

AN ABSTRACT OF THE THESIS OF

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Title: The Relationship Between State Anxiety and Volleyball

Serve Performance

Abstract approved:

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Purpose: The purpose of this study was to investigate the relationship between state anxiety and volleyball serve performance. The CSAI-2 inventory measured state anxiety indirectly by examining the three components of state anxiety. A secondary purpose was to examine the relative influence of the three components in relation to volleyball serve performance.

Methods of Research: The subjects consisted of 13 members from two intercollegiate women's volleyball teams. Three volleyball matches, which included only dual or triangular matches, were selected by the investigator and the respective coaches. The CSAI-2 inventory was given to the subjects

approximately 10 minutes before the selected match. Evaluation of the volleyball serve was conducted by the investigator, using Coleman's five point scoring system.

Conclusions: No significant relationship was found between state anxiety and volleyball serve performance. The somatic component of state anxiety was found to be the most influential of the three components of state anxiety in relation to volleyball serve performance.

THE RELATIONSHIP BETWEEN STATE ANXIETY
AND VOLLEYBALL SERVE PERFORMANCE

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Chapter 1

INTRODUCTION

This study investigated the relationship between an athlete's pre-competitive state anxiety and her volleyball serve performance. Pre-competitive is defined "as being within one hour of the contest" (Martens, Burton, Vealey, Bump & Smith, in press, p. 27). Earlier research (Huddleston & Gill, 1981) has shown that an athlete's state anxiety increased as competition time neared. How this increase in state anxiety immediately before game time affects serve performance is important. It is worth noting that this is a field study using a relatively new sport-specific competitive state anxiety inventory.

Theoretical Formulation

It is accepted that competitive sport situations generate some degree of anxiety within the competing athlete. This pre-competitive anxiety may not be entirely debilitating to the athlete but may instead have a positive effect on the athlete's performance. Knowing how pre-competitive anxiety affects an athlete's performance is important to the coach as well as to the player. In the last fifteen years, the study of competitive anxiety has been widely explored. This study probes further into areas still not clearly understood.

Spielberger (1972a) was one of the first to distinguish between state and trait anxiety. State anxiety (A-state) is "a transitory emotional state or condition of the human organism that varies in intensity and fluctuates over time" (Spielberger, 1972a, p. 39). Trait anxiety (A-trait),

he defined as "relatively stable individual differences in anxiety proneness, that is, to differences in the disposition to perceive a wide range of stimulus situations as dangerous or threatening, and in the tendency to respond to such threats with A-state reactions" (Spielberger, 1972a, p. 39).

Controversy has arisen since Spielberger differentiated between state and trait anxiety. Trait psychologists believe that traits are relatively stable, are a function of the individual, and are not affected by the environment in any way (Martens, 1977). In contrast, the situational psychologists suggest that the environment is the only source affecting behavior. A third group, emphasizing an interaction paradigm, has gained increased popularity. The view "the situation and the person as co-determinants of behavior without specifying either as primary or subsidiary causes of behavior" (Martens, 1977, p. 25).

The major point emerging from this controversy suggested that researchers would learn more in studying situation-specific anxiety instead of general anxiety. How an individual reacts to an everyday stressful situation might be very different from how she would react to a competitive sport situation. If this is true, then specific sport competitive anxiety measures would be better predictors of competitive anxiety than any general anxiety measures. It would seem imperative that such sport-specific measures be developed for use in sport psychology. Martens (1977) developed the Sport Competition Anxiety Test (SCAT) for this purpose. This anxiety scale appears to be the best predictor of state anxiety in sport of any state anxiety inventory developed thus far. Further research demonstrated the need for a sport-specific state anxiety inventory which Martens and colleagues (in press) have recently designed. The Competitive State Anxiety Inventory-2 (CSAI-2) is a modification of Spielberger's State Anxiety

Inventory (1970). This inventory is unique in that it separates state anxiety into three distinct components: cognitive, somatic, and self confidence. Previous tests have looked at state anxiety as a whole. The development of state anxiety inventories of such specificity allows for more thorough and complete investigation of sport competitive anxiety.

The level of pre-competitive state anxiety affecting an athlete's performance has been previously explored. Research indicates that low anxiety is associated with successful performance (Ogilvie, 1968; Martens, 1977; Morgan, 1980; Kroll, 1982). However, some degree of state anxiety before competition will improve performance (Lampman, 1967; Sime, 1982). According to the inverted-U hypothesis, there appears to be an optimal level on a continuum at which the athlete will perform best. This optimal level varies with each individual athlete.

The Problem

Is there a relationship between pre-competitive state anxiety and motor performance? Research indicates that some increase in state anxiety immediately before competition is to be expected and this increase, if up to, but not beyond the athlete's optimal level, can improve motor performance. The amount of state anxiety an athlete needs to achieve her peak performance is uncertain. An athlete's motor performance can be hindered by either too much or too little state anxiety. In order to perform her best, an athlete's state anxiety must remain within her optimal level.

If there is a relationship between state anxiety and motor performance, this relationship should be apparent when motor performance is isolated to the volleyball serve. Limiting the motor performance variable solely to the volleyball serve allows for better control of the variables.

