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RELATIONSHIPS AMONG A SPORT-SPECIFIC MEASURE
OF ATTENTIONAL STYLE, COMPETITIVE ANXIETY, AND
PERFORMANCE OF COLLEGIATE BASEBALL AND SOFTBALL BATTERS

presented by

Richard Ray Albrecht

has been accepted towards fulfillment
of the requirements for

M.A. degree in Physical Education

Deborah L. Feltz
Major professor

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RELATIONSHIPS AMONG A SPORT-SPECIFIC MEASURE OF ATTENTIONAL STYLE, COMPETITIVE ANXIETY, AND PERFORMANCE OF COLLEGIATE BASEBALL AND SOFTBALL BATTERS

By

Richard Ray Albrecht

A THESIS

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ABSTRACT

RELATIONSHIPS AMONG A SPORT-SPECIFIC MEASURE OF ATTENTIONAL STYLE, COMPETITIVE ANXIETY, AND PERFORMANCE OF COLLEGIATE BASEBALL AND SOFTBALL BATTERS

By

Richard Ray Albrecht

The Test of Attentional and Interpersonal Style (TAIS) was developed as an objective measure by which an individual's attentional predisposition could be identified and used to predict performance on a variety of tasks. However, the reliability and validity of the TAIS, when applied to sport settings, has yet to be fully established.

The present study had three purposes: (a) to construct a baseball/softball batting specific (B-TAIS) version of all TAIS attentional subscales, (b) to compare the reliability of the TAIS and B-TAIS, and (c) to compare the validity of the TAIS and B-TAIS by examining relationships between these two measures of attentional style, competitive anxiety and batting performance. The TAIS, B-TAIS and competitive trait anxiety surveys were administered to 29 collegiate baseball and softball players.

The B-TAIS demonstrated slightly higher test-retest reliability than the TAIS on five of the six attentional subscales and was higher than the TAIS in internal consistency on all subscales. Batting performance was positively related to all B-TAIS subscales assumed to assess "effective" attentional deployment and negatively related to all "ineffective" attentional subscales. In addition, significant positive correlations existed between B-TAIS scores on the ineffective attentional subscales and competitive trait anxiety levels. None of these relationships, however, were found with the more general TAIS.

To Karen

ACKNOWLEDGMENTS

While I regret that it is impossible for me to identify all those who have directly and indirectly assisted me in this project, the contributions of a select few must be acknowledged. Another regret I have is that in such a limited space, it becomes equally impossible to convey, even to those being recognized, my true feelings of appreciation.

First, I would like to sincerely thank my committee chairperson, advisor and mentor, Dr. Deborah L. Feltz, for the professional expertise and continued personal support that has enhanced not only the quality of this thesis, but my education in general. I also wish to thank my committee member and friend, Dr. Martha E. Ewing, for providing the technical advice, genuine concern and sense of humor that are essential in a project such as this. A special thanks must also be given to the third member of my committee, Michigan State University head baseball coach, Mr. Thomas W. Smith, who despite his hectic schedule, has always been more than willing to go out of his way to help me whenever possible. Finally, I must also thank Dr. Vern Seefeldt, Director of the Institute for the Study of Youth Sports located at Michigan State University, for providing me with a research assistantship which enabled me to pursue my graduate education.

On a more personal level, I would like to individually thank each member of my family. My mother, for refusing to ever give up on her son, even when he frequently gave up on himself; my father, for all those long hours after a hard day at work he spent (and still spends) teaching his son the game they now share; my sister, Julie, for showing me the importance of a higher education; and most of all, to my wife and best friend, Karen, for every reason imaginable.

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CHAPTER I

INTRODUCTION

Nature of the Problem

Statements commonly used by coaches, players and fans such as 'pay attention', or 'keep your eye on the ball', imply that the degree to which an athlete is able to focus his or her attention on task-relevant cues is at least partly responsible for the difference between success and failure in sport. While numerous examples may be cited where a lack of attention directly or indirectly contributed to the result of a sport competition, one of the best illustrations is that which occurred in the 1982 NCAA championship basketball game.

It was, without a doubt, the most important athletic event in the history of Georgetown University. For the first time since they began playing basketball at that institution, the team had worked its way into a position where they were playing the University of North Carolina for the 1982 national championship of college basketball. With just 10 seconds remaining in the game, and trailing Carolina by a single point, Georgetown was in control of the ball with an excellent opportunity to sink a single basket and win the ultimate prize in college basketball. Guard Fred Brown brought the ball down the court for his team's final shot when, suddenly, for no apparent reason, he softly flipped the ball to North Carolina's James Worthy. The game was over. In all the commotion, Brown's momentary loss of attention resulted in his mistaking Worthy for one of his own teammates. He simply handed him the ball, and with it, the national championship.

One theory that has set forth a possible explanation for this relationship between attention, arousal and performance in athletics is Nideffer's (1976a, 1981) theory of individual attentional style. According to this theory, at any particular point in time, the width of an individual's attentional focus, that is, the amount of information to which he or she is attending, ranges along a continuum between the two mutually exclusive concepts of broad and narrow. At the same time that one's attention is focused in this generally broad or narrow manner, it is being directed toward either internal thoughts and feelings, or external stimuli present in the environment. Figure 1 illustrates the way in which these two dimensions of attentional breadth and direction may be considered in combination to determine an individual's attentional focus at any given time. In addition, there is the natural tendency for an individual to spend an inordinate amount of time functioning within a relatively limited range along each of these two dimensions of attention. This personal inclination toward a standard type of attention is frequently referred to as an individual's 'preferred attentional style' (Nideffer, 1976a, 1981).

Superimposed on this foundation that everyone possesses a preferred attentional style, is the basic assumption presented in Figure 2, that various behavioral tasks make different situational demands on a performer's attention. Nideffer (1976a, 1981) has organized these situational demands into four different categories: broad-external, broad-internal, narrow-external, and narrow-internal. To the extent that one's personal attentional style 'matches,' or is congruent with the specific situational demands of a given task, the better one is likely to perform that task. An example of a task that is frequently cited in the sport science literature as requiring a narrow-external attentional focus is that of hitting a baseball (Nideffer, 1976a, 1978, 1981; Van Schoyck & Grasha, 1981). The theory of attentional style as set forth by Nideffer

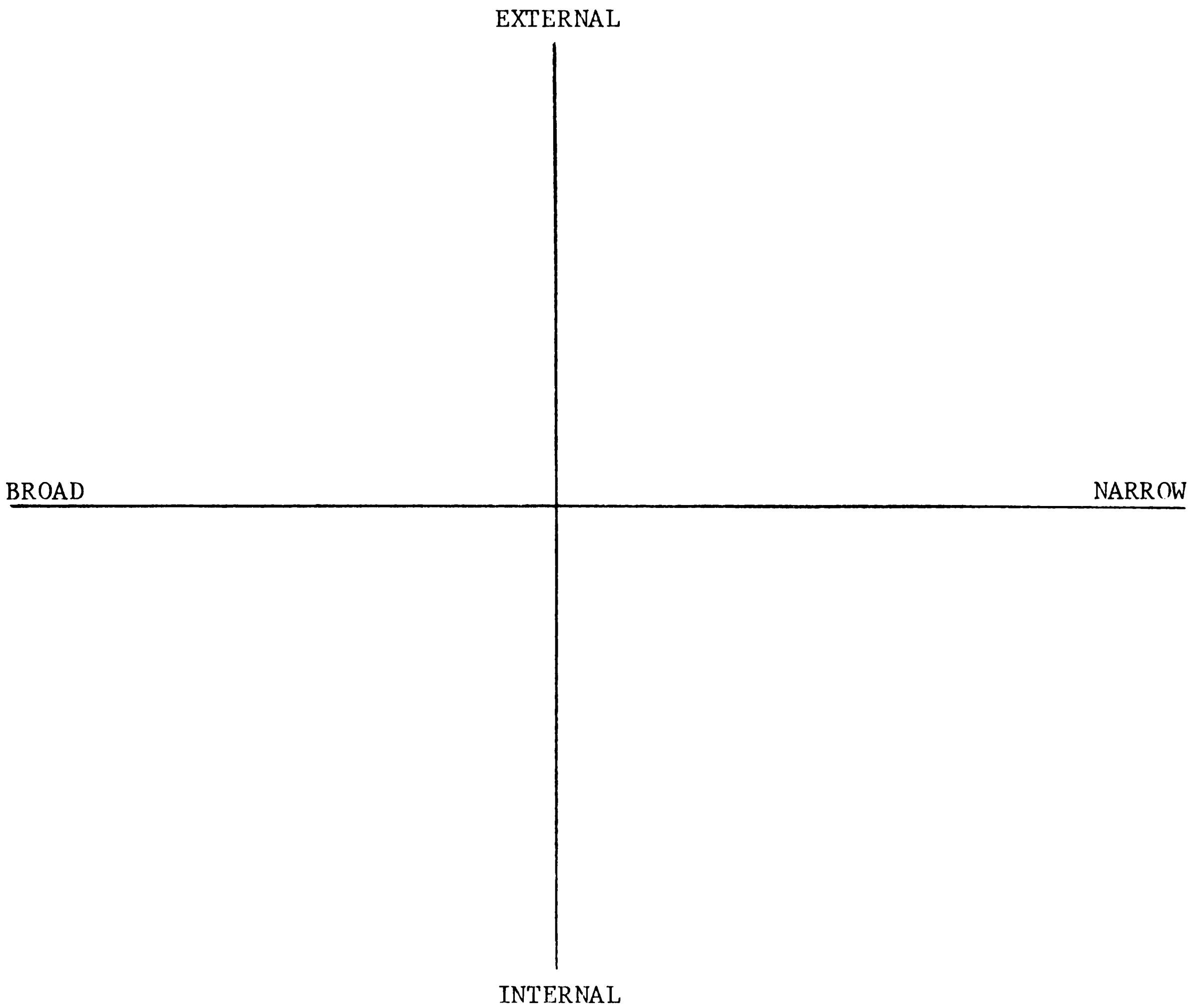


Figure 1. Nideffer's proposed two-dimensional view of individual attention.

Note. From The Inner Athlete (p. 49) by R.M. Nideffer, 1976, New York: Cromwell. Copyright 1976 by Robert M. Nideffer. Reprinted by permission.

EXTERNAL

(Broad-External) Optimal for reacting to complex, rapidly changing situations. A linebacker in football, a defensive player on a fast break, a quarterback on an option play all need to adjust game plan on the spot.	(Narrow-External) Optimal for reacting to some external cue such as the ball in tennis, baseball, volleyball. Needed for concentration in golf, shooting and any one-on-one competition.
BROAD	NARROW
(Broad-Internal) Optimal for a coach who needs to plan pre-game strategy. Necessary to be able to analyze past events in order to adjust to new situations or to different players' needs. Useful for increasing learning speed and reducing repetitive errors.	(Narrow-Internal) Optimal for becoming aware of yourself and your own tension levels. Useful in giving yourself instructions designed to either arouse or relax as the case may be. Helpful for building confidence if used in the right way. Necessary for self-discipline.

INTERNAL

Figure 2. General attentional requirements of various athletic tasks.

Note. From Test of Attentional and Interpersonal Style: An Interpreter's Manual (p. 13) by R.M. Nideffer, 1977, San Diego: Enhanced Performance Associates. Copyright 1977 by Robert M. Nideffer. Reprinted by permission.

would, therefore, predict that those baseball and softball players with a narrow-external attentional style (thereby corresponding to the situational task demands) will tend to perform the task of hitting a baseball or softball more effectively than those hitters with a relatively broad-external, broad-internal or narrow-internal preferred attentional style. The following account, set forth by Nideffer (1980) serves to illustrate the importance of maintaining a task appropriate narrow-external attentional focus while batting:

> In the second game of the world series [Reggie] Jackson was the final out. There were two runners on base and he could have been the hero; instead, he struck out. In a post-game interview, Jackson described his attention as so concentrated on the ball that he felt he could get a piece of any pitch thrown. The count went to three and two and with two outs, the runners were going to be taking off as soon as the pitcher began his delivery. Jackson forgot to 'program' that fact, and it was his downfall. His narrow concentration was broken at the wrong time by the runners leaving the base. He was startled, and his attention became focused inward for a brief second. By the time he regained his control, the ball was by him. (p. 102)

Support for Nideffer's (1976a, 1981) contention that performance is directly related to the degree of congruence which exists between an individual's attentional style and the situation's attentional task demands has come as a result of the development of his Test of Attentional and Interpersonal Style (TAIS). The TAIS consists of the following six attentional subscales: broad external attentional focus (BET); overloaded by external stimuli (OET); broad internal attentional focus (BIT); overloaded by internal stimuli (OIT); narrow attentional focus (NAR); and reduced attentional focus (RED). Table 1 lists and briefly describes each of these attentional subscales contained in the TAIS. These six subscales, however, do not represent all four categories of attentional style proposed by Nideffer. Although broad-external and broad-internal attentional styles can be measured directly by the TAIS, the NAR (narrow-attention) subscale appears to measure only an individual's ability to narrow attention in regard to external stimuli. Thus, while Nideffer's theory of attentional style proposes a fourth (narrow-internal) style of attention, the TAIS does not include a scale specifically for its measurement.

Table 1

Definition of Attentional Subscales Contained in the TAIS

BET	(Broad external attentional focus): 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	(Overloaded by external stimuli): The higher the score the more mistakes due to being confused and overloaded by environmental information.
BIT	(Broad internal attentional focus): High scorers see themselves as effectively integrating information from several different areas.
OIT	(Overloaded by internal stimuli): The higher the score, the more mistakes individuals make because they think about too many things at once.
NAR	(Narrow attentional focus): 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 attentional focus): A high score indicates individuals make mistakes because they narrow attention too much, failing to include all of the task relevant information.

Note. From "Test of Attentional and Interpersonal Style" by R.M. Nideffer, 1976, Journal of Personality and Social Psychology, 34, p. 397. Copyright 1976, American Psychological Association.

Another key element in Nideffer's theory of attentional style involves the relationship between attention and competitive arousal (Nideffer, 1980, 1981). Three major changes in attention are proposed to occur as the level of arousal increases.

First, as arousal increases, the athlete becomes 'locked into' his or her preferred attentional style. The result is an inability to rapidly shift one's attentional focus from one type to another (e.g. from narrow-internal to broad-external) even when a 'flexible' attentional focus may be appropriate for a given task.

The second modification in attention that occurs with an increase in the level of competitive arousal according to Nideffer (1980, 1981), is that one's attentional focus begins to narrow involuntarily. As a result, the amount of information, from both internal and external sources, that may be processed and evaluated is greatly reduced. Clearly, performance will suffer to the extent that this excluded information contains cues relevant to task performance.

Nideffer (1980, 1981) suggests the third, and most significant change in an individual's attentional focus under high levels of arousal is one's tendency to become more internally focused. As Nideffer describes it:

> The person becomes distracted by his own bodily feelings (beating heart, muscle tension, and so on), and his thoughts (why did the runners leave base, what's the matter with me, I might choke, and so on). As attention is directed internally, the ability to concentrate on the game deteriorates (Nideffer, 1980, p. 103).

Based on Nideffer's (1980, 1981) predictions concerning attention and arousal, it follows that the higher an athlete's level of competitive anxiety, the higher he or she should score on the reduced-attention (RED) and internal-overload (OIT) subscales of the TAIS. However, there is no research to support this prediction thus far.

Using the TAIS as a measure of individual attentional style, Nideffer (1978) found that intercollegiate swimmers who scored high on the test's attentional subscales measuring stimulus overload tended to have low and inconsistent performances in competitions; whereas, those swimmers who were able to develop what he defined as being a more task appropriate broad-internal focus of attention, were generally more consistent and achieved higher-level performances. Courtet and Landers (1978) also found that there were significant correlations between varsity rifle team members' TAIS responses and their overall performance scores, with those shooters possessing a broad-internal attentional focus achieving the most accurate performance scores. In addition, they found that among inexperienced shooters, those who scored high on the RED subscale of the TAIS, thereby indicating the tendency to make mistakes because they narrowed their attention too much, made fewer correct identifications on a peripheral task that was presented while they were shooting. Similarly, high caliber performers who had high scores on the external-overload scale (OET) made fewer correct peripheral task identifications, while experienced marksmen who scored high on the internal-overload subscale (OIT) exhibited significantly longer reaction-time latencies on the task.

While there appears to be research evidence supporting the construct validity of the TAIS, (DePalma & Nideffer, 1977; Nideffer, 1977b) the use of any measure of attentional style that does not take into consideration specific situational factors, is to some extent suspect. Interactionists such as Endler (Endler, 1973, 1975; Endler & Magnusson, 1976) would suggest that to focus solely on personality characteristics, while at the same time ignoring the situational context is to address only half of the issue because behavior of any type is a product of the complex interaction between situational variables and the unique personality traits the performer brings with him or her to the situation. The contention that all investigations into the area of individual attentional style be conducted from this interactionist perspective takes on even greater urgency when examining situations that may be to some extent different from those encountered in everyday life. For instance, an athlete may tend to become overloaded with external stimuli in some common, everyday situations, but as a result of training, or some other intervening variable, may not respond in the same manner when operating within a specific sport environment.

One investigation into athletes' attentional processes which used this situation by individual interaction paradigm was conducted by Van Schoyck & Grasha (1981). They found that by using a parallel, sport-specific (tennis) version of the TAIS, it was possible to obtain even higher test-retest and internal consistency reliability coefficients than when using the more general TAIS. In addition, the sport-specific measure of attention was a significantly better predictor of the subject's tennis match play performance. On the negative side, Van Schoyck and Grasha's decision to make the TAIS tennis-specific introduces a number of possible confounding variables. First, the sport of tennis does not contain one predominant attentional demand. It is necessary for a tennis player to constantly and rapidly shift his or her attentional focus along Nideffer's (1976a, 1976b, 1981) proposed 'direction' (internal-external) and 'breadth' (broad-narrow) dimensions of attention. Despite this importance of attentional flexibility in tennis performance, it is not directly assessed by the TAIS. Secondly, task-irrelevant environmental stimuli (e.g. crowd noises) may be artificially reduced by social etiquette associated with the game of tennis. Given this situation, scores on the TAIS subscale assumed to measure the tendency to become overloaded by external stimuli (OET) may not discriminate between effective and ineffective attentional styles. Van Schoyck and Grasha also concluded that given the specific frames of reference found within various sport settings, it may be necessary to construct separate, parallel tests of attentional style for every sport or situation to be measured.

