

**PRECOMPETITIVE STATE ANXIETY,
SELF-CONFIDENCE AND ATHLETIC
PERFORMANCE IN VOLLEYBALL AND
BASKETBALL PLAYERS**

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LIST OF ORIGINAL PUBLICATIONS

This thesis is based on the papers listed below, which will be referred to in the following by their Roman numerals:

- I. Raudsepp, L., Kais, K. The relationship between state anxiety and performance in beach volleyball players. *Journal of Human Movement Studies*, 2002, 403–416.
- II. Kais, K., Raudsepp, L. Cognitive and somatic anxiety and self-confidence in athletic performance of beach volleyball. *Perceptual and Motor Skills*, 2004, 98, 439–449.
- III. Kais, K., Raudsepp, L. Intensity and direction of competitive state anxiety, self-confidence and athletic performance. *Kinesiology*, 2005, 37, 13–20.

INTRODUCTION

The study of emotions in sport is theoretically and practically important for two main reasons. First, they are thought to objectively and/or subjectively affect athletic performance (Hanin, 1999; Lane & Terry, 2000). Second, they convey fundamental information on the athlete-environment relationship (Lazarus, 1999) in terms of subjective importance attributed to the event, perceived ability to cope with it, and action tendency associated with it (e.g. approach, avoidance, reflective self-focused, or interacting externally focused behavior; Green & Sedikness, 1999). This information is crucial to understand athletes' behavior, plan and implement performance-enhancement programmes, and promote athletes' psychological well being (Cerin, 2003). In addition, research has demonstrated that the ability to cope with intense anxiety is integral to success in competitive sport, particularly at the highest levels (Gould, Eklund & Jackson, 1992a, 1992b; Craft, Magyar, Becker & Feltz, 2003).

Research on sport anxiety/performance relationship was initially based on the inverted-U hypothesis (Yerkes & Dodson, 1908). This hypothesis posited a curvilinear relationship between physiological arousal and performance (Gould & Krane, 1992; Yerkes & Dodson, 1908). Moderate level of arousal were generally associated with better performance, whereas arousal levels that were too high or too low led to poorer performance (Spielberger, 1989; Gould & Krane, 1992). Over the past two decades, several other theoretical models and explanations focusing on this relationship have been proposed. These include Multidimensional Anxiety Theory (Martens, Vealey, & Burton, 1990), Catastrophe Models (Hardy, Jones & Gould, 1996), and Zones of Optimal Functioning Models (Hanin, 1986). The theoretical "ideology" of present dissertation is mainly based on multidimensional explanation of sport anxiety based, therefore, on works of Martens and colleagues. Their multidimensional theory suggests that anxiety consisted of both cognitive and somatic subcomponents. A third subcomponent discussed by Martens *et al.* (1990) is the individual difference factor of self-confidence. This encompasses the athlete's global perception of confidence. Although not originally proposed as a subcomponent of anxiety, Martens and co-workers have since included self-confidence in their development of Competitive State Inventory-2 (CSAI-2).

The current work is also based on the "directional perception" of competitive state anxiety proposed by Jones (1991, 1995a, 1995b). Following on from the work in test anxiety which has distinguished between debilitating and facilitating dimensions of the anxiety response (e.g. Alpert & Haber, 1960; Couch, Garber & Turner, 1983) Jones argued that anxiety have both negative and positive consequences in context of athletic performance. For example, one athlete might be 'very concerned' about an upcoming event, to the extent that he/she is worried and in a near-panic, debilitating state. Another athlete who is

also 'very concerned' might view such a state as very necessary since it signals the importance of the event and means that he/she will invest effort in it, thus constituting a motivated, facilitative state. Similarly, two performers experiencing almost identical symptoms of physiological arousal prior to competition might label those symptoms at completely opposite ends of the debilitating-facilitative continuum (Jones, Swain & Harwood, 1996). Research using the scale for directional perception of anxiety has shown that interpretation of anxiety as facilitative is associated with better performance in badminton (Eubank, Smith & Smethurst, 1995), gymnastics (Jones, Swain & Hardy, 1993), basketball (Swain & Jones 1993), and soccer (Hanton, Thomas & Maynard, 2004). The findings not only appear to support value in examining the interpretation of symptoms associated with competitive anxiety, but directional perceptions appears to be more sensitive in distinguishing between individual difference groups than the intensity responses (Jones & Hanton, 2001).

Despite the growing amount of research on sport anxiety using a multidimensional approach, research findings which relate changes in anxiety experienced by athletes to variations in performance are far from comprehensive (Craft *et al.*, 2003; Woodman & Hardy, 2003). Krane (1992) argued that the most prevalent limitation in sport anxiety research have been problems with the operational definitions of performance. Athletic performance can be assessed in several ways. For example, it may be based on objective outcomes such as standard performance measures (e.g. finishing time, place or more specific characteristics of game), on subjective outcomes such as evaluation by a coach or judge, or on self-perceptions of performance (Edwards & Hardy, 1996). These different categories of performance assessment may have different correlations with anxiety (Craft *et al.*, 2003). In addition, researchers have suggested there is a fundamental difference in performance and its relationship to anxiety for participants who play team sports versus individual sports (Martens *et al.*, 1990; Terry, Cox, Lane & Karageorghis, 1996). The number of individuals participating together may moderate the effect of anxiety on performance. Specifically, some authors argue that participants in individual sports should be more adversely affected by anxiety than those in team sports (Martens *et al.*, 1990; Terry *et al.*, 1996).

The variance in performance accounted for by the anxiety components has varied greatly across studies. At best, Edwards and Hardy (1996) were able to predict 10% of variance in performance. Swain and Jones (1996) were able to predict up to 23.4% of performance variance when using their modified CSAI-2 and Sonstroem and Bernardo's (1982) basketball performance measure. However, using very specific performance measures, Parfitt and Hardy (1993) have predicted up to 64% of performance variance on a working memory task with basketball players. Cognitive anxiety predicted performance, but the relationship was positive not negative, counter to the predictions of Multi-dimensional Anxiety Theory (Martens *et al.*, 1990). Parfitt and Pates (1999) found that somatic anxiety positively predicted performance that involved

anaerobic power (height jumped). Self-confidence, and not cognitive anxiety, was the main predictor of performance scores with working memory demands (successful passes and assists). In a recent meta-analysis, Craft *et al.* (2003) found that self-confidence was the strongest predictor of athletic performance while cognitive and somatic anxiety were only modestly related with performance.

The purpose of the present study was to examine the influence of competitive state anxiety and self-confidence on athletic performance in volleyball and basketball.

1. REVIEW OF LITERATURE

1.1. Anxiety

Nearly every concern of human endeavor is thought to be affected somehow by anxiety (Levitt, 1967). Anxiety is a complex emotion with a variety of cognitive, physiological, and behavioral symptoms that has often been linked with stress (Spielberger, 1966; Martens *et al.*, 1990; Lazarus, 1991). Moderate levels of anxiety involve apprehension, nervousness, worry, and tension; very high levels of anxiety may involve intense feelings of fear, catastrophic thoughts, and high levels of physiological arousal (Smith, Smoll & Wiechmann, 1998). The momentary level of anxiety experienced by an individual is termed state anxiety; trait anxiety, on the other hand, is a personality predisposition.

Competitive anxiety has long held a paradoxical fascination for sport psychologists and the coaches and athletes with whom they work (Martens, 1977; Martens *et al.*, 1990). Because no other single psychological attribute can have such a debilitating effect on performance, research on the causes and consequences of competitive anxiety as well as on how practitioners can reduce anxiety or more effectively cope with its effects has been one of the most heavily researched topics in sport psychology (Martens *et al.*, 1990; Smith, Smoll & Schutz, 1990). Measurement of competitive anxiety has received more attention than perhaps any other construct in sport and exercise psychology, and several anxiety inventories have been developed, which have proved to be excellent models for the development of psychometrically sound instruments (e.g. Martens, 1977; Martens *et al.*, 1990; Smith, *et al.*, 1990).

1.1.1. Unidimensional Anxiety theories

Many different theories have been invented to study the relationships between arousal and athletic performance, including inverted-U theory (Yerkes & Dodson, 1908); Easterbrook's cue utilization theory (Easterbrook, 1959); drive theory (Hull, 1943, 1951; Spence, 1956), and zone of optimal functioning (Hanin, 1980, 1986, 1989). It will be necessary to use the term arousal as somewhat synonymous with state anxiety. Arousal is the degree of activation of the organs and mechanisms that are under the control of the body's autonomic nervous system (Cox, 1998).

1.1.2. Inverted-U theory

The anxiety-performance relationship was traditionally discussed in terms of the inverted-U hypothesis (Yerkes & Dodson, 1908; Hebb, 1955). The foundation

for inverted-U theory is the classic work of Yerkes and Dodson (1908). Using dancing mice as subjects, Yerkes and Dodson (1908) set out to discover the relationship between arousal and task difficulty in their effect on performance. In essence, this approach advocated that anxiety affected performance because changes in anxiety were associated with corresponding changes in arousal. Traditionally, psychologists used the words “arousal” and “activation” synonymously to refer to a single unitary construct, which embodied both physiological and psychological characteristics and was concerned with the intensity and behavior. Arousal was hypothesized to have an inverted-U shaped relationship with performance, whereby performance was best at moderate levels of arousal (Hebb, 1955; Broadhurst, 1957). Over the years, a number of researchers have criticized the conceptualization of arousal as a single unitary construct (Lacey, 1967; Hockey & Hamilton, 1983; Neiss, 1988; Jones & Hardy, 1989). Nevertheless, the inverted-U hypothesis has retained its popularity with many sport psychologists (Gill, 1986; Landers, 1994). Anxiety is construct which is often linked to arousal, however the modern theories argue, that anxiety is a meta-cognitive emotion which should be clearly distinguished from the cognitive and physiological states which underlie arousal and activation (Hardy *et al.*, 1996).