Statement of the Problem

Is there a significant relationship between the state anxiety (SA) of the athlete and the athlete's serve performance (SP)?

Is the cognitive component of state anxiety more influential than the somatic component of state anxiety in relation to motor performance?

Is the cognitive component of state anxiety more influential than the self confidence component of state anxiety in relation to motor performance?

Statement of the Hypothesis

(Null Form)

There is no significant relationship between the state anxiety of the athlete (SA) and the athlete's serve performance.

The cognitive component of state anxiety is not significantly more influential than the somatic component of state anxiety in relation to motor performance.

The cognitive component of state anxiety is not significantly more influential than the self confidence component of state anxiety in relation to motor performance.

Symbolic Statement of the Hypothesis

$$H_0: p_{SA/SP} = 0$$

$$H_1: p_{SA/SP} > 0$$

$$H_2: p_{SA/SP} < 0$$

Predictive Statement of the Problem

As predicted by contemporary researchers (Martens, 1977; Kroll, 1982; Martens et al., in press), there is a significant relationship between state anxiety and motor performance.

As predicted by Martens and colleagues (in press), the cognitive component of state anxiety should have a higher correlation with motor

performance than the somatic or the self confidence components.

Purpose of the Study

The primary purpose of this study was to investigate the relationship between the pre-competitive state anxiety of the athlete and her volleyball serve performance. A secondary purpose was to investigate the relative influence of the components of state anxiety (cognitive, somatic, self confidence) with motor performance.

This study was designed to examine any relationships between state anxiety and one's athletic motor performance. If an athlete's optimal level of state anxiety can be determined, then similar studies could be used by coaches and players to further enhance an athlete's performance.

Definitions of Terms

Terms relating to this study have been specifically defined in this section.

Cognitive State Anxiety

A component of state anxiety that involves the mental process of anxiety usually connected with worry. Manifestations of cognitive anxiety in competition are "negative expectations about performance and thus negative self-evaluation" (Martens, Burton, Vealey, Bump & Smith, in press, p. 6).

Somatic State Anxiety

A component of state anxiety that involves "the physiological and affective elements of the anxiety experience which develops from autonomic arousal" (Martens, Burton, Vealey, Bump & Smith, in press, p. 6). Responses of somatic anxiety include an increased heart rate, clammy hands, and tense muscles.

Self Confidence State Anxiety

A component of state anxiety that involves "the absence of cognitive anxiety" (Martens, Burton, Vealey, Bump & Smith, in press, p. 17). This suggests that self confidence and cognitive state anxiety have on opposite ends of the same continuum.

Chapter 2

REVIEW OF RELATED LITERATURE

Only recently have researchers investigated the psychological, as well as the physiological aspects of the athlete in evaluating peak sport performance. Each athlete perceives stressful, competitive situations differently. What relationship, if any, there is between this state anxiety and motor performance is uncertain. This chapter reviews five different areas: (1) the general theory, (2) factors related to state anxiety, (3) the anxiety inventory used, (4) the volleyball serve, and (5) summary.

General Theory

At this time, there are two different theories involving the relationship between arousal and performance--the drive theory and the inverted-U hypothesis. Depending on which theory is accepted, a researcher adopts and develops different predictions. The drive theory states that performance is the result of "the multiplicative function of habit and drive" (Landers, 1980, p. 78). A linear relationship between drive level and performance is proposed in the drive theory. This theory predicts that as drive (arousal) increases so will the probability of the dominant responses increase. Early in skill acquisition drive increase impairs performance. Through practice, when correct responses are learned, arousal will enhance performance. The underlying point is that increased arousal will continue to facilitate performance no matter how high the arousal level.

Arousal is defined as "the degree of energy release of the organism which varies on a continuum from deep sleep to high excitement" (Landers, 1980, p. 77). As the arousal level increases the athlete experiences some amount of unpleasant emotional reactions. It is this condition which is generally referred to as state anxiety.

The inverted-U hypothesis asserts that the level of performance is related to the level of arousal (Malmö, 1959). Increase in arousal will increase performance up to an optimal level, at which further arousal will begin to impair performance (Martens & Gill, 1970). This hypothesis, therefore, postulates an optimal level at which the athlete will attain a peak performance. A curvilinear relationship is proposed between arousal and performance in the inverted-U hypothesis. The inverted-U hypothesis differs from the drive theory most markedly in its prediction of performance when the athlete reaches a high level of arousal. Contemporary researchers are leaning toward the inverted-U hypothesis in explaining the relationship between arousal and motor performance (Martens, 1977; Kroll, 1982; Cratty, 1983).

Factors Related to State Anxiety

If one accepts the inverted-U hypothesis in predicting how arousal affects motor performance, then one should accept that state anxiety can affect motor performance as well. State anxiety is an emotional reaction characterized by an increase in arousal. Landers (1980) claimed that researchers need to look at the arousal factor and not just anxiety as a whole. However, Martens (1977) stated that arousal was only of one dimension--intensity of behavior while state anxiety included intensity and direction of behavior. Since increased arousal level produces anxiety, looking at state anxiety levels will give an indication of the level of

arousal. Therefore, the inverted-U hypothesis should be evident in the relationship between state anxiety and motor performance.