Statement of the Problem

This study had three purposes. The first was to construct a modified, baseball/softball batting-specific (B-TAIS) version of the six attentional subscales contained in Nideffer's original TAIS. Rationale for the development of this task-specific form of the TAIS was based on the research conducted by Van Schoyck (1979) and Van Schoyck & Grasha (1981). The second purpose of this study was to assess the reliability advantages of employing a sport task-specific measure of attentional style by comparing it to a general measure of the attentional process. The third purpose was to make comparisons between the B-TAIS and the TAIS in terms of each instrument's construct validity. Of particular interest was the manner in which a batter's attentional processes varied as a function of his or her skill level and the competitive anxiety he or she experienced while batting.

Based on Nideffer's (1976a, 1981) theory of attentional style, and Van Schoyck's (Van Schoyck, 1979; Van Schoyck & Grasha, 1981) findings in regard to sport-specific tests of attentional style in athletes, the following hypotheses were set forth and empirically tested:

In terms of reliability,

(1) All B-TAIS attentional subscales should exhibit higher two-week

test-retest reliability coefficients than their corresponding TAIS subscale.

(2) All B-TAIS attentional subscales should exhibit greater internal consistency than their corresponding TAIS subscale.

In terms of validity,

(3) A moderate inter-instrument correlation ranging from .40 to .60 should exist between the TAIS and the B-TAIS.

(4) Scores on the B-TAIS and TAIS subscales measuring ineffective deployment of attention (OET, OIT, RED) should be negatively related to seasonal batting performance.

(5) Competitive trait anxiety should be positively related to the overloaded by internal stimuli (OIT) and reduced attentional focus (RED) subscale scores of both the B-TAIS and TAIS.

(6) Scores on the B-TAIS and TAIS subscale measuring the ability to effectively narrow attention (NAR) should be positively correlated with seasonal batting performance.

Delimitations

This study was conducted using an available sample of volunteer varsity intercollegiate baseball and softball players at a large Midwestern university as subjects; therefore, results are limited to this specific subject population. In addition, the task-specific version of the TAIS was designed and constructed to measure only attention within a baseball and softball batting frame of reference.

Definitions

The following definitions were established for this study:

Seasonal Contact Percentage.--The proportional frequency obtained by subtracting the number of times a batter strikes out from official at bats, and dividing the remainder by official at bats for the entire season.

Seasonal Strike-out Percentage.--The proportional frequency obtained by dividing the number of times a batter strikes out by the total number of official at bats for an entire season.

The following definitions regarding attention are taken directly from Nideffer's Test of Attentional and Interpersonal Style (1976b):

Broad External Attentional Focus.--Indicated by high scores on the BET subscale on a test of attentional style. High scores on the scale are obtained by individuals who describe themselves as being able to effectively integrate many environmental stimuli at one time.

Broad Internal Attentional Focus.--Indicated by high scores on the BIT subscale on a test of attentional style. High scores on the scale are obtained by individuals who see themselves as effectively integrating ideas and information from several different areas.

Information Processing Ability.--Indicated by high scores on the INFP subscale on a test of cognitive control. High scorers think a lot and process a great deal of information.

Narrow Attentional Focus.--Indicated by high scores on the NAR subscale on a test of attentional style. The higher the score, the more effective individuals describe themselves in terms of ability to narrow attention.

Overloaded by External Stimuli.--Indicated by high scores on the OET subscale on a test of attentional style. The higher the score, the more mistakes due to being confused and overloaded by environmental information.

Overloaded by Internal Stimuli.--Indicated by high scores on the OIT subscale on a test of attentional style. The higher the score, the more mistakes individuals make because they think about too many things at once.

Reduced Attentional Focus.--Indicated by high scores on the RED subscale on a test of attentional style. A high score indicates individuals make mistakes because they narrow attention too much, failing to include all of the task relevant information.

Limitations

This study includes all of the limitations which are characteristic of non-experimental studies (e.g., sampling and inability to control extraneous variables). In addition, environmental influences such as seasonal and daily variations in temperature and humidity, the time of day, batting order in the line-up, opposing pitcher's ability, factors of chance, and the presence of others during the performance may have differentially influenced individual performance. This study was also limited by the small sample size used to conduct reliability and validity assessments.

Assumptions

It is assumed, for the purposes of this study, that the dependent measure of batting performance as measured by seasonal contact percentage, is a true indication of batting ability. It is further assumed that the construct of attention can be adequately measured by examining only the two dimensions of attentional bandwidth (broad to narrow) and direction (internal to external).

CHAPTER II

REVIEW OF THE LITERATURE

It has been long held as 'common sense' that certain psychological, as well as physical individual differences are in some way related to athletic performance. While numerous attempts have been made to determine empirically the influence that personality factors have on athletic success, the results of these investigations must be categorized as being equivocal at best (Morgan, 1978). One individual trait which has received a great deal of research emphasis concerns the degree to which an athlete is able to focus his or her attention on stimuli that are necessary in the performance of a given athletic task. The theory of attentional style, as proposed by Nideffer (1976a, 1976b, 1981), offers a parsimonious explanation as to how athletic performance may be directly related to an individual's predisposition toward a particular style of attention. Drawing heavily upon Easterbrook's (1959) cue utilization theory, Nideffer's theory also provides an explanation for the relationship between individual anxiety levels and attentional errors.

In an attempt to objectively measure and classify individual attentional style, Nideffer (1976b) developed the Test of Attentional and Interpersonal Style (TAIS). Van Schoyck and Grasha (1981) found that by giving the TAIS a sport-specific (tennis) frame of reference, it was possible to identify even more reliable relationships between an athlete's attentional style and his or her athletic performance. The purpose of this chapter is to provide an examination of the areas of research which have led to the development and use of the TAIS and its variations in sport settings. These areas include selective attention theory, the arousal-performance relationship, perceptual narrowing and cue utilization, and the theory of individual attentional style.

Theories of Selective Attention

At any given moment, hundreds of stimuli from external and internal sources impinge upon the body's sensory receptors. In order to prevent a complete breakdown in organized behavior, resulting from an attempt to attend, process and respond to all these stimuli, the central nervous system necessarily limits the total amount of stimuli an individual can perceive and attend to at any one time (Sage, 1977).

Several attentional theories have set forth possible mechanisms that may account for an individual's ability to selectively attend to certain stimuli in preference to others. Broadbent (1957, 1958), Treisman (1960, 1964) and Deutsch and Deutsch (1963) have all proposed what are described by Kahneman (1973) as 'bottleneck models of attention.' The common feature among these models is that each assumes at some point during information processing, stimuli that are presented simultaneously undergo sequential arrangement or queuing, thereby allowing for only a single stimulus-response process to occur at any one time. Despite the fact that the study of attention has recently been dominated by theories that are based, at least in part, on the assumption of a 'bottleneck' at some point in the information processing system, (Kahneman, 1973) the precise location of such a bottleneck, and the neural mechanisms responsible, remain controversial (Moray, 1970).

An alternative to the bottleneck theories of limited attention is set forth by so-called 'capacity models of attention' (Kahneman, 1973) which attempt to explain the phenomenon of selective attention by assuming that there is a limit on the ability of an individual to engage in mental work.

According to this model, attention is a finite resource which can be allocated, and even divided between simultaneous stimuli, at the discretion of the individual. It becomes obvious, however, that given an individual's limited attentional capacity, any expenditure of attention toward one stimulus necessarily reduces the amount readily available for the internal processing of other stimuli.

While the general phenomenon of selective attention may be adequately explained through the use of such 'bottleneck' or 'capacity' models of attention, each is limited in the sense that inter-individual differences in the ability to process stimuli are not addressed. Interactionists such as Endler and his colleagues (Endler, 1973, 1975; Endler & Magnusson, 1976; Endler & Okada, 1975) would contend that any meaningful model of attention must not only take into consideration the characteristics of the stimuli within a given situation (e.g. intensity, modality, location, duration and frequency) and general principles regarding human information processing, but in addition, it must incorporate another situational factor--the specific attentional demands inherent in the task as well as an individual factor--the unique personality characteristics that the individual brings with him or her to the situation. This person by situation interaction approach is particularly important when attempting to understand the role attention plays in the performance of complex athletic and motor skills.

The Arousal-Performance Relationship

The inverted-U hypothesis. A frequently observed phenomenon in the field of sport psychology concerns the relationship that exists between an athlete's level of arousal during competition, and the degree to which this arousal influences the quality of his or her performance (Landers, 1978). The term 'arousal' in this context is generally used as a reference to behavior solely along an intensity dimension which may range from deep sleep to intense excitement (Duffy, 1957). An explanation that has greatly assisted in the understanding of this arousal-performance relationship is commonly referred to as the 'Yerkes-Dodson Law' or 'inverted-U hypothesis'. Originally formulated on the basis of early research in the area of animal discrimination learning, the inverted-U hypothesis describes the findings of Yerkes and Dodson (1908) that when the intensity of shocks administered to mice was systematically increased, learning on a stimulus discrimination task was facilitated up to a point where maximum learning occurred. However, further increases in shock intensity beyond this 'optimal point' resulted in an actual deterioration in learning. Simply stated, the inverted-U function is the curvilinear relationship, illustrated in Figure 3, which is found to exist between arousal and performance.

Despite the fact that the Yerkes-Dodson Law was formulated on the basis of animal research, similar results have been shown in a wide range of settings and with various subject populations. Stennett (1957), for example, found that human subjects' performance on an auditory tracking task were superior when two physiological measures of arousal--palmar skin conductance and electromyograph recordings--indicated that the subjects were experiencing a 'moderate' level of arousal. On the other hand, he also found that tracking performance tended to be inferior when associated with either very low or very high levels of physiologically measured arousal. The inverted-U relationship between arousal and performance has similarly been shown to exist in the area of motor performance. In a study involving a motor steadiness task, Martens and Landers (1970) used the threat of electrical shock to induce arousal in preadolescent males, and found that optimal performance coincided with subjects experiencing

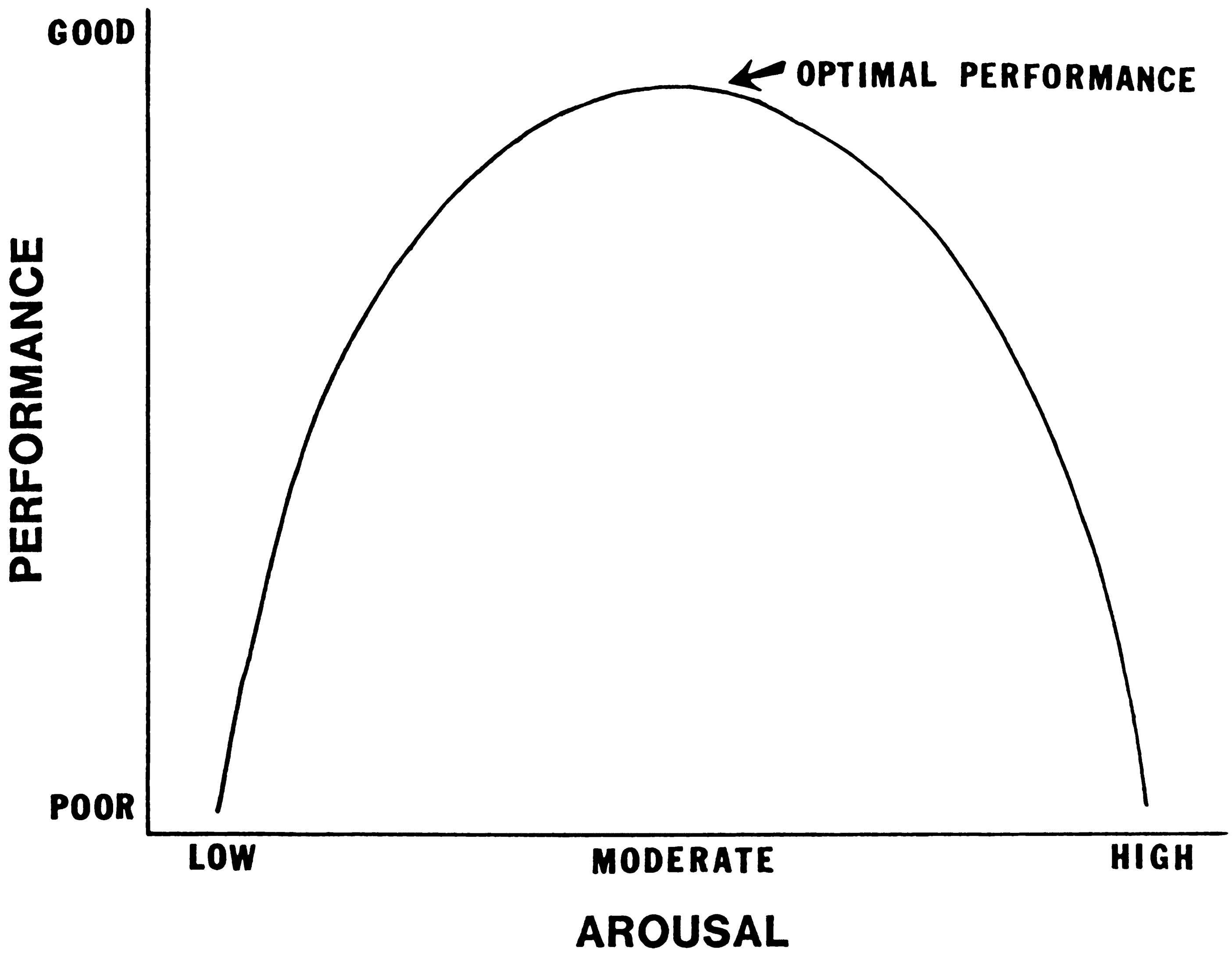


Figure 3. Arousal-performance relationship.

'intermediate' levels of physiologically measured arousal. Similar results have been obtained in numerous investigations involving self-reported measures of arousal and performance in such sports as parachute jumping (Fenz & Epstein, 1967), and high school basketball (Klavora, 1977).

Given the number of studies that have provided empirical support for the inverted-U hypothesis, Martens (1974), in an early review of arousal and motor performance, concluded that the inverted-U hypothesis appeared to be favored. Similarly, Landers (1978), despite setting forth several factors that may mediate the inverted-U relationship such as individual susceptibility to arousal, task competence, or the general complexity of the task, stated that 'the inverted-U hypothesis seems to generalize across field and experimental situations.'

Landers (1978) also pointed out that several intensity-related terms such as 'activation', 'tension', 'stress', and 'drive' are frequently used interchangeably with the previously defined concept of arousal. Still other intensity-related terms that are closely associated with arousal are trait (general) and state (situational) anxiety. While anxiety incorporates the intensity dimension found in the term 'arousal' it also focuses on the directional component of behavior. Arousal, according to Martens and Landers (1970), being unidimensional and only concerned with intensity, may be viewed as having either a positive or negative influence on behavior, whereas anxiety is seen only as having negative effects. By being, for all practical purposes, synonymous with high level arousal (as stated in the inverted-U hypothesis) it is not surprising to find that high levels of anxiety have similarly been observed by many researchers to be inversely related to the quality of athletic performance. Nideffer (1978) for example, found that swimmers who scored high in state anxiety tended to turn in relatively poor and inconsistent performances in practice as well as during competitions. Similar decrements in performance have been found to accompany high levels of anxiety in a variety of complex motor skills such as juggling (Hollingsworth, 1975), bowling (Hall & Purvis, 1978) and collegiate football (Langer, 1966). (See Martens, 1971, for a comprehensive review of this area.)

Perceptual narrowing and cue utilization. Once it was generally accepted that a curvilinear relationship existed between arousal and performance, numerous studies were designed to provide an explanation for this relationship. One particular area of investigation that received considerable attention employed dual task paradigms in order to determine the extent to which environmental stimuli were utilized under varying degrees of arousal (Bahrick, Fitts & Rankin, 1952; Bursill, 1958; Bruner, Matter & Papanck, 1955). Studies of this type demonstrated that improvement on a primary or central task along with the simultaneous impairment of performance on a peripheral or secondary task tends to accompany increases in arousal.

In a series of related experiments, Callaway and Thompson (1953) found that increased sympathetic activity brought about by a variety of physiological stressors such as the submersion of a limb in ice water, or the inhalation of amyl nitrite resulted in consistent decreases in the apparent size of distant objects relative to a nearer object. Callaway and Thompson also demonstrated through their studies that these findings were not due to local opthalmic effects, but were instead explained by the investigators to be 'on the basis of decreased size consistency, which could result from a narrowed awareness, with reduction of reaction to distant cues'. (p. 453)

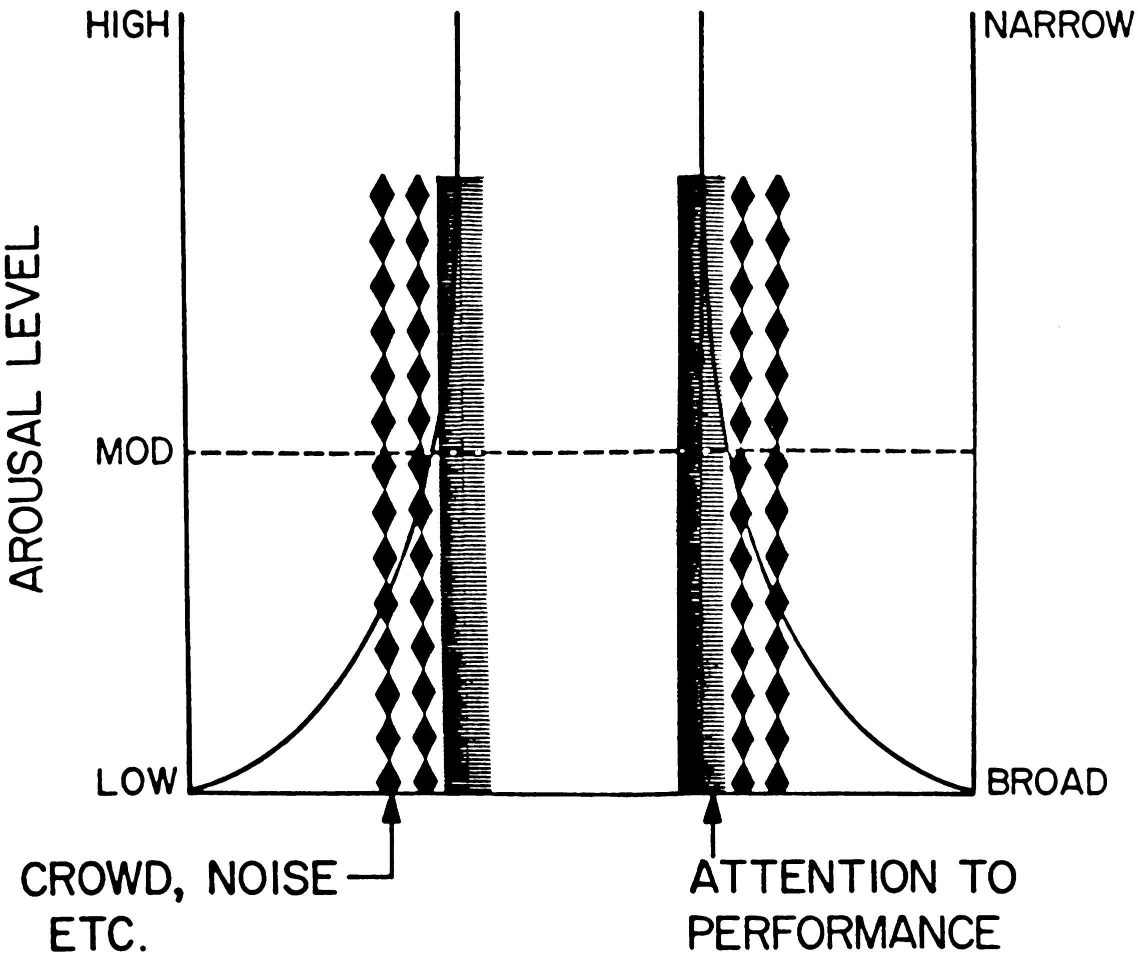
Drawing heavily upon these early findings that increased arousal tends to shrink or reduce the field of cue utilization, Easterbrook (1959) developed a theory of performance based on an individual's range of cue utilization. This theory also attempted to reconcile the apparently contradictory evidence concerning the relationship between arousal and performance--that at low levels, increases in arousal tends to be associated with a facilitation of performance, yet at higher levels, it generally has the opposite, disruptive effect. In this context, Easterbrook defined 'range of cue utilization' as being the total number of environmental cues available in a given situation that an organism is able to detect, attend to, or react to by making a response. The essence of the cue utilization hypothesis according to Easterbrook is as follows:

> It is proposed that emotional arousal acts consistently to reduce the range of cues that an organism uses, and that the reduction in range of cue utilization influences action in ways that are either organizing or disorganizing depending on the behavior concerned. (p.183)

The theory of cue utilization as set forth by Easterbrook (1959) not only assumes that a reduction or shrinkage of the perceptual field takes place as arousal levels increase. In addition, it is hypothesized that as this range of cue utilization is reduced, task-irrelevant cues are excluded from perception before task-relevant cues, and that the simultaneous use of task-irrelevant and task-relevant cues tends to disrupt response effectiveness. Furthermore, the complexity of different tasks will vary on the basis of the number of perceptual cues that must be utilized simultaneously in order to achieve a desired behavior. In general, the more cues that must be utilized, the more complex the task.