1.1.3. Individualized zone of optimal functioning (IZOF)

A central tenet of Hanin’s (1980, 1986, 1989) individualized zone of optimal functioning (IZOF) approach is that each performer has his or her own optimal pre-performance anxiety zone within which performance will be optimal. Conversely, if the performer’s anxiety level lies outside this zone, then performance will be impaired. Several advantages of the IZOF anxiety model have been demonstrated: it is intuitively appealing and realistic (Weinberg, 1990; Gould & Krane, 1992; Jones, 1995a); it predicts precisely at which level of anxiety optimal performance will occur; and it is empirically based with all research conducted in naturalistic field settings, making it an ecologically valid model. The recent studies provide support for the validity of the basic assumptions of the IZOF model as applied to anxiety-performance relationships in competitive (non-elite) athletes (Jokela & Hanin, 1999).

Despite their obvious practical significance for practicing sport psychologists, IZOF appear to be somewhat barren ground at a theoretical level. First, Hanin’s original model utilized a unidimensional conceptualization of anxiety, although subsequent research has considered IZOF based on a multidimensional conceptualization of anxiety (Dennis, Bartsokas, Lewthwaite & Palin, 1993; Gould, Tuffey, Hardy & Lochbaum, 1993; Krane, 1993; Scallen, 1993). Second, and more serious, as Gould and Tuffey (1996) have indicated, IZOF is essentially an individual difference “theory” without any individual difference variable.

1.1.4. Multidimensional anxiety theory

Early studies did not consider the different components of anxiety, but did attempt to identify predictors of anxiety in performers. Simon and Martens (1977) found that competitive state anxiety was higher for young participants in individual sports compared with team sports, and in individual contact sports compared with individual non-contact sports.

Following researchers in clinical psychology, psychophysiology, and test anxiety (Lacey, 1967; Liebert & Morris, 1967; Borkovec, 1976; Davidson & Schwartz, 1976) proposed a multidimensional theory of anxiety and sports performance which predicted that cognitive and somatic anxiety were triggered by different antecedents, and influenced performance via different mechanisms. Cognitive anxiety refers to negative expectations and cognitive concern about performance, consequences of failure, negative self-evaluation, evaluation of one's ability relative to others, inability to concentrate, and disrupted attention. Somatic anxiety refers to one's perception of the affective physiological elements of anxiety, generated from increase of autonomic arousal and unpleasant feeling states such as nervousness, tension and upset. Since cognitive anxiety is principally concerned with the consequences of failure, multidimensional anxiety theory predicts that it should have a negative linear relationship with performance, because it is hypothesized to use up some of the performer's information-processing resources. Empirical support for this negative linear relationship has been obtained by Burton (1988) using collegiate swimmers. Somatic anxiety, on the other hand, is hypothesized to have an inverted-U shaped relationship with performance, presumably because it is associated with changes in physiological arousal; although it should be noted that Martens and associates do not actually offer any reason for this relationship. Empirical support for an inverted-U shaped relationship between somatic anxiety and performance has also been obtained using pistol shooters (Gould, Petchlikoff, Simons & Veveva, 1987), and swimmers (Burton, 1988).

Martens *et al.* (1990) identified self-confidence as a third factor, independent of cognitive and somatic anxiety during their construction of valid measurement instrument. According to multidimensional anxiety theory, self-confidence should have a positive linear relationship with performance, essentially because it is regarded as the opposite of cognitive anxiety. Nevertheless, support has been found for the prediction of a positive linear relationship between self-confidence and swimming performance by Burton (1988), but not by Gould *et al.* (1987), who found a negative linear relationship between self-confidence and shooting performance.

The most obvious implications of multidimensional anxiety theory for elite performance are that elite performers will perform better the less cognitively anxious and more self-confident they are. Multidimensional anxiety theory also predicts that athletes will perform best at intermediate levels of somatic anxiety.

However, the theory proposes that somatic anxiety is a conditioned response to the competitive environment (Hardy *et al.*, 1996).

1.1.5. Catastrophe model of anxiety and performance

Dissatisfaction with the inverted-U hypothesis and multidimensional anxiety theory led Hardy and associates to propose a cusp catastrophe model of anxiety and performance, which attempted to clarify the relationship between cognitive anxiety, physiological arousal, and performance (Fazey & Hardy, 1988; Hardy, 1990). Features of this model include the fact that it incorporates physiological arousal, rather than somatic anxiety, as a predictor variable. Hardy and associates' use of physiological arousal in preference to somatic anxiety was based upon the argument that, theoretically, physiological arousal could exert an influence upon performance via two different mechanisms (Hardy, 1990; Hardy & Parfitt, 1991; Hardy, Parfitt & Pates, 1994). It could cause a direct effect upon performance by changing the performer's activation state, and therefore the availability of certain resources to the performer (Hockey & Hamilton, 1983; Humphreys & Revelle, 1984; Parfitt, Jones & Hardy, 1990). The physiological arousal may influence performance either directly or indirectly, while somatic anxiety could only allow indirect effects upon performance.

According to cusp catastrophe model, if cognitive anxiety is very low, the relationship between arousal and performance is predicted to take the form of the traditional inverted-U. Cognitive anxiety is represented in the model as the decisive factor for determining whether performance changes will be small, large, or somewhere between. However, at high levels of cognitive anxiety, the effects of physiological arousal can be either positive or negative relative to baseline performance, depending upon exactly how high physiological arousal is. Furthermore, continual increases in physiological arousal will eventually lead to a sudden and dramatic decline in performance. Once such a performance decrement has occurred, it can only be reversed by a considerable reduction in physiological arousal beyond the point where the original decrement in performance occurred. The limited empirical tests have so far been performed upon the cusp catastrophe model have been generally supportive of it (Krane, 1990; Hardy & Parfitt, 1991; Hardy *et al.*, 1994; Hardy, 1996). The basic tenets of Fazey and Hardy's catastrophe model were tested by Hardy and Parfitt (1991) and Hardy *et al.* (1994). In both of these studies, cognitive anxiety and physiological arousal were manipulated. Setting cognitive anxiety at a high level and systematically increasing physiological arousal resulted in catastrophic decrements in basketball and bowling performance. Minimal changes in performance were observed when cognitive anxiety was low and physiological arousal was systematically increased. Both of these studies provided strong support of the basic tenets of catastrophe theory.

Several investigators have replaced physiological arousal with somatic anxiety and tested the revised catastrophe model in competitive situations. In these investigations, cognitive and somatic state anxiety was measured immediately before batting in softball (Krane, Joyce & Rafeld, 1994), or before diving off a 3-meter board (Durr, 1996). In the Krane *et al.* (1994) investigation, very minimal support was found for the revised model, in that somatic anxiety related to batting performance in certain critical game situations (situations in which cognitive anxiety would be expected to be high). At the present time, it appears that catastrophe theory is best supported when the model is conceptualized as originally presented by Fazez and Hardy (1988).

1.2. Measuring competitive state anxiety

One of the concerns faced by researchers examining state anxiety has been the development of a valid and reliable tool for its measurement. Spielberger, Gorsuch and Lushene (1970) developed the State-Trait Anxiety Inventory (STAI), but it was designed for the large populations rather than athletes. To overcome this limitation, Martens, Burton, Rivkin and Simon (1980) developed a sport-specific measure of state anxiety, the Competitive State Anxiety Inventory (CSAI). The CSAI was then revised into CSAI-2 to include the multidimensional components of anxiety (Martens *et al.*, 1990).

1.2.1. Competitive State Anxiety Inventory (CSAI-2)

Based on Martens *et al.* (1990), for the development of CSAI-2 “a systematic psychometric process” was followed. More specifically, a pool of 102 items comprised the first form of the questionnaire. These items represented four factors, cognitive and somatic state anxiety, fear of physical harm, and generalized anxiety. The examination of the face validity of these items resulted in a version of 79 items. Following a number of subsequent analyses the subscale of cognitive anxiety was divided into two separate subscales, one with negatively worded (labeled cognitive anxiety) and one with positively worded items (labeled self-confidence). At the same time, the fear of physical harm subscale appeared to be a non-significant predictor of anxiety in sport situations and was eliminated from further analysis. The final form of the CSAI-2 includes three subscales, nine items for each subscale, together with 27 items. These three subscales are labeled cognitive anxiety, somatic anxiety and self-confidence.

In order to test the validity of the final form of the inventory Martens and his colleagues (1990) conducted four studies examining the interrelationships of the subscales and their relationship to performance in team and individual sport,

respectively. According to them, the results of these studies supported the construct validity of the CSAI-2 and verified its use for the estimation of cognitive and somatic state anxiety and self-confidence in sports. Since then, the CSAI-2 has been regarded to be one of the most valid and reliable tools for the measurement of state anxiety (Gould, Petlichkoff & Weinberg, 1984; Barnes, Sime, Dienstbier & Blake, 1986; Karteroliotis & Gill, 1987; Burton, 1988; Jones, 1993; Krane & Williams, 1994). The CSAI-2 has been used in research published in over 40 articles on anxiety in sport and it is perhaps the most well-known anxiety instrument used in sport psychology research.

Stadulis, Eidson and McCracken (1994) reported the development of a 15-item version of the CSAI-2 called it the CSAI-2 for children (CSAI-2C). The CSAI-2C is shortened version of the parent test modified to include language appropriate for children ages 10 to 12.

Very short version of measuring competitive state anxiety has been used by method of Hardy and Upton (1992), which requires participants to self-report their cognitive anxiety, somatic anxiety, and self-confidence as a single score on a scale of 0 to 27. This short version has been invented in order to measure anxiety short period before the competitions or in the middle of competitions (between sets, in half time).