Many sport psychologists agree that anxiety is situation-specific (Spielberger, 1972b; Martens, 1977; Sime, 1982). How state anxiety affects an individual depends on the amount of threat perceived by the athlete. There appears to be no reason why athletes should differ in A-trait from non-athletes when discussing all types of situations. However, there may be some difference in comparing the two groups in situations specific to competitive sports (Martens, 1977). Spielberger (1972a) predicted in his Trait-State Theory of Anxiety that a high A-trait individual will respond with higher A-state than a low A-trait individual in situations perceived to be threatening. From this prediction, researchers have found athletes, especially superior athletes, to have lower general anxiety levels (Ogilvie, 1968; Martens, 1977; Morgan, 1980; Kroll, 1982). The fact that athletes might be lower in A-trait can be interpreted in many ways. Layman (1974) suggested that athletes learn to control and reduce anxiety. Kroll (1982), in turn, suggested that high A-trait athletes are either driven out or eliminated from athletics because of poor performance. Martens proposed a reciprocal cause and effect relationship. He stated that,

a little success due to some inherited ability may initially lower A-trait, these lower levels of A-trait result in lower A-state which cause better performance, better performance continues to reduce A-trait, and so on (Martens, 1977, p. 12).

Age, experience, and skill level of the athlete are also characteristics in the relationship between anxiety and motor performance (Epstein & Fenz, 1965; Huddleston & Gill, 1981; Kroll, 1982; Cratty, 1983). Cratty (1983) reasoned that athletes learn to manage their state anxiety by continuing in competition over a period of time, gaining experience as the years

progress. Kroll (1982) stated that the older and the more experienced athlete generally has lower anxiety levels than the younger and the less experienced athlete. Most researchers believe that athletes learn to control or manage their state anxiety, drop out, or are simply eliminated from athletics altogether. However, Gould (1983), in a very recent study, using the CSAI-2 found no differences between the experienced and the inexperienced athletes for either the cognitive or the somatic components of state anxiety. Skill level is also considered an important factor in looking at how anxiety affects the athlete. Singer concluded, "in general, it appears that stress anxiety hinders the early learning process but does not interfere with or may be beneficial in the later stages of skill development" (Singer, 1972, p. 120). This may be evident in the first-year athlete at any level of competition because of the skill acquisition required in competition. It is not clear how important each factor is in influencing state anxiety.

Anxiety Inventory Used

Anxiety inventories have progressively improved in specificity over the years. Researchers have argued over which type of inventory is best; state measures, trait measures, or situation-specific measures (Morgan, 1979). In a majority of studies which investigated the relationship between anxiety and muscular performance, the Taylor Manifest Anxiety Scale (1953) was used as the measure of trait anxiety (Martens, 1972). Another anxiety scale used in many field studies which measured physical activity in relation to anxiety (Langer, 1966; Lampman, 1967; Morgan, 1970) was the Institute for Personality Testing (IPAT) Anxiety Scale (Cattell & Scheier, 1963). In sport psychology, the State-Trait Anxiety Inventory (STAI) developed by Spielberger, Gorsuch & Lushene (1970) was frequently

used to measure state anxiety (Morgan, 1978). However, Spielberger and colleagues (1970) found that the three trait anxiety scales highly correlated with one another. Martens (1972) noted the superiority of the STAI inventory due to its differentiating between state and trait anxiety.

Researchers were claiming that anxiety was situation-specific (Sarason, Davidson, Lighthall, Waite & Ruebush, 1960; Martens, 1977; Sime, 1982) and thus situation-specific trait anxiety measures were better predictors of elevated state anxiety (Spielberger, 1972b). Consequently, Martens (1977) designed a sport-specific trait anxiety inventory, the Sport Competition Anxiety Test (SCAT). The purpose of SCAT was to predict sport competitive state anxiety. Martens (1977) used analysis of variance in determining SCAT's reliability ($r=.85$). Validity was measured through the use of content, concurrent, predictive and construct validity. All validity measures had high correlations except concurrent validity ($r=.44$). This low correlation between SCAT and the Trait Anxiety Inventory for Adults (Spielberger, Gorsuch & Lushene, 1970) emphasized that SCAT was a better predictor of sport-specific state anxiety.

Once SCAT was employed, researchers felt a need for a sport-specific state anxiety scale as well. Previous state anxiety inventories, such as Spielberger, Gorsuch & Lushene's State Anxiety Inventory, defined state anxiety as unidimensional, thereby looking at state anxiety as a whole. However, researchers were redefining state anxiety as multidimensional (Liebert & Morris, 1967; Borkovec, 1976; Schwartz, Davidson & Goleman, 1978; Landers, 1980; Wine, 1980). Therefore, Martens and colleagues (in press) designed the Competitive State Anxiety Inventory-2 (CSAI-2), a sport-specific multidimensional state anxiety inventory. The CSAI-2 measured state anxiety by assessing three separate components of state anxiety: cognitive, somatic, and self confidence (Martens, Burton, Vealey,

Bump & Smith, in press).

