

THE EFFECT OF MEDITATION ON ANXIETY IN SPORT



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ABSTRACT

The effects of Anapanasati Meditation (AM) and Progressive Relaxation (PR) training on cognitive and somatic state anxiety and self-confidence were examined. Martens et al. (1990) Sport Competition Anxiety Test (SCAT) and Competitive Sport Anxiety Inventory -2 (CSAI-2) were translated into Thai language and were tested for validity and reliability. In a study of 200 Thai university athletes from a range of sports, the Sport Competition Anxiety Test - Thai version (SCAT-T) showed sound stability, internal consistency, and construct validity and The Competitive Sport Anxiety Inventory -2 - Thai version (CSAI-2T) showed acceptable internal consistency of subscales, factor structure, and construct validity. As there were no standard tests for perceived importance and perceived uncertainty at the start of the research, the Perceived Importance of Competition Test (PICT) and the Perceived Uncertainty of Competition Test (PUCT) were developed in English, translated into Thai, and tested for validity and reliability. PICT and PUCT showed sound internal consistency and construct validity, in separate studies, each involving 50 Thai university athletes from various sports. Thai male and female elite and sub-elite level weightlifters (N=48), aged between 18 and 30 years, were assigned to Anapanasati meditation (AM), Progressive relaxation (PR), or a stretching exercise control condition (C) so that the trait anxiety was matched between groups, with 16 participants in each group. They were trained for ten weeks, with equal time given to each group, including three 30 minutes sessions per week with the instructor and individual practice daily. Participants were pre- and post-tested on the Sport Competition Anxiety

Test, Thai version (SCAT-T) and completed the Competitive Sport Anxiety Inventory-2, Thai version (CSAI-2T), the Perceived Importance of Competition Test (PICT), and the Perceived Uncertainty of Competition Test (PUCT) every week at the same time. Analyses of Variance (ANOVA) on gain score partially supported the matching hypothesis, indicating that relaxation only influenced somatic state anxiety consistent with the matching hypothesis, with a significant effect ($p < .05$) after five weeks. As predicted for this group of elite Thai athletes, meditation was an effective treatment for somatic and cognitive anxiety aspects of multidimensional state anxiety, effects being significant ($p < .05$) for somatic anxiety from fifth weeks and for cognitive anxiety from fourth weeks. It was concluded that the matching hypothesis has value in the prescription of anxiety management, but that meditation is an exception. Perceived uncertainty and perceived importance were higher on weeks five and ten when there was an important competition. Supporting their construct validity, but AM moderate this rise, significant ($p < .05$) on Occasion 10. It was concluded that the use of meditation to moderate perceived uncertainty and perceived importance might be a useful state anxiety management technique. The PICT, PUCT, SCAT-T, and CSAI-2T data were submitted to multiple regression analysis, based on Martens, Vealey, and Burton's (1990) theory of competitive anxiety. Results revealed that a model based on the Martens et al. theory was adequate, but two alternative models in the first of which perceived uncertainty, perceived importance, and trait anxiety independently influenced A-state, and where, in the second, perceived uncertainty, perceived importance, and trait anxiety independently influenced cognitive and somatic anxiety separately, produced progressively stronger statistics. It was

concluded that, while the Martens et al. model was a useful starting point, a more sophisticated model is needed to cover the complexities of competition anxiety adequately.

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CHAPTER 1: INTRODUCTION

State Anxiety in Sport

Many situations create anxiety, either in work, sport, or life in general, resulting in uneasy feelings of apprehension and tension. Although anxiety affects individuals differently, a high degree of anxiety can do more harm than good to performance on complex tasks (Martens, 1987). Under the influence of anxiety, the ability to perform a task well seems to diminish, attention and concentration are frequently distracted, and individuals lose their ability to perform to their potential. High levels of anxiety usually inhibit performance, even in a very skilled person. This is true in sport performance and explains why anxiety is one of the most widely researched topics in sport psychology (Bunker & Williams, 1986).

Anxiety has been divided into two broad categories: trait anxiety and state anxiety. Trait anxiety could be defined as a feature of personality. It is a relatively stable predisposition to perceive many situations as threatening and to respond to these situations with increased state anxiety (Spielberger, 1972). State anxiety is defined as an immediate emotional state that is characterised by apprehension, fear, and tension (Spielberger, 1972). According to Davidson and Schwartz (1976), state anxiety is multidimensional, consisting of at least two components, cognitive and somatic anxiety. Cognitive anxiety is

characterised by negative expectations, worry, lack of concentration, and disrupted attention, whereas somatic anxiety refers to the perception of physical symptoms such as tense muscles, “butterflies” in the stomach, raised heart rate, and rapid, shallow breathing.

In order for applied sport psychologists to help athletes best manage their anxiety in certain sport situations, it is necessary to understand the causes of state anxiety. Until recently, research on anxiety management in sport has been limited and atheoretical. Martens, Burton, Vealey, Bump, and Smith (1990) introduced a theory of competitive anxiety, which proposed three intrapersonal antecedents of state anxiety, namely, trait anxiety, perceived importance, and perceived uncertainty. Although the relationship between trait anxiety and state anxiety has been well established, the roles of perceived importance and perceived uncertainty as antecedents of competitive anxiety require further examination. Study of the impact of anxiety management techniques, such as meditation and progressive relaxation, on perceived uncertainty and perceived importance should also clarify the roles of these mediating variables.

Anxiety Management

Because anxiety often affects behaviour and performance negatively and is subjectively unpleasant, applied sport psychologists have employed many anxiety management techniques and strategies to try to reduce anxiety.

Relaxation techniques such as Jacobson's (1930) progressive relaxation or Benson's (1975) relaxation response are widely used, and reported by practitioners to be effective, although not always appealing to active and busy sports performers, because of the time they take to develop and to practice and the limitation of their effects to bodily relaxation (e.g., Morris, 1992).