Given these basic assumptions, the observed performance on a given task may be attributed, at least in part, to the congruence or 'matching' that takes place between the perceptual demands inherent in that task and the performer's range of cue utilization. Figure 4 illustrates how the reduction in the size of the perceptual field may relate to task performance. If an individual's range of cue utilization is relatively broad in comparison to the actual perceptual demands of the task, response effectiveness is reduced due to the simultaneous use of both task-relevant and task-irrelevant cues that are contained in the performer's relatively broad perceptual field. At the other extreme, it is possible that one's perceptual field may become narrowed to such an extent that it excludes not only those task-irrelevant stimuli in the environment, but some task-relevant cues as well. When this situation occurs, performance again suffers, but this time the decrement may be attributed to the loss of task-relevant cues within the perceptual field.

Easterbrook (1959) hypothesized that the degree of cue utilization therefore may be used as a possible explanation for the curvilinear relationship that has been found to exist between arousal and performance (Yerkes & Dodson, 1908). Figure 4 also illustrates how the concept of cue utilization may be modified by arousal to produce the so-called inverted-U effect. At a very low level of arousal, the perceptual field is so broad that it includes virtually all environmental cues available to the performer. At this point, there is little discrimination between those cues that are relevant to the performance of the task at hand, and those that are totally irrelevant. Attention is, therefore, divided between both relevant and irrelevant cues in accordance with theories of limited attention as described in capacity or bottle neck models of attention



<u>Figure 4</u>. Relationship between arousal and perceptual narrowing.

(Kahneman, 1973) resulting in a generally poor performance. As arousal increases to a moderate level, there is a gradual narrowing of the perceptual field, with only secondary, or task-irrelevant cues initially being excluded from the performer's range of cue utilization. At the same time, primary, or task-relevant cues are retained within the perceptual field, thereby offering an explanation for the optimal performance generally observed at this intermediate or moderate level of arousal. However, as arousal is further increased beyond this 'moderate' level, the range of cues being utilized continues to shrink to the point that even those cues that are relevant to the central task become excluded from the performer's perceptual field. With this failure to incorporate all necessary task-related cues, there is logically a corresponding decrease in overall task performance. Ester (1977) in his review of the arousal-performance literature, stated that Easterbrook's theory of cue utilization has been tested directly and indirectly and under a variety of cognitive and motor performance conditions by almost as many methods as there are investigators.

Preliminary experimental evidence (Dirkin & Hancock, 1983) has indicated that relevant environmental cues may be monitored by the performer under stressful conditions even when these cues are located in the visual periphery. This 'refocusing' of primary task-relevant cues can be accomplished by varying one's attentional strategy. The significance of this finding is that it supports the contention that the cue reduction which is observed to occur with increased arousal is not simply a function of the location of sensory input in the visual field (i.e. central vs. peripheral) but instead, is the result of individual attentional mechanisms.

Theory of Individual Attentional Style

Nideffer (1976a, 1976b, 1981), using Easterbrook's (1959) cue utilization theory, Wachtel's (1967) review of the literature in regard to the uses of the concepts of broad and narrow attention, and Hielburn's (1972) research indicating individual perceptual style differences in internal and external scanning ability as his foundation, has developed a parsomonious theory of individual attentional style and human performance. According to this theory, at any single moment, an individual's attentional focus may be described in terms of its position along the two dimensions of attentional breadth and direction. Breadth of attention refers to the amount of information to which an individual is attending, and ranges along a continuum from narrow to broad. At the same time that attention is focused in this generally broad or narrow manner, it is also primarily directed toward either internal thoughts and feelings, or external sources of stimuli. In Chapter I, Figure 1 illustrated how the two dimensions of attentional breadth and direction may be simultaneously considered to determine an individual's attentional focus at any particular time.

According to Nideffer (1976a, 1976b, 1981) while most individuals possess, to some degree, the ability to shift their attentional focus along each of these continua, there is a natural tendency to spend an inordinate amount of time functioning within a relatively limited range along each of these two dimensions of attention. As a result of this personal inclination toward a standard type of attention, it becomes theoretically possible to categorize an individual's personal attentional 'style' as being predominantly (a) broad-external, (b) broad-internal, (c) narrow-external or (d) narrow-internal.

Superimposed on this foundation that everyone possesses a preferred individual attentional 'style', is the basic assumption that various behavioral tasks place different situation-specific demands on a performer's attention. Table 2 contains a list of athletic situations along with the attentional demands Nideffer (1976a) believes are inherent in each of these tasks.

The level of arousal experienced by an individual at any particular moment also has a considerable impact on his or her focus of attention. Nideffer (1980, 1981) proposed three major changes in attention that result from increases in arousal. First, as arousal increases, there is an inability to rapidly shift one's attentional focus from one type to another (e.g. from narrow-internal to broad-external). This lack of attentional flexibility typically results in a rigid adherence to one's predisposed attentional style, even though it may not match the attentional demands of a given situation. A second way in which attention is modified by arousal is in accordance with Easterbrook's (1959) cue utilization theory. As arousal level increases, there is a corresponding involuntary narrowing of one's attentional width. As a result of this perceptual narrowing, the number of informational cues, from both internal and external sources, that are available to be processed and utilized are greatly reduced. To the extent that task-relevant cues are eliminated in this manner from the attentional field, the quality of a performance will necessarily suffer.

At first thought, this involuntary narrowing of attention may actually seem advantageous in those particular sport situations that require a narrow attentional focus such as hitting a baseball or softball as it would tend to place irrelevant stimuli beyond the perception of the hitter. This apparent paradox may be explained by Korchin's (1964) observation that

Table 2

Attentional Demands of Selected Athletic Tasks

	Broad-External	Narrow-Internal	Narrow-External	Broad-Internal
BASEBALL				
1. Hitting			Yes	
2. Pitching				
a. Pitch selection				Yes
b. Delivery			Yes	
3. Fielding	Yes			
4. Stealing	Yes		Yes	
GOLF				
1. Club selection	Yes	Yes		
2. Execution of the shot			Yes	
SWIMMING				
1. Sprints			Yes	
2. Middle distance events		Yes	Yes	
3. Distance events		Yes	Yes	
TENNIS				
1. Pregame strategy				Yes
2. Execution of shot			Yes	
COMMON COMPETITIVE SITUATIONS ACROSS SPORTS				
1. Planning pre-game strategy				Yes
2. Psyching yourself up		Yes		
3. Learning a new move		Yes	Yes	
4. Lowering fear (arousal)	Yes		Yes	

Note: From The Inner Athlete (p. 62-63) by R.M. Nideffer, 1976, New York: Cromwell. Copyright 1976 by Robert M. Nideffer. Adapted by permission.

at moderate levels of anxiety there is a narrowing of the attentional field, but at more extreme levels, there is also a general breakdown of organized behavior and attention becomes more diffuse. In Korchin's words, The anxious individual becomes unable to concentrate, becomes hyper-responsive, and becomes hyper-distractable.

Nideffer (1980, 1981) has further suggested that a third significant change in an individual's attentional focus under high levels of arousal is one's tendency to become more internally focused. As attention is directed internally, the individual becomes preoccupied with his or her own thoughts and bodily sensations. This is of particular relevance in the area of sport anxiety since many sport performances require primary attention be focused on external as opposed to internal stimuli.

Test of Attentional and Interpersonal Style.

Scientific criticism of previously existing personality assessment instruments and the desire to objectively measure and categorize individual attentional styles, led Nideffer (1976b) to develop a self-report Test of Attentional and Interpersonal Style (TAIS). The following are the formally stated goals of the TAIS:

> (1) to provide a conceptual base for understanding what abilities are necessary to be effective in any clearly specified job or performance situation; (2) to measure those abilities which then allow predictions to be made about the probable effectiveness of the respondent, and; (3) to be used as a basis for developing and assigning treatment, and/or training programs based on an individual's current level of functioning. (Nideffer, 1977b, p. 1)

By meeting the above objectives, Nideffer (1977b) suggested that results from the TAIS may be used in (a) selecting and screening employees, (b) counseling employees, (c) improving inter-personal communications and (d) developing and designing training and treatment programs.

The TAIS was constructed using 302 undergraduate students as a norming population. On the basis of an item analysis procedure, 144 TAIS items were placed into 17 rationally defined subscales designed to measure and provide information concerning the respondent's ability to control various factors believed to be important in effective performances across diverse life situations. (See Appendix A for a complete list of TAIS subscales.) Subjects were asked to rate each TAIS item on a 5-point scale ranging from 'never' to 'all the time' in terms of the frequency with which it occurs.

Nine of the 17 subscales purport to describe how an individual is most likely to behave in a variety of interpersonal situations, and two are designed to provide information concerning one's ability to exert behavioral and cognitive control. The six remaining TAIS subscales have been developed to provide an indication of the individual's tendency to adopt either an appropriate or inappropriate attentional focus. High scores on the broad-external (BET), broad-internal (BIT) and narrow-attention (NAR) subscales were thought to reflect effective deployment of attention, while high scores on the corresponding overload-external (OET), overload-internal (OIT) and reduced-attention (RED) subscales were considered indications of an individual's tendency toward an ineffective attentional focus (Nideffer, 1976a, 1981).

Decisions regarding the usefulness of any test must be made on the basis of that instrument's demonstrated ability to measure the phenomena it purports to measure (test validity) and evidence that the test produces relatively consistent results across time (test stability or reliability). Because validity and reliability are of such importance in determining the appropriateness of a test, it is necessary to examine those studies that have been designed to assess these criteria of the TAIS.

Reliability. The need to establish test-retest reliability stems not only from a desire to demonstrate the degree to which a test produces stable results across time, but also because reliability is the foundation upon which test validity rests. It is theoretically possible to construct an instrument that produces very stable results, yet does not measure the phenomenon it was originally intended to measure. On the other hand, test reliability is a prerequisite for test validity. If it is not possible to obtain relatively stable measurements concerning a particular phenomenon, one cannot be confident that the instrument is capable of accurate measurement.

Considering the critical nature of test reliability, it is somewhat surprising to note that Nideffer (1976b, 1977b, 1981) has provided only incomplete and general information regarding original test-retest reliability data collected on the TAIS. Nideffer's only reference to TAIS reliability was a study conducted by Wolfe and Nideffer (1974) who found that by testing 90 undergraduate students at a two-week interval, the 17 subscales contained in the TAIS produced a median test-retest reliability coefficient of .83, and ranged from a low of .60 on the 'obsessive' scale to a high of .93 on the 'physical orientation' subscale. Since no mention is made concerning the reliability of any attentional subscales ('obsessive' and 'physical orientation' are both categorized as interpersonal subscales) it can only be safely assumed that the two-week test-retest reliability coefficients of the six attentional subscales were somewhere in the rather broad range of .60 to .93.

Although Nideffer (1976a, 1977b, 1981) specifically suggested the use of the TAIS with athletes, he offered no evidence of its reliability in measuring the attentional or interpersonal styles of this particular population. Van Schoyck and Grasha (1981), as part of their broader investigation into the measurement of athletes' attentional styles, administered the TAIS to 45 male and 45 female 'club' tennis players. To assess the test-retest reliability of the six attentional subscales of the TAIS, 41 of the 90 subjects completed the instrument a second time. While the investigators' original intent was to have a two-week test-retest interval in order to remain consistent with the previous work of Wolfe and Nideffer (1974), procedural difficulties resulted in the actual test-retest interval to range from ten to 101 days with a mean interval period of 33.8 days (SD = 21.9). Pearson product-moment correlation coefficients for the six attentional subscales were BET=.84, OET=.79, BIT=.84, OIT=.80, NAR=.67, RED=.48. In addition to the test-retest reliability, Van Schoyck and Grasha also used data collected on all 90 subjects to examine the internal consistency reliability of the attentional subscales (BET=.46, OET=.77, BIT=.70, OIT=.69, NAR=.73, RED=.44, INFP=.62).

The stability and internal consistency of the TAIS were also examined by Bietel, Buckles and Richards (1984) using 280 university students who possessed intermediate to advanced sport proficiency in bowling, racketball, running, soccer, swimming, tennis or wrestling. Reliability was evaluated by means of a two-week test-retest as well as through a split-halves technique. In addition, the internal consistency of each TAIS subscale was evaluated. The results of these reliability procedures regarding the six TAIS attentional subscales are presented in Table 3.

Validity. While relatively few studies have been specifically designed to examine TAIS reliability, the attractiveness of having a short, easily administered, accurate measure of an individual's attentional style has resulted in numerous attempts to assess the validity of the TAIS.

Table 3

TAIS Attentional Subscale Reliability Results for Sport Oriented College Students

Subscale	Test-retest	Split-halves	Internal Consistency
BET	.55	.71	.23
OET	.80	.86	.73
BIT	.82	.91	.13
OIT	.77	.86	.61
NAR	.59	.74	.62
RED	.62	.76	.67

Note. From P.A. Beitel, T.M. Buckles, and J.A. Richards, Reliability and internal consistency for sport oriented groups. Paper presented at the 1984 Olympic Scientific Congress, Eugene, OR.

A joint committee of the American Psychological Association, the American Educational Research Association and the National Counsel on Measurement in Education (American Psychological Association, 1974) identified the following three distinct types of validity measures that may be collected which together will enable inferences to be made regarding a particular test's overall validity: (a) construct validity, (b) content validity and (c) the criterion-related validities (predictive and concurrent validity). The TAIS has been assessed most frequently in terms of its criterion-related validities.

Unlike other types of validity, content validity cannot be expressed in terms of correlation coefficients. Instead, as Borg & Gall (1979) point out:

> Content validity is determined by systematically conducting a set of operations such as defining in precise terms the specific content universe to be sampled, specifying objectives, and describing how the content universe will be sampled to develop test items (p. 212).

The basis of TAIS content validity, therefore, must be found in Nideffer's (1976a, 1981) elaborate theory of individual attentional style and the procedures employed in the TAIS development (Nideffer, 1976b).

Borg and Gall's (1979) definition of construct validity is the extent to which a test measures a hypothetical construct. Construct validity of the TAIS has been examined, in a series of studies conducted by Nideffer and his colleagues (McPherson & Nideffer, cited in Nideffer, 1976b); Nideffer & Weins, 1975; Wolfe & Nideffer, 1974) correlating TAIS scores with scores on existing psychological instruments.

Due to the number of studies that have found results supporting Easterbrook's (1959) cue utilization theory, it is generally assumed that one's attentional field tends to undergo an involuntary narrowing as individual arousal levels increase. Particularly relevant in regard to the construct validity of the TAIS, therefore, are those investigations that have examined the relationships which exist between scores on the six TAIS attentional subscales (BET, OET, BIT, OIT, NAR, RED) and various measures of individual anxiety.

Table 4 presents a summary of three separate studies which have correlated TAIS attentional subscales with scores on the State-Trait Anxiety Index (Speilberger, Gorsuch & Lushene, 1970) and the Taylor Manifest Anxiety Scale (Taylor, 1956). Nideffer and Weins (1975) correlated the TAIS scores of 60 police applicants with their scores on several psychological instruments including the Taylor Manifest Anxiety Scale (TMAS), and found the applicants' anxiety levels to be significantly and positively correlated with those TAIS subscales measuring 'ineffective' attention (OET, OIT, RED). In contrast to these findings, anxiety scores were negatively related to all TAIS subscales measuring 'effective' attentional deployment. Although the relationships between anxiety and broad-internal (BIT) and narrow attention (NAR) did not reach statistical significance, the inverse relationship between broad-external attention (BET) and anxiety was found to be significant at the .01 level (See Table 4). Similar results were found by Wolfe and Nideffer (1974) and McPherson and Nideffer (cited in Nideffer, 1976b) when attentional subscale scores of college students were correlated with measures of trait and state anxiety contained in the State-Trait Anxiety Index (See Table 4).

Table 4

Previously Reported Findings Between TAIS Subscales and Self-Reported Anxiety

	Female College Students[a]		Police Applicants[b]	Introductory Psychology Students[c]	
Subscale	STAI STATE	STAI TRAIT	TMAS	STAI STATE	STAI TRAIT
BET	.09	-.17	-.38**	-.13	-.21
OET	.05	.48*	.41**	.33**	.31**
BIT	-.49*	-.60*	-.15	-.19	-.29**
OIT	.03	.43*	.58**	.38**	.39**
NAR	.20	-.40	-.22	-.20	-.26*
RED	.38	.53*	.35**	.55**	.54**
INFP	-.27	-.31	-.14	-.20	-.28**

Note. STAI = State-Trait Anxeity Inventory (Spielberger, Gorsuch & Lushene, 1970). TMAS = Taylor Manifest Anxiety Scale (Taylor, 1956).

