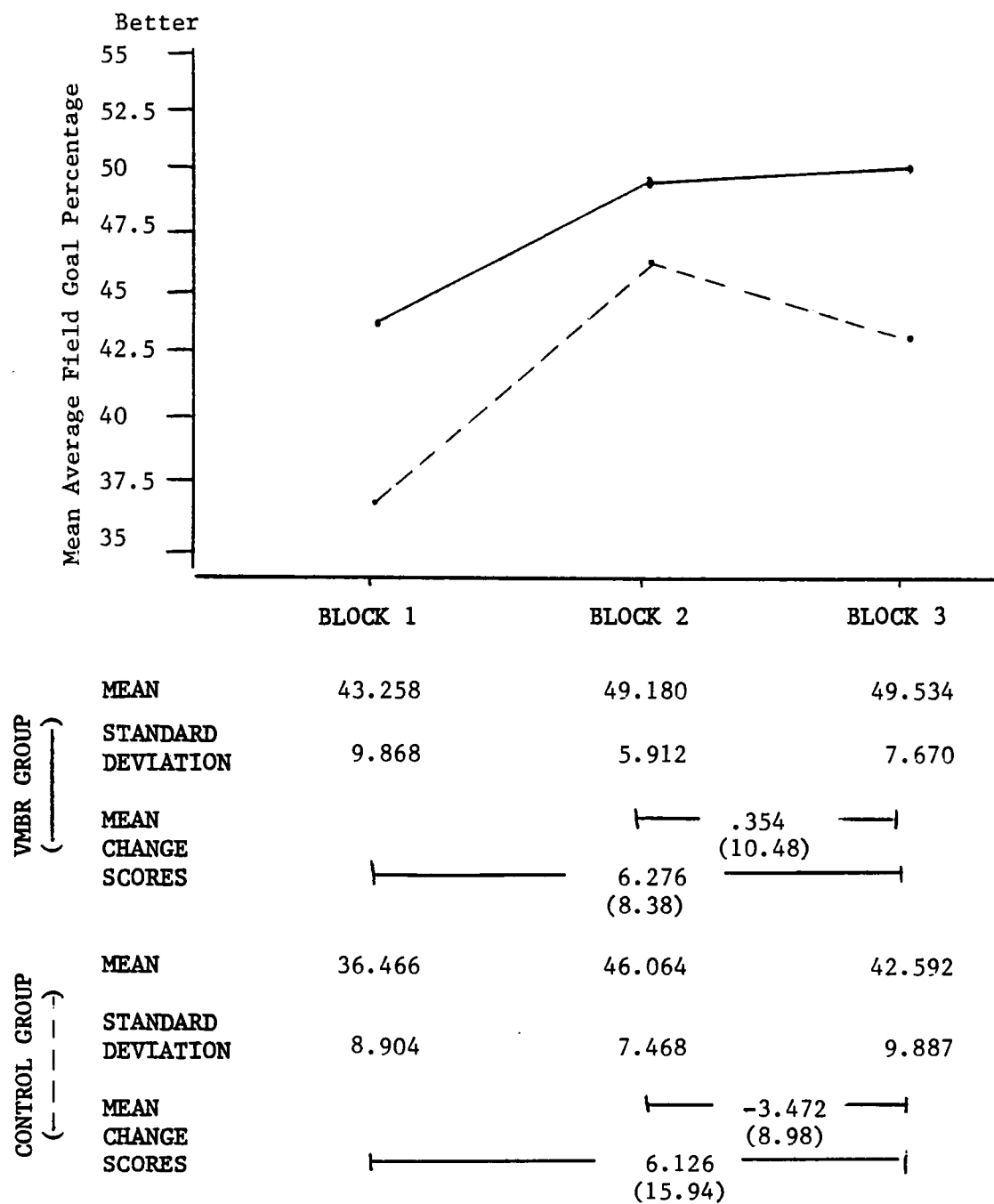


Figure 4. Average field goal percentage. The standard deviations for the change scores are given in parentheses.

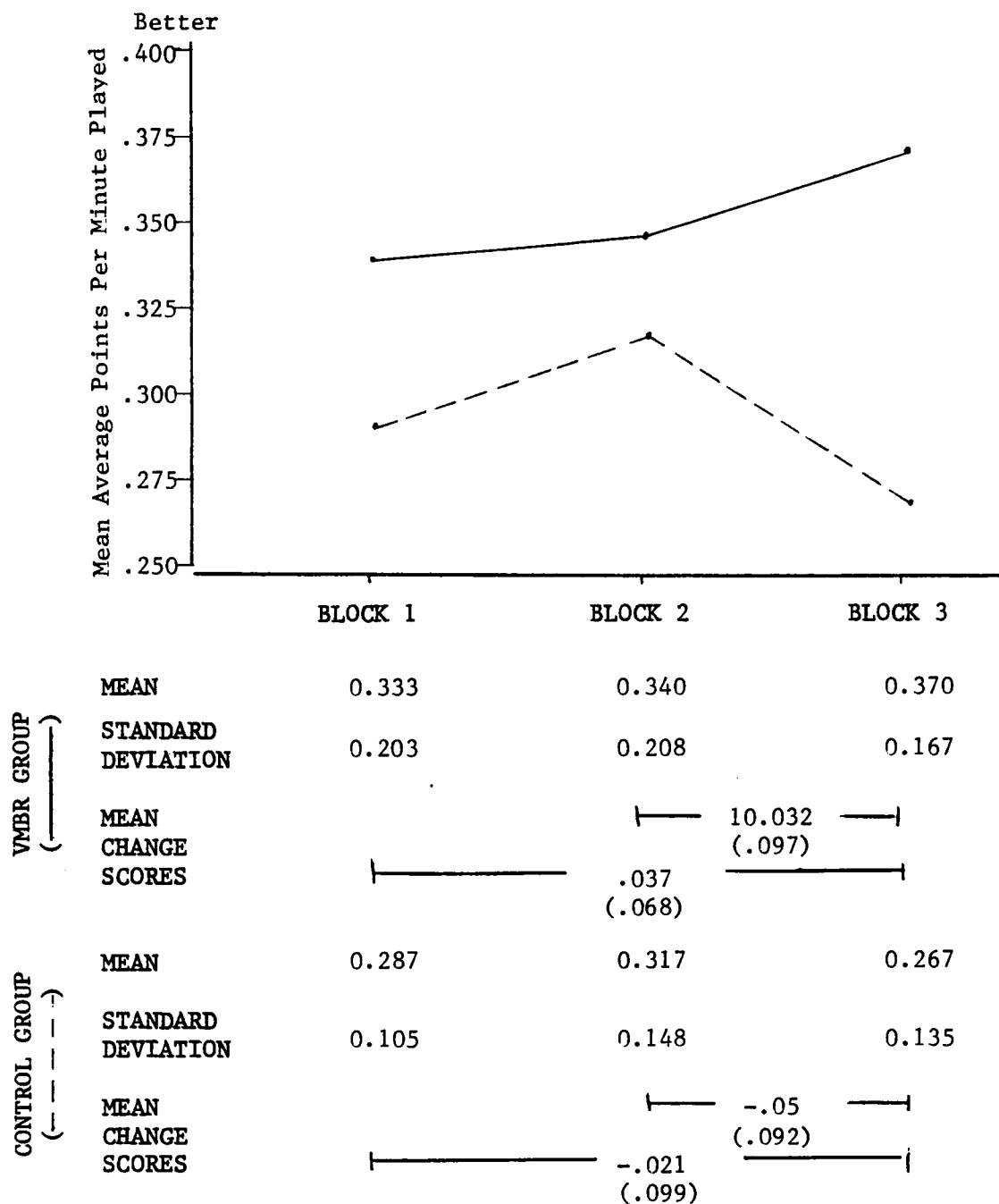


Figure 5. Average points per minute played. The standard deviations for the change scores are given in parentheses.

(Figure 6); (d) average turnovers per minute played (Figure 7); and (e) average fouls per minute played (Figure 8).

For the change scores, it was predicted that there would be a significant ($p < .05$) difference between the groups from block 1 to block 3 in all of the open competitive performance measures. The results of the analyses on the change scores for each of the open task measures revealed no significant ($p < .05$) difference between the groups from: (a) block 1 to block 3, or (b) block 2 to block 3. Therefore hypothesis 4 was not supported. The means and standard deviations for the change scores were calculated for each of the following open task measures respectively: (a) average field goal percentage (Figure 4), (b) average points per minute played (Figure 5), (c) average rebounds per minute played (Figure 6), (d) average turnovers per minute played (Figure 7), and (e) average fouls per minute played (Figure 8).

State Anxiety

The subscales of the Competitive State Anxiety Inventory - 2, CSAI-2 (Martens et al., 1983), are as follows: (a) a cognitive component of state anxiety; (b) a somatic component of state anxiety; and (c) self-confidence. The results of each of the subscale analyses are presented below.

Cognitive component of the CSAI-2

A test of simple main effects on the average cognitive scores from the CSAI-2 revealed no significant ($F_{2,8} = .31, p > .25$) difference