Martens et al. (1990) suggested that the cognitive and somatic components of state anxiety are relatively independent and should be managed by different techniques. Somatic anxiety could be reduced by using physiological relaxation techniques, such as progressive muscle relaxation, the relaxation response, breathing methods, or autogenic training. To decrease cognitive anxiety, athletes should employ cognitive techniques, such as thought stopping, rationalisation, and cognitive restructuring. Questions still remain, however, about the independence of the state anxiety components, how each affects performance, and how each component could be most effectively treated. Another issue is whether any technique can influence both components simultaneously. The results of research investigating the best technique for managing each component, based on the assumption of the independence of the components, has been equivocal (e.g., Deffenbacher & Dietz, 1978; Holroyd, 1978; Holroyd, Westbrook, Wolf, & Badhorn, 1978; Morris & Perez, 1972; Smith & Morris, 1976). Any technique that managed cognitive and somatic aspects of anxiety effectively would be valuable in those practical situations where both components of state anxiety are present.

Meditation as a Stress Management Technique

Goleman (1971) claimed that meditational techniques reduce the effects of stress, increase ability to cut off thoughts, and develop attention and concentration skills. Also, positive psychological and perceptual changes may result from the regular practice of meditation (Hall & Hardy, 1991, as cited in Pearl & Carlozzi, 1994). The benefits of meditational techniques are claimed to be highly effective for people who suffer from the symptoms of stress and anxiety (Goleman, 1971). According to many writers (e.g., Buddhathasa, 1990; Da Liu, 1984; Glasser, 1976; Goleman, 1971; Vajiranana, 1975), meditation has enhanced peoples' lives in a variety of ways, such as reducing the level of stress they experience, giving them a more positive view of themselves and the world, improving their self confidence and self esteem, and getting them closer to what Maslow (1969) described as "self-actualization".

Although meditation has been shown to be an effective technique for reducing the effects of stress in non-sport situation, there is not a great deal of strong empirical evidence from research in sport. Such issues as how and when meditational techniques reduce anxiety, and which aspects of anxiety are altered by meditation remain to be resolved. There has been considerable controversy in the field concerning which intervention techniques are more appropriate for moderating each component of state anxiety, as well as, for enhancing state self-confidence, a construct which emerged during the development of the Competitive State Anxiety Inventory-2 by Martens, et al.

(1990), as a third dimension of that scale, moderately independent of, but related to, somatic and cognitive state anxiety.

Some researchers in the field of sport psychology view meditation only as a mind to muscle relaxation technique only, appropriate for the treatment of somatic anxiety (e.g., Cox, 1994; Harris & Harris, 1986; Martens et al., 1990). Other researchers (Burton, 1990; Davidson & Schwartz, 1976) have stated that some types of meditation, such as transcendental meditation (TM), are appropriate for managing cognitive anxiety (the left hemisphere), and different types of meditation, such as Zen meditation, are more appropriate for managing somatic anxiety (the right hemisphere). Interestingly, Schwartz, Davidson, and Goleman (1978) viewed meditation as a technique associated with cognitive relaxation. Their study indicated that TM reduced cognitive anxiety rather than somatic anxiety. The question of which component of state anxiety is more affected by meditation techniques requires further study in sport.

Several writers in meditation (Buddhathasa, 1990; Conze, 1956; Da Liu, 1976; Sikedra, 1975; Vajiranana Mahathera, 1975) have also claimed that, by practising meditation, practitioners can both relax their bodies and reduce worrying and negative thoughts. If it was found that a single meditation technique can be used to manage both the somatic and cognitive components of state anxiety, and perhaps enhance state self-confidence at the same time, this would suggest the need to modify the matching hypothesis (Davidson & Schwartz, 1976), which proposes that each component should be treated

independently. Such a finding could have important implications for the prescription of the most effective treatment in many situations.

The Present Thesis

The present research examined the proposition that meditation is an effective technique that can manage both components of multidimensional competitive state anxiety, as well as state self-confidence in sport. According to writers in Buddhist meditation (Buddhathasa, 1990; Sekida, 1975; Vajiranana, 1975), the Buddhist techniques are claimed to relax the body and mind together. If that is the case, not only should somatic and cognitive state anxiety both be reduced, but also, state self-confidence should increase. According to Martens et al. (1990), cognitive anxiety and self-confidence are likely to be present in the absence of each other, that is, when cognitive state anxiety is absent or low, it is believed that state self-confidence should increase.

The thesis also studied the effects of meditation on the perceived importance and perceived uncertainty of the situation, which according to the theory of competitive anxiety proposed by Martens et al., (1990), are important influences on state anxiety. Perceived importance and perceived uncertainty may be reduced by meditation because, according to many writers on Buddhist meditation (e.g., Buddhathasa, 1990; Vajiranana, 1975), the Buddhist technique affects the way one looks at the world. It tends to make the striving aspects seem less important and to allow the person to look at the world

differently (Sekida, 1975). Through meditation, certain aspects that bias a person's perception of situation, resulting in greater uncertainty or importance about the situation than is warranted (e.g., great emphasis on the material aspects of life, making judgement of opponent's ability greater than it is) would be reduced. Thus, perception of the importance of sport competition would be moderated in the context of life as a whole, without necessarily leading to any reduction in motivation. Similarly, a different perspective on the world would lead to moderation of perceived uncertainty. The thesis, thus, aimed to elucidate both the matching hypothesis and the theory of competitive anxiety, while providing a test of the efficacy of meditation in elite sport.

CHAPTER 2: LITERATURE REVIEW

Introduction

Although the precise relationship between anxiety and performance is not clear, the focus of a large amount of theory and research on the anxiety and performance relationship, indicates that optimal anxiety level is perceived to be a crucial issue in performance (see, for example, recent reviews by Gould & Krane, 1992; Jones, 1995). Because sport competition is often perceived to have elements of threat, both physical and psychological, anxiety is often elevated and anxiety reduction is the most common aim for performance enhancement (Martens, 1983). Various techniques have been developed to increase arousal and decrease sport-related anxiety in an effort to help athletes control and manage their anxiety levels in order to enhance performance (e.g., Harris & Harris, 1984). There has still been little research on the efficacy of those techniques.