1.2.2. Factor structure of CSAI-2

In spite of the fact that CSAI-2 has been regarded one of the most valid and reliable tools, the recent studies have been criticizing the 3-factor structure of CSAI-2 (Lane, Sewell, Terry, Bartram & Nesti, 1999; Tsorbatzoudis, Barkoukis, Sideridis & Grouios, 2002; Cox, Martens & Russell, 2003). According to Lane and his colleagues (1999) there are at least three arguments to suggest that it would be prudent to re-evaluate the factor structure of CSAI-2.

First at each stage, the ratio of participants to items was below the minimum recommended (5:1) for trustworthy results (Cattell, 1978; Comrey & Lee, 1992; Tabachnick & Fidell, 1996, 2001; Thompson & Daniel, 1996). Stage 1 analyzed the responses of 162 participants to a 79-item scale (ratio 2:1); stage 2 re-analyzed data from the same participants using a reduced 36-item scale (ratio 4,5:1); stage 3 included 80 participants and a 52-item scale (ratio 1,5:1); and stage 4 used the same 80 participants and a 27-item scale (ratio 3:1). Moreover, Tabachnick and Fidell (1996) proposed that general rule is to have at least 300 cases for factor analysis.

A second reason derives from the decision taken at stage 5 of the original validation process to change the word “worried” to “concerned” in the cognitive anxiety scale to reduce the influence of social desirability. Eight of the nine cognitive anxiety items in the CSAI-2 use “concern” as an expression of cognitive anxiety, and it has been argued that expression “I am concerned” can

be interpreted positively or negatively (Barnes *et al.*, 1986; Jones, 1991; Jones & Swain, 1992; Burton & Naylor, 1997; Woodman & Hardy, 2001).

The third argument for re-evaluating the CSAI-2 is that recent developments in computer software to test the factor structures of psychological questionnaires have prompted researchers (Hendrick & Hendrick, 1986; Bentler, 1992; Schutz & Gessaroli, 1993; Thompson & Daniel, 1996) to emphasize the benefits of structural equation modeling techniques such as Confirmatory Factor Analysis (CFA). However, the limitations of exploratory factor analysis (EFA) have been well documented in the literature (Gorsuch, 1983). CFA is proposed to be rigorous test of theory, because data are tested against a hypothesized model. The CSAI-2 was developed using EFA, which, it has been argued (Thomson & Daniel, 1996), lacks of theoretical basis by virtue of its exploratory nature.

Research employing CFA to test the psychometric properties of the CSAI-2 (Lane *et al.*, 1999), as well as the Greek version of CSAI-2 (Tsorbatzoudis *et al.*, 2002), did not confirm the 3-factor structure proposed by Martens and his colleagues (1990). Moreover Lane and his colleagues (1999) suggested that 2-factor structure is preferable to the 3-factor for the assessment of anxiety in competitive settings.

1.2.3. Revised CSAI-2 (CSAI-2R)

Raising criticism of the CSAI-2 (Martens *et al.*, 1990) led to re-evaluation of the questionnaire. Cox and his colleagues (2003) raised three main concerns regarding Martens *et al.*'s (1990) use of exploratory factor analysis (EFA) and principal component analysis (PCA) in developing the CSAI-2, namely the appropriateness of EFA vs. PCA, choice of rotation methods, and sample size issues.

EFA and PCA are two different approaches to determining the factor structure of instrument. In EFA only the common variance among observed variables is available for analysis, while in PCA both common variance and unique variance (including error variance) are available (Fabringer, Wegener, MacCallum & Strahan, 1999; Tabachnick & Fidell, 2001). Through EFA, researchers can identify latent constructs that represent correlations among measured variables, and it is for this reason that EFA rather than PCA is appropriately used in scale construction (Cattell, 1978; Fabringer *et al.*, 1999).

Second, Martens *et al.* (1990) reported that they used both varimax (orthogonal) and oblique (correlated) rotations in interpreting and determining factor structure. When theoretical or empirical evidence indicates that latent constructs are correlated, logic dictates that oblique rotation should be used (Loehlin, 1998; Fabringer *et al.*, 1999). Given that the three subscales of the CSAI-2 are hypothesized to measure sport-specific state anxiety, one can argue

that only oblique rotation procedures should have been used in developing CSAI-2. The sample size has been already discussed earlier.

Based on the results from the Lagrange Multiplier Test, Cox *et al.* (2003) deleted 10 items from the original CSAI-2. They concluded that new revised CSAI-2 (CSAI-2R) has stronger psychometric properties in terms of its factor structure than original instrument. Moreover, they recommended that both researchers and clinicians use the CSAI-2R in place of the CSAI-2. The CSAI-2R has three-factor structure with 7 items measuring somatic anxiety, 5 cognitive anxiety and 5 self-confidence.

1.3. Direction of state anxiety

Early seventies, Alpert and Haber (1960) distinguished between debilitating and facilitating anxiety and found that a scale which measured both types of anxiety provided a significantly stronger predictor of academic performance than a conventional debilitating scale. In addition, other researchers (e.g. Munz, Costello & Korabek, 1975; Hudesman & Weisner, 1978; Wine, 1980) have demonstrated the importance of distinguishing between facilitative and debilitating anxiety. Research within the sport literature has also indicated the possible facilitative effects of anxiety on performance (Mahoney & Avenier, 1977). Swain and Jones (1993) proposed that intensity-alone approach to the measurement of the cognitive anxiety construct provides limited information.

Jones (1991) argued that the CSAI-2 measures only the intensity of anxiety symptoms and that high scores may not necessarily have negative connotations. The CSAI-2 measures intensity of state anxiety and says nothing about the individual's perception whether his response, be it high or low, would debilitate or facilitate performance. The athlete's perception, relative to a specific item on the CSAI-2 has been labeled direction state of anxiety. Direction of state anxiety is athlete's interpretation whether his felt level of intensity was debilitating or facilitative relative to performance (Edwards & Hardy, 1996; Jones, 1991, 1995b; Jones & Hanton, 1996; Jones, Hanton & Swain, 1994; Jones & Swain, 1992, 1995). To take into account the directional component of competitive state anxiety, the CSAI-2 was revised (Jones & Swain, 1992). The revised CSAI-2 requires a second response from the subject relative to each item on a 7-point scale whether the level of intensity is facilitative or debilitating (ranging from -3 to +3). Davis and Cox (2002) used the directionality scale from range 1 (highly debilitating) to 7 (highly facilitative) in order to simplify data interpretation avoiding potential negative scores.

At least two explanations have been offered for the finding that performance can sometimes improve under high levels of anxiety (Eysenck, 1978, 1982; e.g. Carver & Scheier, 1986, 1988). Carver and Scheier (1988)

proposed that anxiety would be facilitative provided that the individual's expectations regarding coping and goal attainment remained favorable; however, when expectations became unfavorable, anxiety would become debilitating. Similarly, Eysenck's (1982, 1992) processing efficiency theory suggests that anxious performers will invest additional effort in the task if they still perceive themselves to have at least a moderate probability of success. Jones (1995b) adapted and modified Carver and Scheier's (1988) work to propose a model of debilitating and facilitative competitive anxiety. In this model, control is broadly conceptualized as the performer's cognitive appraisal of the degree of control that he or she is able to exert over the environment and self. Some preliminary support for the predictions of this model has been provided in a study of swimmers by Jones and Hanton (1996).

Jones and associates also introduced the concept of "frequency" of competition-related intrusions. Frequency was observed as proportion of time about the competition-related occupied performer's thoughts. Swain and Jones (1993) demonstrated that, although the intensity of cognitive anxiety symptoms remained relatively stable throughout the pre-competition period, the frequency with which athletes experienced these symptoms increased progressively during that period.

1.3.1. Anxiety direction and performance

An initial study in sport psychology to give empirical support to the notion that anxiety can have facilitative or debilitating effects on performance was conducted by Jones and Swain (1992). Results showed that the overall directional mean scores on all three CSAI-2 subscales were positive, indicating that the subjects interpreted their anxiety and self-confidence symptoms as facilitative to performance. Jones *et al.* (1993) study of gymnasts performing in a beam competition showed no significant differences between high and low performance groups on cognitive and somatic anxiety intensity scores, or on somatic anxiety direction scores. However, the high performance group reported their cognitive anxiety symptoms to be more facilitative to performance than the low performance group. Similar results reported Jones *et al.* (1994), and Jones and Swain (1995) comparing elite and non-elite groups and Jones and Hanton (1996) comparing groups with high and low expectation.

These studies have revealed a consistent pattern of findings in their comparisons between elite and non-elite performers on both, state and trait responses (Jones & Swain, 1992; Jones *et al.*, 1994), good and poor performers (Jones *et al.*, 1993), high and low competitive individuals (Jones & Swain, 1992) and positive and negative goal experience groups (Jones & Hanton, 1996). Although no significant differences were found in the intensity of symptoms between groups, the elite performers, good performers, highly competitive individuals and members of the positive goal expectancy group

reported significantly more facilitative interpretations of symptoms associated with competitive anxiety than their comparison groups. Furthermore, the intensities of symptoms interpreted as facilitative towards performance by the elite and good performance groups were accompanied by significantly higher self-confidence than the non-elite and poor performers respectively (Jones *et al.*, 1993, 1994; Jones & Swain, 1995). Although Jones (1995b) argued that whether an athlete perceives the anxiety symptoms to be facilitative or debilitating may depend more on individual performance expectations than intensity symptoms.

Swain and Jones (1996) compared the relative contributions of the intensity and direction dimensions of cognitive and somatic anxiety to the prediction of basketball performance. Their results showed that direction was a better predictor of performance than intensity for both components of anxiety. Contrastingly, Edwards and Hardy (1996) found that directional perceptions of anxiety did not predict netball performance.

Over the last decade, a growing body of research has supported the distinction between intensity and direction through examining both personal and situational variables such as antecedents of competitive anxiety (Hanton & Jones, 1997), psychological skill use (Fletcher & Hanton, 2001), sport type classification (Hanton, Jones & Mullen, 2000), hardiness (Hanton, Evans & Neil, 2003), gender (Perry & Williams, 1998), and temporal dimensions (Thomas, Maynard & Hanton, 2004). Pointing to the research of Jones and Hanton (2001), Hanton *et al.*, (2004) proposed that directional perceptions could influence temporal changes in competitive anxiety symptoms.