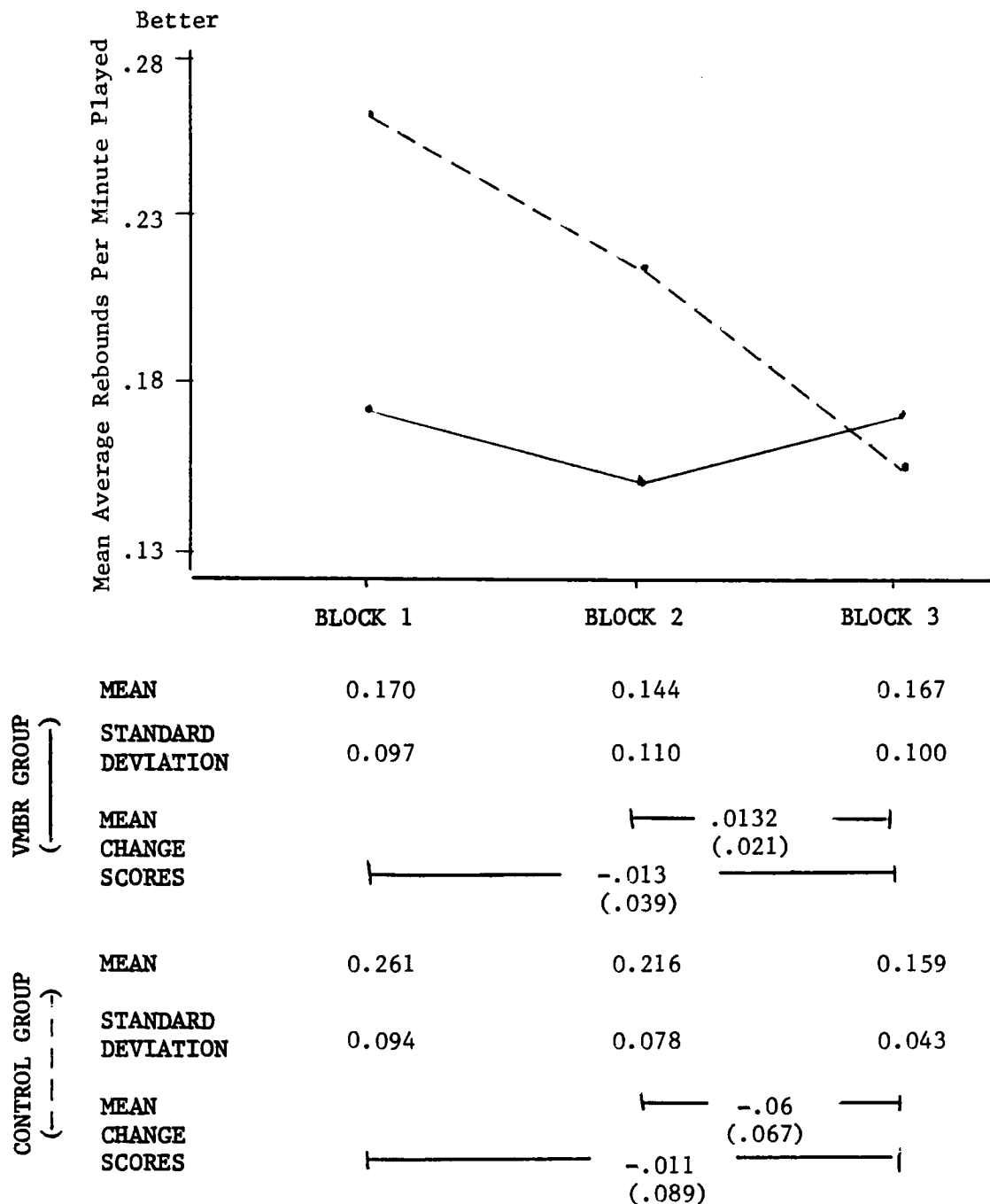


Figure 6. Average rebounds per minute played. The standard deviations for the change scores are given in parentheses.

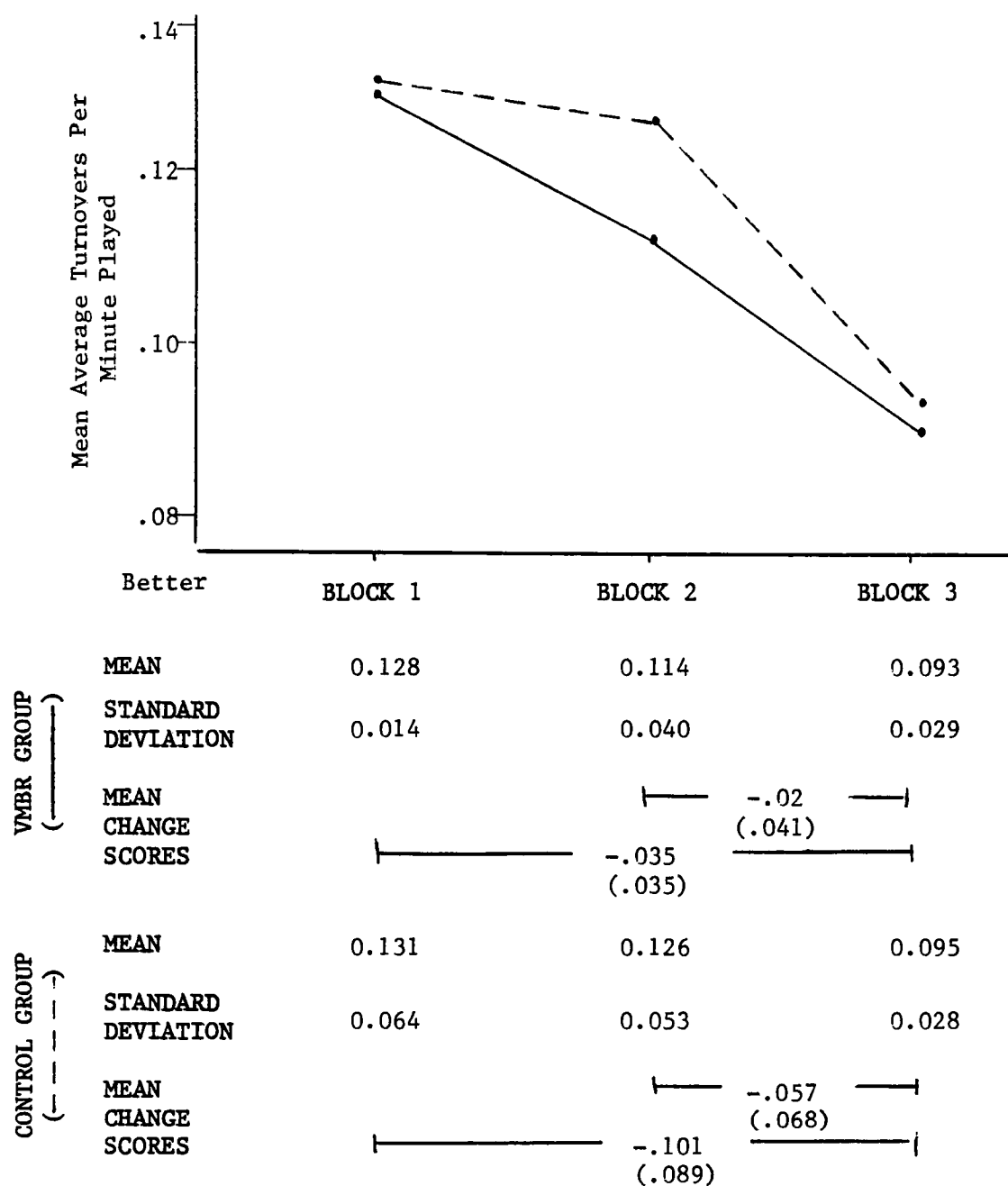


Figure 7. Average turnovers per minute played. The standard deviations for the change scores are given in parentheses.

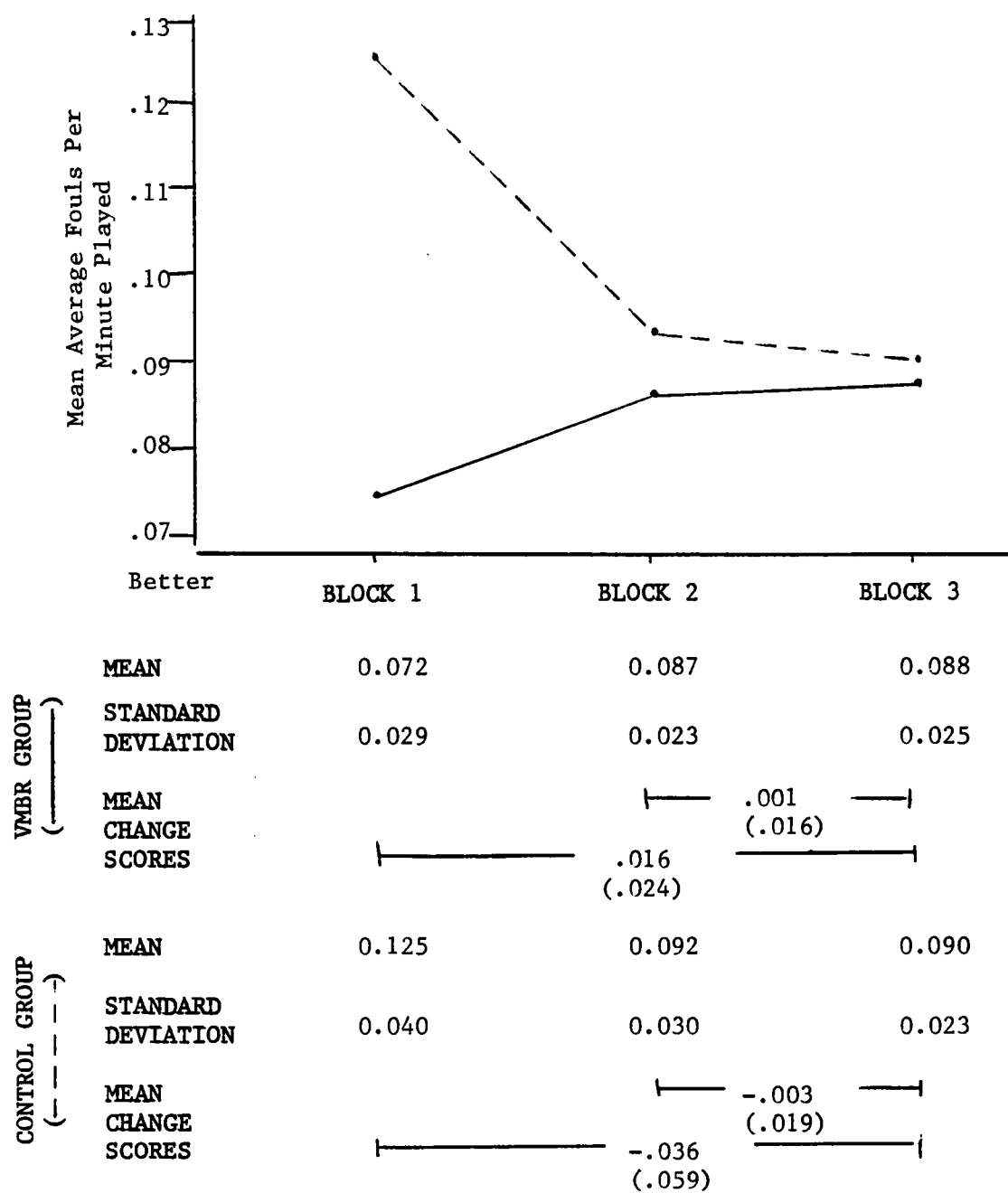


Figure 8. Average fouls per minute played. The standard deviations for the change scores are given in parentheses.

between the VMBR and no treatment groups at block 1. It was predicted that as a result of the relaxation training (block 2) and continuation of the relaxation technique contained in visuo-motor behavior rehearsal (VMBR) (block 3), the VMBR group would show a significant ($p < .05$) decrease in the average cognitive scores on the CSAI-2 when compared to the no treatment group at block 2 and block 3. The simple main effects analyses revealed no significant ($p < .05$) differences between the VMBR and no treatment groups on average cognitive scores at block 2 ($F_{3,8} = .63, p > .25$) or block 3 ($F_{4,8} = .58, p > .25$). As a result, hypothesis 5, as set forth in this study, was not supported. The means, standard deviations, and directional changes for the two groups concerning average cognitive scores were computed (Figure 9).