Some researchers have begun advocating the view that anxiety is a multidimensional, rather than a unitary, phenomenon (Burton, 1988; Gould, Petlichkoff, Simons, & Vevera, 1987; Martens, Vealey, & Burton, 1990). These researchers have proposed that the two different dimensions of state anxiety, somatic anxiety and cognitive anxiety, have different effects on athletes' performance. According to many researchers (Davidson & Schwartz, 1976; Jones, 1990; Martens, Burton, Vealey, Bump, & Smith, 1983), cognitive

anxiety tends to impair performance on cognitive components of complex tasks, through such effects as worry or distracting attention. Somatic anxiety, it is argued, impairs performance through its effects on the autonomic nervous system, such as by producing tense muscles or butterflies in the stomach (e.g., Bunker & Williams, 1986; Jones, 1991; Martens et al., 1990).

With regard to these two dimensions of anxiety, Davidson and Schwartz (1976) proposed the “matching hypothesis”. The “matching hypothesis” stated that to reduce unwanted symptoms effectively, the stress management techniques selected must match the anxiety symptoms experienced. In other words, cognitive techniques should be used by performers experiencing predominantly cognitive anxiety symptoms, and somatic techniques should be used by performers experiencing predominantly somatic anxiety symptoms. Although many techniques have been used to manage somatic or cognitive anxiety, with origins ranging from clinical psychology to eastern philosophy (e.g., progressive relaxation, imagery relaxation, biofeedback relaxation training, autogenic training, various kinds of meditation, Yoga, thought stopping techniques, positive self-talk, rationalisation, cognitive restructuring, imagery, and goal setting), the amount of research that specifically examines which techniques are more efficacious for managing each dimension of anxiety is limited.

Meditation has been viewed by many researchers in sport psychology as a somatic stress management technique (Harris, 1986; Martens, 1987), whereas others, such as Davidson & Schwartz (1976), have stated that some kinds of

meditation could be used as techniques to reduce cognitive anxiety. Jones (1991) viewed meditation as a mental relaxation technique that is appropriate to use for reducing cognitive anxiety, as opposed to physical relaxation techniques that are more suitable for reducing somatic anxiety. There are many types of meditation that use different devices for attaining their goals. These devices include such varied techniques as concentration on breathing, visualising an object, imagining the sound of a Sanskrit syllable (Mantra), working on a paradoxical riddle (Koan), or just sitting (Zazen) (Layman, 1980). Although using different methods, all of these meditation techniques have certain features in common. All require that the meditation position should be relaxed and upright, permitting deep and easy breathing. All involve developing awareness of the present, with lack of concern for the past and future, and all provide training in concentration of attention. It has been claimed that meditation can have many positive effects on athletes' thoughts, feelings, and performance (Cox, 1990; Jones, 1991). Some researchers have claimed that meditation helps athletes' performance by its calming effect that improves concentration, forces attention on the present, and conserves energy (Bloomfield, Cain, Jaffee, & Kory, 1975). Also, Pearl and Carlozzi (1994) found that meditation had a positive effect in reducing athletes' trait and state anxiety levels.

The following review of literature contains the issues raised here in detail. First, definitions are presented to clarify the use of terms. Next, theories of anxiety, and anxiety management, particularly those relating to performance,

are presented. Measurement is then considered in some detail, as the multidimensional theory of anxiety and the matching hypothesis are related to the way anxiety is measured. Because effective anxiety management techniques are very important for enhancing sport performance, testing the effectiveness of two anxiety management techniques for reducing the two components of state anxiety is the main focus of this thesis. The review, thus, includes research on anxiety and performance and the use of various techniques in interventions to manage anxiety. It next focuses on the nature and proposed effects of meditation on the components of the multidimensional model of state anxiety and on the mediating variables in the theory of competitive anxiety (Martens et al., 1990). The matching hypothesis, and research examining the effects of anxiety management techniques on different components of state anxiety, is also a focus of the review. From the review, it is made clear how research on meditation as an anxiety reduction technique can examine the matching hypothesis and effects on perceived uncertainty and perceived importance, which is a central aspect of the theory of competitive anxiety. Because meditation is a technique claimed to act on somatic and cognitive anxiety (Davidson & Schwartz, 1976), the technique could be particularly efficient in addressing both components. Discussions of this proposition are included in the review .

Definitions

The major anxiety concepts in the field are now defined to clarify their usage in this thesis.

Arousal

Arousal has been referred to as physiological activation or autonomic reactivity. An individual's state of arousal is seen as varying on a continuum ranging from deep sleep at one end to extreme excitement at the other (Malmö, 1959). Landers and Boutcher (1986) viewed arousal as “an energizing function that is responsible for harnessing of the body's resources for intense and vigorous activity” (p. 164). Cox (1994) described arousal as the degree of activation of the organs and mechanisms that are under the control of the body's autonomic nervous system. Although arousal has often been operationalised in terms of physiological indices, including heart rate, muscle tension, sweating of the palms of the hands, and respiration, Gould and Krane (1992) claimed that a number of researchers consider that arousal reflects a psychological process, as well as physiological reactions. They stated that

Given a composite of these views, arousal is best defined as general physiological and psychological activation of the organism that varies on a continuum from deep sleep to intense excitement.

Although arousal has traditionally been inferred through physiological indexes such as heart rate and respiration, some

investigators feel that it also represents a cognitive or mental intensity of behavior (pp. 120-121).