1.3.2. Self-confidence and performance

Research (Mahoney & Avenier, 1977; e.g. Burton, 1988) has indicated that self-confidence is an important predictor of performance that is at least partially independent of cognitive anxiety (Burrows, Cox & Simpson, 1977; Thayer, 1978; Hardy & Whitehead, 1984; Martens *et al.*, 1990). The original exploratory factor analysis of the CSAI-2 (Martens *et al.*, 1990) revealed cognitive anxiety and self-confidence factors, which they argued should therefore be regarded as being relatively independent of each other.

Studies have revealed that self-confidence plays some role in determining the interpretation that performers place upon their anxiety symptoms, and therefore the effect of anxiety upon performance (Hardy, 1990; Hardy & Jones, 1990; Jones, 1995b). Jones *et al.* (1993) found that self-confidence intensity correlated more strongly with performers' directional interpretations of their cognitive and somatic anxiety symptoms than with the intensity of these symptoms. Edwards and Hardy (1996) reported that athletes perceived their anxiety more facilitative to performance as self-confidence increased. Self-confidence is suggested to be a powerful construct in sport that has the ability to

influence performance over and above the effect exerted by cognitive anxiety and physiological arousal (Hardy *et al.*, 1996) and to discriminate between anxiety interpretations (Jones *et al.*, 1994; Jones & Hanton, 2001; Hanton & Connaughton, 2002). Hardy (1990) suggested that self-confidence might protect against the potential debilitating effects of anxiety.

Self-confidence has been reported facilitative to performance in several studies (Lane *et al.*, 1995; Wiggins, 1998; Hanton, Mellalieu & Young, 2002; Thomas *et al.*, 2004); moreover, self-confidence is more facilitative compared to cognitive and somatic anxiety.

1.4. Anxiety and athletic performance

Multidimensional anxiety theory makes three specific predictions regarding the intensity of anxiety symptoms: (a) a negative linear relationship should exist between cognitive anxiety and performance; (b) a quadratic (inverted-U) shaped relationship should exist between somatic anxiety and performance; (c) a positive linear relationship should exist between self-confidence and performance.

Early test anxiety research (Doctor & Altman, 1969; Morris & Liebert, 1970) and competitive anxiety research (Gould *et al.*, 1984; Burton, 1988) concurred that the cognitive component of anxiety affected performance more directly than the somatic component. Increases in somatic anxiety have been associated in height jumped (Parfitt, Hardy & Pates, 1995) and perceptuo-motor speed (Jones & Cale, 1989), and a decrease in short-term memory (Parfitt & Hardy, 1993). Increases in cognitive anxiety have been associated with improvements in critical flicker fusion, pattern search (Parfitt & Hardy, 1987) and rebound shooting (Parfitt & Hardy, 1993). The proposition that intensity perceptions of cognitive anxiety and self-confidence are related to perception of success or failure has received considerable support (Gould *et al.*, 1984; Jones, Swain & Cale, 1990, 1991; Hall & Kerr, 1994; Hall, Matthews & Kerr, 1994; Hanton & Jones, 1994; Lane *et al.*, 1995), whereas support for the proposition that somatic anxiety is determined primarily by environmental stimuli has been relatively tenuous.

Participants, who experience high anxiety and self-confidence simultaneously, may still perform successfully (Jones & Hanton, 2001). Conversely, performers who experience high anxiety without the accompanying feelings of confidence may suffer performance decrements. The absence of self-confidence during stressful competition maybe critical factor, owing to its additional motivational properties along with experiencing anxiety symptoms (Eyenseck & Calvo, 1992).

1.4.1. CSAI-2 and athletic performance

Following the development of the CSAI-2, over 40 studies have examined the relationship between the CSAI-2 subcomponents and sport performance. An initial series of studies examined how the subcomponents of anxiety would predict performance (McAuley, 1985; Gould *et al.*, 1987; Burton, 1988). Burton (1988) was one of the first to use the CSAI-2 on a sample of elite athletes. He asked two samples of elite swimmers to complete the CSAI-2 just prior competition. The performance outcome for this study was the swimmers' times, which were obtained from the swim-meet results. Correlational and multiple regression analysis showed that cognitive anxiety was more consistently and strongly related to performance than was somatic anxiety. Burton's (1988) study is considered to be a landmark study, not only for its investigation of the reliability of the CSAI-2, but also for providing evidence for the theoretical underpinnings of the multidimensional anxiety theory. Gould *et al.* (1987), on the other hand, failed to find any identifiable relationship between cognitive anxiety and performance, and unexpectedly, a negative relationship was noted between self-confidence and performance. Other studies have revealed no significant relationships between cognitive anxiety and performance (Maynard & Cotton, 1993; Hammermeister & Burton, 1995; Vadocz, Hall & Moritz, 1997) or between self-confidence and performance (Williams & Krane, 1992; Maynard & Cotton, 1993). Thus, the relative impact of cognitive anxiety and self-confidence upon competitive sport performance remains unclear.

In their meta-analysis studying relationship between CSAI-2 and athletic performance Craft *et al.* (2003) concluded that only self-confidence predicted performance well, while other subscales relationships to performance were weak. Based on the results of this meta-analysis authors caution researchers against using the CSAI-2 to examine the anxiety/performance relationship. Woodman and Hardy's (2003) meta-analysis revealed that both cognitive anxiety and self-confidence were significantly related to sport performance.

Finally, researchers must continue to examine whether the CSAI-2 is actually assessing somatic anxiety. Due to a lack of content validity studies, the question remains as to whether the CSAI-2 is doing an adequate job of assessing this construct. Furthermore, because the proposed three-factor structure of the CSAI-2 was not supported with confirmatory factor analysis (Lane *et al.*, 1999), this inventory needs to be examined further.

1.5. Measuring athletic performance

In spite of the fact, that use of the CSAI-2 has not led to consistent results or the ability to consistently predict performance; researchers have continued to employ this inventory. Krane (1992) argued that the most prevalent methodological limitations have been problems with the operational definitions with performance. Athletic performance can be assessed in several ways. It may be based on objective outcomes such as standard performance measures (e.g. win or loss, finishing time, place), on subjective outcomes such as evaluation by a coach or judge, or on self-perceptions of performance (Edwards & Hardy, 1996). Studies have tended to use outcome scores as dependent variables rather than more sensitive indicators of athletic performance (Smith, Bellamy, Collins & Newell, 2001). Recently, more researchers have recognized the importance of using more sensitive and sport-specific measures to establish the relationship between competitive anxiety and sport performance (Parfitt & Pates, 1999). For example, Sonstroem and Bernardo (1982) provided measurement of overall playing performance in basketball, including shot percentage, total rebounds, assists, steals, personal fouls, and turnovers. Similar measurements in volleyball have been invented by Handford and Smith (1992) and Smith *et al.* (1998).

Qualitative methods of data collection are another possibility determining anxiety/performance relationship. Such methods have been used by different researchers interviewing athletes (e.g. Gould, Eklund & Jackson, 1993; Hanton & Jones, 1999a, 1999b; Hanton & Connaughton, 2002; Hanton *et al.*, 2002). Of particular methodological significance is the recommendation that a combination of quantitative and qualitative methodologies be used (Swain & Jones, 1993).

1.5.1 Type of sports

Researchers have suggested there is a fundamental difference in performance and its relationship to anxiety for participants who play team sports versus individual sports (Martens *et al.*, 1990; Terry, Cox, Lane & Karageorghis, 1996). The number of individuals participating together may moderate the effect of anxiety on performance. Regardless of type of sport, self-confidence seems to be positively related to enhanced performance (Craft *et al.*, 2003; Woodman & Hardy, 2003). Furthermore, the self-confidence/performance relationship is strongest for individual sports. Although cognitive and somatic anxiety also seems more influential in individual rather than team sports, the coefficients for the relationships of cognitive and somatic anxiety with performance are both positive and rather weak (Kleine, 1990; Martens *et al.*, 1990; Terry *et al.*, 1996).

1.5.2 Type of skills

While there is shortage of research on the relationships of open and closed skills of performance (Terry & Slade, 1995), these two types of skills may be influenced differently by anxiety. An open skill can involve either an individual or team sport with the athlete performing in an interactive and ever-changing environment (i.e. basketball, tennis). A closed skill is performed in a more stable environment that is relatively predictable and often self-paced (i.e. golf, gymnastics). Terry and Youngs (1996) discussed how the predictive nature of competitive anxiety appears stronger for open skills such as basketball and netball than for closed skills such as weightlifting. The recent studies reveal, that relationship between anxiety and performance is stronger for open skills (Kleine, 1990; Terry & Slade, 1995; Craft *et al.*, 2003).

1.5.3. Athletic ability

In addition to the different sports being assessed, the various levels of athletic ability among the participants in these studies have also raised some concern about making comparisons or generalizations across studies. For example, while elite athletes may face higher competitive demands than recreational athletes, they may also be more familiar with such demands and possibly more prepared to handle anxiety. Craft *et al.* (2003) found in their meta-analysis that the European club athletes (high-standard) had the strongest relationships between anxiety, self-confidence, and performance comparing to U.S. national level, college athletes and college physical education students (low-standard). Similar results reported Woodman and Hardy (2003), who found that cognitive anxiety and self-confidence mean effect sizes were greater for high-standard athletes. In higher-level athletes, the presence of cognitive anxiety seems to enhance performance. The finding was similar for somatic anxiety, which also showed a positive relationship (Craft *et al.*, 2003).