For the change scores on the average cognitive component, it was predicted that there would be a significant ($p < .05$) difference between the groups from block 1 to block 2. The test of simple main effects on the change scores for the cognitive component of the CSAI-2 revealed no significant ($p < .05$) difference between the groups from: (a) block 1 to block 2 ($F_{2,8} = 1.88, p > .10$), (b) block 2 to block 3 ($F_{2,8} = .07, p > .25$), or (c) block 1 to block 3 ($F_{2,8} = .46, p > .25$) for the two groups. As a result, hypothesis 6 was not supported. The change scores are indicated (Figure 9).

Somatic component of the CSAI-2

A test of simple main effects on the average somatic scores from the CSAI-2 (Martens et al., 1983) revealed no significant ($F_{2,18} = .65, p > .25$) difference between the VMBR and no treatment groups at block 1.

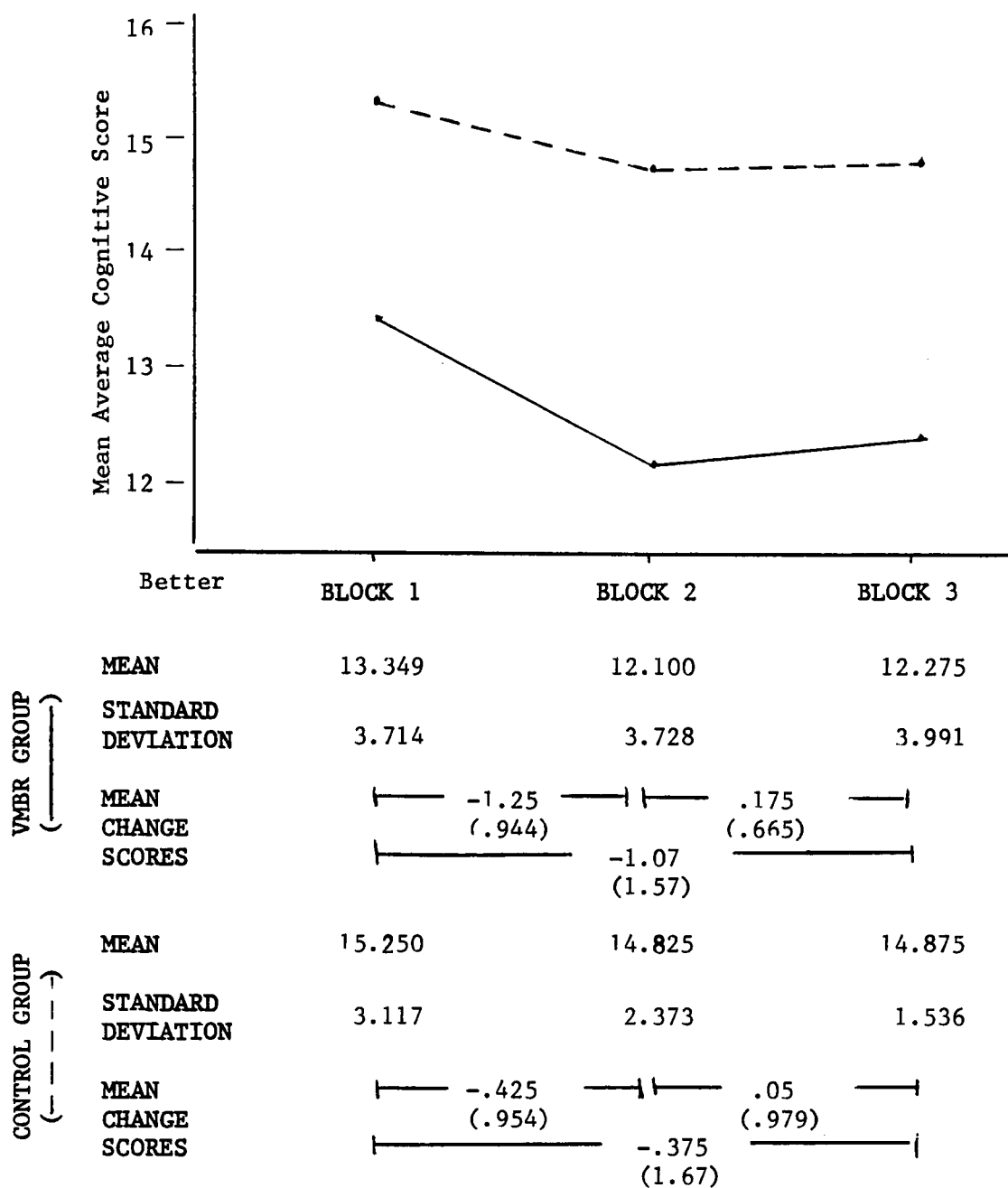


Figure 9. Average cognitive score on CSAI-2. The standard deviations for the change scores are given in parentheses.

It was predicted that during relaxation training (block 2) and continuation of the relaxation technique step in visuo-motor behavior rehearsal (VMBR) (block 3), the VMBR group would show a significant ($p < .05$) decrease in the average somatic scores on the CSAI-2 when compared to the no treatment group at block 2 and block 3. The simple main effects analysis indicated that the VMBR group had significantly ($F_{3,8} = 5.88, p < .05$) lower average somatic scores when compared to the no treatment group at block 2. The block 3 test of simple main effects on average somatic scores revealed no significant ($F_{4,8} = 1.40, p > .25$) difference between the groups. Since the VMBR group was significantly ($p < .05$) lower than the no treatment group at block 2, hypothesis 7, as set forth in this study, was supported. The means, standard deviations, and directional changes across time for the two groups concerning average somatic scores are presented (Figure 10).

For the analysis of the change scores (Figure 10), it was predicted that there would be a significant ($p < .05$) difference between the groups from block 1 to block 2 and/or block 3 in the average somatic CSAI-2 (Martens et al., 1983) scores for the groups in the study. The analysis on the change scores revealed that the VMBR group was significantly ($F_{2,8} = 6.74, p < .05$) better than the control group from block 1 to block 3, but not from block 1 to 2 ($F_{2,8} = 1.88, p > .10$) or block 2 to block 3 ($F_{2,8} = .76, p > .25$). Therefore, hypothesis 8, as set forth for this study, was supported. The change scores are presented (Figure 10).

Self-confidence component of the CSAI-2

When compared to the no treatment group, it was predicted that the VMBR would show no significant ($p < .05$) difference in average

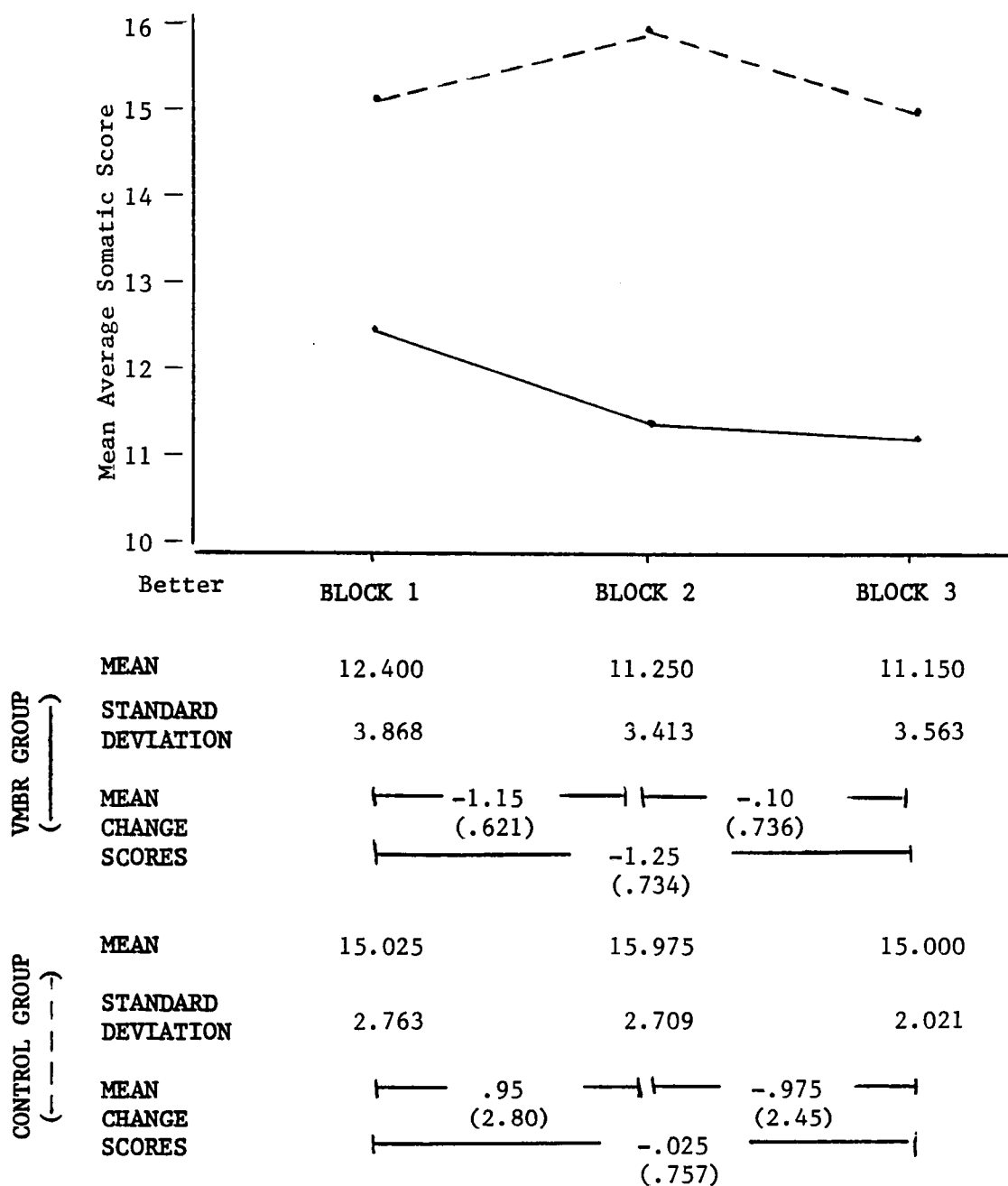


Figure 10. Average somatic score on CSAI-2. The standard deviations for the change scores are given in parentheses.

self-confidence scores at block 1 and significantly ($p < .05$) higher average self-confidence scores at block 2 and/or block 3. This prediction was based on the expected theoretical results of relaxation training (block 2) and visuo-motor behavior rehearsal (VMBR) (block 3). The simple main effects analysis on each of the three blocks revealed no significant ($p < .05$) differences between the VMBR and no treatment groups on the average self-confidence scores from the CSAI-2. Therefore, hypothesis 9, as set forth in this study, was not supported. The means, standard deviations, and directional changes across time for the two groups concerning average self-confidence scores are presented (Figure 11).