Oxendine (1970) noted the importance of positive and negative feelings associated with being psyched up. Anshel (1995) agreed that emotional aspects of arousal do exist. Arousal is usually considered to be neutral. Any negative or positive affect associated with arousal depends on the individual's interpretation of the situation in which the arousal occurs. For example, a high state of arousal associated with performing in public could be experienced as joy and excitement by one individual, whereas it could be interpreted as fear and anxiety by another. Even though there have been many attempts to clarify the nature of arousal, the concept and definition of arousal are still unclear. Neiss (1988) criticised the concept of arousal, particularly arguing that arousal is usually conceived and measured as a physiological concept, which by itself gives no information about the psychological state being experienced. Thus, high arousal measured by indices such as heart rate, respiration, skin conductance, or body temperature, could reflect anxiety or elation. There has also been some confusion between the concepts of physiological arousal and somatic anxiety, as noted, for example, by Gould and Krane (1992). In this thesis, the term arousal will be employed to refer to the activation of the person as measured by psycho-physiological indices. Its use will be restricted to those aspects of theory and research where arousal has been the central concept, such as the inverted-U hypothesis. Because the focus of the thesis is anxiety, in

particular, cognitive and somatic state anxiety, both components of state anxiety, will be an important focus of the thesis.

Stress

Stress was defined by McGrath (1970) as “a substantial imbalance between environmental demand and response capability, under conditions where failure to meet the demand has important consequences” (p. 20). Also, Selye (1974) suggested that not all stressors should be perceived as negative. He differentiated stress as eustress, stress that is experienced with positive affect, such as feelings of joy, exhilaration, or happiness, and distress, stress that is experienced with negative affect, such as feelings of fear, apprehension, or worry. Again, stress itself is neutral, but the circumstances that surround it and their interpretation determine whether it is experienced as positive or negative. For example, a stressful situation, like a major sport final, may affect individuals involved differently, depending on the background of each individual. Experienced individuals who have been involved in many finals might feel only a moderate level of stress. Players who have never been in a final before might feel highly stressed in a negative way, because they are afraid they will not perform up to the expected level, whereas other performers, who have never been in a final before, may feel joy and excitement, that is positive or eustress, because they view the situation as an opportunity to succeed and meet an optimal challenge. Because stress is a relatively vague concept that can be manifested in positive or negative affect, this thesis will

avoid use of the concept, except when quoting from the work of others who use the term stress in their discussions.

Anxiety

Anshel, Freedson, Hamill, Haywood, Horvat, and Plowman (1991) defined anxiety as a “subjective feeling of apprehension or perceived threat, sometimes accompanied by heightened physiological arousal” (p. 9). Gould and Krane (1992) viewed anxiety as feelings of nervousness and tension associated with activation or arousal of the organism, and also stated that anxiety can be considered the emotional impact or cognitive dimension of arousal. The conception of anxiety had been elaborated earlier by Spielberger (1966), who distinguished between trait anxiety, a relatively stable disposition, and state anxiety, a transient feeling of apprehension or nervousness. These conceptions are discussed shortly.

First, it is necessary to clarify use of the terms arousal, stress, and anxiety in this thesis, on the basis of the preceding discussion. Although often used interchangeably by writers in the field, there are distinctions between arousal, stress, and anxiety. Arousal is an activation level that ranges from lowest to highest, and most of the time would cause bodily reactions or sensations to occur, but it is not clear what psychological state these bodily symptoms reflect. An optimal level of arousal has been claimed to be crucial for best sport performance (Hanin, 1980; Klavara, 1977; Martens & Landers, 1970), but the optimal level differs for different tasks, different individuals, and different skill levels (hardy, Jones, & Gould, 1996), so it is not clear what that

level should be. Hence, the concept of arousal is difficult to apply directly, and its use will, thus, be reserved to those areas of review where it is central.

Similarly, the use of the term stress in the discussion of anxiety, although common, is often not informative. Its use will be restricted to citations by those authors who refer to it directly. This thesis is concerned with anxiety in general and, particularly, with cognitive and somatic state anxiety, so these terms will be used widely in this review and the rest of the thesis. The nature of trait and state anxiety, multidimensional state anxiety, and the sports specific applications of these concepts are now discussed.

Trait and State Anxiety

The previous comments on anxiety suggested state anxiety is a transitory experience, that fluctuates from moment to moment. Early conceptions of anxiety suggested that it is a unitary personality trait (Spence & Taylor, 1956). Spielberger (1966) developed the conception of anxiety as having both state and trait qualities. He noted that it is necessary to differentiate between anxiety as a mood state and as a personality trait, which led to his state-trait theory of anxiety. State anxiety was defined by Spielberger as an emotional state characterised by subjective, consciously perceived feelings of apprehension and tension, accompanied by, or associated with, activation or arousal of the autonomic nervous system. The condition of state anxiety according to Spielberger, would then vary from moment to moment and it would fluctuate proportionally to the perceived threat in the immediate situation. Trait anxiety, on the other hand, is an acquired behavioural

disposition that predisposes an individual to perceive a wide range of objectively nondangerous circumstances as threatening and to respond to these perceived threats with an amount and intensity of state anxiety reaction as though confronting objective danger. Spielberger's state-trait theory of anxiety also predicted that high trait anxious individuals perceive more situations as threatening and react with greater state anxiety in a greater variety of situations than low trait anxious individuals.

Martens (1977) proposed that a sport specific anxiety scale was necessary to understand and examine anxiety in sport and developed the Sport Competition Anxiety Test (SCAT), which measured the anxiety level a person generally feels, or trait anxiety. Shortly after the SCAT was developed, Endler (1978) proposed that both trait and state anxiety are multidimensional. His work was supported at the state level by Martens et al. (1990), with the development of the Competitive State Anxiety Inventory-2 (CSAI-2), which consisted of separate measures of cognitive state anxiety, somatic state anxiety, and state self-confidence. Also, a multidimensional measure of trait anxiety, the Sport Anxiety Scale (SAS) has been developed by Smith, Smoll, and Schutz (1990). The Sport Anxiety Scale (SAS) was developed as a sport specific measure of three trait anxiety components, somatic reactions, cognitive worry, and concentration disruption.