1.5.4. Gender differences

Gender differences have also been topic of research in relationships between anxiety and athletic performance. Women typically report higher cognitive anxiety and lower self-confidence than men (Martens *et al.*, 1990; Jones *et al.*, 1991; Krane & Williams, 1994; Russell, Robb & Cox, 1998). Contrastingly, Woodman and Hardy (2003) found in their meta-analysis that pre-competitive cognitive anxiety and self-confidence had a greater impact on the performance of men than that of women. Recent research findings have shown that while males do conform to theoretical predictions regarding pre-competition temporal

patterning of the CSAI-2 components, females do not (Jones & Cale, 1989; Jones *et al.*, 1991). Both these studies showed that cognitive anxiety in females increased during the pre-competition period, that the somatic anxiety response became elevated earlier in males, and self-confidence decreased as the event approached. Swain and Jones (1993) reported that males and females did not differ in the temporal patterning of their cognitive anxiety intensity responses.

1.5.5. Temporal patterns

The time when the CSAI-2 was administered relative to the competition, from 7 days prior to just 1-minute prior, may also affect how well it predicts performance. An assessment of anxiety 24 hours before a competition may not yield the same information about one's anxiety state as when administered just 15 minutes prior to competition. Cognitive anxiety, somatic anxiety, and self-confidence have all showed the strongest relationships with performance at 31–59 min prior to competition, and the relationships weakened as time of competition drew near (Craft *et al.*, 2003). Gould, Petlichkoff and Weinberg (1984) administered the CSAI-2 just 5 min prior to competition and found no relationship between scores on the subscales and wrestling performance in the first period of a wrestling match. Wiggins (1998) found that cognitive anxiety remained relatively stable before the competition, whereas somatic anxiety levels increased significantly from 24 hr to 1 hour.

Using a qualitative design, Hanton *et al.* (2002) recently established that performers interpretation of symptoms could change as competition approaches. These authors noted that performers interpreted cognitive and somatic symptoms as facilitative during the preparation phase for competition, but these same symptoms were interpreted as debilitating directly before performance. Although much has been learned about the pre-competition emotional states of performers using such methods, the extent to which pre-competitive anxiety states accurately reflect in-event anxiety remains unclear (Smith *et al.*, 2001). Accordingly, the importance of gathering information on how anxiety changes across the time course of competition appears fundamental to improving the predictive value of theories that seek to explain how such anxiety may influence athletic performance. Possibilities include psychophysiological measures and short self-report measures; for example, the various version of the Mental Readiness Form (Murphy, Greenspan, Jowdy & Tammen, 1989; Krane, 1994; Edwards & Hardy, 1995; Smith *et al.*, 2001) could offer some potential.

2. PURPOSE OF THE STUDY

The purpose of the study was to examine the influence of competitive state anxiety and self-confidence on athletic performance in volleyball and basketball. The specific aims of the study were:

1. Examine the relationships between intensity and direction of competitive state anxiety, self-confidence and performance in volleyball and basketball using objective and subjective measures.
2. Compare precompetitive anxiety and self-confidence of beach volleyball players in different competitive level.
3. Assess intensity and direction of competitive state anxiety and self-confidence prior different matches in indoor volleyball and basketball.

3. MATERIAL AND METHODS

3.1. Participants

The participants of this study were 66 male beach volleyball players, 12 male indoor volleyball players and 12 male basketball players. The beach volleyball players performed in international level and highest national level, the indoor volleyball and basketball players performed in highest national level. All beach volleyball players were sampled between 1998 and 2001 at the middle of the competition cycle. Beach volleyball players completed altogether 120 questionnaires, 54 questionnaires in study 1 and 66 questionnaires in study 2. Players of the indoor sports were studied through 11 different matches, for a total of 132 questionnaires overall. The measures were completed in the middle of the competitive season of 2003.

3.2. Measures

Competitive State Anxiety Inventory-2 (Martens *et al.*, 1990) was used to identify preperformance cognitive and somatic anxiety and self-confidence, with nine items in each subscale. The response scale asked each participant to rate the intensity with which each symptom was being experienced from 1 (not at all) to 4 (very much so). Thus the possible intensity scores on each subscale ranged from 9 to 36.

CSAI-2 was translated into Estonian. After making some revisions in the translated version, the items were translated back into English by a bilingual expert. The back-translated items were then checked for accuracy and correct meaning. Confirmatory factor analysis using LISREL 8 (Jöreskog & Sörbom, 1993) was used to test the three-factor model proposed by Martens *et al.* (1990). Confirmatory factor analysis supported for a hypothetical three-factor structure for CSAI-2. The hypothesized three-factor model showed acceptable fit indices ($\chi^2 / d.f.$ ratio= 3.77; Bentler's Comparative Fit Index= .92; Goodness-of-Fit Index= .92; Adjusted Goodness of Fit Index= .89; Root Mean Square Residual= .06). Cronbach alpha coefficients estimating internal consistency for the intensity responses ranged from .75 to .92, which are similar to those noted by Martens and his colleagues (1990).

The direction scale developed by Jones and Swain (1992) was included for the cognitive and somatic anxiety items, on which each participant rated the extent to which the experienced intensity of each symptom was either facilitative or debilitating of subsequent performance on a scale from -3 (very debilitating) to +3 (very facilitative). Thus, the possible direction scores on each subscale ranged from -27 to +27, where the negative score denoted a state of debilitation, a positive score a state of facilitation, and a score of zero that

intensity was unimportant to performance. Internal reliability for the direction scales was .74 (for somatic anxiety) and .87 (for cognitive anxiety).

3.3. Procedure

Participants completed the questionnaire just before the warm-up phase, approximately 1 hour before the competition. This time frame has been used consistently in previous research (Woodman & Hardy, 2001) and was regarded as acceptable since it did not interfere with the player's preparation routines. Participants were provided with instructions for the completion of the test including the anti-social desirability instructions as recommended by Martens *et al.* (1990), and a guarantee of confidentiality in writing. The players were asked to respond to the test according to how they feel right now. Basketball players filled the questionnaire prior 5 and indoor volleyball players prior 6 different matches. The beach volleyball players completed the inventory only before the first match of the competition day.

3.4. Assessment of skill components

For the evaluation of individual skill components in volleyball, a standard rating scale developed by Handford and Smith (1999) was used. The following individual skill components were assessed: serve (0= a service error leading to a side-out; 1= the receiving team gains full control of the ball; 2= the receiving team gains partial control of the ball; 3= the receiving team fails to direct the ball to their setter at the required position; 4= a serve leading to a point); attack (0= attack leads to a point against the attacking team; 1= the attack beats or deflects from the block causing a pass directly to the defending team; 2= the attack beats or deflects from the block resulting in either side being able to develop a limited number of attack options; 3= the attack beats or deflects from the block in such a way that either the blocking team are unable to develop a counter attack; 4= the attack beats or deflects the block resulting in a point); block (0= the block commits a rule violation or the block contact resulting in a point against the blocking team; 1= the block contact is such that the blocking team fails to gain control of the ball with no counter attack possible; 2= the block contact leads to a limited number of attack options available to either team; 3= the block contact is such that the blocking team gain full control of the ball with all attack options available; 4= the block contact leads directly to a point for the blocking team); reception (0= the reception leads directly to a point against the receiving team; 1= the reception fails to be directed to the partner or the ball is returned directly into the opponent's court; 2= the reception requires the partner to move out of position to play the ball resulting in a limited number

of attack options; 3=the reception is passed directly to the partner with all attack options available); setting (0= the setter's contact with the ball results in a point against the attacking team; 1= the set lacks the correct spatial and temporal placement causing the attacker to adjust the position and timing of the attack; 2= the set lacks the correct spatial or temporal placement causing the attacker to modify their attacking action; 3= the set is accurate in both spatial and temporal placement in relation to the attacker); defense (0= the ball contacts the court directly from defending player; 1= the defender fails to gain control of the ball leading to no attack option being available; 2= the defensive contact leads to the setter moving out of position to play the ball with a limited number of attack options available; 3= the defensive contact is passed directly to the partner with all attack options available). The sum of skill components was calculated summing all the mean scores of different volleyball skills.

The assessment of individual skill components was performed using video recordings of the games. Two cameras (Panasonic S-VHS) were positioned on a filming balcony 4 m above and 8 m behind the playing court. Two volleyball experts (each with more than 10 years of playing and coaching experience) served as observers. Inter-observer agreement was .967.

3.5. Subjective performance evaluation

Subjective performance evaluation in basketball and indoor volleyball was completed by coaches of the teams (head and assistance coach). They were asked to evaluate the player's performance on a 10-point Likert-type scale from 1 ("played much worse than usual") to 10 ("played much better than usual"). Both coaches evaluated the players individually; afterwards the mean score was calculated.

3.6. Statistical procedures

Descriptive statistics (means, standard deviations, internal consistency) and Pearson correlations were calculated for all measures. Multiple regression analysis was used to predict volleyball performance of athletes. Confirmatory factor analysis using LISREL 8 (Jöreskog & Sörbom, 1993) was used to test the three-factor model of CSAI-2 proposed by Martens *et al.* (1990).

4. RESULTS

4.1. Precompetitive state anxiety and performance in beach volleyball players

Table 1 shows the scores for cognitive and somatic anxiety and self-confidence intensity and direction subscales in two groups of participants. Separate one-way analysis of variance was conducted to determine if there were any significant differences between elite (international) and non-elite (national) players. The results show that the elite group scored significantly higher on the both somatic ($F_{1,54} = 6.23, p < .01$) and cognitive anxiety ($F_{1,54} = 10.18, p < .01$) direction subscales. The anxiety intensity results revealed significant differences in cognitive anxiety ($F_{1,54} = 13.08, p < .001$) and self-confidence ($F_{1,54} = 12.77, p < .001$). There were no significant differences in somatic anxiety intensity subscale between non-elite and elite groups.

Table 1. Means, standard deviations and F-ratios for one-way analyses of variance for CSAI-2 scores.