The CSAI-2 was an outgrowth of the CSAI developed by Martens in 1977. The CSAI, a modification of the State Anxiety Inventory (Spielberger, Gorsuch & Lushene, 1970), was a shortened form designed for competitive situations and omitted items which were not pertinent in competitive situations. The CSAI-2 is based, in part, from the original CSAI but measures three components of state anxiety and is in accordance with the multidimensional view of state anxiety held by contemporary researchers of state anxiety.

Reliability was measured by examining the internal consistency of the CSAI-2 which evaluated the degree to which items in the same subscale are interrelated (Martens, Burton, Vealey, Bump & Smith, in press). Cronbach's alpha coefficients ranged from .79 to .90, confirming a high degree of internal consistency for each of the subscales.

The CSAI-2 concurrent validity was examined by investigating each of the CSAI-2 subscales with four trait anxiety scales (Martens' SCAT, 1977; Spielberger, Gorsuch & Lushene's Trait Anxiety Inventory, 1970; Alpert & Haber's Achievement Anxiety Test, 1960; Rotter's Internal-External Control Scale, 1966) and four state anxiety scales (Morris & Engle's revised Worry-Emotional Inventory, 1981; Schwartz, Davidson & Goleman's Cognitive-Somatic Anxiety Questionnaire, 1978; Spielberger, Gorsuch & Lushene's State Anxiety Inventory, 1970; Zuckerman's Affect Adjective Checklist, 1960). The concurrent validity was evident with firm support of predicted relationships among the CSAI-2 subscales and the related anxiety scales.

The construct validity of the three subscales was also proven, partially through the support of the concurrent validity but also from evidence of studies done by Martens. This evidence indicated that each of the CSAI-2 subscales were significantly influenced by competitive trait

anxiety, sex, the skill level of the athlete, and the type of sport. The construct validity is determined by comparing "the operational definitions of the new constructs (sport-specific cognitive state anxiety, somatic state anxiety, and state self confidence)" with "other constructs as predicted by theory" (Martens, Burton, Vealey, Bump & Smith, in press, p. 33).

The significance of having a state anxiety inventory which distinguishes between cognitive and somatic state anxiety is of great importance. Research has suggested state cognitive and somatic anxiety are separate but interacting components of state anxiety (Liebert & Morris, 1967; Borkovec, 1967; Martens et al., in press).

Statistically, Martens and colleagues (in press) found intercorrelations among the CSAI-2 subscales ranging from $-.31$ to $.60$. More importantly, cognitive and somatic anxiety are thought to have different antecedents (Martens et al., in press; Schwartz, Davidson & Goleman, 1978; Gould, Petlichkoff & Weinberg, 1983). A person could experience primarily somatic anxiety in one situation and experience primarily cognitive anxiety in another situation.

Already mentioned is the fact that state anxiety increased as time of competition neared (Huddleston & Gill, 1981). Martens and colleagues (in press) found that somatic anxiety increased prior to performance and dissipated once performance began while cognitive anxiety remained relatively constant provided there was no change in expectation of performance (Morris & Fulmer, 1976). This was also reported by Gould, Petlichkoff & Weinberg (1983). Cognitive anxiety was predicted to be a more powerful influence on performance than somatic anxiety (Morris et al., 1981; Martens et al., in press). Gould, Petlichkoff & Weinberg (1983) only partially supported this prediction. Similar results have been reported by

researchers investigating test anxiety (Liebert & Morris, 1967; Spielger, Morris & Liebert, 1968; Deffenbacher, 1980; Wine, 1980). Wine (1971, 1980) explained this further in her direction of attention hypothesis. She argued that individuals focus their attention differently in evaluative situations, certain individuals will divide their attention with self-preoccupied worry about themselves and the task while others will focus more fully on the task. Therefore, it is the cognitive or the self-preoccupied worry component of test anxiety that interferes with task performance. Cognitive anxiety has been defined in sport psychology as negative self evaluation or expectation of performance. This negative expectation could seriously affect performance (Bandura, 1977).

The third component of state anxiety, found by Martens and colleagues (in press) through factor analysis, is self confidence. A lack of information on this third component has limited the discussion of its importance. One study done by Taylor (1983) predicted competitive performance of athletes in six collegiate sports with state measures of self confidence and anxiety. He found in cross-country runners that an increase in self confidence to a certain point improved performance, whereafter, a higher level of self confidence hindered performance. This was also true in the same group for cognitive state anxiety. These findings suggest that there is an optimal level of self confidence and cognitive state anxiety necessary for peak performance.

Volleyball Serve

The skill chosen to investigate motor performance was the volleyball serve. The volleyball serve is a closed-loop skill with feedback, error detection, and error correction as elements of the skill (Adams, 1971). It also involves no one except the athlete who is serving. Many experts in

the field of volleyball claim it is a major offensive skill (Keller, 1968; Coleman, 1972). It is only through the serve that a team can score points and points can be scored directly from a service ace.

In 1970, Gorton's study, Evaluation of the Serve and Pass in Women's Volleyball Competition, employed a charting system developed by Coleman and Neville in 1969 by which a statistician could evaluate the effectiveness of the serve. Each serve was evaluated according to the probability of the serving team scoring a point (Coleman, 1981). However, Coleman (1981) stated that the serve evaluation is directly related to the skill of the passer. The evaluation scale was a four point scoring system, later changed to a five point system to include the value of zero (coleman, 1975). Coleman (1975) again, through further research, altered the evaluation system by giving the value of five to a service ace (see Appendix A). He found that the probability of success of a type two serve to be two-fifths or forty percent instead of fifty percent. This statistical system, with minor adjustments is used by most researchers and coaches in evaluating the volleyball serve (Gorton, 1970; Cox, 1974; Coleman, 1975; Nelson, 1980).