[a] *N* = 28 (McPherson & Nideffer, cited in Nideffer, 1976b); [b] *N* = 60 (Nideffer & Wiens, (1975); [c] *N* = 83 (Wolfe & Nideffer, 1974).

$^{*}p < .05$. $^{**}p < .01$.

Turner and Gilliland (1977) conducted a study designed to compare college students' TAIS scores with their performance on two measures of attentional focus. Ten male and 46 female introductory social science students completed the 52 items contained in the six TAIS attentional subscales and were then administered the Digit Span and Block Design subtests of the Wechsler Adult Intelligence Scale (WAIS). The investigators hypothesized that the Digit Span subtest would be significantly and positively correlated with scores on the narrow-attention (NAR) subscale while performance on the Block Design subtest would require both broad-internal (BIT) and broad-external (BET) forms of attention. Four scores were derived from the WAIS subtests: (a) Digit Span forward score, (b) Digit Span backward score, (c) total Digit Span score and (d) Block Design score, which were then correlated with the individuals' scores on the six TAIS attentional subscales. Of the 24 correlations (four WAIS scores by six TAIS subscale scores) only one was found to be statistically significant (BIT with Block Design, $r = .29$, $p < .05$). Nideffer (1977a), however, contended that Turner and Gilliland's conclusions that the attentional subscales included in the TAIS lack construct validity was unwarranted because the use of college students as subjects resulted in a highly skewed distribution.

It should be obvious from the preceding discussion that content and construct validities are essential elements of any test. Despite their importance, neither can be considered a substitute for measures of criterion-related validity (APA, 1974). The two types of criterion-related validity--predictive and concurrent validity--are closely related concepts in the sense that both are measures of the degree to which inferences from an individual's test score can be made regarding his or her probable standing on a second variable or criterion. The subtle difference between these two types of validity is clearly stated in the American Psychological Association's Standards for Educational and Psychological Tests:

> Statements of predictive validity indicate the extent to which an individual's future [italic added] level on the criterion can be predicted from a knowledge of prior test performance; statements of concurrent validity indicate the extent to which the test may be used to estimate an individual's present [italic added] standing on the criterion. (American Psychological Association, 1974, p. 26).

In the area of sport research, criterion-related validities are of particular relevance because it is frequently desirable to draw inferences about athletic performance on the basis of individual test results. Not surprisingly, the wish to relate test scores with performance has led the TAIS to be most frequently examined in terms of its criterion-related validity. While investigations pertaining to the criterion-related validity of the TAIS are broadly reported as indications of the test's predictive validity, (Nideffer, 1976b; Reis & Bird, 1982; Vallerand, 1983) the lack of an appropriate time interval between the TAIS administration and assessment on the established criterion variable would be more accurately described as a measure of TAIS concurrent validity.

Several studies have been conducted to determine the extent to which TAIS attentional subscale scores may be used to discriminate between high, medium and low levels of athletic performance. The rationale for such investigation is grounded firmly on Nideffer's (1977b) contention that TAIS scores may be used as a means of measuring attentional abilities which allow predictions to be made regarding the probable effectiveness of a respondent, and as a basis for developing and assigning treatment and/or training programs.

Van Schoyck (Van Schoyck, 1979; Van Schoyck & Grasha, 1981) examined the relationship between scores on the six attentional subscales of the TAIS and the performance of "club" tennis players. The results of this study indicated it was not possible to differentiate between beginning, intermediate or advanced skill levels in tennis solely on the basis of TAIS attentional subscale scores.

In a similar vein, a series of studies undertaken at Boston University (reported in Zaichkowsky, 1984) were designed to determine the degree to which the TAIS could accurately discriminate between successful and less successful athletes. In one study using 140 female college swimmers, divers and controls, Jackson (1980) tested the hypothesis that the TAIS could be used to discriminate between low, medium and high athletic performers. A discriminate function analysis revealed that the reduced-attention (RED) subscale did contribute to separating poor from medium and high level swimming performances, and the external-overload (OET) scale correctly identified 70% of the divers into groups of high and low performers. In addition, athletes (both swimmers and divers) were found to have group means more toward the 'effective' end of the attentional continuum compared to the controls. Despite the fact that the TAIS was found to discriminte to some extent on the basis of athletic success, the author concluded that the TAIS was unable to identify predictable attentional strengths and weaknesses.

In a second, closely related study, Aronson (1981) examined whether the TAIS was capable of differentiating between elite and non-elite male collegiate gymnasts. While a discriminate function analysis revealed the entire TAIS (all 17 subscales) was able to discriminate between elite and non-elite gymnasts, none of the six attentional style subscales contributed to this discrimination.

Vallerand (1983) examined the relationship between TAIS attentional subscales and a specific component of sport performance--decision making ability. He hypothesized that collegiate basketball players who possessed good sport-related decision making skills would score relatively higher on the BET, BIT, NAR and INFP (effective) subscales of the TAIS, and lower than poor or average decision makers on the OET, OIT and RED (ineffective) subscales. Results, however, showed no significant differences existed among the decision making groups in terms of TAIS subscale scores.

Reis and Bird (1982) conduced a two-part investigation to determine whether or not TAIS attentional subscale scores could predict performance on a task consisting of the processing of peripheral cues. In the first study, 78 male and female college students were administered the TAIS. Scores attained on the broad-external (BET) and reduced-attention (RED) subscales were used to classify the subjects as either being 'broad' or 'narrow' attenders. It was hypothesized that those subjects possessing a broad attentional style would be superior to those classified as having a narrow attentional focus at processing peripheral cues while focusing on a primary, tracking task. Results indicated that there was no significant difference between the scores of broad and narrow attenders in regard to the time on target (primary task) but reaction times to a peripheral light stimulus was found to be significantly faster for those subjects classified as having a broad attentional focus of attention.

In the second investigation, 10 broad attenders and 10 narrow attenders included in the first study were given false feedback in regard to their performance on a pursuit rotor task. Half of the subjects received false positive feedback, the remainder, false negative feedback. An attentional style by feedback interaction was found to exist, with broad attenders receiving positive feedback being superior in peripheral cue processing.

Despite a small sample size (N = 10) Nettleton (1982) has also provided at least partial support for the concurrent validity of the TAIS. In this investigation, the relationship between absolute error scores on a coincident anticipation timing task and scores on the narrow-attention (NAR) subscale of the TAIS were statistically significant when compared by means of a Spearman rank-order coefficient.

Sport-Specific Measures of Attentional Style

The ability to predict athletic performance on the basis of personality traits has been shown to improve if the assessment instrument is given a situation-specific frame of reference (Cox, 1985). As Nideffer (1976b) put it:

> The arguments thus far reviewed, lend to the position that assessment devices should be as situation-specific as possible (e.g. questions should be phrased to reflect actual behavior in particular settings). (p. 395)

In an effort to similarly improve performance predictions based on surveys of individual attentional style, several sport-specific measures of attention have been developed.

Etzel's (1979) Riflery Attention Questionnaire (RAQ), a 25-item self-report instrument, was developed to assess the validity of a multidimensional, sport-specific model of attention. Five subscales measuring attentional (a) capacity, (b) duration, (c) flexibility, (d) intensivity, and (e) selectivity are contained in the survey. Despite the promise of improved predictive validity, Etzel's own research, including a factor analysis performed on data collected on 71 elite rifle shooters, did not support the existence of the five independent attentional components assumed to be measured by the RAQ. In addition, a discriminant function analysis revealed no significant RAQ subscale differences between the upper and lower 17% of the sample subjects.

Another, somewhat different approach in the development of sport-specific measures of attentional style has been to modify the original TAIS (Nideffer, 1976b) by giving each attentional subscale items a particular sport reference. The first sport-specific attentional instrument constructed in this manner was Van Schoyck's (Van Schoyck, 1979; Van Schoyck & Grasha, 1981) tennis-specific T-TAIS. Subsequently, a similar procedure was used by Mann (1984) in the development of a golf-specific test of attentional style (G-TAS).

By comparing the tennis-specific T-TAIS to its parent measure, Van Schoyck (Van Schoyck, 1979; Van Schoyck & Grasha, 1981) found that giving each attentional item a sport-specific frame of reference improved the test's overall reliability and validity. Higher test-retest reliability correlation coefficients were demonstrated by the T-TAIS on all six attentional subscales. Similarly, with the exception of the reduced-attention (RED) subscale, all sport-specific subscales exhibited higher internal consistency (alpha reliability) coefficients when compared to the general measure. In regard to criterion-related validity, the tennis-specific measure of attentional style was found to discriminate between skill levels of 'club' tennis players better than the TAIS. However, Van Schoyck also examined item-subscale correlations and interscale correlations, and found that giving the TAIS a tennis-specific frame of reference resulted in more intersubscale dependence.

Although Mann (1984) did not directly compare the reliability and validity of her golf-specific G-TAS to the original TAIS, a G-TAS two-week test-retest reliability coefficient of .86 suggests that a specific frame of reference may contribute to a more precise measurement of athletic attentional style. In the same investigation, however, a discriminate function analysis revealed no significant differences between the G-TAS scores of the more and less successful female professional golfers.

While these two investigations illustrate the potential advantages of sport-specific measures of attentional style, the research designs employed leave several important questions unanswered. For example, despite the importance of anxiety in Nideffer's (1980, 1981) theory of attentional style, neither study examined the relationships between anxiety, attention and performance. In addition, the sport of tennis does not contain one dominant attentional demand and therefore does not lend itself to testing Nideffer's theoretical assumptions. Finally, both tennis and golf are surrounded by social etiquette that may reduce extraneous environmental stimuli, and alter the required attentional demand.

CHAPTER III

METHOD

Subjects

Fifteen members of the Michigan State University 1984 men's varsity intercollegiate baseball team and 14 members of the women's varsity intercollegiate softball team served as subjects in the present study. The choice of college-level athletes as participants in the study was made in order to maintain as much consistency as possible with the original work by Nideffer (1976b) in which college undergraduates were used as a norming population for the Test of Attentional and Interpersonal Style (TAIS). The selection of intercollegiate athletes as subjects was also made in an attempt to obtain a population that was not still in the learning phase of the specific task (i.e., Little League players) while at the same time, avoiding those highly skilled performers such as professional athletes, who as Lawther (1977) points out, are less subject to internal and external distractions. They have, in his view, learned successfully to block extraneous stimuli which may function as distractions through the process of negative adaptation. In addition, the selection of a young population of athletes as subjects (such as Little Leaguers) may present a problem in terms of language difficulties when administering the tests of attentional styles.[1]

Measures of Attentional Style

Each subject's individual attentional style was assessed and classified through the use of two 59-item survey instruments. The first measure consisted of the six attentional subscales (BET, OET, BIT, OIT, NAR, RED) and the cognitive control subscale (INFP) of Nideffer's (1976b)

TAIS. In addition, a baseball/softball batting specific parallel version of the TAIS which was developed specifically for the purpose of this study was also given to all subjects.

Test of Attentional and Interpersonal Style (TAIS). The original TAIS as developed by Nideffer (1976b) contains a total of 144 items grouped into 17 rationally defined attentional and interpersonal subscales. Six subscales reflect attentional processes, two reflect cognitive and behavioral control characteristics, and the remaining nine are concerned with various aspects of interpersonal style. Table 5 describes the six attentional and cognitive control subscales used in the present investigation. (See Appendix A for a complete list of all 17 TAIS subscales.)

The number of items included in each subscale varies from six (BET) to 19 (INFP), with considerable item overlap occurring among the scales as a result of single items being incorporated within two or more test subscales. The items are of a general nature, without any reference to a particular sport context. Table 6 contains examples of items included in each TAIS subscale used in the present study.

The test-retest reliability of the original TAIS was based on data collected using 45 male and 45 female undergraduates enrolled in an introductory psychology course. Intercorrelations on all 17 subscales of the TAIS ranged from .60 to .93 with a median of .83 (Nideffer, 1976b). Van Schoyck and Grasha, (1981) using only the six attentional subscales and the information processing scale from the original TAIS, found correlation coefficients ranging from .48 on the RED subscale to .84 on the BIT scale.

Batting-specific Test of Attentional Style (B-TAIS). The rationale for the development of a batting-specific version of the TAIS is based on

Table 5

Definition of TAIS Subscales Used in the Present Study

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 scorers see themselves as effectively integrating information from several different areas.
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.
INFP	(Information processing): High scorers think alot and process a great deal of information.

Note. From *The Inner Athlete* (p. 118) by R.M. Nideffer, 1976, New York: Cromwell. Copyright 1976 by Robert M. Nideffer. Reprinted by permission.

Table 6

Examples of Items Contained in Each TAIS Subscale Used in the Present Study.

Subscale	Example
BET	"I am good at rapidly scanning crowds and picking out a particular person or face."
OET	"At stores, I am faced with so many choices I can't make up my mind."
BIT	"I theorize and philosophize."
OIT	"When people talk to me I find myself distracted by my own thoughts and ideas."
NAR	"When I read it is easy to block out everything but the book."
RED	"I make mistakes because my thoughts get stuck on one idea or feeling."
INFP	"The work I do involves a wide variety of seemingly unrelated material and ideas."

Note. From Test of Attentional and Interpersonal Style. Copyright 1974 by Robert M. Nideffer. Adapted by permission.

research conducted by Van Schoyck & Grasha (1981). They concluded that through the use of a sport-specific (tennis) measure of attentional style patterned after Nideffer's original TAIS, it was possible to obtain more reliable and valid estimates of individual attentional style as it pertains to the attentional demands present in a particular sport environment. Specifically, the test-retest correlation coefficients for the sport-specific measure of attentional style ranged from a low of .68 on the RED subscale to a high of .91 on the OET subscale, and were higher on the tennis-specific measure for every attentional subscale than those obtained using the TAIS. In addition, the sport-specific version was found to possess higher internal consistency and was a more accurate measure of skill level differences in attentional style than the parent TAIS.

Items contained in the batting-specific version (B-TAIS) of the TAIS were generated by two individuals with extensive knowledge in the areas of psychology and baseball/softball batting skills. All 59 items on the six attentional and cognitive control subscales of the TAIS were converted to a baseball/softball batting-specific reference, maintaining as much of the original TAIS content, grammatical structure, and wording in each item as possible. (See Appendix B for a complete list of B-TAIS items by subscale.) An example of an item included on the TAIS narrow attention (NAR) subscale, and its B-TAIS counterpart is as follows:

TAIS: "When I read, it is easy to block out everything but the book."

B-TAIS: "When I bat, it is easy to block out everything but the ball."

When all 59 TAIS attentional and information processing subscale items had been converted to a batting-specific frame of reference, items contained in the original TAIS, the tennis-specific version of the TAIS developed by Van Schoyck (1979) and the newly constructed B-TAIS were reviewed by a panel of five sport psychologists. The five reviewers were selected on the basis that each had recently published articles in the Journal of Sport Psychology dealing specifically with the topic of attentional style and each used the Test of Attentional and Interpersonal Style as a measure of athletes' attentional style. All experts rated each of the 59 B-TAIS items on the basis that its general meaning, as it relates to the appropriate attentional subscale of the TAIS, had been maintained. If disagreement existed among the raters, the opinions of the majority prevailed (See Appendix C for rater agreement on each B-TAIS item). Each B-TAIS item was also reveiwed by an intercollegiate varsity baseball and softball coach in order to assure the task relevancy of the items was adequate, as sport-task specific measures of attentional style.

Measures of Competitive Trait Anxiety

Given the relationships that have been shown to exist between anxiety and athletic performance, all subjects were asked to complete two separate measures of competitive trait anxiety--the Sport Competition Anxiety Test (Martens, 1977) and a trait version (CTAI-2) of the Competitive State Anxiety Inventory-2 (Martens, Burton, Vealey, Bump & Smith, 1983). Two measures of competitive anxiety were used in an attempt to off-set the bias that any one measure may have (Campbell & Fiske, 1959).

Sport Competition Anxiety Test (SCAT). The SCAT is a survey instrument designed to assess the level of trait anxiety that is present within an individual during competitive situations. The self-report measure comprises of 15 statements such as 'Before I compete, I feel uneasy,' and 'Before I complete, I get a queasy feeling in my stomach', to which the subjects respond that with them, this occurs either (a) Often, (b) Sometimes, or (c) Hardly Ever. (See Appendix D for a complete copy of SCAT along with scoring instructions.)

Competitive Trait Anxiety Inventory-2 (CTAI-2). A second measure of competitive anxiety used in the present study was a modified trait version (CTAI-2) of the Competitive State Anxiety Inventory-2 (CSAI-2; Martens et al., 1983). The CSAI-2, a 27 item, self-report instrument, was developed in response to the need for a multidimensional assessment of competitive anxiety. Three subcomponents of anxiety are measured by the CSAI-2: (a) cognitive (worry), (b) somatic (physiological arousal), and (c) confidence. A 4-point Likert-type scale is used in scoring all inventory items. While the CSAI-2 was originally intended as a measure of state anxiety, it was assumed by this author that modifying the test instructions so that each item is answered in terms of how the subject usually feels would result in a general or trait measure of competitive anxiety (CTAI-2; See Appendix E for a complete copy of the CTAI-2.)

Measures of Batting Performance

One way to assess the validity of a test of attentional style is to examine the relationship that exists between an individual athlete's scores on the six subscales measuring attentional style, and his or her seasonal batting performance. The result of every time-at-bat for each subject during the entire 1984 varsity intercollegiate baseball and softball season was recorded by a paid official scorer present at each game. It is this individual's responsibility to declare the official outcome of each hitter's time-at-bat, and to accurately record this outcome on an official scorecard. On the basis of these official game records, measures of seasonal batting performance were calculated.

Procedure

Administration of attention and anxiety measures. All 59 items contained in the attentional and cognitive control subscales of the original TAIS as well as the 59 items included in the batting task-specific parallel version (B-TAIS) were administered to each subject in a group setting during a regularly scheduled practice session after the teams returned to campus following their annual 'southern spring training trips'. This testing period was scheduled so as to enable the subjects to draw upon their recent batting experiences when answering the questionnaire. Both the TAIS and the B-TAIS were self administered. Questions were printed on reusable test booklets, while the subject's responses of: (a) never, (b) rarely, (c) sometimes, (d) frequently, (e) always, were recorded on specially prepared answer sheets.