Analysis of the changes in the average self-confidence CSAI-2 scores was predicted to be significantly ($p < .05$) better for the VMBR group from block 1 to block 2 and/or block 3 than for the control group. The test of simple main effects calculated for the change scores revealed no significant ($p < .05$) differences between the groups from block 1 to block 2 ($F_{2,8} = 2.68$, $p < .10$) or block 3 ($F_{2,8} = 3.09$, $p > .10$), nor from block 2 to block 3 ($F_{2,8} = 1.67$, $p > .25$). The change from block 1 to block 2 did approach significance ($p .10$), with the VMBR group indicating a higher or better change in scores. As a result, hypothesis 10 was not supported. The change scores are presented (Figure 11).

Trait Anxiety

The Sport Competition Anxiety Test (SCAT) (Martens, 1977) was used to determine the effects of VMBR on trait anxiety of highly skilled

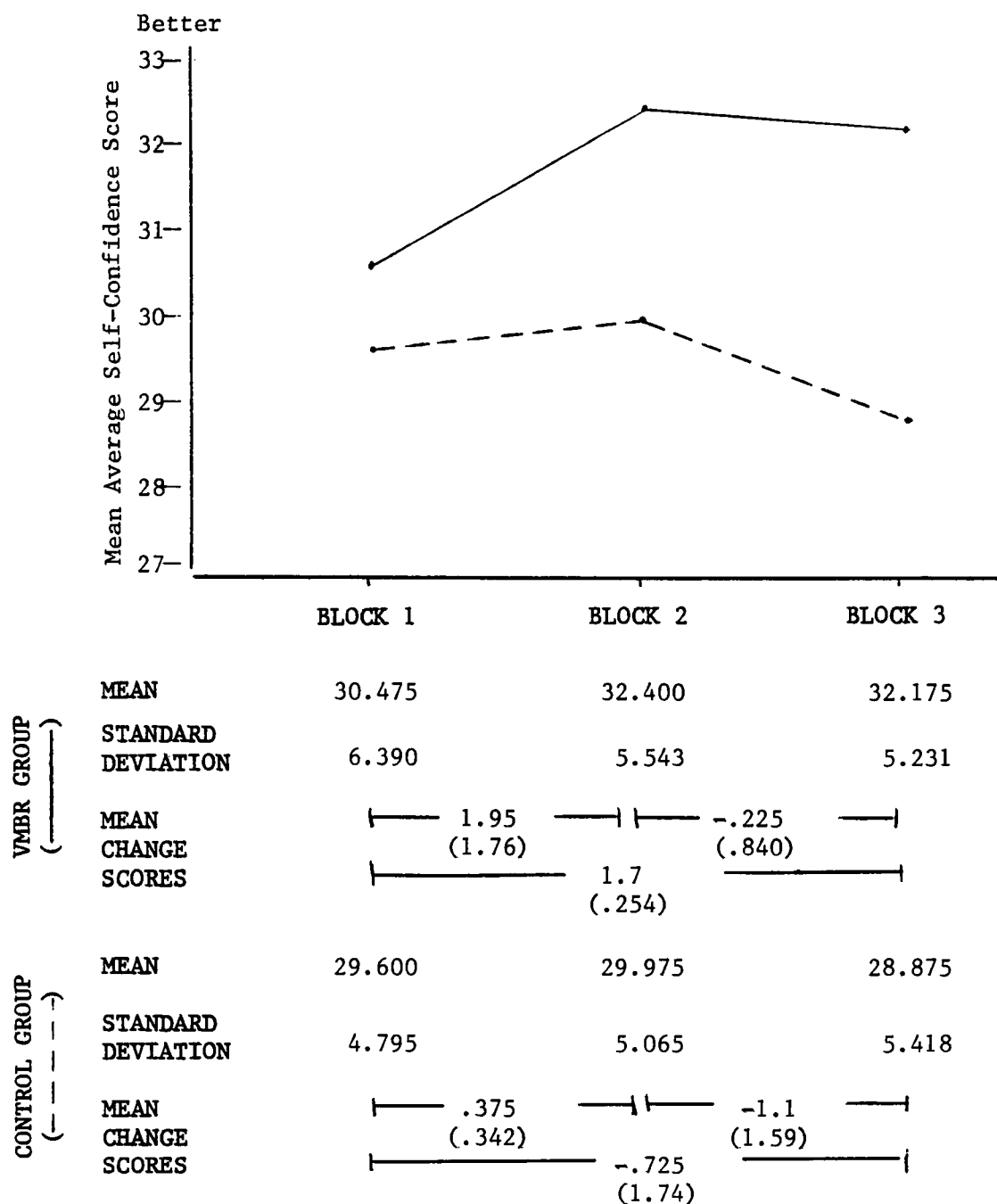


Figure 11. Average self-confidence score on CSAI-2. The standard deviations for the change scores are given in parentheses.

subjects. It was predicted that there would be no significant ($p < .05$) difference between the two groups on the pre-test scores (block 1) or the post-test scores (block 2) of the SCAT. This prediction was based on the theoretical projection of trait anxiety being a stable personality characteristic which would, therefore, not be affected by VMBR. The test of simple main effects on each of the two blocks indicated no significant ($p < .05$) difference between the VMBR and no treatment groups at block 1 ($F_{2,8} = .37, p > .25$) or block 2 ($F_{2,8} = .11, p > .25$) (Table 1). As a result, hypothesis 11, as set forth in this study, was supported.

Attentional Style Characteristics

The Test of Attentional and Interpersonal Style (TAIS) (Nideffer, 1976a) was used to determine the effects of VMBR on the attentional, control, and interpersonal characteristics of highly skilled subjects. The attentional factor of the TAIS contains six scales (Nideffer, 1981) and are as follows: (a) broad external attentional focus (BET); (b) overloaded by external stimuli (OET); (c) broad internal attentional focus (BIT); (d) overloaded by internal stimuli (OIT); (e) narrow attentional focus (NAR); and (f) reduced attentional focus (RED). The two scales contained within the control factor (Nideffer, 1981) of the TAIS are: (a) information processing (INFP); and (b) behavior control (BCON). The interpersonal factor (Nideffer, 1981) includes the following scales: (a) control scale (CON); (b) self-esteem (SES); (c) physical orientation (P/O); (d) obsessive (OBS); (e) extroversion

TABLE 1

Simple Main Effects Procedure on SCAT Scores

Block 1					
Source	df	Sum of Squares	<u>F</u>	PR	<u>F</u>
Group	1	6.40	.45		.25
Error	8	113.60			

Block 2					
Source	df	Sum of Squares	<u>F</u>	PR	<u>F</u>
Group	1	19.60	1.24		.25
Error	8	126.40			

(EXT); (f) introversion (INT); (g) intellectual expression (IEX); (h) negative affect expression (NAE); and (i) positive affect expression (PAE). Subject pre- and post-test scores on each of the scales were used as dependent measures to determine the effects of VMBR on the attentional, control, and interpersonal factors of the TAIS (Nideffer, 1976b). It was predicted that VMBR would have no significant ($p < .05$) effect on any of the TAIS scales since the attentional, control, and interpersonal factors are considered to be stable personality characteristics. At block 1, the simple main effects procedure revealed no significant ($p < .05$) difference between the VMBR group and the no treatment group on the pre-test TAIS scales. There was also no significant ($p < .05$) difference between the two groups at block 2 (post-test scores) on any of the TAIS scales (Tables 2-18). As a result, hypothesis 12, as set forth in this study was supported.

TABLE 2

Simple Main Effects Procedure on BET

Factor of the TAIS

Block 1

Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	0.10	.01	.25
Error	8	88.80		

Block 2

Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	0.90	.08	.25
Error	8	86.00		

TABLE 3

Simple Main Effects Procedure on OET
Factor of the TAIS

Block 1				
Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	0.1	.00	.25
Error	8	236.0		

Block 2				
Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	25.6	2.36	.25
Error	8	86.8		

TABLE 4

Simple Main Effects Procedure on BIT

Factor of the TAIS

Block 1				
Source	df	Sum of Squares	$\underline{F}$	PR > $\underline{F}$
Group	1	4.9	.17	.25
Error	8	229.6		

Block 2				
Source	df	Sum of Squares	$\underline{F}$	PR > $\underline{F}$
Group	1	0.0	0.0	.25
Error	8	47.6		

TABLE 5

Simple Main Effects Procedure on OIT

Factor of the TAIS

Block 1				
Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	36.1	3.14	.10
Error	8	92.0		
Block 2				
Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	1.6	.20	.25
Error	8	62.8		

TABLE 6

Simple Main Effects Procedure on NAR

Factor of the TAIS

Block 1				
Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	28.9	1.26	.25
Error	8	183.2		

Block 2				
Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	0.40	.03	.25
Error	8	126.0		

TABLE 7

Simple Main Effects Procedure on INFP

Factor of the TAIS

Block 1				
Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	4.9	.07	.25
Error	8	554.0		
Block 2				
Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	10.0	0.32	.25
Error	8	251.6		

TABLE 8

Simple Main Effects Procedure on BCON

Factor of the TAIS

Block 1

Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	0.10	.01	.25
Error	8	130.8		

Block 2

Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	25.6	2.05	.10
Error	8	100.0		

TABLE 9

Simple Main Effects Procedure on CON

Factor of the TAIS

Block 1				
Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	32.4	1.71	.25
Error	8	151.6		

Block 2				
Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	48.4	1.35	.25
Error	8	287.6		

TABLE 10

Simple Main Effects Procedure on SES

Factor of the TAIS

Block 1

Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	0.8	.09	.25
Error	8	75.2		

Block 2

Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	10.0	0.46	.25
Error	8	173.6		

TABLE 11

Simple Main Effects Procedure on DEP

Factor of the TAIS

Block 1				
Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	0.90	.11	.25
Error	8	68.0		
Block 2				
Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	2.5	.67	.25
Error	8	30.0		

TABLE 12

Simple Main Effects Procedure on P0

Factor of the TAIS

Block 1				
Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	1.6	.25	.25
Error	8	50.8		
Block 2				
Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	0.4	.03	.25
Error	8	92.0		

TABLE 13

Simple Main Effects Procedure on OBS

Factor of the TAIS

Block 1				
Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	0.1	.01	.25
Error	8	70.0		
Block 2				
Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	6.4	1.28	.25
Error	8	40.0		

TABLE 14

Simple Main Effects Procedure on EXT

Factor of the TAIS

Block 1				
Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	52.9	1.14	.25
Error	8	372.0		

Block 2				
Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	0.9	.02	.25
Error	8	302.0		

TABLE 15

Simple Main Effects Procedure on INT

Factor of the TAIS

Block 1				
Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	57.6	1.98	. 10
Error	8	232.4		

Block 2				
Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	78.4	2.28	. 10
Error	8	275.6		

TABLE 16

Simple Main Effects Procedure on IEX

Factor of the TAIS

Block 1				
Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	1.8	.27	.25
Error	8	56.0		

Block 2				
Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	14.4	1.23	.25
Error	8	94.0		

TABLE 17

Simple Main Effects Procedure on NAE

Factor of the TAIS

Block 1				
Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	0.0	0.0	.25
Error	8	91.6		

Block 2				
Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	25.6	1.75	.10
Error	8	116.8		

TABLE 18

Simple Main Effects Procedure on PAE

Factor of the TAIS

Block 1				
Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	1.25	.78	.25
Error	8	12.8		

Block 2				
Source	df	Sum of Squares	<u>F</u>	PR > <u>F</u>
Group	1	40.0	1.54	.25
Error	8	208.4		

Summary

It was predicted that visuo-motor behavior rehearsal (VMBR) would significantly ($p < .05$) affect both the closed and open competitive tasks utilized in this study. The results of the study indicated that VMBR did significantly ($p < .05$) improve the competitive performance of the closed task, but not that of the open tasks. The average somatic scores on the state anxiety instrument were also found to be significantly lower ($p < .05$) for the VMBR group than the control group. The SCAT (Martens, 1977) and the TAIS (Nideffer, 1976b), which were trait measures, were not expected to be affected by VMBR and indicated no differences between the groups following the VMBR exposure.