Summary

In explaining the relationship between arousal and motor performance, contemporary researchers tend to support the inverted-U hypothesis. This theory claims that increased arousal will increase the athlete's performance, but only to a certain degree. At this point, excessive arousal may impair rather than enhance one's motor performance.

The study of the inverted-U hypothesis indicates that anxiety is induced as one's arousal level increases. An increase in arousal creates a condition of state anxiety. As the athlete perceives a situation to be threatening, her arousal level increases which produces state anxiety. The

relationship between state anxiety and motor performance has many determinants. Research has shown that the amount of threat an athlete perceives affects this relationship. Other influential characteristics are one's age, athletic experience, and the athlete's skill level.

State anxiety inventories are used to measure the level of state anxiety in a particular situation. The CSAI-2 was the inventory used in this study. This recently developed inventory enables the investigator to take a closer look at an athlete's state anxiety by probing into three specific components of state anxiety (cognitive, somatic, self confidence). However, cognitive state anxiety appears to be the most influential in relation to motor performance.

The volleyball serve was selected from all volleyball skills to be the motor performance measure because it required individual execution. Examining one specific volleyball skill as the motor performance measure provided a more concentrated study of the relationship between state anxiety and motor performance.

Chapter 3

METHODS AND PROCEDURES

This chapter is sub-divided into five areas: (1) population and sampling, (2) materials and instrumentation, (3) design of the study, (4) data collection, and (5) data analysis. The methods and procedures are discussed in these five sections.

Population and Sampling

The population consisted of two intercollegiate women's volleyball teams, both affiliated with the National Association of Intercollegiate Athletics (NAIA). A minimum of three state anxiety and motor performance measures per subject were required for analysis of intraindividual relationships between the CSAI-2 and motor performance (Gould, Petlichkoff, & Weinberg, 1983) and therefore only the 13 subjects who completed all three measures were studied in this investigation. The subjects ranged in age from 18 to 23 years, with the mean age of 19.5 years and had participated in competitive volleyball (high school and/or college) from one to six years, the mean being 4.3 years.

Materials and Instrumentations

The CSAI-2 was the instrument use in measuring state anxiety (see Appendix B). This inventory is a paper and pencil test composed of 27, four point Likert scale items. Each subscale (cognitive, somatic, self confidence) has it's own individual score. Nine statements for each

subscale produced a score ranging from 9 to 36 with 36 being a high state of anxiety. The scoring consisted of adding items: 1, 4, 7, 10, 13, 16, 19, 22, and 25 for the cognitive anxiety. Somatic anxiety was found by adding items: 2, 5, 8, 11, 14R, 17, 20, 23, and 26. Item 14 was scored in reverse order. The following items were scored for the self confidence subscale: 3, 6, 9, 12, 15, 18, 21, 24, and 27. The title of the form given to the subjects was the Illinois Self-Evaluation Questionnaire recommended by Martens and colleagues (in press) to reduce possible response bias. The CSAI-2 was convenient to use, taking less than five minutes to administer.

The Coleman (1975) five point scoring system was the evaluation scale used to measure motor performance on the volleyball serve. Points were assessed as follows. A service ace was worth five points, a service error was zero, and the remaining points were scored in relation to the opponent's return of serve. There is greater probability that a weaker serve would be easily returned by the opponents, therefore receiving few points and demonstrating a poorer performance. On the other hand, a service ace would score five points, increasing the strength of serve. The player's total serve points were added together and divided by the total number of attempts providing the average score for serves in one match.

Design of the Study

The relationship between state anxiety and motor performance was examined through the use of the CSAI-2 and the Coleman five point scoring system. This study investigated the subjects' state anxiety and motor performance measures for all three matches combined.

Early in the volleyball season, the investigator introduced the idea of this study to both volleyball teams, clarifying exactly what was to be required of them. Both coaches agreed to allow their volleyball players

to be used in the study. Also, each subject signed an informed consent form for this study (see Appendix C).

Three volleyball matches, which were scheduled between September and November, were selected by the investigator and the respective coaches to provide the experimental setting. All matches were duals or triangulars; no tournament matches were examined. One match investigated was in the morning while all the remaining matches were played in the evening. Also, the data from the matches in which the team was playing an opponent which they had not previously played during the season were utilized.

Intercollegiate volleyball has developed into a game of specialization; setters, hitters, and backrow defensive players. Since not all players play each position, not every player will serve, therefore this study was limited in the number of subjects examined to those who regularly served.

Data Collection

The CSAI-2 inventory examined three components of state anxiety, giving a separate score for each subscale. The CSAI-2 was administered during the pre-match warmup. In volleyball, the pre-match warmup consists of the serving team having the first five minutes on the volleyball court while the other team is off the court, then the receiving team is allowed five minutes on the court, and finally, both teams share the court for the final two minutes for serving. This is known as the 5-5-2. It was during the five minutes off the court that the CSAI-2 was administered to the respective team. The instructions given to the players were condensed and modified slightly from the instructions Martens and colleagues (in press) provided (see Appendix D).