Prior to the actual survey administration, the informed consent of each subject was obtained, and the investigator explained that the information provided would be used to examine what collegiate baseball or softball hitters think about while batting. The investigator further explained that all answers would be seen only by him, and would not be released to the coaching staff, or any other individual without the written approval of the subject. The athletes were also told that the general results of the completed investigation would be made available to them and their coaching staff. The importance of accurate, truthful responses to the success of the study was also stressed prior to administration. The order of tests was counterbalanced, with one half of the baseball and softball players receiving the original TAIS first, and then the B-TAIS, while with the remaining half, the order of administration was reversed. After each subject completed the two measures of attentional style, he or she then completed the SCAT. The total time required to complete both measures of attention and the anxiety inventory was approximately 30 minutes.

To assess the test-retest reliability of both attentional measures as well as to compare the two anxiety inventories, all subjects completed the original TAIS and the B-TAIS at a two-week interval. During this retest session, each subject also completed the CTAI-2. This two-week interval was selected in order to maintain consistency with Nideffer's (1976b) original protocol. Scoring on both measures of attentional style was in accordance with the procedures set forth by Nideffer (1977b) for the scoring of the TAIS.

Collection of performance measures. Official scorer's statistics were obtained for all regularly scheduled Michigan State University intercollegiate varsity baseball and softball competitions during the 1984 season. The varsity baseball team was involved in 46 competitions, 26 at their home field, and 20 taking place at opponents' fields. The varsity softball team played 18 home competitions and 20 on the road during the regular season. On the basis of the official game statistics, seasonal batting performance was calculated for all baseball players who had at least 46 official plate appearances, and softball players who had batted at least 38 times during the season (an average of one plate appearance per game). This was done to control for athletes who had few, if any official at-bats during the year. (For example, Big Ten baseball has a designated hitter rule, thereby allowing the pitchers to go an entire season without batting.)

Seasonal contact percentage was used as a measure of each subject's overall batting performance. This index was derived by subtracting the number of times a batter struck out during the season from his or her official at bats, and dividing the remainder by the number of official plate appearances during the season.

Treatment of Data

Data collected in the study were subjected to a variety of statistical procedures. All analyses were performed on a Cyber 750 mainframe computer using version 8.3 of the Statistical Package for the Social Sciences (SPSS; Nie, Hull, Jenkins, Steinbrenner & Bent, 1975; Hull & Nie, 1981). Pearson product-moment correlation coefficients were calculated to estimate TAIS and B-TAIS test-retest reliability, interscale correlations, subscale by item correlations, and relationships between attentional subscales, competitive anxiety and performance. An estimate of the consistency with which TAIS and B-TAIS subscale items measured unique attentional dimensions was assessed by computing the Cronbach alpha reliability coefficient for each subscale. Fisher's *Z* transformations and independent *t*'tests were used to determine significant differences between the baseball and softball teams on all attentional, anxiety and performance variables. Orthogonal varimax rotation factor analysis was also performed on both tests of attentional style. An oblique factor analysis was also performed as a check on the influence of possible correlated factors. The oblique analysis results were reported only if they differed substantially from the orthogonal analysis.

CHAPTER IV

RESULTS AND DISCUSSION

This chapter contains two major sections: (a) results of statistical procedures used to examine the relationships among attentional style, competitive anxiety and performance, and (b) a general discussion of these findings. The results section has been further organized into three subsections. The first includes descriptive statistics for each measure of attentional style, anxiety and performance. The second compares the reliability of the general measure of attentional style to that of the modified, batting-specific version, and the third compares the validity of these two instruments. All results are reported at the .05 level of significance unless otherwise specified.

Results

Descriptive Statistics

Attentional measures. Means and standard deviations for each of the attentional and information processing subscales contained in Nideffer's (1976b) original TAIS and the batting-specific B-TAIS are presented in Table 7. Total sample statistics are given in addition to separate scores for baseball and softball players.

Because only male athletes were members of the varsity baseball team and only females participated in varsity softball, *t*'tests[2] were performed using the Statistical Package for the Social Sciences (Nie et al., 1975) for each attentional and information processing subscale of the TAIS and B-TAIS to check for possible gender differences that may have

Table 7

Means and Standard Deviations for TAIS and B-TAIS Subscales

	TAIS		B-TAIS	
Subscale	M	SD	M	SD
Baseball[a]				
BET	13.67	2.41	14.07	2.97
OET	18.93	4.11	15.21	5.66
BIT	18.00	3.21	17.36	4.03
OIT	13.79	3.14	12.86	3.53
NAR	27.33	5.29	30.79	6.18
RED	25.79	3.04	24.71	6.03
INFP	41.00	8.12	41.14	6.14
Softball[b]				
BET	14.43	2.88	13.42	2.84
OET	15.67	4.01	11.62	3.53
BIT	17.69	2.90	16.08	3.50
OIT	12.08	2.72	10.08	2.69
NAR	27.17	3.56	32.00	7.72
RED	24.00	3.96	21.00	5.12
INFP	43.50	5.55	39.17	8.60
Total Sample[c]				
BET	14.03	2.63	13.77	2.88
OET	17.48	4.32	13.48	5.01
BIT	17.86	3.02	16.74	3.77
OIT	12.96	3.02	11.52	3.40
NAR	27.26	4.52	31.35	6.82
RED	24.93	3.56	23.00	5.83
INFP	42.11	7.08	40.23	7.29

[a]n=15. [b]n=14. [c]n=29.

existed between the two teams. All results were nonsignificant; therefore, the two teams were combined for all further analyses of attentional style. A summary of the *t*'tests performed are contained in Appendix F.

Figure 5 illustrates how subjects' TAIS and B-TAIS scores compare to those reported by Nideffer (1976b). Attentional profiles for the baseball/softball batters are compared with Nideffer's college student norms by plotting the groups' means as *Z* scores. College norms are represented as 0.0 *Z* on each subscale. The batters' scores were found to be considerably higher than the college norms on the narrow-attention (NAR) subscale of both the TAIS and B-TAIS. The subjects' TAIS attentional profile appears virtually identical to the college student norms with the exception that the subjects' mean score on the NAR subscale was one full standard deviation above the norming population. This extraordinarily high NAR score was even more pronounced on the B-TAIS. NAR subscale scores on the B-TAIS were nearly two *Z* scores above the norm, while B-TAIS scores on every other subscale were found to be somewhat below the college student norm reported by Nideffer. While the general configuration of the attentional profile is similar for the B-TAIS and TAIS, differences between subscales tend to be magnified through the use of the situation-specific B-TAIS.

Competitive anxiety measures. Two measures of competitive trait anxiety were completed by each subject. The Sport Competition Anxiety Test (SCAT; Martens, 1977) was administered during the initial testing session and a trait version (CTAI-2) of the Competitive State Anxiety Inventory-2 (CSAI-2; Martens, Burton, Vealey, Bump & Smith, 1983) was completed at the time of the retest session two weeks later. Means and standard deviation scores for each team are given in Table 8 for both anxiety instruments.

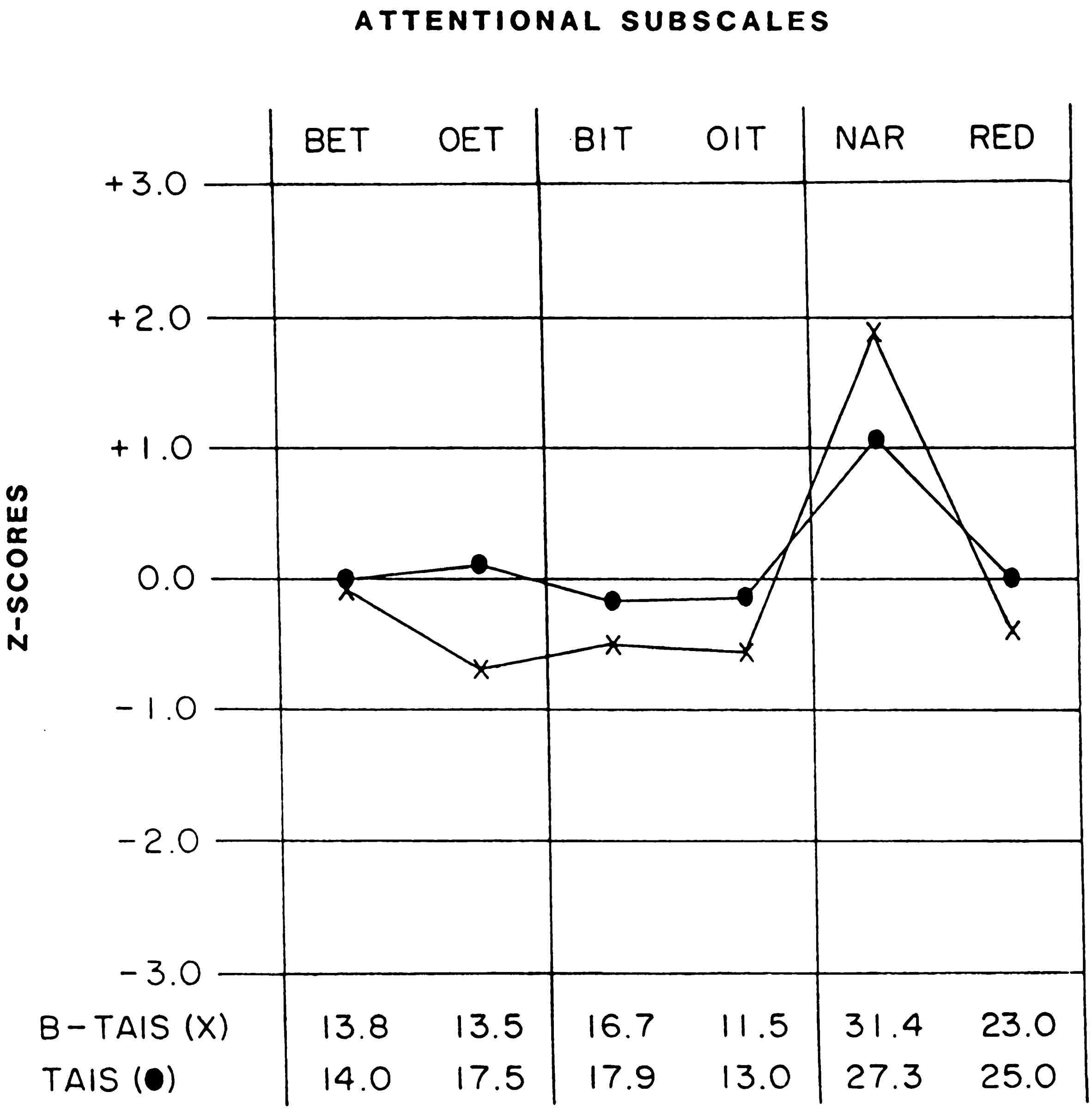


Figure 5. Comparison of TAIS and B-TAIS subscale scores to Nideffer's college student norms.

Table 8

Means and Standard Deviations for Competitive Trait Anxiety Measures

	Group					
	Baseball[a]		Softball[b]		Total Sample[c]	
Measure	M	SD	M	SD	M	SD
SCAT	18.07	4.38	17.00	3.37	17.55	3.90
CTAI-2						
Cognitive	17.06	3.66	15.50	2.61	16.46	3.23
Somatic	15.80	3.91	13.25	2.93	14.41	3.57
Confidence	29.40	3.24	28.33	4.68	28.82	4.03

Note. CTAI-2 is a trait modified version of the CSAI-2 (Martens, Burton, Vealey, Bump & Smith, 1983).

[a]*n*=15. [b]*n*=14. [c]*n*=29.

While members of the baseball team exhibited somewhat higher competitive anxiety scores on the SCAT as well as the CTAI-2 subscales measuring cognitive and somatic anxiety, *t*'tests performed between the two teams revealed no significant differences. A summary of the *t*'tests performed for each anxiety measure are contained in Appendix F.

Batting performance measures. Seasonal batting performance data for each subject was obtained by compiling official scorers' game statistics for the entire 1984 baseball and softball seasons. Means and standard deviations for both teams on 12 recorded and derived performance measures are given in Table 9.

Table 9

Means and Standard Deviations for Batting Performance Measures

	Baseball[a]		Softball[b]	
Performance	M	SD	M	SD
Hits	30.09	26.90	21.40	15.39
Batting average	.327	.249	.192	.073
Runs scored	23.45	21.81	10.30	6.02
Doubles	5.00	5.06	2.80	2.62
Triples	1.73	1.62	0.80	0.92
Home runs	3.82	5.93	0.40	0.84
Slugging percentage	.511	.259	.244	.101
Bases on balls	15.00	13.89	9.90	8.24
Strikeouts	14.82	11.42	13.30	8.51
Strikeout percentage	.127	.137	.112	.097
Contact percentage	.873	.137	.888	.097

Note. Batting average, slugging percentage, strikeout percentage and contact percentage are derived performance measures.

[a] n=15. [b] n=14.

Although it is assumed that a batter's appropriate or inappropriate attentional focus will contribute in some way to all performance measures listed in Table 9, other factors such as an individual's biomechanical efficiency, running speed, physical strength, scorer's judgment or sheer luck may also determine performance in many of these areas. Contact percentage, defined as the percentage of official plate appearances in which the subject made contact with the ball in such a manner that the ball was put into play, was considered by the author as the single best indicator of a subject's appropriate or inappropriate attentional focus while batting. Contact percentage is a derived performance measure which is calculated by subtracting the number of times a batter strikes out from his or her official times at bat, and dividing the remainder by official times at bat. Results of *t*'tests conducted to check team differences that existed in contact percentage were nonsignificant; therefore, the two teams were combined for further batting performance analyses. A summary of the *t*'tests performed are contained in Appendix F.

Comparisons of TAIS and B-TAIS Reliability

Test-retest reliability. The stability of the original TAIS and its modified, batting-specific (B-TAIS) counterpart was examined by calculating two-week test-retest reliability coefficients for each instrument's attentional subscales. Test-retest coefficients for TAIS and B-TAIS subscales are given in Table 10.

Table 10

Test-Retest Reliability Coefficients for TAIS and B-TAIS Subscales

Subscale	TAIS	B-TAIS
BROAD EXTERNAL	.82	.88
OVERLOAD EXTERNAL	.82	.87
BROAD INTERNAL	.92	.95
OVERLOAD INTERNAL	.91	.72
NARROW ATTENTION	.82	.84
REDUCED ATTENTION	.72	.76
INFORMATION PROCESSING	.92	.90

Note. The test-retest interval was two-weeks. All reliability coefficients were significant at .05 level.

Based on Van Schoyck and Grasha's (1981) finding that a tennis-specific version of the TAIS resulted in increased stability over time when compared to the original TAIS, it was hypothesized that the batting task-specific B-TAIS would similarly exhibit higher test-retest correlations than the parent measure on all six attentional subscales. Examination of Table 10 reveals that while the test-retest reliabilities of both attentional measures were significant and generally high, five of the six B-TAIS attentional subscales demonstrated the predicted increase in stability. Despite these general stability increases shown to exist on the B-TAIS, the only statistically significant difference in test-retest reliability between the two instruments occurred on the OIT subscale purported to measure the tendency to become overloaded by internal stimuli. The OIT exhibited significantly more stable results on the original TAIS as compared to the task-specific B-TAIS ($Z = 2.26$, $p < .05$). Thus, only partial support was provided for this hypothesis. A summary of the Fisher Z transformations and Z values used to compare the test-retest correlations is contained in Appendix G.

The extent to which the stability coefficients of the TAIS and the B-TAIS are comparable to previous findings reported by other investigators was also examined. Table 11 allows comparisons to be made between the TAIS stability findings of the present study and Van Schoyck and Grasha's (1981) findings employing varying test-retest intervals ranging from 10 to 101 days (mean interval=32 days); and Beitel, Buckles and Richards' (1984) two-week test-retest correlations on a sample of university students holding various sport orientations.

The present study resulted in test-retest correlations somewhat higher than those found in previous investigations. While Wolfe and Nideffer's (1974) incomplete report of stability coefficients for each attentional

Table 11

Comparison of TAIS Test-Retest Reliability Between Present and Previous Studies

Attentional Subscale	Van Schoyck[a] Grasha	Beitel et al.[b]	Present[c] Study
BET	.65	.55	.82
OET	.79	.80	.82
BIT	.84	.82	.92
OIT	.80	.77	.91
NAR	.67	.59	.82
RED	.48	.62	.72
INFP	.71	.87	.92

[a]*n* = 41. [b]*n* = 280. [c]*n* = 29.

subscale makes accurate comparisons virtually impossible, the lower correlations in the Van Schoyck and Grasha's (1981) study may be explained, in part, by the longer test-retest intervals. Somewhat more surprising are the stability correlations reported by Beitel et al. (1984). Despite the adherence to a two-week interval, the Beitel et al. investigaton resulted in lower stability correlations on four of the six TAIS attentional subscales (BET, BIT, OIT, NAR) than were found by Van Schoyck and Grasha.

Test-retest reliability comparsions can similarly be examined between the batting-specific B-TAIS and previously developed sport-specific variations of the TAIS. Table 12 presents test-retest reliability correlations for the attentional and information processing subscales of the B-TAIS as well as Van Schoyck and Grasha's (1981) tennis-specific (T-TAIS) version and Mann's (1984) golf-specific (G-TAS) adaptation of the TAIS.

Table 12

Comparison of Test-Retest Reliability Among Sport-Specific Versions of the TAIS

Attentional Subscale	T-TAIS[a]	G-TAS[b]	B-TAIS[c]
BET	.85	.83	.88
OET	.91	.66	.87
BIT	.86	.87	.95
OIT	.85	.76	.72
NAR	.74	.88	.84
RED	.68	.72	.76
INFP	.90	—	.90

[a] Tennis-specific T-TAIS (Van Schoyck & Grasha, 1981); $n = 42$.
[b] Golf-specific G-TAS (Mann, 1984); $n = 43$.
[c] Baseball/Softball Batting-specific B-TAIS; $n = 29$.

Examination of Table 12 reveals similar test-retest results were obtained with the three modified, sport-specific versions of the TAIS. While all three instruments produced generally high test-retest correlations, relatively lower stability was demonstrated on all subscales assumed to indicate 'ineffective' deployment of attention (OET, OIT, RED), with the exception of the T-TAIS subscales assessing internal and external overload.

Internal consistency. It was hypothesized that all B-TAIS attentional subscales should exhibit greater internal consistency than their corresponding TAIS subscale. An estimate of the consistency with which subscale items measured each attentional and information processing dimension was assessed by computing Cronbach alpha reliabiity coefficients (Cronbach, 1951) for each TAIS and B-TAIS subscales. Alpha reliability coefficients for each attentional instrument are reported in Table 13.

Table 13

Internal Consistency Reliability Coefficients for TAIS and B-TAIS Subscales

Subscale	TAIS	B-TAIS
BROAD EXTERNAL	.55*	.65*
OVERLOAD EXTERNAL	.76*	.85*
BROAD INTERNAL	.41*	.54*
OVERLOAD INTERNAL	.68*	.75*
NARROW ATTENTION	.64*	.71*
REDUCED ATTENTION	.13	.50*
INFORMATION PROCESSING	.37*	.63*

*$p < .05$.