CHAPTER V

DISCUSSION OF RESULTS

In previous reviews of the mental practice literature, researchers have concluded that mental practice has a positive effect on the learning and performance of a motor task (Feltz & Landers, 1983; Richardson, 1967; Weinberg, 1982). This conclusion was presented in a very general sense as the literature reviewed yielded somewhat conflicting results (Feltz & Landers, 1983; 1967; Weinburg, 1982). This study was conducted in an attempt to: (a) control the variables which have been suggested to be contributing factors to these conflicting results; and (b) more clearly identify the specific effects of mental practice techniques. The results yielded by this research are discussed in relation to the literature reviewed and are presented in the following sections: (a) type of task; (b) state anxiety; (c) trait anxiety; and (d) attentional, control, and interpersonal style.

Type of Task

Previous research

In the mental practice studies previously reviewed, the following closed tasks were utilized: (a) a punchboard learning task (Smith & Harrison, 1962); (b) the hock swing to a horizontal bar (Phipps & Morehouse, 1969); (c) the jump foot (Phipps & Morehouse, 1969); (d) the volleyball serve (Shick, 1970); (e) mirror drawing (Smyth, 1975); (f) hopscotch (Minas, 1980); and (g) dart throwing (Epstein, 1980). Of these studies, only two reported significant findings. The Smith and

Harrison (1982) investigation reported that mental practice groups significantly ($p < .05$) improved their performance on the punchboard task. Shick's study revealed that the mental practice group performed significantly ($p < .025$) better than the no practice group on the volleyball serve test. All of these studies utilized subjects of a novice or beginning skill level.

The open tasks utilized in these mental practice studies included: (a) forehand tennis drive (Surburg, 1968); (b) soccer hitch kick (Phipps & Morehouse, 1969); (c) volleyball wall volley (Shick, 1970); and (d) pursuit rotor (Smyth, 1975). Of these studies, only two reported significant findings. Surburg's (1968) results revealed significant ($p < .05$) improvement in the execution of the forehand tennis drive utilizing novice college students as subjects. Phipps and Morehouse (1969) reported that the soccer hitch kick, an open task which was investigated along with two closed tasks, was the only skill in which performance was significantly ($p < .05$) improved. Here also, novice college students were utilized as subjects.

Two studies which were reviewed utilized VMBR as a mental training technique. Hall and Erffmeyer (1983) used a closed task, basketball free throw shooting in investigating the effectiveness of VMBR as a mental practice technique. The subjects, highly skilled female basketball players, had a significant ($p < .05$) improvement in free throw shooting performance. Weinberg, Seabourne, and Jackson (1981) also reported an increase in karate performance, an open task, for highly skilled subjects utilizing VMBR as a mental training technique.

Of these investigations which reported significant findings for either mental practice or VMBR techniques, none were conducted in the real competitive sport environment. Weinberg et al., (1981) attempted investigation of VMBR with the competitive phenomenon, but the competitive environment utilized was contrived by the researchers. This left uncertainty about the generalizability of the effects of mental practice techniques, for highly skilled subjects, to the real competitive sport environment. When combined with the conflicting results reported for different skill levels for both open and closed tasks, this uncertainty was even more pronounced.

In this study, the performance of highly skilled subjects on both open and closed tasks measured in the competitive sport environment was designed to address this uncertainty. It was predicted that for highly skilled subjects a group receiving VMBR would differ significantly ($p < .05$) in performance from a no treatment group during competition on: (a) the specific closed task; and (b) the specific open tasks in the sport of basketball. The specific closed task was free throw shooting, assessed by average free throw percentage. The specific open task measures were: (a) average field goal percentage; (b) average points per minute played; (c) average rebounds per minute played; (d) average turnovers per minute played; and (e) average fouls per minute played.

Closed task

The results of this research indicated that VMBR was effective for improvement of the closed task measure, average free throw percentage, as measured in the competitive environment for highly skilled subjects.

The significant ($p < .05$) difference between VMBR and control groups was found at block 3, as predicted, with the VMBR group showing an improvement from block 1 to block 3 of approximately 7.3% in their average free throw percentage scores (Figure 3, p. 54). The control group showed a decrement in performance from block 1 to block 3 of approximately 17% in their average free throw percentage scores (Figure 3, p. 54). These results supported the findings of Hall and Erffmeyer (1983) with their utilization of a closed task and highly skilled athletes. The major difference between the two studies was that the present study was conducted in a competitive field setting and the Hall and Erffmeyer (1983) study was conducted in a non-competitive environment.

The difference in performance between the two groups in this study on the closed task was not only significant from a statistical standpoint; it was also important from a real world perspective. The games which were included in block 3 were games which occurred during the latter part of the competitive season and were the determinants for the team's inclusion in post-season tournaments. As a result, these games may have been viewed as much more important or stressful to the subjects than the games which occurred earlier in the season. This more stressful point in the season may be one explanation for the 17 percent decrement in the average free throw percentage for the control group as compared to the 7.3 percent improvement by the VMBR group. From a total team perspective, this 24.3 ($17 + 7.3$) percent difference between the groups may be viewed by a coach as very important. By evaluating the potential effect on team scores, the impact that the difference could

possibly have on the outcome of any particular game or even an entire season becomes more evident.

Open tasks

Performance on the open task measures: (a) average field goal percentage; (b) average points per minute played; (c) average rebounds per minute played; (d) average turnovers per minute played; and (e) average fouls per minute played, did not indicate significant ($p < .05$) statistical differences between groups. Although this research did not reveal significant ($p < .05$) differences between groups for the competitive open tasks, the VMBR group did indicate a greater improvement on certain tasks. From block 2 to block 3, the VMBR group improved on the average field goal percentage score by .35 percent while the control group decreased by 3.5 percent (Figure 4, p. 56), which makes a difference between the groups of 3.85 ($3.5 + .35$) percent. Although the difference is not as great as the free throw percentage difference, a 4 percent difference in field goal percentage could still have an impact on the outcome of a game.

The trend, although not as pronounced, was also true for average points per minute played (Figure 5, p. 57) and average rebounds per minute played (Figure 6, p. 59). The VMBR group improved from block 2 to block 3 by .03 points per minute played, approximately 1.2 points per game, while the control decreased by .05 points per minute played, or approximately 2 points per game (Figure 5, p. 57). When these scores are multiplied by 5, the number of subjects per group, the VMBR group

collectively improved by 6 points per game while the control group collectively decreased by 10 points per game.

For average rebounds per minute played, again from block 2 to block 3, the subjects in the VMBR group increased by .01 rebounds per minute played, approximately .5 rebounds per game, while the subjects in the control group decreased by .06 rebounds per minute played, or approximately 2.4 rebounds per game (Figure 6, p. 59). When looking at the impact of the total group, the VMBR group improved by 2.5 (.5 x 5) rebounds per game while the control group decreased by 12 (2.4 x 5) rebounds per game. As mentioned earlier, even though these differences between groups on open task measures were not statistically significant ($p < .05$), they may be viewed as important by performance conscious coaches because of the potential effects on game scores and outcomes.

The average turnovers per minute played (Figure 7, p. 60) indicated no differences between the groups at any of the blocks, and little, if any changes occurred in the scores from: (a) block 1 to block 3; or (b) block 2 to block 3. This may be partially explained by the fact that a turnover is not a task which can actually be practiced mentally. A turnover is simply a measure which is used in the sport of basketball as part of an evaluation of performance.

The two groups were statistically ($p < .05$) different at block 1 on the scores for average fouls per minute played, but not at blocks 2 or 3 (Figure 8, p. 61). There seems to be no apparent reason why the groups differed on this pre-experimental measure. The group scores moved towards each other at block 2 and even more at block 3, with no significant ($p < .05$) changes occurring (Figure 8, p. 61).

One possible explanation for the results in this study indicating a significant improvement in the closed task and not in the open tasks was the ability of subjects to consistently deal with all the environmental stimuli in every mental practice trial on the closed task and not on the open tasks. In other words, the resulting task demands were consistent for every free throw performed in mental practice, while for the open tasks, the environment was recognized as constantly changing from trial to trial. For example, field goals were attempted in the imagery sessions from numerous positions on the court and under various types of defensive pressure from the opponent. Therefore, it was impossible to mentally practice shooting field goals from all the possible positions to the same extent it was possible to mentally practice shooting free throws, given the fixed time frame for VMBR sessions in an experimental study. The requirements from trial to trial of open tasks are constantly changing and the opportunity to mentally practice an open task such as shooting a field goal, with the same movement and conditions on every shot, was not realistic.

State Anxiety

Researchers in the areas of motor behavior and sport psychology (Powell & Verner, 1982; Sonstroem & Bernardo, 1982; Weinberg & Genuchi, 1982) have concluded that high levels of anxiety negatively influence performance. Powell and Verner (1982) reported that higher levels of anxiety, as measured by the Spielberger et al. (1970) SAI, negatively influenced performance on a first-time parachute jump, an open task. Sonstroem and Bernardo (1982) reported that state anxiety had a

significant effect ($p < .01$) on composite performance and total points per game for subjects competing in a basketball tournament.

Training in techniques for relaxation, meditation, and visual imagery has been reported to induce self-control of anxiety (Cade & Coxhead, 1979). This projection has been investigated by researchers utilizing the sport environment (DeWitt, 1980; Weinberg et al., 1981). These studies reported that mental training techniques were effective in the reduction of competitive state anxiety.