Evaluation of the volleyball serve was conducted by the investigator for all six matches. The Coleman (1975) five point scoring system was the

evaluation scale used. The investigator conducted this evaluation from the bleacher area located away from the volleyball team's bench.

Data Analysis

Correlations between the three state anxiety and motor performance scores across the three matches provided the analysis of data. In addition, the means and standard deviations of the four variables (cognitive, somatic, self confidence, motor performance) across the three matches were calculated.

Chapter 4

ANALYSIS OF DATA

The analyses used in this study are discussed utilizing five approaches to the data: (1) introduction, (2) interrelatedness of the three components of state anxiety, (3) analysis of the means and standard deviations of the four variables (cognitive, somatic, self confidence, motor performance), (4) correlation of the three components of state anxiety with motor performance across the three matches, and (5) summary. Analysis of the data in these five areas examined the relationship between state anxiety and motor performance.

Introduction

The purpose of this study was to determine if there was a relationship between state anxiety and motor performance. A secondary problem investigated was to determine if any one of the components of state anxiety (cognitive, somatic, self confidence) influenced motor performance more than any other component.

Only thirteen subjects out of the original twenty-seven subjects selected from two intercollegiate women's volleyball teams completed all of the test items. Their data were used in this study. Data from three matches selected by the investigator and the respective coaches were analyzed. All matches were against opponents whom the team had not previously played in the season. The matches selected occurred at various times throughout the season.

The analyses consisted of a correlation of the three state anxiety and motor performance scores for the thirteen subjects across all three of the matches. In addition, the means and standard deviations for each of the four variables (cognitive, somatic, self confidence, motor performance) were calculated.

Interrelatedness of Three Components of State Anxiety

Three subscales of state anxiety were used to measure state anxiety. The degree to which each subscale was related to each of the other subscales is presented in Table 1. Intercorrelations among the three subscales were examined to verify the independence of the subscales as would be expected from previous research findings (Liebert and Morris, 1967; Borkovec, 1967; Martens et al., in press).

It was expected that the cognitive subscale and the somatic subscale would have a moderate positive correlation (Martens et al., in press). This would indicate on interrelatedness between the two subscales but, more importantly it would show an independence of the two subscales. A moderate positive relationship ($r=.454$) was found in this study between the cognitive and the somatic subscales. The correlation between the cognitive and the somatic subscales ($r=.454$) was only slightly lower than compared to the mean findings that Martens (in press) found ($r=.518$) from several different sports.

It was expected that the cognitive subscale and the self confidence subscale would have a moderate inverse relationship since the self confidence subscale measured the absence of cognitive state anxiety (Martens et al., in press). This correlation between the cognitive subscale and the self confidence subscale was the lowest; only a slight inverse

relationship ($r=-.332$) was found. Martens (in press) had found a higher correlation ($r=-.48$) from his mean findings of several different sports.

The correlation between the somatic subscale and the self confidence subscale was expected to have a slight inverse relationship (Martens et al., in press). A moderate inverse relationship ($r=-.604$) was found between the somatic subscale and the self confidence subscale. This correlation ($r=-.604$) was higher than that found previously by Martens (in press) ($r=-.466$).

The correlations were only slightly different than those found by Martens and colleagues (in press). All of the correlations were in the expected direction although the magnitude of the relationship were not exactly the same. These slightly different correlations may have been due to the greater number of subjects used in Martens' (in press) study compared to the number of subjects used in this study. However, the correlations between the three subscales of state anxiety confirm that each subscale is interrelated, yet each is a separate component of state anxiety as Martens (in press) has stated.

TABLE 1

CORRELATIONS AMONG MEASURED
SUBSCALES OF STATE ANXIETY

CSAI-2 Subscales	1	2	3
1. Cognitive	-	.454	.332
2. Somatic	-	-	-.604
3. Self Confidence	-	-	-

*Significant at the .05 level.

Analysis of Means and Standard Deviations
of the Four Variables

The three state anxiety subscales were shown to be independent but interrelated components of state anxiety (Martens et al., in press). In general, the data from this study support Martens' (in press) theory of the interrelatedness of the components of state anxiety. However, the data from this study produced slightly lower correlations between each of the subscales of state anxiety than Martens (in press) found.

The cognitive subscale was higher than the somatic subscale score which is consistent with what Marten (in press) found. The mean cognitive score for all subjects was 16.487 with a standard deviation of 3.129 while the mean somatic score was 14.385 with a standard deviation of 4.270. The scoring system ranged from 9 points to 36 points for each of the subscales of state anxiety. Thirty-six points indicated the highest level of state anxiety for the cognitive and the somatic subscales. For the self confidence subscale, 36 points indicated the lowest level of state anxiety. The performance measure was based on Coleman's (1975) five point scoring system. The mean scores and standard deviations for all four variables (cognitive, somatic, self confidence, motor performance) are presented in Table 2.