Inspection of Table 13 reveals that the internal consistency of the B-TAIS was higher than the TAIS on every attentional and information processing subscale and rank order of the attentional subscale internal consistency coefficients was identical for both instruments. The overload-external (OET) subscale had the highest alpha coefficient on both measures (B-TAIS = .85; TAIS = .76) and reduced-attention (RED) the lowest (B-TAIS = .50; TAIS = .13). Although the internal consistency of the B-TAIS was higher than the TAIS on every subscale, none of the internal consistency coefficient differences between the B-TAIS and TAIS reached the .05 level of statistical significance, thus only partially supporting the hypothesis. Jensen (1978), however, has suggested that the generally accepted standard for reliability estimates is above .70. Using this level as a criterion, three of the six B-TAIS attentional subscales

(OET, OIT, NAR) but only one TAIS subscale (OET) may be considered as demonstrating acceptable levels of internal consistency. One must remember, however, that the sample size used in the present study (n = 29) was not very large.

Examination of Table 14 allows comparisons to be made between TAIS internal consistency findings of the present study and those reported by other investigators. With the exception of the low alpha coefficient on the reduced-attention subscale (.13) internal consistency coefficients demonstrated in the present study were comparable to those reported by Van Schoyck and Grasha (1981) and Bietel et al. (1984).

Table 14

Comparison of TAIS Subscale Internal Consistency (Alpha Reliability) Between Present and Previous Studies

Attentional Subscale	Van Schoyck & Grasha[a]	Beitel et al.[b]	Present Study[c]
BET	.46	.23	.55
OET	.77	.73	.76
BIT	.70	.13	.41
OIT	.69	.64	.68
NAR	.73	.62	.64
RED	.44	.42	.13
INFP	.62	.68	.37

[a] n = 90. [b] n = 280. [c] n = 29.

Internal consistency correlations for the seven attentional and information processing subscales contained in the B-TAIS are compared in Table 15 with the results reported for previously developed sport-modified versions of the TAIS. While the B-TAIS did not generally produce internal consistency coefficients in the range as those reported by Van Schoyck and Grasha (1981) for the tennis-specific T-TAIS, they are comparable to Mann's (1984) findings relative to her golf-specific G-TAS. In addition, the reduced-attention (RED) alpha coefficient of .50 on the B-TAIS was considerably higher than that reported for either the T-TAIS (.16) or the G-TAS (.26).

Table 15

Comparison of Internal Consistency (Alpha Reliability) Among Sport-Specific Versions of the TAIS

Attentional Subscale	T-TAIS[a]	G-TAS[b]	B-TAIS[c]
BET	.82	.75	.65
OET	.83	.54	.85
BIT	.82	.71	.54
OIT	.83	.38	.75
NAR	.83	.86	.71
RED	.16	.27	.50
INFP	.77	--	.63

[a] Tennis-specific T-TAIS (Van Schoyck & Grasha, 1981); *n* = 90.
[b] Golf-specific G-TAS (Mann, 1984); *n* = 43.
[c] Baseball/Softball Batting-specific B-TAIS; *n* = 29.

Independence of subscale dimensions. The fact that 10 of the 52 TAIS items composing the six attentional subscales and 8 of the 19 items contained in the information processing subscale are included in more than one subscale raises serious questions regarding the degree to which each TAIS subscale represents an independent dimension of attention. Nideffer (1976b), being sensitive to this potential problem, followed a method suggested by Jackson (1971) for assessing subscale independence.

Mean correlations were calculated between test items and their appropriate subscale. These correlations were then compared to the correlation that existed between items not included on the scale (irrelevant items). If a correlation between nonsubscale items and a particular subscale exceeded the mean correlation between relevant items and that subscale, item overlap was assumed. Using this method, Nideffer found between 0 and 22% item overlap among the TAIS attentional subscales. Rather than relying on one single measure, Van Schoyck (1979) additionally investigated TAIS subscale independence by examining the number of items that correlated better with an irrelevant subscale as compared to its own, and by calculating interscale correlation coefficients between all attentional subscales.

In order to remain consistent with Van Schoyck's (Van Schoyck, 1979; Van Schoyck & Grasha, 1981) investigation into TAIS subscale independency, item by subscale correlation coefficients were computed for those items contained in the six attentional subscales of the TAIS and B-TAIS. Table 16 presents the number of items within each subscale that correlated higher with an irrelevant subscale than with its own.

A considerable amount of item overlap on both attentional measures is revealed in Table 16. The general TAIS was found to have 48% of its attentional items correlate better with irrelevant attentional subscales. Fifty percent of the B-TAIS items had higher correlations with irrelevant subscales. The largest share of item overlap with both instruments occurred on the subscales assumed to measure 'ineffective' deployment of attention (OET, OIT, RED). On the TAIS, 53% of the items assessing 'ineffective' attention were found to overlap with other subscales, while only 42% of the 'effective' items correlated higher with irrelevant attentional subscales. This difference is even more pronounced on the B-TAIS. Sixty-four percent of the 'ineffective' attentional items contained in the OET, OIT and RED subscales correlated higher on other subscales of attention, while only 31% of the items composing the 'effective' BET, BIT and NAR subscales were found to overlap. Van Schoyck (1979) reported similar TAIS item overlap using this method of comparison. With the information processing subscale included, he found 46% of the original TAIS items, and 63% of his tennis modified (T-TAIS) items correlated better with irrelevant subscales. Also consistent with the results of the present study, Van Schoyck found substantially more overlap in regard to items contained on the 'ineffective' subscales for both the TAIS (effective item overlap = 12%, ineffective item overlap = 28%) and T-TAIS (effective item overlap = 15%, ineffective item overlap = 44%).

Table 16

TAIS and B-TAIS Items With Higher Absolute Correlations on Irrelevant Subscales Than Its Own

	Attentional Instrument[a]			
	TAIS		B-TAIS	
Attentional Subscale	No. of items	% of Subscale	No. of items	% of Subscale
BET	2	33.3	1	16.7
OET	6	50.0	7	58.3
BIT	3	37.5	3	37.5
OIT	3	33.3	8	88.9
NAR	6	50.0	4	33.3
RED	10	66.7	8	53.3
Effective Deployment	11	42.3	8	30.8
Ineffective Deployment	19	52.8	23	63.9

Note. BET, BIT, NAR are effective attentional deployment subscales. OET, OIT, RED are ineffective attentional deployment subscales.

[a]n = 29.

Another method which can be employed to determine subscale independence involves computing interscale correlations. As Van Schoyck (1979) suggested, one indication of attentional subscale independence would be a relatively low interscale correlation among the scales. Interscale correlation coefficients for the six attentional subscales contained in the TAIS and B-TAIS are presented in Table 17.

Six of the 15 interscale correlations computed for the B-TAIS and five interscale correlations for the TAIS were found to be positively and significantly correlated, thereby suggesting a lack of independence between these subscales. All subscales assessing 'ineffective' attentional deployment (OET, OIT, RED) were significantly intercorrelated on both instruments. Similarly, all 'effective' attention subscales (BET, BIT, NAR) were significantly inter-related on the B-TAIS, and all but the BET-NAR relationship were found to be significant on the TAIS. This high degree of overlap between the three 'effective' and the three 'ineffective' subscales would tend to limit the sensitivity of these instruments to detecting only overall 'effective' versus 'ineffective' attentional deployment. The overlapping of internal and external subscales (i.e., BET-BIT; OET-OIT) found on both instruments has the potential of masking any true distinctions that may exist on Nideffer's (1976a, 1976b, 1981) proposed 'direction of attention' dimension. Similarly, the overall lack of independence demonstrated between subscales assessing an effective broadening (BET, BIT) and narrowing (NAR) as well as an ineffective broadening (OET, OIT) and narrowing of attention (RED) would tend to obscure any differences along Nideffer's dimension measuring breadth of attention.

Table 17

Interscale Correlations Among the B-TAIS and TAIS Attentional and Information Processing Subscales

	B-TAIS						
	BET	OET	BIT	OIT	NAR	RED	INFP
BET	1.00						
OET	0.14	1.00					
BIT	0.75**	-0.02	1.00				
OIT	-0.01	0.65**	-0.21	1.00			
NAR	0.44*	-0.17	0.35*	-0.27	1.00		
RED	0.05	0.43*	-0.05	0.52**	0.10	1.00	
INFP	0.86**	0.04	0.74**	-0.07	0.49*	0.02	1.00

	TAIS						
	BET	OET	BIT	OIT	NAR	RED	INFP
BET	1.00						
OET	-0.18	1.00					
BIT	0.65**	-0.07	1.00				
OIT	-0.27	0.72**	-0.24	1.00			
NAR	0.31	0.03	0.55**	-0.23	1.00		
RED	-0.21	0.48**	-0.19	0.66**	0.15	1.00	
INFP	0.82**	-0.24	0.82**	-0.36*	0.35*	-0.39*	1.00

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

Van Schoyck (1979), using a larger sample size (N = 90) found even more significant intercorrelations among the six TAIS attentional subscales. Ten of the 15 subscale correlations computed for the TAIS reached the .01 level of significance. As was the case in the present study, Van Schoyck also found that more interscale correlations demonstrated statistical significance with the sport-specific instrument. Only 2 of the 15 attentional subscale intercorrelations on Van Schoyck's tennis-specific T-TAIS failed to reach the .01 level of significance. Similarly, Nideffer (1976b), using a sample size of 230, found significant relationships between all TAIS subscales.

Since the relatively large sample size employed by Van Schoyck (1979) and Nideffer (1976b) tends to result in very modest correlations reaching statistical significance, when examining the degree of overlap between attentional subscales, it may be more informative to consider the strength of the relationship rather than its statistical significance. In the present study, four TAIS and three B-TAIS subscale intercorrelations exceeded .50, indicating a common variance of 25% between the two subscales. Van Schoyck found three TAIS and eight T-TAIS interscale correlations greater than .50, while Nideffer reported 5 of the 15 TAIS attentional subscale intercorrelations to exceed .50.

A further indication of general lack of subscale independence in the TAIS and the B-TAIS is revealed through factor analysis. If each subscale is, in fact, responsible for measuring a specific and unique dimension of attention, a six factor solution (one factor for each attentional subscale) should result. On the other hand, if there is a degree of subscale overlap, less than the six predicted factors will be used in the factor analytic solution. As Table 18 illustrates in regard to the TAIS and the

Table 18

Orthogonal Varimax Rotation Factor Analytic Solution for TAIS and B-TAIS

	Attentional Subscale	Factor One	Factor Two
Attentional Instrument			
B-TAIS			
	BET	.9157	.2159
	OET	-.0421	.7359
	BIT	.7905	-.0032
	OIT	-.2358	.9043
	NAR	.5067	-.1062
	RED	-.0308	.5497
	INFP	.9307	.1287
	Eigenvalue	2.645	1.736
	Pct. of Var.	60.4	39.6
	Cum. Pct.	60.4	100.0
TAIS			
	BET	.5941	.2710
	OET	-.3640	.6923
	BIT	.7087	.5317
	OIT	-.5471	.6779
	NAR	.2246	.3247
	RED	-.6055	.4604
	INFP	.7998	.3637
	Eigenvalue	2.344	1.745
	Pct. of Var.	57.3	42.7
	Cum. Pct.	57.3	100.0

B-TAIS, an orthogonal, varimax rotation factor analysis resulted in the emergence of only two factors underlying all six attentional subscales. An oblique factor analysis was conducted and resulted in similar findings.

Upon examining Table 18, the similarity between the TAIS and B-TAIS factor analytic solutions becomes apparent. With the exception of the TAIS subscale measuring the ability to effectively narrow attentional focus (NAR) which did not load heavily on either factor, all subscales assessing 'effective' deployment of attention loaded heavily on the first factor while those subscales measuring 'ineffective' attention deployment loaded heavily on the second factor.

Van Schoyck (1979) and Vallerand (1983) have reported TAIS factor analytic solutions similar to those in the present study. The only differences worth noting are that both previous investigations resulted in a three factor solution. Vallerand also found NAR to load on what he referred to as a 'scan' factor but could also be called an 'effective attentional deployment' factor as the BET and BIT are categorized.

The factor loadings of the B-TAIS were even more pronounced. All 'effective' attentional subscales (NAR, BIT, BET) loaded heavily on the first factor, while 'ineffective' attentional subscales (RED, OIT, OET) loaded substantially on the second factor. The somewhat clearer distinctions that exist on the B-TAIS may reflect the ability of a task-specific instrument to describe a precise situation more accurately.

To summarize the findings regarding TAIS subscale independence, all three measures of independence employed in the present study (irrelevant item-subscale correlations; interscale correlations; and factor analysis) tend to support Van Schoyck's (1979) position that the TAIS attentional subscales lack subscale independence and, therefore, do not measure unique attentional dimensions. Similar findings regarding the B-TAIS seem to further suggest that intentionally constructing a sport-specific measure of attention in such a way that it remains faithful to the original instrument results in duplication of any flaws existing in the parent measure.

Comparisons of TAIS and B-TAIS Validity

Convergent validity. Prior to making construct validity comparisons between the TAIS and the B-TAIS, it is necessary to determine the extent to which these two instruments measure the same general attentional phenomena. If a high correlation exists between the instruments, it is assumed that while they may be assessing the same attentional phenomena, the sport task-specific version is so similar to its parent measure that it offers little in the way of new information, and is, therefore, unnecessary. On the other extreme, a very low correlation between the instruments would indicate the TAIS and B-TAIS are, in fact, assessing completely different attentional attributes. A moderate correlation ranging from .40 to .60, thereby producing a coefficient of determination explaining 16-38% of the common variance between the instruments was hypothesized as evidence of acceptable convergence between the two measures of attentional style. An overall correlation coefficient of .50 was obtained, which was sufficient to accept the hypothesis of convergent validity between the TAIS and the B-TAIS. Van Schoyck (1979) reported a .41 correlation between his tennis-specific (T-TAIS) modification of the TAIS and Nideffer's (1976b) original instrument. Mann (1984) reported obtaining a heterotrait-homomethod coefficient of .56 between the TAIS and her golf-specific (G-TAS) adaptation.

Construct validity. According to Nideffer's (1976a, 1976b, 1981) theory of attentional style, increases in individual anxiety levels are associated with (a) involuntary reductions of attentional breadth, and (b) a predominantly internal focus of attention. Thus, it was hypothesized that there should be significant positive correlations between anxiety and an over-reduction of attention; and anxiety and an overload on internal attention on both the TAIS and B-TAIS. The relationships existing between competitive trait anxiety, as measured by the SCAT and the CTAI-2 and attentional subscales contained in the TAIS and B-TAIS are presented in Table 19. As hypothesized, there was a significant positive correlation for the TAIS and B-TAIS between the subscale indicating a tendency to make mistakes because attention is narrowed too much (RED) and competitive anxiety. While no other significant relationships were found to exist between trait anxiety and the general TAIS, competitive anxiety was found to be significantly correlated with each B-TAIS subscale measuring an 'ineffective' deployment of attention. This supports the hypothesis for the B-TAIS but not for the TAIS. The finding for the B-TAIS tends to support Korchin's (1964) contention that at high levels of arousal, attention tends to become diffuse, hyper-responsive and hyper-distractable, and also lends support to the construct validity of the B-TAIS.

Although the SCAT and the CTAI-2 subscales were correlated in the expected direction (cognitive .37, somatic .22, confidence -.33) the predicted anxiety-attention relationships are not as clear with the CTAI-2 as with the SCAT. Both the TAIS and the B-TAIS subscale assessing the ability to effectively narrow attentional focus (NAR) were positively correlated to the confidence subscale of the CTAI-2 and negatively related to cognitive and somatic anxiety. In addition, the predicted positive relationships were found between the TAIS subscales measuring the ability to effectively broaden attention (BET, BIT) and confidence. Predicted significant positive correlations were also found between the B-TAIS subscales measuring overload from internal stimuli and both cognitive (r = .42, $p < .05$) and somatic (r = .38, $p < .05$) anxiety, as well as between the

Table 19

Correlation Coefficients Between B-TAIS and TAIS Attentional Subscales and Competitive Trait Anxiety (n = 29)

Subscale	SCAT	CTAI-2 Confidence	CTAI-2 Cognitive	CTAI-2 Somatic
B-TAIS				
BROAD EXTERNAL(BET)	.20	.29	.19	.07
OVERLOAD EXTERNAL(OET)	.41*	-.21	.41*	.34
BROAD INTERNAL(BIT)	.28	.02	.22	.22
OVERLOAD INTERNAL(OIT)	.37*	-.07	.42*	.38*
NARROW ATTENTION(NAR)	.14	.44*	-.58**	-.58**
REDUCED ATTENTION(RED)	.45*	.19	-.32	-.28
TAIS				
BROAD EXTERNAL(BET)	-.19	.39*	-.18	-.45*
OVERLOAD EXTERNAL(OET)	.20	-.18	.27	.29
BROAD INTERNAL(BIT)	-.11	.39*	.06	-.27
OVERLOAD INTERNAL(OIT)	.16	.03	.06	.13
NARROW ATTENTION(NAR)	-.09	.33*	-.51*	-.66**
REDUCED ATTENTION(RED)	.39*	.20	-.00	-.11

Note. BET, BIT and NAR indicate "effective" attentional deployment. OET, OIT and RED indicate "ineffective" attentional deployment.

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

overload-external subscale and cognitive anxiety (r = .41, $p < .05$).

Nideffer's (1976a, 1976b, 1981) theory of attentional style suggests two additional construct validity predictions that were hypothesized in this study. First, since batting in baseball and softball tends to require a narrow-external focus of attention (Nideffer, 1976a, 1978, 1981; Van Schoyck & Grasha, 1981) scores on the TAIS and B-TAIS indicating the ability to effectively narrow attention (NAR) should be positively related to batting performance. Secondly, all 'ineffective' deployment of attention subscale scores should be negatively related to batting performance.

Examination of Table 20 reveals that the predicted positive relationship was demonstrated between performance and NAR subscale scores on the B-TAIS (r =.30), but not on the more general TAIS (r = -.11) and so only partially supports the fifth hypothesis. All TAIS and B-TAIS subscales assessing 'ineffective deployment of attention' (OET, OIT, RED) were found as predicted, to be inversely related to seasonal batting performance supporting the last hypothesis. In addition, performance was also found to be related in the positive direction to B-TAIS subscales assumed to assess 'effective' deployment of attention (BET, BIT, NAR) and negatively related to all 'ineffective' attentional subscales (OET, OIT, RED). This pattern did not occur for the more general TAIS.