	Elite group (n= 20)		Non-elite group (n= 34)		df	F	p
Cognitive anxiety							
Intensity	18.44	4.04	23.18	4.32	1.54	13.08	<.001
Direction	5.57	4.41	-3.04	5.78	1.54	10.18	<.01
Somatic anxiety							
Intensity	19.56	4.11	19.74	4.23	1.54	3.06	NS
Direction	7.81	4.13	-1.26	5.55	1.54	6.23	<.01
Self-confidence	23.52	4.18	15.87	4.69	1.54	12.77	<.001

Table 2. Means, standard deviations and F-ratios for one-way analyses of variance for volleyball skill components.

	Elite group (n= 20)		Non-elite group (n= 34)		df	F	p
Serve	2.84	0.75	2.63	0.61	1.54	2.43	NS
Attack	3.34	0.74	2.58	0.84	1.54	8.11	<.01
Block	3.02	0.64	2.34	0.65	1.54	9.38	<.01
Reception	2.82	0.52	2.68	0.57	1.54	2.42	NS
Setting	2.62	0.60	2.34	0.61	1.54	2.68	NS
Defense	2.63	0.62	1.58	0.55	1.54	7.03	<.05

Table 2 shows the scores for individual skill components in two groups of players. Analysis of variance indicated that the elite group scored significantly higher on attack ($F_{1,54} = 8.11, p < .01$), block ($F_{1,54} = 9.38, p < .01$) and defense ($F_{1,54} = 7.03, p < .05$).

The correlation coefficients between direction and intensity subscales and skill components are presented in Table 3. Both somatic and cognitive intensity subscales were not significantly related with the execution of different skill components. The self-confidence was significantly positively ($r = .41-.61$) related with the execution of different skill components. Significant correlations ($r = .27-.54$) between skill components and direction subscales of somatic and cognitive anxiety were also obtained.

Table 3. Correlations between anxiety, self-confidence and volleyball performance (n= 54).

Variables	Serve	Attack	Block	Reception	Defense	Sum of skill components
Cognitive anxiety Intensity	.15	-.06	.22	.07	-.12	.09
Direction	.27*	.36**	.34*	.42**	.51**	.34*
Somatic anxiety Intensity	-.11	.20	-.03	-.18	-.06	-.06
Direction	.37**	.33*	.31*	.54**	.35**	.38**
Self-confidence	.54**	.61**	.44**	.41**	.54**	.53**

* $p < .05$

** $p < .01$

Figure 1 shows the summary of multiple regression analysis in predicting the beach volleyball performance.

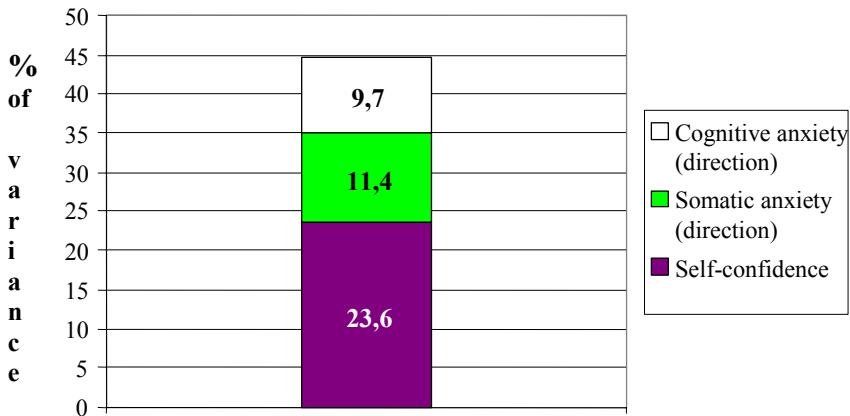


Figure 1. Summary of stepwise multiple regression analysis for variables predicting beach volleyball performance (n= 86).

Stepwise multiple regression analyses were employed to establish which subscales of the modified CSAI-2 best-predicted sum of the beach volleyball skill components. Results revealed that self-confidence of the players was the strongest predictor of beach volleyball performance accounting for 23,6% of the

variance. In addition, directional perception of somatic and cognitive anxiety were significant predictors of the volleyball performance accounting for 11,4% and 9,7% of the variance. In total, directional perceptions of somatic and cognitive anxiety and self-confidence accounted for 44,7% of the variance in the sum of the skill components. More detailed information concerning the results of multiple regression analyses can be found in Paper I (Table 4) and Paper II (Table 3).

4.2. Precompetitive state anxiety in indoor volleyball and basketball players

Descriptive statistics (Table 4) revealed that both groups had high self-confidence and low anxiety intensity, with volleyball players' higher score of self-confidence ($M=27.82$, $SD=3.54$) than basketball players. Both directional subscales had also overall positive mean scores and somatic anxiety was rated more facilitative to performance ($M=3.97$, $SD=6.01$) than cognitive anxiety ($M=1.05$, $SD=6.75$).

Table 4. Means (\pm S.D.) of the modified CSAI-2 for the volleyball and basketball players.

	Overall	Volleyball	Basketball
Cognitive anxiety intensity	13.83 \pm 3.20	14.84 \pm 3.13	12.93 \pm 3.01
Somatic anxiety intensity	12.33 \pm 2.80	12.00 \pm 2.15	12.63 \pm 3.27
Self-confidence	26.38 \pm 4.09	27.82 \pm 3.54	25.01 \pm 4.15
Cognitive anxiety direction	1.05 \pm 6.75	1.30 \pm 6.91	0.82 \pm 6.66
Somatic anxiety direction	3.97 \pm 6.01	6.40 \pm 5.58	1.80 \pm 5.58*
Performance	5.38 \pm 1.75	4.78 \pm 1.72	5.93 \pm 1.61

* $p<.05$

Table 5. Intercorrelations of CSAI-2 intensity and direction scores and performance.

	C.A.I.	S.A.I.	S-C.	C.A.D.	S.A.D.	Performance
Cognitive anxiety intensity	–	.50*	–.52*	–.48*	–.06	.29*
Somatic anxiety intensity		–	–.50*	–.37*	–.33*	–.15
Self-confidence intensity			–	.60*	.55*	.00
Cognitive anxiety direction				–	.59*	.06
Somatic anxiety direction					–	.05
Performance						–

* $p<.05$

C.A.I.– cognitive anxiety intensity, S.A.I.– somatic anxiety intensity, S-C.– self-confidence, C.A.D.– cognitive anxiety direction, S.A.D.– somatic anxiety direction.

Table 5 shows correlations between direction and intensity subscales and performance. Athletic performance had a positive significant correlation with intensity of cognitive anxiety (.29, $p < .05$), while no significant correlation revealed between performance and somatic anxiety and self-confidence ($-.15, .00, p < .05$.) as well as performance and cognitive and somatic anxiety direction (.06, .05, $p < .05$).

Figures 2, 3 and 4 show the scores for somatic and cognitive anxiety and self-confidence across 6 games in basketball and volleyball. Mean scores for somatic and cognitive anxiety intensity and direction and self-confidence intensity were moderately stable prior different matches.

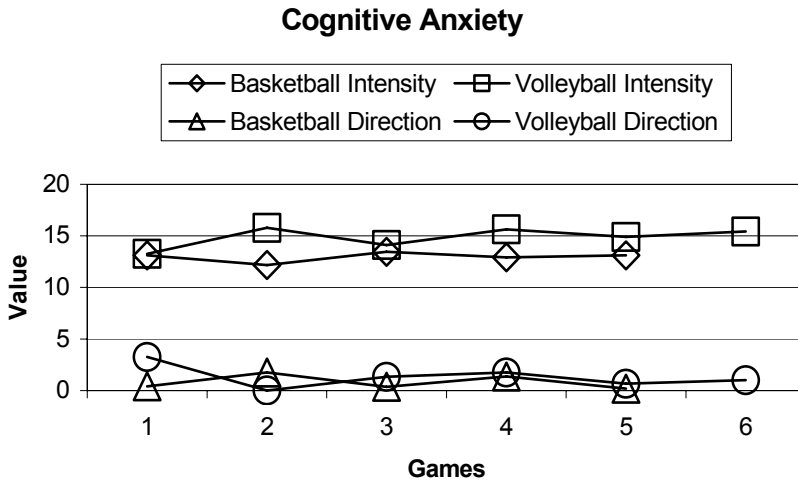


Figure 2. Cognitive anxiety intensity and direction prior the different games.

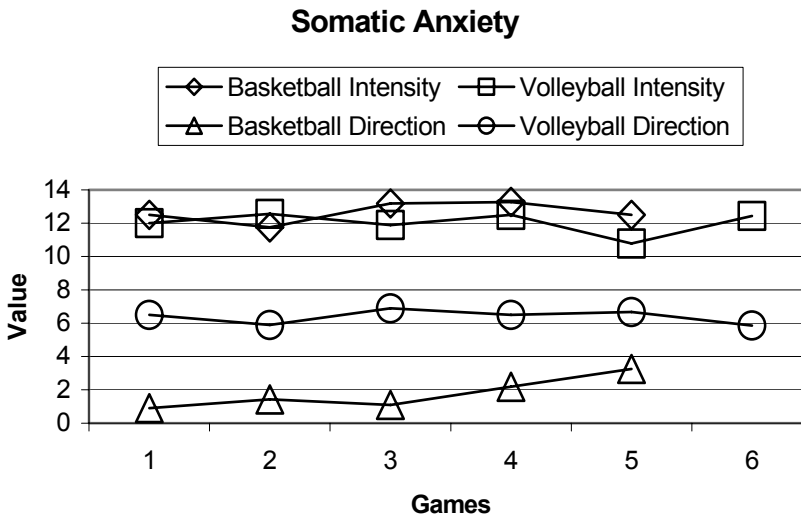


Figure 3. Somatic anxiety intensity and direction prior the different games.