TABLE 2
MEANS AND STANDARD DEVIATIONS

Variables	Means	Standard Deviations
Cognitive	16.487	3.129
Somatic	14.385	4.270
Self Confidence	28.231	4.429
Motor Performance	1.796	0.479

*Significant at the .05 level.

Correlation of Three Subscales of State

Anxiety with Motor Performance

The CSAI-2 inventory does not provide one overall state anxiety score which could be correlated to motor performance scores. Therefore, the relationship between state anxiety and motor performance was investigated by comparing the correlations of each of the three subscales (cognitive, somatic, self confidence) with the motor performance scores.

A secondary problem examined in this study was how each of the three subscales independently influenced motor performance. If any or all of the three subscales had a significant correlation with motor performance, it could be assumed that there was a significant relationship between state anxiety and motor performance. The relationships between each of the three subscales and motor performance are presented in Table 3.

TABLE 3

CORRELATION OF THREE SUBSCALES OF
STATE ANXIETY WITH MOTOR PERFORMANCE

State Anxiety	Motor Performance
Cognitive	.116
Somatic	-.213
Self Confidence	-.105

*Significant at the .05 level.

It was predicted that cognitive anxiety would be the most influential of the state anxiety subscales when correlated with motor performance (Martens et al., in press). This correlation was expected to be a positive correlation up to an optimal cognitive level, after which increased cognitive state anxiety would negatively affect motor performance, varying with each

individual (Taylor, 1983). However, the cognitive component of state anxiety was not found to be the most influential in relation to motor performance, although it was a positive correlation ($r=.116$). This positive correlation was interpreted to mean that some degree of cognitive state anxiety will aid in improving motor performance to an optimal level. Beyond this optimal level, a further increase in cognitive state anxiety will hinder motor performance. Simply stated, an athlete should be expected to have some mental anxiety about her performance but not so much that her focus is only on her mental expectation and not directed toward her motor performance.

Somatic state anxiety was expected to have an inverse relationship with motor performance (Martens et al., in press). The lower the athlete's somatic state anxiety the better the performance level achieved. In this study, the somatic subscale was found to be inversely related as expected and appeared to influence motor performance more than the cognitive or self confidence subscales ($r=-.213$). Smith and colleagues (in press) also found that somatic anxiety accounted for a major portion of competitive state anxiety. The less body tenseness and general physiological tightness the better the motor performance will be. This finding that the somatic subscale was the most influential in relation to motor performance, however, does not agree with the findings of Martens (in press). Martens and colleagues suggested that cognitive state anxiety had a stronger influence in relation to motor performance than somatic state anxiety. Martens (in press) indicates that somatic anxiety increases prior to competition but once competition begins it dissipates. Therefore, cognitive state anxiety should influence motor performance the most.

The relationship between self confidence and motor performance was expected to be a positive correlation up to an optimal level at which

further increase in self confidence would negatively affect motor performance (Taylor, 1983). This optimal level of self confidence would vary with each individual. The self confidence-motor performance correlation, in this study, showed an slight inverse relationship ($r=-.105$). This inverse relationship is due in part to the moderate inverse correlation found in Match 3. It is possible that because the majority of the athletes (9 out of 13) were playing a non-conference opponent (junior college or smaller university) for their third match, they were over self confident and this could have negatively influenced their motor performance.

Summary

In summary, the analyses consisted of a correlation between the three subscales (cognitive, somatic, self confidence) of state anxiety and motor performance across the three matches. Also, the means and standard deviations for the three matches combined were calculated for the three state anxiety subscales and motor performance.

The three components of state anxiety were found to be separate, yet interrelated components since correlations among the subscales were found only to have had moderate relationships. The mean cognitive score was approximately two points higher than the mean somatic score.

Three separate scores were given for state anxiety, therefore the relationship between state anxiety and motor performance had to be found indirectly by examining whether a significant relationship existed between any of the three subscales of state anxiety and motor performance. No significant relationship was found between state anxiety as measured by CSAI-2 and motor performance in this study.

It could be possible that due to the limited number of subjects, no significant relationships were apparent between subscales of state anxiety

and motor performance. However, this study does suggest that somatic state anxiety may have more influence over motor performance.

Chapter 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The purpose of this study was to investigate the relationship between state anxiety and motor performance. A secondary purpose was to examine the relative influence of the three components of state anxiety (cognitive, somatic, self confidence) in relation to motor performance.

Summary

Thirteen members of two intercollegiate women's volleyball teams served as subjects in this study. Only players who served in all three of the selected volleyball matches were chosen as subjects. The CSAI-2, a state anxiety inventory, was employed to obtain the state anxiety scores. The athletes' serve performance was evaluated solely by the investigator using the Coleman (1975) five point scoring system.

The design of the study provided that the CSAI-2 would be given approximately 10 minutes before the volleyball match. Three matches were selected by the investigator and the respective coaches in which the team being investigated was playing an opponent which they had not previously played during the season.

The data were analyzed using a correlation study of the three state anxiety and motor performance scores across the three volleyball matches. Also, the means and standard deviations of the three state anxiety and motor performance scores across the three volleyball matches were calculated.