Scores on the TAIS assessing the tendency to become overloaded by internal (OIT) and external (OET) sources of stimuli were inversely and significantly related to overall batting performance. Similarly, a significant negative relationship existed between the batting-specific OIT subscale and performance. In addition to the negative correlations between the 'ineffective' subscales and performance, scores on the B-TAIS subscale measuring the ability to effectively integrate information from several sources (BIT) were positively and significantly related to batting performance.

Table 20

Correlation Coefficients Between Contact Percentage and TAIS and B-TAIS Attentional Subscales[a]

Attentional Subscale	TAIS	B-TAIS
Effective Attention		
NARROW ATTENTION (NAR)	-.11	.30
BROAD INTERNAL (BIT)	-.21	.57*
BROAD EXTERNAL (BET)	-.21	.25
Ineffective Attention		
REDUCED ATTENTION (RED)	-.18	-.27
OVERLOAD INTERNAL (OIT)	-.51*	-.45*
OVERLOAD EXTERNAL (OET)	-.62*	-.36

[a] $n = 29$.

*$p < .05$.

It appears that by giving the TAIS a batting task-specific frame of reference, relationships between the various attentional subscales and performance were more likely to occur in the predicted direction. Specifically, positive correlations were shown between performance and all 'effective' attentional subscales, while negative correlations were found between performance and all subscales measuring 'ineffective' deployment of attention.

Discussion

While the relationship between a task appropriate focus of attention and increased athletic performance is axiomatic, there remains a need to generate instruments capable of accurately assessing individual attentional style or attentional abilities. Nideffer's (1976b) TAIS was developed in an attempt to measure individual attentional style across a variety of life situations. Van Schoyck and Grasha (1981) subsequently found that TAIS reliability and validity could be improved if the attentional survey items were given a sport-specific frame of reference. The present study had three purposes: (a) to construct not only a sport-specific, but in fact, a sport task-specific (baseball/softball batting) version of the attentional and information processing subscales contained in the original TAIS, (b) to compare the reliability of the TAIS and the B-TAIS and (c) to compare the validity of the TAIS and B-TAIS.

The first purpose of the present study, which was, to construct a sport-specific version of the TAIS attentional and information processing subscales, was accomplished by modifying each survey item so as to give it a baseball/softball batting frame of reference (B-TAIS). Once constructed, the B-TAIS was reviewed by a panel of five sport psychologists, all of whom had demonstrated familiarity with the TAIS and expertise in the area of attention. Each expert rated all 59 B-TAIS items on the basis that its original meaning, as it related to the appropriate attentional subscale of the TAIS had been maintained. If disagreement existed among the raters, the opinions of the majority prevailed. Using this criterion, none of the items required revision. Although the B-TAIS does not have the generalizability of the TAIS, it does permit a more specific assessment of attention in the skill of batting. Having such an instrument may prove invaluable to future research directed at determining the role of individual attentional style in athletic performance. For example, B-TAIS subscale scores may be used to operationally define attentional distractability in research designed to test the theory set forth by Sanders (1981) that the drive-like effects attributed to social facilitation/impairment, commonly observed in sport settings, are primarily a function of distraction.

The second purpose of the present study was to compare the reliability of the modified B-TAIS to the original TAIS. Specifically, two types of reliability were examined: test-retest reliability and internal consistency. While test-retest correlation coefficients were found to be generally high for both measures, the B-TAIS exhibited somewhat more stability than the TAIS on five of the six attentional subscales. The original TAIS demonstrated greater stability only on the attentional subscale assumed by Nideffer (1976b) to measure the tendency to become overloaded by internal stimuli (OIT).

One explanation that may be given for the generally higher stability found within the B-TAIS attentional subscales is that through the use of a task-specific instrument, it is possible to set forth the identical attentional context of each item across all testing sessions. For example, the item contained in the narrow-attentional subscale of the original TAIS, "It is easy for me to direct my attention and focus narrowly on something," is written in general terms. Since the exact context of this item is not specified, but rather left to the judgment of the subject, it is possible that the item is given a completely different meaning with each test administration. In the initial testing session, the subject may respond in terms of his or her ability to focus attention in a narrow fashion while reading a book. However, during retesting, the item may be interpreted by the same subject in the context of his or her ability to narrow attention when driving an automobile. In contrast, when this item is written with the batting-situation frame of reference, "It is easy for me to direct my attention and focus narrowly while I bat," the likelihood is increased that it will be interpreted in regard to the same behavior during both the test and the retest administration of the B-TAIS. Unlike the TAIS, there is only one context in which this item can be answered--the ability of the subject to narrow his or her attention while batting in baseball or softball.

The consistency with which items contained in each TAIS and B-TAIS subscale measure a specific dimension of attention, was assessed by computing Cronbach alpha reliability coefficients. The hypothesis stating that each B-TAIS attentional and information processing subscale would exhibit higher internal reliability than the corresponding TAIS subscale was supported by the results. The most dramatic increase in internal consistency was found on the attentional subscale purported to indicate the tendency to make mistakes of underinclusion because attention is narrowed too much (RED). The internal consistency coefficient of .16 on the RED subscale of the TAIS resulted in a coefficient of determination that accounted for less than 3% of the common variance ($\underline{r}^2 = .0256$). On the other hand, the alpha reliability coefficient of .50 found on the RED subscale of the B-TAIS accounts for approximately 25% of the common subscale variance. Alpha reliabilities found in the present study that revealed all B-TAIS subscales to be higher in internal consistency than corresponding TAIS subscales, may be partially explained again by the fact that with a task-specific measure of attentional style, each subscale is directed toward assessing an individual's attentional focus in a single area of human behavior. Since all B-TAIS items in a particular subscale relate solely to the ability to focus attention in a particular manner while batting, it is not surprising to find that responses show more consistency when compared to a general instrument designed to measure attentional focus across a wide variety of life situations. For example, the following items are contained in the RED subscale of the TAIS:

> I focus on one small part of what a person says and miss the total message.
>
> 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.
>
> I get anxious and block out everything on tests.
>
> It is easy for me to forget about problems by watching a good movie or by listening to music.

It becomes readily apparent, that even though all of the items listed above have been developed to assess the tendency to make mistakes because attention is narrowed too much, it is unlikely that an individual will be equally susceptible to excessive attentional reduction in each of the several situations presented. In contrast, reduced attention is assessed by the B-TAIS in regard to only one activity--batting. The following are the four corresponding B-TAIS items after being given a batting-specific frame of reference:

> I tend to focus on one small part of a pitcher's delivery, and miss those things that may give me a better idea of what (s)he is throwing me.

When batting, I have a tendency to listen to the catcher or the infielder's chatter, and forget about the upcoming pitch.

When I get up to bat, I get anxious and forget what it was I was going to try to do against this particular pitch.

It is easy to forget about an error that I have made in the field when I am hitting.

It is not unreasonable to assume that by limiting subscale items to a single activity, the consistency with which each subscale measures a particular aspect of attention will improve. Van Schoyck and Grasha (1981) reported similar improvements in internal consistency by giving each TAIS item a tennis-specific frame of reference.

Due to the relatively small sample size ($\underline{n}$ = 29) employed in the present study, inferences drawn from the results must be done only with utmost caution. Despite this limitation, it appears that the present investigation supports the Van Schoyck and Grasha (1981) findings that giving the TAIS a specific frame of reference results in an overall increase in instrument reliability as measured by test-retest stability and subscale internal consistency.

The third purpose of the present study was to compare the validity of Nideffer's (1976b) TAIS to the batting task-specific B-TAIS. Comparisons were made between the two measures of attentional style on the basis of convergent and construct validity. In terms of the convergent validity, an overall correlation coefficient of .50 was obtained between the TAIS and B-TAIS. By calculating the coefficient of determination ($\underline{r}^2$), the common variance among the two measures may be estimated to be approximately 25% ($\underline{r}^2$ = .25) thereby allowing the inference that while the B-TAIS and the TAIS are sufficiently correlated so as to indicate both instruments are assessing essentially the same attentional phenomena, a substantial amount of new attentional information is provided through the administration of the task-specific B-TAIS.

Previously constructed sport-specific modifications of the TAIS have produced comparable inter-instrument correlations. Van Schoyck (1979) reported a correlation of .41 between the TAIS and his tennis-specific T-TAIS. Mann (1984) similarly found an overall correlation coefficient of .56 to exist between the TAIS and her golf-specific test of attention (G-TAS).

While construct validity cannot be established in the course of a single investigation, three hypotheses were formulated concerning the characteristics of baseball and softball batters who had high scores on particular subscales of the B-TAIS and TAIS, in contrast to those batters with low scores. Taken together, these hypotheses allow a tentative theory to be formed in regard to the nature of the attentional constructs believed to be measured by these tests of attentional style (APA, 1974).

As mentioned in Chapter I, Nideffer's theory of individual attentional style (Nideffer, 1976a, 1976b, 1981) is built on two assumptions: (a) individuals tend to exhibit a stereotypical 'preferred attentional style' when faced with a variety of life situations, and (b) all behavioral tasks place specific attentional demands on the performer. The result is that to the extent there is congruence between an individual's attentional style and the attentional demands required in a particular task, performance on that task will tend to improve.

Drawing upon Easterbrook's (1959) theory of cue utilization, Nideffer (1980, 1981) further sets forth the proposition that increases in anxiety levels tend to be associated with an involuntary reduction in the breadth of attention. In addition to reducing the absolute number of environmental cues to which the individual can attend, Nideffer's theory also states that as anxiety increases, there is a tendency for attentional focus to increasingly become directed toward internal thoughts and feelings.

Given the fact that the task of hitting a baseball or softball is thought to carry with it a narrow-external attentional demand, (Nideffer, 1976a, 1978, 1981; Van Schoyck & Grasha, 1981) it was hypothesized that in accordance with Nideffer's theory, scores on the B-TAIS and TAIS subscale purported to measure the ability to effectively narrow attention (NAR) would be positively correlated with seasonal batting performance. Conversely, scores on TAIS and B-TAIS subscales assumed to indicate 'ineffective' deployment of attention (OET, OIT, RED) were hypothesized to be negatively correlated with seasonal batting performance. The final hypothesis formulated in regard to construct validity stated that the level of competitive trait anxiety experienced by the baseball/softball batters would be positively correlated with the internal-overload (OIT) and reduced-attention (RED) subscales of both the TAIS and B-TAIS.

Taking all results together the sport task-specific B-TAIS was found to have greater construct validity than the TAIS. First, unlike the TAIS, a positive, although statistically nonsignificant relationship was found between the B-TAIS subscale measuring the ability to effectively narrow attentional focus (NAR) and batting performance. Secondly, all B-TAIS and TAIS subscales assessing an 'ineffective' deployment of attention, were negatively related to performance. Finally, the strongest support for greater construct validity of the B-TAIS was in relation to the third hypothesis. Both RED and OIT subscales of the batting-specific B-TAIS were significantly correlated with scores on a competitive trait anxiety measure

(SCAT); whereas, only the RED correlation reached significance in the TAIS.

These differences may result from the ability of the task-specific instrument to assess the degree to which the subject is able to effectively direct his or her attention toward task-appropriate cues, as opposed to any cue--relevant or irrelevant--present in the environment. For example, while the ability to direct one's attention in a narrow-external manner may generally be necessary to hit a baseball, it is specifically the ability to direct attention in a narrow-external manner toward a task-relevant environmental cue (i.e. the ball) that must be assessed. An equal ability to narrow attention in regard to non-relevant stimuli (e.g. a butterfly fluttering around the pitcher's head) would result in a performance decrement.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The present study had three specific purposes: (a) to construct a baseball/softball batting task-specific (B-TAIS) version of the six attentional style subscales contained in the Test of Attentional and Interpersonal Style (TAIS), (b) to compare the reliability, validity and subscale independence of the TAIS with the B-TAIS, and (c) to examine the relationships that exist among batters' attentional style, level of competitive trait anxiety and batting performance.

Based on Nideffer's (1976a, 1981) theory of individual attentional style and Van Schoyck's (Van Schoyck, 1979; Van Schoyck & Grasha, 1981) findings regarding the use of sport-specific tests of attentional style with athletes, the following hypotheses were set forth and tested:

In terms of reliability,

(1) All B-TAIS attentional subscales should exhibit higher two-week test-retest reliability coefficients than their corresponding TAIS subscale.

(2) All B-TAIS attentional subscales should exhibit greater internal consistency than their corresponding TAIS subscale.

In terms of validity,

(3) A moderate inter-instrument correlation ranging from .40 to .60 should exist between the B-TAIS and the TAIS.

(4) Competitive trait anxiety should be positively related to overload by internal stimuli (OIT) and reduced attentional focus (RED) subscale scores on both the B-TAIS and TAIS.

(5) Scores on the B-TAIS and TAIS subscale measuring the ability to effectively narrow attention (NAR) should be positively correlated with seasonal batting performance.

(6) Scores on the B-TAIS and TAIS subscales measuring ineffective deployment of attention (OET, OIT, RED) should be negatively related to seasonal batting performance.

The batting task-specific B-TAIS was constructed by modifying all 59 items contained in the six attentional (BET, OET, BIT, OIT, NAR, RED) and cognitive control (INFP) subscales of the original TAIS in such a way that each item was given a baseball/softball batting-specific frame of reference. Once constructed, the content validity of the B-TAIS was assessed by a panel of five sport psychologists who had familiarity with the TAIS. Each rated the B-TAIS items on the basis that its general meaning, as it relates to the appropriate TAIS subscale, had been maintained.

Subjects in the study were 15 intercollegiate varsity baseball and 14 intercollegiate varsity softball players at a large Midwestern university. At the initial testing session, all subjects completed both the TAIS and the B-TAIS as well as the Sport Competition Anxiety Test (SCAT; Martens, 1977). A retest session was held at a two-week interval, at which time each subject again completed both measures of attentional style and a trait-modified version (CTAI-2) of the Competitive State Anxiety Inventory-2 (CSAI-2; Martens et al., 1983). Seasonal contact percentage (the number of times a batter made contact with the ball in such a manner as to put the ball "in play", divided by the total number of official plate appearances) was used as an indicator of overall batting performance. Contact percentage for each subject was calculated on the basis of game statistics as recorded by an official scorer present at each game.

Because only male athletes were members of the varsity baseball team, and only females participated in varsity softball, *t*'tests were performed for each attentional and information processing subscale of the TAIS and B-TAIS. In addition, differences between the teams' anxiety scores on both the CTAI-2 and the SCAT as well as seasonal contact percentage were statistically examined. All *t*'test results were nonsignificant, therefore, the two teams were combined for additional analyses.

Reliability of the TAIS and B-TAIS was examined in terms of each instrument's stability and internal consistency. Pearson product-moment correlation coefficients were used to estimate each measure's two-week test-retest reliability. While stability coefficients were generally high for both the TAIS and the B-TAIS, five of the six B-TAIS subscales demonstrated higher correlation coefficients than their TAIS counterparts. Despite the general stability increases found with the B-TAIS, Fisher *Z* transformations revealed that the only statistically significant difference between the two instruments occurred on the one attentional subscale (OIT) which was found to be more stable on the TAIS. Thus, only partial support was provided for the first hypothesis.

An estimate of the consistency with which subscale items measured each attentional and information processing dimension was assessed by computing Cronbach alpha reliability coefficients for each TAIS and B-TAIS subscale. Internal consistency of the B-TAIS although nonsignificant, was higher than the TAIS on all attentional and information processing subscales. The second hypothesis, therefore, was again only partially supported.

As an indication of convergent validity, a correlation coefficient of .50 was found between the original TAIS and the B-TAIS. This moderate correlation supports the third hypothesis and the assumption that while both instruments assess the same general attentional phenomena, each also contributes unique information regarding individual attentional style.

Comparisons concerning the construct validity of the TAIS and B-TAIS were made on the basis of correlations between OIT (internal-overload) and RED (reduced-attention) scores and self-reported levels of competitive trait anxiety and between NAR (narrow attention) scores on each instrument and overall seasonal batting performance. The strongest support for greater construct validity of the B-TAIS was indicated by significant positive correlations between B-TAIS scores on the three 'ineffective' subscales and competitive trait anxiety (RED = .45, OET = .41, OIT = .37). Again, the more general TAIS showed no such relationship, and therefore only supports the fourth hypothesis for the B-TAIS.

B-TAIS scores on the NAR subscale measuring the ability to effectively narrow attention were, as expected, significantly and positively correlated with batting performance (.30). The fifth hypothesis was only supported for the B-TAIS, however, because NAR scores on the TAIS were inversely related to performance (-.16). All TAIS and B-TAIS subscales assessing 'ineffective' deployment of attention (RED, OET, OIT) were found as predicted, to be inversely related to seasonal batting performance, thus supporting the sixth hypothesis for the TAIS and B-TAIS. Performance was also found to be positively related to all B-TAIS subscales assumed to measure 'effective' deployment of attention (NAR, BET, BIT) while negatively related to all 'ineffective' attentional subscales (RED, OET, OIT). No such relationship existed for the TAIS.

Three measures of subscale independence: (a) irrelevant item by subscale correlations, (b) interscale correlations, and (c) factor analysis supported Van Schoyck's (1979) contention that the attentional subscales contained in the TAIS lack subscale independence, and therefore, do not measure unique attentional constructs. This overlapping of attentional subscales was even more pronounced on the task-specific B-TAIS.

Conclusions

Based upon the findings and within the limitations of this study, the following conclusions were reached:

(1) In general, TAIS attentional subscale reliability, both in terms of stability and internal consistency, is improved when each item is given a task-specific frame of reference.

(2) Taking all results together, a sport task-specific version of the TAIS exhibits greater construct validity than the more general measure.

(3) The TAIS lacks the attentional subscale independence necessary to measure the unique attentional constructs suggested in Nideffer's (1976a, 1981) theory of individual attentional style.

(4) Constructing sport-specific measures of individual attentional style by modifying the original TAIS so each item is given a task-specific frame of reference results in the intentional duplication of any flaws existing in the parent measure. In addition, such a procedure may actually reduce subject rapport by decreasing the face validity of the original instrument (Anastasi, 1982).

Recommendations for Future Research

Due to a natural selection process and years of trial-and-error learning, an athlete's ability to direct attention toward specific, sport-related stimuli may differ from his or her observed attentional style in everyday life situations. To the extent that such differences occur, accuracy in the assessment of an individual's sport-related attentional style through the use of general attentional instruments will be limited. This, in addition to the evidence indicating that modifying a general measure of attention tends to result in the duplication of any flaws in the existing instrument, illustrates the need for a sport-related measure of attentional style, developed and tested in strict adherence to contemporary psychometric procedures. While such rigorous development standards would obviously improve attentional assessment, the effort required to design separate instruments for each sport would be prohibitive. Therefore, a general sport-related instrument should be developed wherein each attentional item is prefaced by a phrase such as: "When I am participating in my sport. . ." which would allow the individual to answer each item in the context of his or her particular sport. Norms could then be compiled as to how athletes in a wide variety of sport settings respond to each test item.