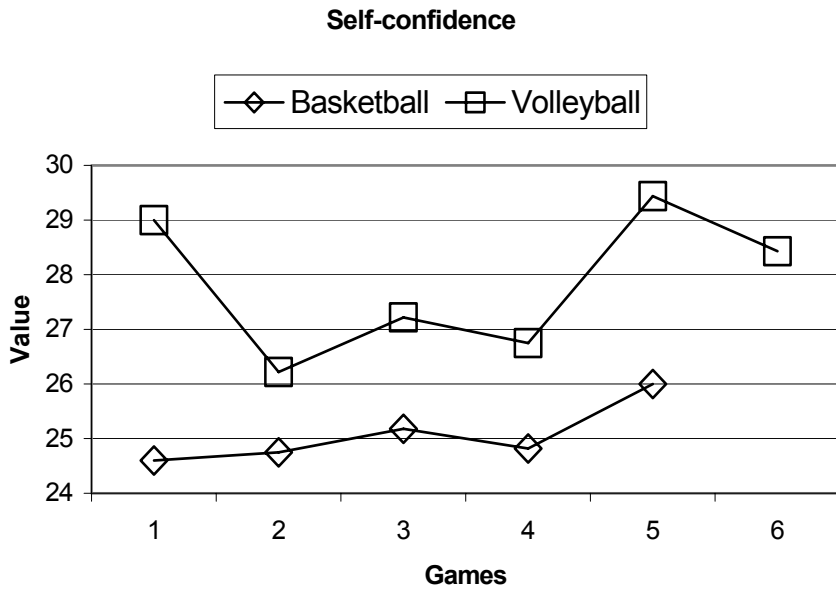


Figure 4. Self-confidence prior the different games.

5. DISCUSSION

It is widely believed that anxiety plays a role in athletic performance. Because no other single psychological attribute can have such a debilitating effect on performance, research on the causes and consequences of competitive anxiety as well as on how practitioners can reduce anxiety or more effectively cope with its effects has been one of the most heavily researched topics in sport psychology (Martens *et al.*, 1990; Smith, Smoll & Schutz, 1990; Jones, 1995b; Hanton *et al.*, 2000). Not surprisingly, measurement of competitive anxiety has received more attention than perhaps any other construct in sport and exercise psychology (Jones & Hanton, 1996; Cerin, Szabo, Hunt & Williams, 2000).

Research in clinical and test anxiety literature has separated the state anxiety into the cognitive and somatic components (Liebert & Morris, 1967; Borkovec, 1976; Davidson & Schwartz, 1976). The current multidimensional approach to competitive state anxiety emerged through the work of Martens *et al.* (1990) and their development of the Competitive State Anxiety Inventory-2 (CSAI-2), which measures cognitive anxiety, somatic anxiety, and self-confidence.

Recent research developments in multidimensional competitive anxiety have challenged the traditional assumption that anxiety is always negative and detrimental to athletic performance. Because of limitations in measuring the 'intensity' of the construct exclusively through Competitive State Anxiety Inventory-2 (CSAI-2, Martens *et al.*, 1990), Jones (1991, 1995b) introduced the notion of 'directional perceptions'. Directional perceptions refer to how individuals interpret the extent to which the intensity of anxiety experienced before competition facilitates or debilitates athletic performance (Jones & Swain, 1992).

Present study represents an examination of Jones's (1991, 1995b) directionality hypothesis within the context of Multidimensional Anxiety Theory (Martens *et al.*, 1990). A number of sport psychologists (Burton, 1990; Parfitt *et al.*, 1990; Swain & Jones, 1993; Lane *et al.*, 1995; Cerin *et al.*, 2000) have suggested that researchers attempting to gain a greater understanding of competitive state anxiety can benefit from examination of dimensions other than just the intensity of the response which the CSAI-2 measures. The purpose of the present study was to investigate the effects of competitive state anxiety (intensity and direction) and self-confidence on athletic performance in volleyball and basketball players.

The results supported the hypothesis that scores on self-confidence and direction (but not intensity) subscales of precompetitive somatic and cognitive anxiety predicted athletic performance in beach volleyball (See Paper I and II). Athletes' self-confidence with conjunction of directional perception of somatic and cognitive anxiety predicted 44,7% of the variance in beach volleyball performance. Our results provide further support for the directionality hypothesis (Jones, 1991, 1995b) according to which the intensity-alone in

relationship of competitive anxiety and performance provides limited information. The correlations showed that directional perceptions of beach volleyball players were moderately positively related with different skill components. Thus, when athletes perceived their state anxiety before competition as facilitative to their performance, their actual game effectiveness was also higher. These results are generally consistent with previous research using the CSAI-2 with the scale of directional perception of anxiety (Jones *et al.*, 1993; Eubank *et al.*, 1995; Swain & Jones, 1996). Our results showed that self-confidence was positively (although only modestly) correlated with different beach volleyball skills as well as with sum of skill components.

Two recent meta-analytic studies also yielded a positive relationship between self-confidence (Woodman & Hardy, 2003), self-efficacy (Moritz, Feltz, Fahrback & Mack, 2000), and competitive sport performance. Specifically Woodman and Hardy (2003) reported that self-confidence was significantly related to sport performance (mean effect size $r=.24$), and this relationship was stronger for men than for women and for high standard athletes than for low standard athletes. However some studies have also produced no significant relationship between self-confidence and athletic performance (Williams & Krane, 1992; Maynard & Cotton, 1993; Jerome & Williams, 2000).

Results with indoor volleyball and basketball players indicated that, generally, intensity and direction of somatic and cognitive anxiety and self-confidence of the players, was not related to athletic performance evaluated subjectively by the coaches of the teams (See Paper III). However, intensity of cognitive anxiety was positively moderately related with athletic performance. The cognitive and somatic anxiety and self-confidence were relatively stable prior different competitions. Recent studies have examined the temporal patterns of anxiety prior the competitions. Wiggins (1998) reported that once an athlete appraises the anxiety symptoms as facilitative or debilitating, and assesses a level of expectation for performance, those evaluations remain consistent in the final 24 hours prior competition. Cognitive anxiety, somatic anxiety, and self-confidence have all showed the strongest relationships with performance at 31–59 min prior to competition, and the relationships weakened as time of competition drew near (Craft *et al.*, 2003). Hanton *et al.* (2004) examined the temporal patterns of symptom intensity, direction and frequency in 7day pre-competition phase (7 days, 48 hr, 24 hr, 2, hr, 30 min). Cognitive and somatic intensity increased between 2 hr and 30 min before the competition, while self-confidence decreased in such times. Thomas *et al.* (2004) reported that cognitive anxiety increased from 48 hr to 24 hr and 24 hr to 1 hr before competition, while somatic intensity increased on the day of competition.

The relationship between the intensity and direction scores within each of the CSAI-2 subscales revealed the negative significant correlation between the intensity and direction of cognitive and somatic anxiety. These results are

showing that higher levels of anxiety were associated with less favorable perceptions in terms of consequences for performance. The negative correlations found between self-confidence and intensity subscales of the somatic and cognitive anxiety supported previous research conducted by Jones *et al.* (1993). Furthermore, as we expected, self-confidence of the players was positively related with directional perceptions of somatic and cognitive anxiety. The relationships between precompetitive anxiety and self-confidence with athletic performance were weak, with only positive correlation between intensity of cognitive anxiety and performance. Several previous research findings support our results (Craft *et al.*, 2003). The hypothesized relationships between anxiety and performance were not supported for wrestling (Gould *et al.*, 1984), gymnastics and golf (Krane & Williams, 1987), triathlon (Lane *et al.*, 1995) and rugby (Maynard & Howe, 1987).

Several possible explanations to the weaker relationships between anxiety and performance of indoor sports compared to beach volleyball. Researchers have suggested there is a fundamental difference in performance and its relationship to anxiety for participants who play team sports versus individual sports (Martens *et al.*, 1990; Terry *et al.*, 1996). Although beach volleyball is counted as team sport, there are several characteristics similar to individual sport; lack of substitutions is the main. Therefore it is reasonable to observe beach volleyball together with disciplines like tennis doubles, rowing double scull, etc. Performance in which athletes work with others to try to obtain optimum sport performance may have different relationship with anxiety than does performance undertaken by oneself. Craft *et al.* (2003) revealed in their meta-analysis that in team sport only self-confidence was significantly related to performance (.19), while in individual sport cognitive (.16) and somatic anxiety (.21) and self-confidence (.49) were significantly related to athletic performance. The second reason is connected to measuring the athletic performance. According to this study it seems that the best way to determine performance is the use of relatively objective measures comparing to subjective evaluation. Recent years more researchers have recognized the importance of using more sensitive and sport specific measures to establish the relationship between competitive anxiety and sport performance (Parfitt & Pates, 1999).

This study has some unique aspects and strengths. One of the strengths is using elite athletes as subjects. Initial research on the anxiety and sport relationship focused on high-level competitive elite athletes, but researchers more recently have focused on volunteers and students in physical education classes. While this may have increased the volume of studies employing the CSAI-2, it has done little to advance the knowledge of the anxiety/performance relationship for competitive athletic populations. The most interesting finding of the study of Craft *et al.* (2003) was that the European club athletes had the strongest relationships between anxiety, self-confidence, and performance, because in Europe the club athlete truly represents the professional athlete, whereas in the U.S. the elite athlete group may include many who are just a step

above of the college level (Edwards & Hardy, 1996). In present study the beach volleyball players can be viewed as elite sportsmen competing the highest level of the world. Elite athletes participating in the highest level of the world had significant and the strongest relationship between performance and cognitive (.53), somatic anxiety (.78) and self-confidence (1.24); college athlete's numbers were .28 for cognitive anxiety, -.09 somatic anxiety and .12 for self-confidence; college students .07, .02, .23 respectively (Craft *et al.*, 2003).