It was subsequently hypothesized for the present study that VMBR would significantly ($p < .05$) reduce precompetition state anxiety of highly skilled subjects. The instrument which was used to determine precompetitive state anxiety was the CSAI-2 which contains subscales for: (a) a cognitive component of state anxiety; (b) a somatic component of state anxiety; and (c) self-confidence. For these subscales, it was predicted that the VMBR group would show a significant ($p < .05$) decrease in the average cognitive and somatic subscale scores, and a significant ($p < .05$) increase in the average self-confidence subscale scores. The subscale score changes were predicted to occur at block 2, which was the beginning point for training in progressive relaxation.

Cognitive component of state anxiety

Results from this study revealed no significant ($p < .05$) differences between the VMBR and control groups at any of the three blocks on the average cognitive subscale scores of the CSAI-2 (Figure 9, p. 63). The groups also showed no significant ($p < .05$) change in the

average cognitive subscale scores from block 1 to block 2, where the training in progressive relaxation began (Figure 9, p. 63).

Somatic component of state anxiety

Results indicated no significant ($p < .05$) differences between the groups, VMBR and control, at any of the three blocks on the average somatic subscale score of the CSAI-2 (Marens et al., 1983). The scores did show a significantly ($p < .05$) better change for the VMBR group as compared to the control group in the average somatic scores from block 1 to block 3, with the VMBR group indicating a greater decrease or better change than the control group (Figure 10, p. 65). A lower somatic score suggested that the subjects were responding with lower numbers from a Likert scale to the statements on the CSAI-2 which dealt with autonomic arousal such as rapid heart rate, shortness of breath, clammy hands, butterflies in the stomach, and tense muscles. A higher response to these statements suggested an increased awareness of these elements.

Self-confidence

Results from this study revealed no significant ($p < .05$) differences between the VMBR and control groups at any of the three blocks on the average self-confidence subscale scores on Martens et al. (1983) CSAI-2. The groups also showed no significant ($p < .05$) change in the average self-confidence scores from block 1 to block 2 or block 3.

Failure to attain statistically significant differences may have been a result of the utilization of highly skilled subjects. Due to the experience level of these subjects and their repeated exposure to the competitive environment, the resulting precompetition anxiety levels may

not have been influenced as much as might be expected with less experienced subjects. The results may also have been influenced by the fact that subjects were repeatedly ($n = 24$) exposed to the CSAI-2 questionnaire and this exposure may have resulted in boredom or lack of careful consideration when answering the CSAI-2 items. Other explanations include: (a) the utilization of a small sample size ($n=5$); and (b) the possible lack of sensitivity of Martens et al., (1983) CSAI-2.

Trait Anxiety

The SCAT (Martens, 1977) was developed as a sport specific instrument to determine the general or trait anxiety disposition of an athlete. Since trait anxiety was described by Spielberger (1966) as a stable personality disposition, relaxation training and/or mental training techniques would not be expected to affect this dimension of anxiety. Thus, it was hypothesized, in this study, that VMBR would not significantly ($p < .05$) affect trait anxiety scores on the SCAT for highly skilled subjects. Because the VMBR and control groups were not statistically different, the null hypothesis was not rejected. Thus, the study provided support for the stability of the trait anxiety construct.

Attentional, Control, and Interpersonal Factors

The Test of Attentional and Interpersonal Style (TAIS) was developed by Nideffer (1976b) to measure attentional, control, and interpersonal factors which may be used to profile an individual's attentional style. These profiles may subsequently be used: (a) to predict how an individual will perform in specific situations; and (b) as a guide in the development of training programs to enhance an individual's performance in specific situations (Nideffer, 1981). Therefore, these attentional, control, and interpersonal factors are considered to provide a profile of an individual's stable personality disposition. In other words, the factors would be considered to be trait measures. Therefore, it was hypothesized for this study that VMBR would not significantly ($p < .05$) affect the scales contained within the attentional, control, and interpersonal factors of the TAIS. Scores on the following scales were measured using Nideffer's (1976b) attentional factor: (a) broad external attentional focus (BET); (b) overloaded by external stimuli (OET); (c) broad internal attentional focus (BIT); (d) overloaded by internal stimuli (OIT); (e) narrow attentional focus (NAR); and (f) reduced attentional focus (RED). Scores for the control factor (Nideffer, 1976b) included the following scales: (a) information processing (INFP); and (b) behavior control (BCON). Scales used to measure the interpersonal factor (Nideffer, 1976b) were: (a) control scale (CON); (b) self-esteem (SES); (c) physical orientation (P/O); (d) obsessive (OBS); (e) extroversion (EXT); (f) introversion (INT);

(g) intellectual expression (IEX); (h) negative affect expression (NAE); and (i) positive affect expression (PAE).

Results indicated that VMBR did not significantly ($p < .05$) affect the scales contained within the attentional, control, and interpersonal factors of the TAIS (Nideffer, 1976b). Therefore, the null hypothesis was not rejected and the study provided support for the stability and trait construct of the TAIS.

CHAPTER VI

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

Summary

The purpose of this study was to determine, for highly skilled female basketball players, the effects of visuo-motor behavior rehearsal (VMBR) on: (a) the closed and open competitive performance tasks involved in the sport of basketball; (b) state and trait anxiety levels; and (c) attentional, control, and interpersonal characteristics. Ten members of a Division I nationally ranked women's basketball team were utilized as subjects.

Performance measures for the closed and open tasks were collected during the team's 1983-84 regular season games. The measures for: (a) state and trait anxiety, and (b) attentional, control and interpersonal characteristics (Nideffer, 1981), were selected on the basis of previous reported research which confirmed their role in the sport environment. The Competitive State Anxiety Inventory - 2, CSAI-2 (Martens et al., 1983), was utilized to measure pre-competition state anxiety. The Sport Competition Anxiety Test, SCAT (Martens, 1977), provided the trait anxiety measures. The attentional, control, and interpersonal characteristics were measured by the Test of Attentional and Interpersonal Style, TAIS (Nideffer, 1976b).

A 2 x 3 (groups x blocks) repeated measures design provided the sum of squares information for the planned comparisons for the performance and state anxiety measures. The planned comparisons were investigated

through the use of simple main effects analyses (Kirk, 1968) to identify differences between the VMBR and control groups.

The effects of VMBR on: (a) trait anxiety, and (b) attentional, control, and interpersonal characteristics were evaluated with planned comparisons using simple main effects procedure (Kirk, 1968). A 2 x 2 (groups x blocks) repeated measures design provided the sum of squares information for the statistical contrasts.

The previously reported research indicated conflicting results concerning the effects of mental practice and VMBR on the performance of a motor task (Feltz & Landers, 1983; Weinberg, 1982). In order to account for some of the variables which were previously uncontrolled, this study utilized the classification of skills according to the nature and demands of the task to determine more specific effects of mental practice techniques. These tasks were measured in a field setting in order to yield a clearer picture of the usefulness of VMBR in a competitive or real world setting. Support for the use of VMBR with highly skilled performers was indicated by the superior performance of the experimental group on average free throw percentage, the closed task measure. Schmidt (1982) reported that mental practice or imagery had previously been ineffective in the performance enhancement of highly skilled individuals. In this study, no significant differences were found between the groups on any of the open task measures.

Previous researchers (Powell & Verner, 1982; Sonstroem & Bernardo, 1982; and Weinberg & Genuchi, 1980) have concluded that higher levels of anxiety are related to poorer performance. Although other studies (DeWitt, 1980; Weinberg et al., 1981) reported that mental training

techniques were effective in the reduction of competitive state anxiety, the present study found no significant differences between the VMBR and control groups as measured by the CSAI-2, on the following subscales of state anxiety: (a) a cognitive component of state anxiety; (b) a somatic component of state anxiety; and (c) self confidence. A significant difference in the change between groups was noted for the average somatic scores, with the VMBR group indicating a greater decrease or more positive change than the control group.

Trait anxiety, which was described by Spielberger (1966) as a stable personality disposition, was not expected to be effected by VMBR. The VMBR and control groups were not found to be statistically different which, therefore, supported the stability of the trait anxiety construct.

The attentional, control, and interpersonal factors measured by the TAIS are projected to provide a profile of an individual's stable personality disposition (Nideffer, 1976a). As a result, these factors are considered to be trait measures. This study supported these projections as no differences were found between the experimental and control groups following VMBR.

Conclusions

This study was designed to investigate for highly skilled subjects the effects of VMBR on: (a) the performance of the specific closed and open skills within the sport of basketball as measured during actual games; (b) the state and trait anxiety levels of the performers; and (c) the attentional, control, and interpersonal characteristics of the

performers. The hypotheses stated in Chapter I were tested utilizing simple main effects procedure (Kirk, 1968). As a result of the analyses, the following conclusions are offered.

1. For performance of a closed task in a competitive sport setting: (a) VMBR may contribute to a significant improvement, and (b) VMBR may contribute to the performance of the treatment group to being significantly better than that of the control group.
2. The true effect of VMBR on the performance of open tasks remains to be determined.
3. The somatic component of state anxiety as measured by the CSAI-2 (Martens et al., 1983) may be significantly improved with VMBR.
4. The cognitive component of state anxiety or the self-confidence scores as measured by the CSAI-2 (Martens et al., 1983) are not readily influenced by VMBR.
5. Trait anxiety, as measured by the SCAT (Martens, 1977), and the attentional, control, and interpersonal factors, as measured by the TAIS (Nideffer, 1976b), are not readily influenced by VMBR.

Implications for Future Research

This study has demonstrated that visuo-motor behavior rehearsal (VMBR) may be effective in the enhancement of the competitive performance of a closed task, free throw shooting, in the sport of basketball. There are also implications from this research for the possible usefulness of VMBR in the reduction of the somatic component of state anxiety. Other parameters concerning the effects and usefulness of VMBR as a mental training technique are still in need of investigation. The following suggestions are presented as possible investigations to clarify these parameters.

1. Evaluate the effects of VMBR on the competitive performance of open tasks over an extended period of time such as an entire season.
2. Determine the effects of VMBR on state anxiety and the relationship of these effects, if any, to competitive performance.
3. Investigate the effects of VMBR over an extended period on the attentional, control, and interpersonal factors of the TAIS.

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APPENDICES

APPENDIX A

COMPETITIVE STATE ANXIETY INVENTORY - 2

APPENDIX A

COMPETITIVE STATE ANXIETY INVENTORY - 2

Name: _____ Sex: M F Date: _____

DIRECTIONS: A number of statements which athletes have used to describe their feelings before competition are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel right now-at this moment. There are no right or wrong answers. Do not spend too much time on any one statement, but choose the answer which describes your feelings right now.