The work of Martens et al. (1990) on the CSAI-2 and the work of Smith et al. (1990) has contributed to a more refined view of anxiety. Anxiety, is no longer viewed as unidimensional, existing continuously at one level, but as a

state fluctuating from moment to moment, as well as a trait, a disposition or proneness. It is also viewed as multidimensional, with subcomponents for both trait and state anxiety.

Multidimensional State Anxiety

Recently, many sport psychologists (e.g., Burton, 1988; Gould, Petlichkoff, Simons, & Vevera, 1987; Krane & Williams, 1987; Martens et al., 1983; Martens et al., 1990) have focused on the multidimensional nature of state anxiety. This line of research stems from the work of Liebert and Morris (1967) who introduced two components of anxiety that they labeled cognitive worry and emotional arousal. Davidson and Schwartz (1976) and Borkovec (1976) identified two similar components of anxiety that they termed cognitive anxiety and somatic anxiety. The cognitive-somatic distinction is essentially the same as the worry-emotionality distinction according to Morris, Davis, and Hutchings (1981).

Davidson and Schwartz (1976) operationalised cognitive state anxiety as negative concerns about performance, inability to concentrate, and disrupted attention, whereas somatic state anxiety was operationalised as perceptions of bodily symptoms of autonomic reactivity, such as butterflies in the stomach, sweating, shakiness, and increased heart rate. Martens et al. (1990) defined cognitive anxiety in sport as “most commonly manifested in negative expectations about performance and thus negative self-evaluation, both of which precipitate worry, disturbing visual images, or both” (p. 120). They also defined somatic anxiety in sport as:

the physiological and affective elements of the anxiety experience that develop directly from autonomic arousal. Somatic A-state is reflected in such responses as rapid heart rate, shortness of breath, clammy hands, butterflies in the stomach, and tense muscles” (p. 121).

During the development stage of the Competitive State Anxiety Inventory-2 (CSAI-2; Martens et al., 1990), factor analysis of the items revealed a third component in addition to the expected cognitive and somatic components, which Martens et al. (1990) considered as another dimension of the CSAI-2. This component was identified as state self-confidence. It was then concluded that the CSAI-2 measured three dimensions or components, cognitive anxiety, somatic anxiety, and state self-confidence.

Cognitive anxiety and self-confidence represent opposite ends of the same cognitive evaluation continuum (Martens et al., 1990). Vealey (1986) defined self-confidence in sport as “the belief or degree of certainty individuals possess about their ability to be successful in sport” (p. 222). The value of self-confidence in sport can be clearly seen through Horsley’s (1995) statement that:

“Doubt, uncertainty and anxiety plague the thinking of athletes who lack confidence. Compared to highly confident athletes, the less confident are likely to be less persistent, more hesitant, make more

unforced errors and lack the time and space to execute their skills” (p. 311).

This conception of self-confidence appears to identify it as an independent, if related, construct to anxiety. Thus, caution should be exercised in referring to self-confidence as a component of state anxiety. Because it has been consistently identified as an element of the CSAI-2, many researchers have considered state self-confidence in anxiety research alongside cognitive and somatic state anxiety (e.g., Burton, 1988; Gould et al., 1984). Although it is clearly understood, in this thesis, that self-confidence is theoretically distinct from anxiety, because of the close relationship between state self-confidence, as measured by the CSAI-2, and the two state anxiety components measured by that instrument, the thesis also examines changes in state self-confidence. It should be noted that there are differences in the conceptions of self-confidence proposed by Horsley (1995), Vealey (1986), and Martens et al. (1990). Horsley’s discussion presents self-confidence to be more of a general disposition. Vealey proposed state and trait aspects of self-confidence in sport. State sport confidence is a transient state, but Vealey’s conception refers to the person’s global confidence in their sport capability at that moment, whereas competitive state self-confidence as measured by the CSAI-2, refers to the individual’s confidence at that moment with reference to performance in the specific, upcoming competition.

The most popular current conception of anxiety in sport competition (Martens et al., 1990) proposes a unitary trait component that predisposes individuals to perceive sports situations as threatening and to react with large rises in state anxiety. Those moment to moment fluctuations of state anxiety divide into the somatic (bodily reactions), and the cognitive (worrying evaluations) anxiety components. Along with variations in the factorially independent, but frequently related construct of state self-confidence.

Theories of Anxiety and Performance

In sport, especially at the elite level, performance is the most important issue. There is substantial anecdotal evidence, as well as evidence from qualitative research, indicating that anxiety is often experienced to be debilitating to athletes' performance (e.g., Gould, Eklund, & Jackson, 1993; Gould, Jackson, & Finch, 1993). Sport psychologists have responded by using intervention techniques to manage anxiety. The precise time when those techniques need to be used depends upon the nature of the anxiety-performance relationship as well as the level of anxiety needed. It is, thus, necessary to consider research that examines the anxiety-performance relationship. In the field of sport psychology, many theories of the anxiety-performance relationship have been proposed. The major theories are now reviewed.

Drive Theory

Hull's (1943) drive theory, as modified by Spence and Spence (1966), suggested that performance (P) is a product of drive (D) and habit strength (H). Drive was conceptualised by Hull to be a reflection of all the person's needs at any moment. Thus, it was considered to represent the pooled energising mechanism of the person. Spence and Spence (1966) operationalised drive as arousal. Habit strength means level of learning or skill, thus, a skilled performer would have a high level of habit strength, whereas a novice would have a low level. A more fine grained analysis would normally be adopted by drive theorists, to assess the habit strength of each different response.