In addition, each subscale of the test should be developed to directly assess one theoretical dimension of attention. For example, a minimum of six subscales directly measuring (a) broad-internal, (b) broad-external, (c) narrow-internal, (d) narrow-external, (e) attentional width flexibility, and (f) attentional direction flexibility are necessary to test Nideffer's (1976a, 1981) theoretical assumptions regarding individual attentional style. Still other performance-related attentional dimensions such as duration, capacity, intensivity and selectivity, which have been suggested by other investigators, (e.g., Etzel, 1979) may be incorporated into a more complete theoretical model of individual attentional style. The TAIS information processing subscale may also be modified so as to assess not only the ability to process a great deal of information, but the degree to which this processing can take place in a limited amount of time.

Once constructed, such a measure may facilitate further investigations into possible individual attentional differences which may exist in response to competitive anxiety. For example, while current attentional theory suggests that increased arousal tends to result in (a) reduced attentional flexibility, (b) narrowed attentional bandwith, and (c) increased internal focus, certain individuals may be identified as being more or less susceptible to malfunctions along one or more of these attentional dimensions.

FOOTNOTES

[1]According to Nideffer (1977b) "Many of the test items require a certain amount of life experience before they can be adequately answered. For this reason, it is suggested that individuals taking the test be old enough to go to high school and have an 8th grade reading level" (pg. 6).

[2]The SPSS subprogram T-TEST provides the capability of computing an approximation to *t* for independent sample means with unequal sample sizes.

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APPENDICES

APPENDIX A

LIST OF 17 TAIS SUBSCALES

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LIST OF 17 TAIS SUBSCALES

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 scorers 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.

INFP (Information processing): High scorers 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 anti-social.

CON (Control): A high score indicates the individual see 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 thoughts and ideas. They have a need for personal space.

IEX (Intellectual expression): A high score indicates the person expresses thoughts 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.

Note. From "Test of Attentional and Interpersonal Style" by R.M. Nideffer, 1976, Journal of Personality and Social Psychology, 34, p. 397. Copyright 1976, American Psychological Association.

APPENDIX B

B-TAIS ITEMS AND SCORING INSTRUCTIONS

APPENDIX B

B-TAIS ITEMS AND SCORING INSTRUCTIONS

1. I am good at glancing at the positioning of the defense, and quickly picking out where the ball should be hit.

2. It is easy for me to focus on a number of things at the same time while I bat.

3. When I bat, I have so many things on my mind that I get confused and forget my instructions.

4. When batting, I keep changing back and forth from one stance and grip to another.

5. When in the batter's box my mind is going a mile a minute.

6. I find myself in the battter's box just looking at the pitcher with my mind a complete blank.

7. I tend to focus on one small part of a pitcher's delivery, and miss those things that my give me a better idea of what (s)he is throwing me.

8. When I get anxious or nervous while hitting, my attention becomes narrow and I fail to see important cues that are going on around me.

9. When hitting, I can keep track of several things at the same time, such as the count, the coaches' instructions, and the type of pitch that I am most likely to see.

10. When I'm batting, I find myself distracted by the sights and sounds around me.

11. When batting, I only think about one thing at a time.

12. When asked by my teammates what a given pitcher is throwing, my answers are too narrow, and don't give them the information they are looking for.

13. I need to have all information regarding a certain pitcher before I know how to hit against him/her.

14. My interests in hitting are narrower than are those of most players.

15. I make mistakes while batting because my thoughts get stuck on one idea or feeling.

16. I have a lot of energy for a hitter my age.

17. I have difficulty telling what a pitcher is thinking by wathcing his/her moves.

18. When batting, I have a tendency to listen to the catcher or the infielder's chatter, and forget about the upcoming pitch.

19. When I get up to bat, I get anxious and forget what it was I was going to try to do against this particular pitch.

20. Pitchers can fool me by throwing a type of pitch that I'm not expecting, or by using an unorthodox motion.

21. With so much going on around me as I bat, it is difficult for me to keep my concentration for any length of time.

22. When up to the plate, I know what everyone in the field is doing.

23. While batting, my thoughts are limited to just the pitcher and the ball.

24. I am good at picking up the rotation of the ball after it leaves the pitcher's hand.

25. While hitting, my thoughts are coming to me so fast that I can hardly keep up with them.

26. Hitting a baseball is a skill which involves a wide variety of seemingly unrelated tasks and strategies.

27. It is easy for me to consider the various aspects of the game such as the score, the number of base runners, the outs, and the count, and from this, get a good idea of what to do when I get up to the plate.

28. It is easy for me to keep my mind on the single thought of hitting the baseball.

29. Just by watching a pitcher warm-up, or throw to one of my teammates, I can figure out how to hit him/her.

30. While batting, I make mistakes because I get too involved with what one player is doing, and forget about the others.

31. I approach the mental aspects of hitting in a focused, narrow, and logical fashion.

32. While batting, outside happenings or objects tend to grab my attention.

33. I think a lot about different batting strategies and tactics.

34. After I bat, and my teammates ask me about what the pitcher has thrown me, my answers are too broad, and I tell them more than they really need to know.

35. When I'm batting, the diamond seems to be a booming, buzzing, brilliant flash of color and confusion.

36. My interests in hitting are broader than those of most players.

37. I am good at quickly analyzing a pitcher and assessing his/her strengths and weaknesses.

38. It is easy for me to keep my mind on the single sight of the ball approaching the plate.

39. When I am preparing to bat, I am good at analyzing complex situations such as what should be done given the score, the number of outs, runners on base, etc.

40. It is easy for me to keep outside sights and sounds from interfering with my thoughts while hitting.

41. When batting, I get so caught up in my own thoughts I forget what's going on around me.

42. When a pitcher is trying to "set me up" I can think several moves ahead, and see what (s)he's doing.

43. I am socially outgoing, talking to the catcher and/or umpire while I bat.

44. When I'm batting, I find myself distracted by my own thoughts and ideas.

45. Batting is exciting, and keeps me interested.

46. I am always on the move in the batter's box.

47. It is easy to forget about an error that I have made in the field when I am hitting.

48. When I am hitting, if the coach doesn't give me a signal, I can't make up my mind what strategy to use.

49. It is easy for me to direct my attention and focus narrowly while I bat.

50. I seem to work on my hitting in "fits and starts" and "bits and pieces."

51. All I need is a little information about opposing pitchers, and I can think of a number of ways I can go about trying to hit them.

52. When I bat, it is easy for me to block out everything except the ball.

53. When hitting, I have difficulty clearing my mind of a single thought or idea.

54. Sometimes while hitting, the developments in the game come so fast that it makes me light headed or dizzy.

55. It is easy for me to keep my thoughts from interfering with my hitting while I'm at the plate.

56. When the pitcher has a wide variety of different pitches, I get confused as to which one to expect.

57. I sometimes have to step out of the batter's box because I get distracted by irrelevant sights and sounds.

58. I get confused trying to bat with so many things happening all at the same time.

59. The coach has to repeat the signs because I get distracted by my own irrelevant thoughts when I prepare to bat.

B-TAIS Scoring Procedures

All B-TAIS items are scored: 0 = never; 1 = rarely; 2 = sometimes; 3 = frequently; 4 = always. The following items are included in each subscale score:

BET	1,22,29,37,39; and 17 (reverse scored)
OET	4,10,21,32,35,46,48,52,54,55,56; and 40 (reverse scored)
BIT	2,27,33,36,39,42,49; and 30 (reverse scored)
OIT	3,18,20,25,34,41,44,57; and 53 (reverse scored)
NAR	11,14,23,24,28,31,38,40,45,47,50,53
RED	6,7,8,11,12,13,15,18,19,23,30,31,45,51; and 2 (reverse scored)
INFP	1,2,5,9,16,22,23,26,33,36,37,39,42,43,45,46,51; and 7,11 (reverse scored)

APPENDIX C

AGREEMENT AMONG SPORT PSYCHOLOGISTS ON B-TAIS ITEMS

APPENDIX C

Table 21

Agreement Among Sport Psychologists on B-TAIS Items

B-TAIS Item Number	Percentage of Rater Agreement	B-TAIS Item Number	Percentage of Rater Agreement
1	100	31	80
2	100	32	100
3	80	33	100
4	80	34	100
5	60	35	100
6	100	36	100
7	60	37	60
8	80	38	100
9	80	39	100
10	100	40	100
11	80	41	80
12	100	42	100
13	100	43	100
14	100	44	60
15	100	45	100
16	80	46	100
17	80	47	100
18	100	48	100
19	100	49	100
20	100	50	100
21	80	51	100
22	100	52	100
23	100	53	80
24	100	54	100
25	100	55	80
26	100	56	100
27	100	57	100
28	80	58	60
29	100	59	80
30	60		

APPENDIX D

SCAT SURVEY AND SCORING INSTRUCTIONS

APPENDIX D

SCAT SURVEY AND SCORING INSTRUCTIONS

DIRECTIONS: Below are some statements about how persons feel when they compete in sports. Read each statement and decide if you HARDLY EVER, SOMETIMES, or OFTEN feel this way when you compete in sports. If your choice is HARDLY EVER, put an "x" under the column marked "(1) Hardly Ever"; if your choice is SOMETIMES, place an "x" under the column marked "(2) Sometimes"; and if your choice is OFTEN, place an "x" under the column marked "(3) Often". There are no right or wrong answers. Do not spend too much time on any one statement. Remember to choose the word that describes how you usually feel when batting.

		(1)Hardly Ever	(2)Sometimes	(3)Often
1.	Competing against others is socially enjoyable.	1_____	2_____	3_____
2.	Before I compete I feel uneasy.	1_____	2_____	3_____
3.	Before I compete I worry about not performing well.	1_____	2_____	3_____
4.	I am a good sportsman when I compete.	1_____	2_____	3_____
5.	When I compete I worry about making mistakes.	1_____	2_____	3_____
6.	Before I compete I am calm.	1_____	2_____	3_____
7.	Setting a goal is important when competing.	1_____	2_____	3_____
8.	Before I compete I get a queasy feeling in my stomach.	1_____	2_____	3_____
9.	Just before competing I notice my heart beats faster than usual.	1_____	2_____	3_____
10.	I like to compete in games that demand considerable physical energy.	1_____	2_____	3_____
11.	Before I compete I feel relaxed.	1_____	2_____	3_____
12.	Before I compete I am nervous.	1_____	2_____	3_____
13.	Team sports are more exciting than individual sports.	1_____	2_____	3_____

14.	I get nervous waiting to start the race or meet.	1_____	2_____	3_____
15.	Before I compete I usually get uptight.	1_____	2_____	3_____

All SCAT items are scored 1 = Hardly Ever; 2 = Sometimes; 3 = Often. An overall SCAT score is computed by omitting items 1, 4, 7, 10, and 13, reverse scoring items 6 and 11 and summing the item scores.

APPENDIX E

CTAI-2 SURVEY AND SCORING INSTRUCTIONS

APPENDIX E

CTAI-2 SURVEY AND SCORING INSTRUCTIONS

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 usually feel when batting. There ar no right or wrong answers. do not spend too much time on any one statement, but choose the answer whch describes your feelings in general.

	Not at All	Somewhat	Moderately So	Very Much So
1. I am concerned about the 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 the 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

	Not at All	Somewhat	Moderately So	Very Much So
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 goal	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

Item 1, 4, 7, 10, 13, 16, 19, 22 and 25 are included in the "cognitive" anxiety subscale. Items 2, 5, 8, 11, 14, 17, 20, 23 and 26 are included in the "somatic" anxiety subscale. Items 3, 6, 9, 12, 15, 18, 21, 24, and 27 are contained in the "confidence" subscale. Only item 14 (somatic subscale) is reverse scored.

APPENDIX F

SUMMARY OF *t'* TESTS

APPENDIX F

Table 22

Summary of t' Tests Between Baseball and Softball Teams

	Baseball		Softball			
Variable	M	SD	M	SD	F value	Probability
Games Played	31.55	21.75	37.90	13.86	2.46	.191
Official at Bats	91.98	74.61	95.90	58.40	1.63	.474
Hits	30.09	26.90	21.40	15.39	3.06	.108
Runs Scored	23.45	21.81	10.30	6.01	13.13	.001
Batting Average	.327	.249	.192	.073	11.58	.001
Home Runs	3.82	5.93	0.40	0.84	49.45	.001
Doubles	5.00	5.06	2.80	2.61	3.74	.060
Triples	1.73	1.62	0.80	0.92	3.10	.103
Slugging Percentage	.511	.259	.244	.101	6.58	.009
Bases on Balls	15.00	13.89	9.90	8.24	2.84	.132
Strikeouts	14.82	11.42	13.30	8.51	1.80	.391
Strikeout Percentage	.127	.138	.112	.097	1.97	.232
SCAT Score	18.07	4.38	17.00	3.37	1.69	3.53
CTAI-2:						
Cognitive	17.60	3.66	15.50	2.61	1.96	.290
Somatic	15.80	3.91	13.25	2.93	1.78	.362
Confidence	29.40	3.24	28.33	4.68	2.09	.279

(Table 22 continued)

Variable	Baseball		Softball			
	M	SD	M	SD	F value	Probability
TAIS:						
BET	13.67	2.41	14.43	2.88	1.42	.521
OET	18.93	4.11	15.67	4.01	1.05	.947
BIT	18.00	3.21	17.69	2.90	1.22	.732
OIT	13.79	3.14	12.08	2.72	1.33	.626
NAR	27.33	5.29	27.17	3.56	2.20	.194
RED	25.78	3.04	24.00	3.96	1.69	.359
INFP	41.00	8.12	43.50	5.55	2.14	.211
B-TAIS:						
BET	14.07	2.97	13.42	2.84	1.09	.893
OET	15.21	5.66	11.62	3.53	2.58	.111
BIT	17.36	4.03	16.08	3.50	1.33	.631
OIT	12.86	3.53	10.08	2.69	1.72	.358
NAR	30.79	6.18	32.00	7.72	1.56	.440
RED	24.71	6.03	21.00	5.12	1.39	.592
INFP	41.14	6.14	39.17	8.60	1.96	.247

APPENDIX G

FISHER'S Z TRANSFORMATION RESULTS

APPENDIX G

Table 23

Fisher's Z Transformations of Reliability Correlations Obtained on B-TAIS and TAIS Subscales

Attentional Subscale	B-TAIS r	Z transformation of B-TAIS r	TAIS r	Z transformation of TAIS r	$Z = \frac{Z_1 - Z_2}{\sqrt{1/n-3 + 1/n-3}}$
Test-Retest					
BET	.8795	1.3758	.8193	1.1537	.801
OET	.8616	1.3414	.8192	1.1537	.677
BIT	.9516	1.8527	.9247	1.6226	.830
OIT	.7224	1.0253	.9120	1.5393	-2.262
NAR	.8444	1.2349	.8169	1.1477	.314
RED	.7634	1.0034	.7195	0.9076	.345
INFP	.9028	1.4882	.9201	1.5890	-.363
Internal Consistency					
BET	.65320	.7806	.54832	.6155	.595
OET	.84983	1.2562	.75974	.9962	.937
BIT	.53719	.5999	.40798	.4332	.601
OIT	.74917	.9706	.68030	.8291	.510
NAR	.70655	.8812	.63550	.7514	.468
RED	.50271	.5533	.12714	.1277	1.535
INFP	.63393	.7481	.37286	.3919	1.284

APPENDIX H

HUMAN SUBJECTS APPROVAL

MICHIGAN STATE UNIVERSITY

UNIVERSITY COMMITTEE ON RESEARCH INVOLVING
HUMAN SUBJECTS (UCRIHS)
[illegible] ADMINISTRATION BUILDING
(517) [illegible]

EAST LANSING • MICHIGAN • [illegible]

May 8, 1984

Mr. Richard R. Albrecht
Institute for the Study of
Youth Sports

Dear Mr. Albrecht

Subject: Proposal Entitled, "Relationships Between Individual Attentional Style and Batting Performance in Intercollegiate Baseball and Softball"

UCRIHS review of the above referenced project has now been completed. I am pleased to advise that the rights and welfare of the human subjects appear to be adequately protected and the Committee, therefore, approved this project at its meeting on May 7, 1984.

You are reminded that UCRIHS approval is valid for one calendar year. If you plan to continue this project beyond one year, please make provisions for obtaining appropriate UCRIHS approval prior to May 7, 1985.

Any changes in procedures involving human subjects must be reviewed by the UCRIHS prior to initiation of the change. UCRIHS must also be notified promptly of any problems (unexpected side effects, complaints, etc.) involving human subjects during the course of the work.

Thank you for bringing this project to our attention. If we can be of any future help, please do not hesitate to let us know.

Sincerely,

Henry E. Bredeck
Chairman, UCRIHS

HEB/jms

cc: Feltz

MSU is an Affirmative Action/Equal Opportunity Institution

APPENDIX I

RAW DATA

APPENDIX I

RAW DATA

DATA DIRECTORY

CARD	COLUMN	VARIABLE	CODE			
CARD 1	1	Team	1	Baseball		
			2	Softball		
	2-3	Subject ID	01-99			
	4-5	Age	Age in years			
	6	Class	1	Freshman		
			2	Sophomore		
			3	Junior		
			4	Senior		
	7-8	Playing Position	01	Pitcher	06	Shortstop
			02	Catcher	07	Left field
			03	1st Base	08	Center field
			04	2nd Base	09	Right field
			05	3rd Base	10	Designated Hitter
	11-78	B-TAIS Pretest	1	Never		
			2	Rarely		
			3	Sometimes		
			4	Frequently		
			5	Always		
CARD 2	4-62	TAIS Pretest	1	Never		
			2	Rarely		
			3	Sometimes		
			4	Frequently		
			5	Always		
	65-78	SCAT	1	Hardly Ever		
			2	Sometimes		
			3	Often		
CARD 3	4-65	B-TAIS Retest	1	Never		
			2	Rarely		
			3	Sometimes		
			4	Frequently		
			5	Always		

CARD	COLUMN	VARIABLE	CODE
CARD 4	4-62	TAIS Retest	1 Never
			2 Rarely
			3 Sometimes
			4 Frequently
			5 Always
CARD 5	4-30	CTAI-2	1 Not At all
			2 Somewhat
			3 Moderately So
			4 Very Much So
CARD 6	5-6	Games Played	
	8-10	Seasonal At Bats	
	12-13	Runs Scored	
	15-16	Hits	
	17-20	Batting Average	
	22-23	Doubles	
	25	Triples	
	27-28	Home Runs	
	30-31	Runs Batted In	
	33-34	Bases on Balls	
	36-37	Strikeouts	
	38-41	Slugging Percentage	

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