		Not At All	Somewhat	Moderately So	Very Much So
(c)	1. I am concerned about this competition	1	2	3	4
(s)	2. I feel nervous	1	2	3	4
(sc)	3. I feel at ease	1	2	3	4
(c)	4. I have self-doubts	1	2	3	4
(s)	5. I feel jittery	1	2	3	4
(sc)	6. I feel comfortable	1	2	3	4
(c)	7. I am concerned that I may not do as well in this competition as I could	1	2	3	4
(s)	8. My body feels tense	1	2	3	4
(sc)	9. I feel self-confident	1	2	3	4
(c)	10. I am concerned about losing	1	2	3	4
(s)	11. I feel tense in my stomach	1	2	3	4
(sc)	12. I feel secure	1	2	3	4

		Not At All	Somewhat	Moderately So	Very Much So
(c)	13. I am concerned about choking under pressure	1	2	3	4
(s)	14. My body feels relaxed (reverse scoring)	1	2	3	4
(sc)	15. I'm confident I can meet the challenge	1	2	3	4
(c)	16. I'm concerned about performing poorly	1	2	3	4
(s)	17. My heart is racing	1	2	3	4
(sc)	18. I'm confident about performing well	1	2	3	4
(c)	19. I'm worried about reaching my goal	1	2	3	4
(s)	20. I feel my stomach sinking	1	2	3	4
(sc)	21. I feel mentally relaxed	1	2	3	4
(c)	22. I'm concerned that others will be disappointed with my performance	1	2	3	4
(s)	23. My hands are clammy	1	2	3	4
(sc)	24. I'm confident because I mentally picture myself reaching my goal	1	2	3	4
(c)	25. I'm concerned I won't be able to concentrate	1	2	3	4

		Not At All	Somewhat	Moderately So	Very Much So
(s)	26. My body feels tight	1	2	3	4
(sc)	27. I'm confident of coming through under pressure	1	2	3	4

APPENDIX B

LETTER AND INFORMED CONSENT

Topic: Letter and Informed Consent from Subjects

Investigator: Tina M. Buckles

Information: All inquiries, questions, etc. should be directed to
Tina M. Buckles, Division of Physical Education.

Dear Subject:

You have been selected for inclusion in a study concerning the performance of highly skilled players in a competitive situation. The purpose of the study is to determine the effects of a mental practice technique on: (a) performance in the basketball game, (b) attentional style, and (c) competitive feeling states. I have received permission from Coach Pat Summitt for your participation in this study. Your agreement to participate in this study would include the following:

- (a) Completion of 2 questionnaires at the beginning and end of the study,
- (b) Completion of 1 questionnaire 30 minutes before each home and away game, and
- (c) Participation in the mental practice sessions. These MP sessions will be scheduled at your convenience 4 times per week for 15-25 minutes beginning next week and continuing through the remainder of this regular season.

The mental practice sessions would include:

- (a) Relaxation training the first 4 sessions,
- (b) Relaxation combined with imagery training for the next 4 sessions, and
- (c) Relaxation combined with imagery of specific basketball competitive performance tasks for the remainder of the sessions during this season.

The mental practice sessions will be conducted in a quiet room with only you and I present. Sessions will be scheduled ahead of time for periods which are as convenient as possible for you.

Your game statistics of free throw and field goal percentages, rebounds, assists, turnovers, and fouls would be used to represent performance in each game for the 1983-84 season. These will be obtained from the videotapes, game statistics, and play-by-play readouts that are regularly recorded for use in the women's basketball program.

All information will be kept strictly confidential. No one, including the coaches, will have access to any of the information on the questionnaires except the researcher. No names will be attached to the data; and individual players will never be identified in reporting the results and conclusions of the study. I will be happy to assist in answering any questions that you may have during or following this study. Finally, your participation in this study is completely voluntary, and you may choose not to participate or withdraw from participating at any time. Neither your participation nor your withdrawal from the study will have any effect on your academic status or your standing with the basketball team or coaches.

After having read the attached letter, I understand the purpose of the study and what is expected of me. I agree to participate in this study during the 1983-84 basketball season.

Subject's Name

Subject's Signature

Local Phone Number

Date

Witness

Project Director:

Tina M. Buckles

Office #350 HPER

Phone 974-5111

APPENDIX C

SCALE ITEMS ON THE TAIS

APPENDIX C

SCALE ITEMS ON THE TAIS

Broad External Attentional Focus (BET)

- 34. I am good at quickly analyzing complex situations around me, such as how a play is developing in football or which of four or five kids started a fight.
- 42. In a room filled with children or out on a playing field, I know what everyone is doing.
- 44. I am good at rapidly scanning crowds and picking out a particular person or face.
- 55. I have difficulty telling how others feel by watching them and listening to them talk.
- 65. I am good at glancing at a large area and quickly picking out several objects, such as in those hidden figure drawings in children's magazines.
- 68. I can figure out how to respond to others just by looking at them.

Overloaded By External Stimuli (OET)

- 1. When people talk to me I find myself distracted by the sights and sounds around me.
- 7. I run back and forth from task to task.
- 8. I seem to work in "fits and starts" or "bits and pieces".
- 11. The world seems to be a booming buzzing brilliant flash of color and confusion.
- 29. It is easy for me to keep sights and sounds from interfering with my thoughts.
- 30. Happenings or objects grab my attention.
- 33. With so much going on around me, it's difficult for me to think about anything for any length of time.
- 35. At stores I am faced with so many choices I can't make up my mind.

- 46. I get confused trying to watch activities such as a football game or circus where a number of things are happening at the same time.
- 56. People have to repeat things to me because I become distracted by irrelevant sights or sounds around me.
- 64. I get confused at busy intersections.
- 71. Sometimes lights and sounds come at me so rapidly they make me lightheaded or dizzy.

Broad Internal Attentional Focus (BIT)

- 3. All I need is a little information and I can come up with a large number of ideas.
- 20. I theorize and philosophize.
- 24. My interests are broader than most people's.
- 27. It is easy for me to focus on a number of things at the same time.
- 34. I am good at quickly analyzing complex situations around me, such as how a play is developing in football or which of four or five kids started a fight.
- 51. In games I make mistakes because I am watching what one person does and forget about the others.
- 52. I can plan several moves ahead in complicated games like bridge and chess.
- 70. It is easy for me to bring together ideas from a number of different areas.

Overloaded By Internal Stimuli (OIT)

- 2. When people talk to me I find myself distracted by my own thoughts and ideas.
- 10. My thoughts and associations come so rapidly I can't keep up with them.
- 19. I get caught up in my thoughts and become oblivious to what is going on around me.
- 28. It is easy for me to keep thought from interfering with something I am watching or listening to.

- 47. I have so many things on my mind that I become confused and forgetful.
- 59. On essay tests my answers are (were) too broad, bringing in irrelevant information.
- 69. I have a tendency to get involved in a conversation and forget important things like a pot on the stove, or like leaving the motor running on the car.
- 72. People have to repeat things because I get distracted by my own irrelevant thoughts.
- 73. People pull the wool over my eyes because I fail to see when they are obviously kidding by looking at the way they are smiling or listening to their joking tone.

Narrow Attentional Focus (NAR)

- 4. My thoughts are limited to the objects and people in my immediate surroundings.
- 6. The work I do is focused and narrow, proceeding in a logical fashion.
- 14. When I read it is easy to block out everything but the book.
- 18. I think about one thing at a time.
- 25. My interests are narrower than most people's.
- 26. It is easy for me to direct my attention and focus narrowly on something.
- 28. It is easy for me to keep thoughts from interfering with something I am watching or listening to.
- 29. It is easy for me to keep sights and sounds from interfering with my thoughts.
- 31. It is easy for me to keep my mind on a single thought or idea.
- 32. I am good at picking a voice or instrument out of a piece of music that I am listening to.
- 43. It is easy for me to keep my mind on a single sight or sound.
- 49. It is easy for me to forget about problems by watching a good movie or by listening to music.

Reduced Attention (RED)

4. My thoughts are limited to the objects and people in my immediate surroundings.
5. I need to have all the information before I say or do anything.
6. The work I do is focused and narrow, proceeding in a logical fashion.
15. I focus on one small part of what a person says and miss the total message.
17. I have difficulty clearing my mind of a single thought or idea.
18. I think about one thing at a time.
27. It is easy for me to focus on a number of things at the same time.
39. When I get anxious or nervous my attention becomes narrow and I fail to see important things that are going on around me.
48. On essay tests my answers are(were) too narrow and don't cover the topic.
49. It is easy for me to forget about problems by watching a good movie or by listening to music.
51. In games I make mistakes because I am watching what one person does and forget about the others.
62. I make mistakes because my thoughts get stuck on one idea or feeling.
66. I get anxious and block out everything on tests.
69. I have a tendency to get involved in a conversation and forget important things like a pot on the stove, or like leaving the motor running on the car.
74. I can spend a lot of time just looking at things with my mind almost a complete blank except for reflecting the things that I see.

Information Processing (INFP)

3. All I need is a little information and I can come up with a large number of ideas.

4. My thoughts are limited to the objects and people in my immediate surroundings.
9. The work I do involves a wide variety of seemingly unrelated material and ideas.
15. I focus on one small part of what a person says and miss the total message.
18. I think about one thing at a time.
20. I theorize and philosophize.
23. My environment is exciting and keeps me involved.
24. My interests are broader than most people's.
27. It is easy for me to focus on a number of things at the same time.
34. I am good at quickly analyzing complex situations around me, such as how a play is developing in football or which of four or five kids started a fight.
42. In a room filled with children or out on a playing field, I know what everyone is doing.
44. I am good at rapidly scanning crowds and picking out a particular person or face.
52. I can plan several moves ahead in complicated games like bridge and chess.
54. In a roomful of people I can keep track of several conversations at the same time.
65. I am good at glancing at a large area and quickly picking out several objects, such as in those hidden figure drawings in children's magazines.
67. Even when I am involved in a game or sport, my mind is going a mile a minute.
116. I am socially outgoing.
140. I have a lot of energy for my age.
141. I am always on the go.

Behavior Control (BCON)

- 7. I run back and forth from task to task.
- 8. I seem to work in "fits and starts" or "bits and pieces".
- 16. In school I failed to wait for the teacher's instructions.
- 40. Even though I am not hungry, if something I like is placed in front of me, I'll eat it.
- 50. I can't resist the temptation when it is right in front of me.
- 92. I enjoy activities with danger or an element of the unknown in them.
- 117. I have difficulty waiting for good things to happen.
- 118. I peeked at Christmas time.
- 119. When I am angry I lose control and say things that sometimes hurt others.
- 120. I have been angry enough that I physically hurt someone.
- 128. I am in control of interpersonal situations.
- 129. I fought in school.
- 130. I have used illegal drugs.

Control Scale (CON)

- 37. I figure out how to respond to others by imagining myself in their situation.
- 58. I am good at analyzing situations and predicting in advance what others will do.
- 60. People fool me because I don't bother to analyze the things that they say; I take them at face value.
- 63. I am constantly analyzing people and situations.
- 68. I can figure out how to respond to others just by looking at them.
- 79. People take advantage of me.
- 82. I am good at getting my own way.