According to the theory, the arousal-performance relationship is a linear relationship such that $P = D \times H$. The theory predicts that, when a person is in the early stage of learning, the dominant response or habit would be incorrect, thus, an increase in drive during initial skill acquisition would impair performance. As the skill becomes well learned, the dominant response should be more frequently a correct one, so an increase in drive improves performance. Drive theory was originally supported by some research on simple skills (Spence, 1966; Taylor, 1956). For some time, research in the field of motor behaviour and sport psychology has favoured an alternative explanation, the inverted-U hypothesis, more than drive theory (Fenz & Jones, 1972; Lowe, 1977). The main problem with drive theory, is that it states that an increase in drive for the high skill performer should increase performance as the correct response would be dominant. This is at odds with the real world of

sport. Even with highly skilled experts on a particular task, increase in drive only increases performance up to a point, after which more drive or arousal tends to be associated with a decrease in performance. As an example, Landers and Boutcher (1986) stated that:

there are many instances of overaroused sprinters recording false starts in intense competition. Similarly, many superenergised weightlifters have forgotten to chalk up or have lifted the barbell in a biomechanically inefficient way in major competitions. Thus, on experiential grounds, it appears that even among weightlifters, sprinters, and long or middle distance runners there are limits to the amount of arousal the athlete can tolerate without suffering performance decrements (p. 171).

Martens (1974) reviewed the research evidence for the two theories and concluded that drive theory should be rejected, because it is difficult to test with real motor skills, where habit hierarchies are hard to measure, and because support from research is equivocal at best.

The Inverted-U Hypothesis

The inverted-U hypothesis was first proposed by Yerkes and Dodson (1908), in an attempt to explain the relationship between arousal and performance. The hypothesis predicted that the relationship between arousal and performance is curvilinear, taking the shape of an inverted-U. The hypothesis has received much support (Klavora, 1977; Martens & Landers,

1970; Sonstroem & Bernardo, 1982), and increasing criticism (Hardy & Fazey, 1987; Jones & Hardy, 1989; Landers, 1980) based on the methodological, interpretive, conceptual, and statistical problems associated with it (Gould & Krane, 1992). It has also been criticised more recently for its failure to recognise the multidimensional nature of arousal and anxiety (Hardy & Fazey, 1987; Jones & Hardy, 1989) for failing to consider interactions of arousal subcomponents and the precise shape of the curve (Hardy, Jones, & Gould, 1996).

The inverted-U hypothesis proposes a relationship between performance and arousal such that, as the arousal level increases from drowsiness to alertness, there is a progressive increase in performance efficiency. Once the level of arousal increases beyond an optimal level, however, such as from alertness to a state of high excitement, performance decreases (Martens & Landers, 1970). The optimal level of arousal will depend on task characteristics, such as strength, power, or endurance, as opposed to fine skill components, as well as individual difference factors, such as competitive trait anxiety. In order to ensure athletes are at their optimal state of arousal for performance, the arousal demand of the sport task and the athlete's typical competitive state must, therefore, be considered. Attempts to raise performance to its peak by increasing arousal to its optimal level, if it is thought to be too low, or by decreasing level of arousal, when it is considered to be too high, have achieved only moderate success, because there seem to be other factors that affect the relationship between anxiety and performance

(Hardy & Fazey, 1987). The inverted-U hypothesis seems to be too simple an explanation of the complex relationship between performance and anxiety.

The main problem of the inverted-U hypothesis is that it is too simple, whereas the complex relationship between performance and anxiety seems to need more dimensions to permit an adequate explanation. Also the inverted-U hypothesis is too global, it does not include individual difference factors and assumes there is an optimal level of anxiety, that leads to best performance. According to the hypothesis, optimal level of arousal only differs for different kinds of task, such as gross motor skills, which require higher levels of arousal than fine motor skills, and the hypothesis seems to conclude that everyone who competes in sports that require gross motor skill would need a high level of arousal to perform well.

The inverted-U hypothesis has received tremendous amounts of attention from researchers in sport psychology, and has been the most popular attempt to explain the relationship between arousal and performance. Recently, the hypothesis has been criticised by a number of researchers based on its simplicity and lack of practical utility (Hardy & Fazey, 1987; Jones & Hardy, 1989; Kerr, 1985; Weinberg, 1990). Many theories have evolved as alternatives to the inverted-U hypothesis; some appear to be complex variations of the inverted-U hypothesis and some appear to be clearly different from the inverted-U hypothesis. Three alternatives, which have received most attention, are: Hanin's (1980) zone of optimal functioning hypothesis, Apter's (1984) reversal theory, and Hardy and Fazey's (1987) catastrophe model.

Zone of Optimal Functioning (ZOF) hypothesis.

Hanin (1980) proposed that it is unlikely that one specific optimal level of state anxiety exists, that always leads to best performance. From the results of his research using a Russian version of Spielberger's (1977) State-Trait Anxiety Inventory (STAI), Hanin proposed that different athletes have different levels of optimal state anxiety. Although optimal state anxiety is moderate for many performers, for some athletes, the optimal level of state anxiety is very low, whereas for others it is very high. Hanin suggested that, through systematic multiple observations of athletes' state anxiety and performance level, a zone of optimal functioning (ZOF) could be identified for each athlete. According to the theory, an athlete's zone of optimal functioning can be identified by actually measuring state anxiety immediately before a number of competitions and determining the level of anxiety that relates to the best performance. Because this is likely to be a long-term process, that is, identifying athletes' level of anxiety for best performance. Hanin suggested an alternative process, which is by asking the athletes to reflect upon past performances and to complete the inventory according to how they felt immediately before best performance. Once the athletes' optimal state anxiety score is determined, the ZOF can be identified by calculating a range of plus or minus approximately half a standard deviation or four points on each side of the predetermined Spielberger's STAI state scale score. According to the theory, athletes whose state anxiety falls within their ZOF would be expected to perform better than athletes whose state anxiety is outside the ZOF.

Although this approach seems to be practical and realistic, the theory still requires further study to document the reliability and validity of the techniques and concepts involved (Gould & Krane, 1992). Also, the theory is based on a unidimensional concept of anxiety, whereas a number of researchers, such as Gould and Krane (1992), have proposed that a multidimensional approach may yield more information and add to the theory's predictive potential. The idea of a zone of optimal functioning has also been based on a general measure of state anxiety, the STAI state scale that has proved less sensitive in competitive contexts than sports specific measures, such as the CSAI-2 (Martens et al., 1990). Finally, no theoretical rationale is offered for the relationship, that is, Hanin did not explain why performance is best in the optimal zone.