The second strength is the use of relatively objective measures of sport performance. Using an ideographic design, Burton (1988) demonstrated the hypothesized relationships between anxiety responses and swimming performance. Also, using a subjective performance criterion, Hammermeister and Burton (1995) showed that intensity scores on cognitive anxiety correlated negatively with triathlon performance. Contrastingly, the hypothesized relationships were not supported for wrestling (Gould *et al.*, 1984), gymnastics and golf (Krane & Williams, 1987), triathlon (Lane *et al.*, 1995) and rugby (Maynard & Howe, 1987). Two reasons, which at least partly, may explain for these inconsistencies, include the use of not objective performance measures and failure to consider subjects interpretations of the meaning of their anxiety symptoms (Hardy *et al.*, 1996). A majority of studies have tended to use outcome score, e.g., win or loss, performance times, as dependent variables rather than more sensitive indicators of athletic performance. Outcome measures may provide indirect support for the idea that performance is affected by anxiety, but it does not allow conclusions as to why or how anxiety affects the actual execution of movements (Bennett, 2000). Such global performance indices probably lack the necessary sensitivity to show whether and how anxiety influences performance. The evidence emerging from such research suggests that a strong case can be made for the development and use of more sensitive, valid, and sport-specific performance measures in competitive anxiety research. However, only few studies have been conducted in which videotaped performance of athletes during competition was analyzed (Smith *et al.*, 2001).

The present study has also several limitations. First of all, the use of a one-time assessment of precompetitive anxiety does not permit analysis of temporal patterning of anxiety and its effects on athletic performance. Jones *et al.* (1993), for example, argued that temporal factors have a significant effect on the stress and anxiety process, while anticipatory stress prior to competition is often perceived as facilitating to performance, whereas stress during competition is perceived as significantly more debilitating. According to Craft *et al.* (2003) the effects on athletic performance of cognitive anxiety (.34), somatic anxiety (.61), and self-confidence (1.07) are significant and highest 31–59 minutes prior competition; following 15 minutes or less prior competition .17, -.11, .20 respectively. Although the measures of the present study were made in this time zone prior competition, the importance on gathering information on how anxiety changes across the time of competition (preparation, execution, and evaluation stages of competition) appears fundamental to improving the

predictive value of theories on how such anxiety may influence athletic performance (Jokela & Hanin, 1999; Smith *et al.*, 2001). It is advisable to extend the study measuring the anxiety temporally prior single competition and through the season in order to have the better understanding of the state anxiety of athletes.

The second limitation is related to small group of participants. Although in beach volleyball 86 and indoor 132 questionnaires were tested, it is still below the minimum recommended (5:1) for trustworthy results (Cattell, 1978; Comrey & Lee, 1992; Thompson & Daniel, 1996; Tabachnick & Fidell, 1996, 2001). One reason of low number of subjects is connected with high level of quality of the participants; where students or volunteers were not used in order to larger the number of subjects. Hanton *et al.* (2002) conducted a qualitative investigation with only 9 elite performers in order to investigate how anxiety and performance are related in the highest level of sport. One possible solution to get more detailed information between precompetition state anxiety and athletic performance is to approach individually, especially in beach volleyball, which lies between individual and team sport.

Finally, recent research employing confirmatory factor analysis to test psychometric properties of the Competitive State Anxiety Inventory-2 (Lane *et al.*, 1999; Iosifidou & Doganis, 2001) did not confirm the three-factor structure proposed by Martens *et al.* (1990). Moreover, Cox *et al.* (2003) worked out the Revised Competitive State Anxiety Inventory-2 (CSAI-2R) by removing some items from the original questionnaire. They concluded that CSAI-2R has stronger psychometric properties in terms of its factor structure than the original instrument. In spite of the fact, that researchers have criticized the original questionnaire CSAI-2, it is still one of the most well known instruments used in sport psychology research and over 40 studies have examined the relationship between CSAI-2 subcomponents and athletic performance (Craft *et al.*, 2003). Estonian version of the modified CSAI-2 on contrary showed both acceptable internal consistency estimates as well as factorial validity (3-factor model with acceptable fit indices) of the inventory although only 58% of the common variance was accounted for (paper II).

In conclusion our findings revealed significant differences in anxiety direction and intensity between two groups of players with different competitive (international and national) levels (paper I). High levels volleyball players interpreted their anxiety as more facilitative to performance and their volleyball skill components were significantly higher compared to national levels players. The results supported the hypothesis that scores on self-confidence and direction (but not intensity) subscales of precompetitive somatic and cognitive anxiety predicted athletic performance in beach volleyball (paper II). Our results provide further support for the directionality hypothesis (Jones, 1991, 1995b) according to which the intensity-alone in relationship of competitive anxiety and performance provides limited information. Results with indoor volleyball and basketball players indicated that relationships between

precompetitive anxiety and self-confidence with athletic performance (evaluated subjectively by the coaches of the teams) were weak (paper **III**). The cognitive and somatic anxiety and self-confidence were relatively stable prior different competitions.

CONCLUSIONS

1. Self-confidence and direction (but not intensity) subscales of precompetitive somatic and cognitive anxiety predicted athletic performance in beach volleyball. Athletes' self-confidence with conjunction of directional perception of somatic and cognitive anxiety predicted 44,7% of the variance in beach volleyball performance.
2. The level of cognitive anxiety was positively moderately related with athletic performance (evaluated subjectively by the coaches of the teams) in indoor volleyball and basketball. Directional perception of anxiety and somatic anxiety were not related with athletic performance.
3. Beach volleyball players with the higher (international) performance level evaluated precompetitive state anxiety as more facilitative compared to national level players.
4. Cognitive and somatic anxiety and self-confidence were relatively stable prior different competitions in indoor volleyball and basketball.

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SUMMARY IN ESTONIAN

VÖISTLUSEELNE ÄREVUSSEISUND JA ENESEKINDLUS NING SPORTLIK SAAVUTUSVÕIME VÕRKPALLURITEL JA KORVPALLURITEL

Kokkuvõte

Võistlemisega kaasnev ärevus on olnud spordipsühholoogide, treenerite ja sportlaste huviorbiidis juba pikka aega. Kuna ärevuse mõju võistlemisele võib olla ülimalt määrava tähtsusega, siis on ärevuse põhjuste ja tagajärgede välja selgitamine ning saadud teadmiste abil ärevuse vähendamine või suurendamine olnud üheks enimuuritud valdkonnaks spordipsühholoogias. Erinevad teooriad on püüdnud välja selgitada ärevuse mõju võistlemise tulemuslikkusele, teiste seas Überpööratud-U Teooria (Yerkes ja Dodson, 1908), Katastroofi Mudelite Teooria (Hardy, 1990) ja Individuaalsete Ärevuse Tsoonide Teooria (Hanin, 1986). Viimasel ajal on üha enam populaarsust võitnud Multidimensionaalne Ärevuse Teooria (Martens, Vealey ja Burton, 1990). Käesoleva uuringu eesmärgiks oli hinnata sportlaste võistluseelset ärevust lähtuvalt Multidimensionaalsest Ärevuse Teoriast, kasutades selleks eesti keelde tõlgitud ärevuse määramise instrumenti VSÄK-2 (Võistluseelse Ärevuse Küsimustik-2; Martens jt., 1990), millele lisati ärevuse soodustavat/takistavat mõju hindavad skaalad (Jones, 1991).

Vaatlusalusteks olid 66 rannavõrkpallurit ja 2 meeskonda (12 saalivõrkpallurit ja 12 korvpallurit), kes tegelesid alaga rahvusvahelisel ja/või Eesti tipptasemel. Ankeedid täideti ajavahemikus 1998–2003. Uuringu käigus hinnati vaatlusaluste võistluseelset somaatilist ja kognitiivset ärevust ning ärevuse soodustavat või takistavat mõju võistlemisele, samuti enesekindlust. Võistlustulemuseks võeti töös objektiivsete statistiliste mänguelementide efektiivsusnäitajad (Handford ja Smith, 1999) ja võistkondade treenerite subjektiivsed hinnangud sportlase võistlemisele. Saalivõrkpallis ja korvpallis vaadeldi võistluseelset ärevust erinevate võistluskohtumiste eel.

Käesoleva uuringu tulemused näitasid, et sportlase enesekindlus ja ärevuse mõju võistlemisele (mitte ärevuse intensiivsus) prognoosisid 44,7% rannavõrkpallurite võistlustulemuste variatiivsusest. See kinnitas Jones'i (1991) teooriat, et ärevuse intensiivsus üksinda võib anda limiteeritud informatsiooni ärevuse ja võistlustulemuse seostest. Sportlaste enesekindlus oli mõõdukalt korrelatsioonis erinevate rannavõrkpalli elementide sooritamise efektiivsusega. Kõrgema tasemega rannavõrkpallurid (rahvusvaheline tase) hindasid ärevuse parameetreid võistlemist soodustavamaks kui madalama tasemega sportlased (siseriiklik tase). Sisealade sportlaste (saalivõrkpall ja korvpall) ärevuse näitajatest oli ainsana võistluse tulemuslikkusega (treenerite subjektiivne hinnang) seoses kognitiivse ärevuse intensiivsus, samas kui ärevuse mõju näitajad olulisi seoseid

ei andnud. Erinevate võistluskohtumiste eel hinnatud ärevuse parameetrid püsisid mängude lõikes suhteliselt stabiilsed.

Kokkuvõtvalt võib uuringu tulemuste põhjal järeldada, et mida kõrgem on sportlaste tase, seda positiivsemaks hinnatakse ärevuse mõju võistlemisele. Kasutades võistluse tulemuslikkuse hindamise parameetrina objektiivseid statistilisi näitajaid on võistluseelse ärevuse mõju paremini hinnatav kui subjektiivsete näitajate puhul. Samuti võib täheldada, et mida individuaalsem on spordiala, seda suuremad on seosed võistluseelse ärevuse ja võistlemise tulemuslikkuse vahel.

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PUBLICATIONS

Raudsepp, L., Kais, K. The relationship between state anxiety and performance in beach volleyball players. *Journal of Human Movement Studies*, 2002, 403–416.

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