- 86. I enjoy intellectual competition with others.
- 87. I enjoy individual athletic competition.
- 88. I compete(d) athletically.
- 90. I compete with myself intellectually.
- 91. I compete with myself physically.
- 92. I enjoy activities with danger or an element of the unknown in them.
- 93. I express my opinions on issues.
- 95. When I believe deeply in something I find I am a poor loser and unable to compromise.
- 100. I express my anger.
- 128. I am in control of interpersonal situations.
- 129. I fought in school.
- 131. In groups I am one of the leaders.

Self-Esteem (SES)

- 24. My interests are broader than most people's.
- 90. I compete with myself intellectually.
- 91. I compete with myself physically.
- 96. I am socially self-confident when interacting with those who are like myself.
- 98. I am socially self-confident when talking in front of large groups.
- 99. I am socially self-confident when talking with the opposite sex.
- 105. I was one of the smartest kids in school.
- 106. I am a good person.
- 131. In groups I am one of the leaders.
- 132. People admire me for my intellect.

- 133. People admire me for my physical ability.
- 134. People admire me for my concern for others.
- 135. People admire me for my social status.

Physical Orientation (P/O)

- 76. I engage in physical activity.
- 87. I enjoy individual athletic competition.
- 88. I compete(d) athletically.
- 91. I compete with myself physically.
- 92. I enjoy activities with danger or an element of the unknown in them.
- 123. In school the kids I hung around with were athletes.
- 133. People admire me for my physical ability.

Obsessive (OBS)

- 4. My thoughts are limited to the objects and people in my immediate surroundings.
- 5. I need to have all the information before I say or do anything.
- 6. The work I do is focused and narrow, proceeding in a logical fashion.
- 13. When I make a mistake it is because I waited too long and got too much information.
- 17. I have difficulty clearing my mind of a single thought or idea.
- 18. I think about one thing at a time.
- 35. At stores I am faced with so many choices I can't make up my mind.
- 45. I have difficulty shifting back and forth from one conversation to another.
- 62. I make mistakes because my thoughts get stuck on one idea or feeling.

Extroversion (EXT)

- 85. I talked a lot in class when I was in school.
- 89. I physically express my feelings of affection.
- 101. I dated in high school.
- 102. People think I am a clown.
- 108. I need to help others.
- 109. I need to be liked.
- 115. I am a good mixer.
- 116. I am socially outgoing.
- 122. I acted in dramatic productions in high school and/or college.
- 125. In school the kids I hung around with were popular.
- 131. In groups I am one of the leaders.
- 133. People admire me for my physical ability.
- 135. People admire me for my social status.
- 136. I ran for class offices in school.

Introversion (INT)

- 21. I enjoy quiet, thoughtful times.
- 36. I spend a great deal of my time thinking about all kinds of ideas I have.
- 41. I am more of a doing kind of person than a thinking one.
- 77. People describe me as serious.
- 78. I sit alone listening to music.
- 80. I keep my thoughts to myself.
- 81. I keep my feelings to myself.
- 84. Others see me as a loner.
- 114. I am seen as a cold person by others.

121. At dances or parties I find a corner and avoid the limelight.

124. In school the kids I hung around with were intellectuals.

Intellectual Expression (IEX)

80. I keep my thoughts to myself.

83. I like to argue.

85. I talked a lot in class when I was in school.

86. I enjoy intellectual competition with others.

93. I express my opinions on issues.

105. I was one of the smartest kids in school.

131. In groups I am one of the leaders.

132. People admire me for my intellect.

Negative Affect Expression (NAE)

83. I like to argue.

95. When I believe deeply in something I find I am a poor loser and unable to compromise.

100. I express my anger.

103. I get mad and express it.

119. When I am angry I lose control and say things that sometimes hurt others.

120. I have been angry enough that I physically hurt someone.

129. I fought in school.

138. People see me as an angry person.

139. I see myself as an angry person.

Positive Affect Expression (PAE)

81. I keep my feelings to myself.

- 84. Others see me as a loner.
- 89. I physically express my feelings of affection.
- 101. I dated in high school.
- 107. My feelings are intense.
- 114. I am seen as a cold person by others.
- 115. I am a good mixer.
- 116. I am socially outgoing.
- 134. People admire me for my concern for others.

APPENDIX D

PROGRESSIVE RELAXATION PROCEDURES

APPENDIX D

PROGRESSIVE RELAXATION PROCEDURES

Muscle groups will be dealt with in the following order (Bernstein & Borkovec, 1973, p. 25):

- 1) Dominant hand and forearm
- 2) Dominant biceps
- 3) Nondominant hand and forearm
- 4) Nondominant biceps
- 5) Forehand
- 6) Upper cheeks and nose
- 7) Lower cheeks and jaw
- 8) Neck and throat
- 9) Chest, shoulders, and upper back
- 10) Abdominal or stomach region
- 11) Dominant thigh
- 12) Dominant calf
- 13) Dominant foot
- 14) Nondominant thigh
- 15) Nondominant calf
- 16) Nondominant foot

The sequence for each muscle group is as follows (Bernstein & Borkovec, 1973, p. 25):

1. The client's attention should be focused on the muscle group.
2. On the signal "now" from the investigator, the muscle group is tensed.
3. Tension is maintained for a period of 5-7 seconds.

4. On the signal "O.K., relax", the muscle group is released.
5. The subjects' attention is maintained upon the muscle group as it relaxes.

Example of verbal instructions for one muscle group (Bernstein & Borkovec, 1973, pp. 25-26).

"O.K., now I'd like you to focus all of your attention on the muscles of your right hand and lower arm."

"Alright, by making a tight fist I'd like you to tense the muscles in the right hand and lower arm, now." Tension is held 5-7 seconds. "Feel the muscles pull; notice what it's like to feel tension in these muscles as they pull and remain hard and tight."

"O.K., relax." Attention is focused on the relaxing feeling for 30-40 seconds. "Just let these muscles go, noticing the difference between tension and relaxation, focusing on the feeling in this muscle group as it becomes more and more relaxed."

The tension-release sequence is repeated with 5-7 seconds of tension and 45-60 seconds of relaxation.

"Alright, if the muscles in the right hand and lower arm feel completely relaxed, I'd like you to signal by lifting the little finger on the right hand."

In case of failure to get a relaxation signal after two tension-release cycles, the cycle may be repeated. If given the signal, instructions will be given to move on to the next muscle group.

Summary and assessment (Bernstein & Borkovec, 1973, pp. 28-29).

Once the subject has signaled relaxation for all sixteen muscle groups, summary of the session is next.

"O.K., now, we've relaxed the muscles in the arms and hands; just allow them to continue relaxing. We've relaxed the muscles in the face and neck; go on allowing them to remain deeply relaxed. We've relaxed the muscles of the chest, the shoulders, the upper back, the abdomen; allow these muscles now to become even more deeply relaxed. We've relaxed the muscles of the legs and feet; just allow these muscles now to remain deeply and completely relaxed."

"Now, I'd like you to signal if you feel the slightest bit of tension in any muscle group anywhere in the body.: If no signal, "O.K., I'd like you signal if you feel completely relaxed all through the body." Once a signal is given, the subject will be allowed a minute or two to enjoy this state, with the investigator remaining silent.
Terminating relaxation (Bernstein & Borkovec, 1973, p. 29)

The subject will be informed to count backward from 4 to 1 and on the count of 4, to begin to move the legs and feet, on the count of 3 move arms and hands, on the count of 2 move head and neck, on the count of 1 open her eyes. "On the count of 1, I'll ask you to open your eyes, feeling quite calm and relaxed, very pleasantly relaxed, just as if you'd had a brief nap."

APPENDIX E

IMAGERY TRAINING PROCEDURES

APPENDIX E

IMAGERY TRAINING PROCEDURES

1. The subject will be asked to progress mentally through the relaxation procedures and to allow themselves to become very pleasantly relaxed. They will be given a period of 2-5 minutes. The subject will be asked to signal the investigator when this state is achieved.
2. The subject will be asked to picture an object in their room. The researcher will instruct subject to focus attention on the color, the distance away from the subject, and other finite details of the object.
3. The subject will be asked to picture other objects in the room in relation to this initial object. The subject's attention will be directed to details such as how far apart they are, which is closer, etc.
4. The subject will then be asked to move objects or rearrange the objects in the room. "Try to move the door to the wall behind your bed. Picture the other objects in the room in relation to this change. Now, move the closet to the opposite wall, picture the other objects in the room in relation to this change." Three to five seconds will be allowed between each instruction, and the subject will be asked to signal when the task is accomplished.
5. Before termination, the subject will be allowed one to two minutes just to clear their mind and enjoy the state of relaxation.

6. The session will be terminated just as the progressive relaxation procedures (Appendix D).

APPENDIX F

TASK IMAGERY PROCEDURES

APPENDIX F

TASK IMAGERY PROCEDURES

1. The subject will be asked to progress mentally through the relaxation procedures and to allow themselves to become very pleasantly relaxed. The subject will be asked to signal the investigator when this state is achieved.
2. The subject will be asked to imagine themselves in the middle of their dorm room. "Looking through you own eyes, turn around slowly and picture all the objects in your room." The subject will be asked to signal the investigator when this is accomplished.
3. The subject will be asked to imagine themselves in the middle of a basketball court. "Try to imagine how it smells, how it feels." "Looking through your own eyes, turn around slowly, picture the court lines, the benches, the backboard, the goals, etc."
4. The subject will be instructed to successfully perform one of the game performance tasks. For example, free throws. "Through your own eyes, picture yourself standing at the free throw line. Feel the ball in your hands, picture the rim of the goal. Now , using your own technique, shoot a free throw. Feel the movement as you shoot, the ball as it leaves your fingertips. Follow the path of the ball through the air, through the rim, and through the net. Feel your follow-through." The subject will be asked to signal the investigator when the image is successfully accomplished.
5. The performance task will be repeated 10 times.

6. Before termination, the subject will be allowed one to two minutes just to clear their mind and enjoy the state of relaxation.
7. The session will be terminated just as in progressive relaxation (Appendix D).

VITA

Tina Marie Buckles was born in Bristol, Tennessee, on December 16, 1954. She attended elementary and junior high schools in that city and was graduated from Sullivan East High School in June 1972. The following September she entered Tennessee Technological University and in August 1976 she received a Bachelor of Science degree in Health Education. In September 1976 she accepted a graduate assistantship at Tennessee Tech as women's volleyball coach and completed a Master's degree in August 1977 in Physical Education. She accepted a full-time position at Tennessee Tech in the fall of 1977 as Women's Athletic Trainer and Volleyball Coach. From 1979 to 1981, she was Women's Basketball Coach and instructor at Emory and Henry College in Emory, Virginia. From 1981 to 1984 she was a graduate teaching assistant at the University of Tennessee, Knoxville. She will receive the Doctor of Philosophy degree with a major emphasis in Motor Behavior/Sport Psychology in August 1985.