Conclusions

When analysis of the data were completed, the following conclusions were drawn:

1. No significant relationship between state anxiety and motor performance was found in this study.
2. The somatic component of state anxiety was found to be the most influential in relation to motor performance of the three subscales (cognitive, somatic, self confidence) examined.
3. The three subscales of state anxiety (cognitive, somatic, self confidence) were found to be interrelated yet, separate components of state anxiety.

Recommendations

After completing this investigation, the investigator has several recommendations for further research in this area.

1. Repeat the study in a tournament setting so that at least 50 subjects could be studied.
2. Repeat the study examining only a few subjects continuously throughout the volleyball season in order to conduct an intra-individual study.
3. Repeat the study, having the subjects complete a Likert scale regarding their perceived importance of the game. Compare the state anxiety levels of the subjects with the perceived importance of the game ratings.
4. Development of a state anxiety scale which would provide separate

scores for the components of state anxiety in addition to providing a single score for state anxiety.

5. In addition to recording the outcome of the motor performance include such factors as strength of contact of the serve, importance of the game, strength of the opponent, and the point difference in the game. With these external factors in mind, a point scale could be developed.

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APPENDIX A

Coleman's Five Point Scoring System

for the Volleyball Serve

Coleman's Five Point Scoring System
for the Volleyball Serve

Type of Serve	Points
Ace--the receiving team cannot control the ball	5
Serving team receives a free ball	3
Passing team can set but cannot run a multiple offense	2
Ideal pass--passing team may run a multiple offense	1
Service error	0

APPENDIX B

Competitive State Anxiety Inventory-2

The Competitive State Anxiety Inventory-2 (CSAI-2)

Name: _____

Date: _____

Directions: A number of statements which athletes have used to describe their feelings before competition are given below. Read each statement and 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
1. I am concerned about this competition.	1	2	3	4
2. I feel nervous	1	2	3	4
3. I feel at ease	1	2	3	4
4. I have self-doubts	1	2	3	4
5. I feel jittery	1	2	3	4
6. I feel comfortable	1	2	3	4
7. I am concerned that I may not do as well in this competition as I could	1	2	3	4
8. My body feels tense.	1	2	3	4
9. I feel self-confident.	1	2	3	4
10. I am concerned about losing	1	2	3	4
11. I feel tense in my stomach	1	2	3	4
12. I feel secure.	1	2	3	4
13. I am concerned about choking under pressure	1	2	3	4
14. My body feels relaxed.	1	2	3	4
15. I'm confident I can meet the challenge.	1	2	3	4

16.	I'm concerned about performing poorly	1	2	3	4
17.	My heart is racing	1	2	3	4
18.	I'm confident about performing well.	1	2	3	4
19.	I'm worried about reaching my goal.	1	2	3	4
20.	I feel my stomach sinking	1	2	3	4
21.	I feel mentally relaxed. .	1	2	3	4
22.	I'm concerned that others will be disappointed with my performance. . .	1	2	3	4
23.	My hands are clammy. . . .	1	2	3	4
24.	I'm confident because I mentally picture myself reaching my goals. . . .	1	2	3	4
25.	I'm concerned I won't be able to concentrate. . .	1	2	3	4
26.	My body feels tight. . . .	1	2	3	4
27.	I'm confident of coming through under pressure	1	2	3	4

APPENDIX C

Informed Consent Form

INFORMED CONSENT FORM

As a member of a selected intercollegiate volleyball team, you are being asked to give consent for use of the data gathered on you in this study. Only the major investigator, Sue Becker, will have access to the code list identifying data with specific subjects. All data will be recorded on a coded form. The data will be reported in a manner which does not reveal identity of any one particular subject.

At four selected volleyball matches each subject will be asked to complete a questionnaire regarding their anxiety state. Also, at these four matches each subject will be rated by the investigator on their serve performance. Such testing poses no physical dangers, but might be viewed as a possible source of embarrassment or psychological stress. The subjects are reminded that their individual data will be coded, allowing only the investigator and the subject to identify specific results, thereby reducing the chances for embarrassment. Also, it should be pointed out that a certain amount of psychological stress is usually associated with participation in athletic contests and is not necessarily undesirable. It is critical to this study that each subject answer each question as honestly as possible and not in a manner they feel somebody else expects them to answer.

The major objective of this study is to see if state anxiety does influence motor performance. If a relationship between state anxiety and motor performance can be established, then future research might provide answers of how to control anxiety in order to achieve peak performance. Your cooperation in this study will be useful in answering such questions for future athletes.

"I have read the above statement and have been fully advised of the procedures to be used in this project. I have been given sufficient opportunities to ask any questions I had concerning the procedures and possible risks involved. I understand the potential risks involved and I assume them voluntarily. I likewise understand that I can withdraw from the study at anytime without being subjected to reproach."

Date

Subject

APPENDIX D

Verbal Instructions for CSAI-2 Inventory

Verbal Instructions for CSAI-2 Inventory

"The inventory you are about to complete measures how you feel right now. Please complete the inventory as honestly as you can. Sometimes athletes feel they should not admit to any nervousness, anxiety, or worry before competition because this is undesirable. Actually, these feelings are quite common and to help us understand them, we want you to share your feelings with us candidly. Your answers will not be shown or discussed with your coach. Please take your time and read each statement."