Reversal Theory

Apter's (1984) reversal theory is based on the notion that there are two meta-motivational states that influence anxiety levels, as well as other psychological variables. These are the telic and paratelic states. A telic meta-motivational state could be described as a goal-directed orientation, whereas the paratelic meta-motivational state is considered to be fun loving with an emphasis more on the present, rather than the future or the past. Reversal theory received its name from the notion that the person's state switches back and forth between the telic and paratelic meta-motivational states. In the telic mode, the individual views high arousal to be unpleasant and stressful, whereas low arousal is viewed as relaxing. In the paratelic mode, increased arousal is

viewed as exciting and low arousal is interpreted as boredom. In addition, individuals are telic or paratelic dominant, so telic dominant performers are more likely to be in goal-directed states at any time.

Apter's concept of switching between the two modes could be exemplified in the risk taking sports, such as rock climbing or parachuting. The danger involved produces a high level of arousal, anxiety in the telic mode, and then when the danger is mastered, the anxiety suddenly reverses and becomes excitement in the paratelic mode. According to the theory, arousal could be positive or negative depending on the person's perception of the situation. Cox (1994) has stated that an application of the reversal theory to sport could involve, first, determining if the individual is in a telic or paratelic state, and second, determining if the person is suffering too high or too low a level of arousal. For an athlete suffering from high anxiety while in the telic state, there are two possible options. The first option is to decrease the level of arousal through a stress management strategy, and the second option is to induce a reversal to the paratelic state. The athlete will then view the high anxiety situation as exciting and challenging instead of threatening or unpleasant. For the athlete who suffers from too low arousal while in a paratelic state, there are also two options available. The first option is to increase the level of arousal to induce excitement through psyching up techniques, and the second option is to switch to a telic state, where the athlete would view a boring situation as relaxing instead. Reversal theory still needs more research examination. Also, it is still unclear exactly what telic and paratelic states are and what

mechanisms control them. Thus, it would be difficult to identify techniques that reliably induce reversals. In addition, reversal theory seems to propose a dichotomous framework, that meta-motivation is either telic or paratelic, whereas athletes generally experience a continuum of more or less anxiety. More research is needed in this area to help identify and measure telic/paratelic states at any time and to determine techniques to alter one state to the other.

Catastrophe Model

Hardy and Fazey (1987) applied Thom's (1975) catastrophe model to the anxiety-performance relationship in an attempt to explain more precisely the relationship between anxiety and performance. Hardy and Fazey (1987) proposed that when performers exceed their optimal level of arousal, their performance often drops dramatically rather than gradually, and a return to even a moderate level of performance will be very difficult. They suggested that small reductions in arousal do not make any notable difference to performance once this stage has been reached. The phenomenon described by these researchers seems to contrast with the inverted-U hypothesis.

The cusp catastrophe model, which is illustrated in Figure 2.1, hypothesises that performance depends on the interaction of physiological arousal and cognitive anxiety. When cognitive anxiety is low, performance will increase as physiological arousal increases up to an optimal level, from which further increases in physiological arousal will be associated with a gradual deterioration of performance, as in the inverted-U model. In the case of high cognitive anxiety, however, the catastrophic effect will occur. After

physiological arousal increases up to the optimal level, when cognitive anxiety is high, further increases in physiological arousal will result in a dramatic drop in performance level, the catastrophe, rather than a gradual drop, as predicted by the inverted-U hypothesis. Attempts to regain the previous, higher level of performance by simply decreasing physiological arousal by a small amount will be unsuccessful at this stage, because the person is on the lower plane in the model to the right of the cusp in Figure 2.1. The catastrophe model was partially tested by Hardy and Parfitt (1991) who found that increases in physiological arousal, such as heart rate were differentially related to performance depending on whether cognitive anxiety was high or low. Their results were consistent with the model.

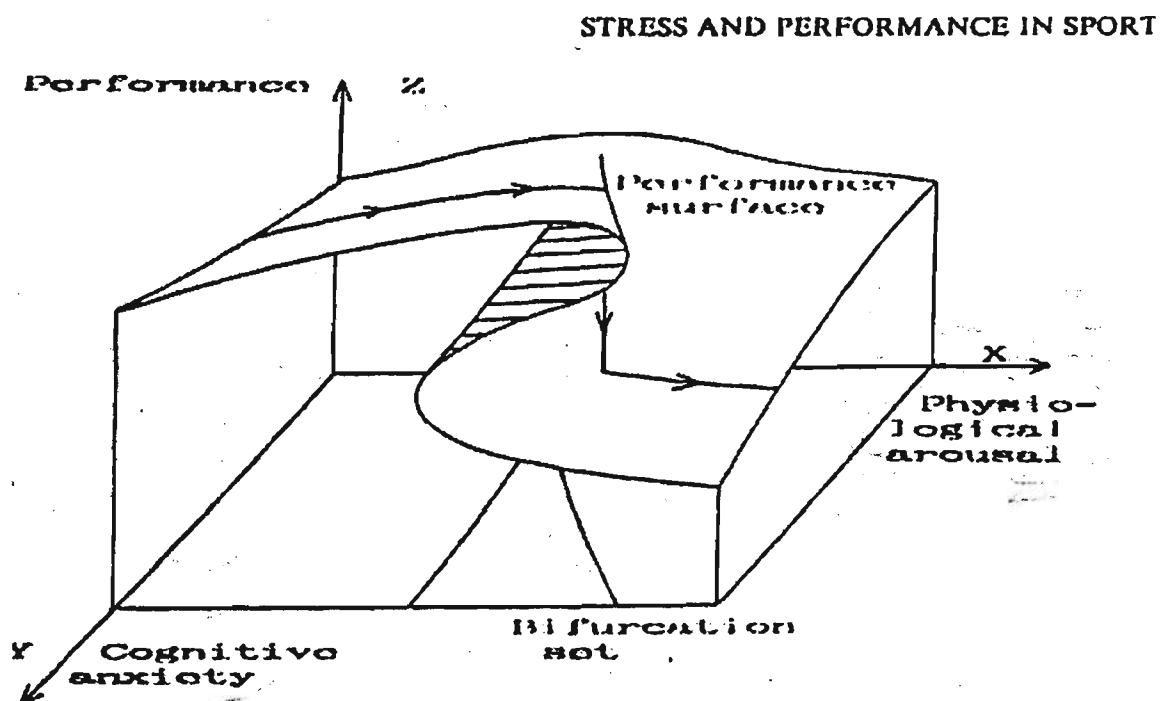


Figure 2.1. Hardy and Fazey's (1987) catastrophe model of the relationship between anxiety and performance.

Hardy and Fazey (1987) proposed the catastrophe model in an attempt to explain more clearly the relationship between anxiety and performance. It has offered a more precise view of the relationship between cognitive anxiety, physiological arousal or somatic anxiety, and performance. They also applied the multidimensional theory of anxiety in an interesting way. The catastrophe theory approach still requires further study to examine and validate it. Presently, questions about the effects of each component of anxiety on sport performance and about the interactive influences of somatic and cognitive anxiety on sport performance still remain to be examined in detail.

The anxiety-performance model based on catastrophe theory has its strengths and weaknesses. Catastrophe theory precisely explains the relationship between anxiety and sport performance by addressing self-confidence, physiological and cognitive effects of arousal and anxiety on performance (Hardy, Jones, and Gould, 1996). The theory also indicates that sports performance in actual, competitive conditions is rarely totally predictable and is certainly more complex than a linear or even a quadratic (inverted-U) model can explain. A weakness of catastrophe theory is that it is very complicated, and, in order to test the theory, many observations over a long period of time are required (Gould & Krane, 1992). Also, there is some disagreement as to whether the somatic dimension should be identified as physiological arousal, as in Hardy and Fazey's (1987) original, or as somatic anxiety, the person's interpretation of the bodily sensations associated with

physiological arousal, as proposed by Krane (1990). The theory awaits further research to test its efficacy and applicability.

Research results on the relationship between anxiety and performance are still equivocal, so it is not yet clear what level of cognitive and somatic anxiety will lead to optimal performance under what conditions. It is the case that most athletes on many occasions need to reduce or moderate their cognitive or somatic anxiety level, so anxiety management techniques are important in applied work.

The Multidimensional Anxiety Theory

In the last 20 years, research in competitive state anxiety has been characterised by a move away from the traditional unidimensional approach toward a multidimensional approach, on the grounds that anxiety cannot be accurately measured if viewed as a global, undifferentiated state (Borkovec, 1976). Many researchers have suggested that it is important to differentiate between cognitive and somatic anxiety, because the two components have different antecedents and are hypothesised to affect performance differently (Davidson & Schwartz, 1976; Gould et al., 1984; Martens et al., 1983). Cognitive anxiety is reflective of negative expectations, whereas somatic anxiety is a conditioned response to particular stimuli associated with competition, such as locker-room preparation, seeing the playing field, hearing crowd noise, or performing warm-up routines. (Martens et al., 1990). It is

predicted that there would be a negative linear relationship between cognitive anxiety and performance (Burton, 1988), and an inverted-U relationship between somatic anxiety and performance (Gould et al., 1987). Based on conceptions from other areas of psychology, Martens et al. (1983) developed the CSAI-2, which is described in the next section, to measure cognitive and somatic state anxiety specific to sports competition.

Gould et al. (1984) conducted two studies using the CSAI-2 with 37 wrestlers and 63 volleyball players, and did not find clear antecedents of cognitive and somatic anxiety, or a significant relationship of either state anxiety dimension to performance. Also, Gould et al. (1987) studied 39 police pistol shooters, again using the CSAI-2 and measuring their performance in a competition the researchers organised. The results showed that cognitive anxiety was not related to performance, somatic anxiety was related to performance in an inverted-U fashion, and state self-confidence was negatively related to performance, a result that Gould et al. were at a loss to explain.

Research that supported predictions of the multidimensional theory of state anxiety was conducted by Burton (1988). Burton studied 98 female swimmers and found a negative linear relationship between performance and cognitive anxiety, and a curvilinear relationship between performance and somatic anxiety. There was also a positive linear relationship between state self-confidence and performance, as predicted. Furthermore, Hardy (1996) found that self-confidence significantly predicted golf performance over and above the variance in performance predicted by cognitive and somatic anxiety. Also,

self-confidence has been viewed as a factor that could control anxieties (Jones, 1995, Jones & Hanton, 1996). Thus, although it has been supported by some research, questions still remain to be resolved regarding the multidimensional theory of state anxiety. Most of the experiments found that cognitive and somatic anxiety are likely to covary. Also, stressful situations tend to elicit both components together, so it is difficult to find a competitive situation that creates only somatic anxiety without cognitive anxiety or only cognitive anxiety without somatic anxiety (Morris, Davis, & Huchings, 1981; Smith & Morris, 1976). Research evidence on the independence of cognitive and somatic anxiety in relation to sport competition, thus, is still equivocal.

The effects of the components of competitive state anxiety on performance were found not to be straightforward in a number of studies (Parfitt & Hardy, 1987; Parfitt, Jones, & Hardy, 1990). The two studies found that sometimes somatic anxiety was associated with performance in cognitive-based tasks (Davidson & Schwartz, 1976; Parfitt & Hardy, 1987) and cognitive anxiety was associated with performance in motor-based tasks (Burton, 1990). It has been suggested that the components of the multidimensional theory of state anxiety often appear to be working together or interacting rather than independently affecting performance (Hardy & Fazey, 1987; Hardy, Jones, & Gould, 1996). Cognitive and somatic anxiety may be interdependent under some circumstances and to varying extents. One component could be quite high, while the other is low, allowing for their interactive effect on performance to cover many different combinations. For example, one or two

days before a very important competition, such as an Olympic final, while somatic anxiety should not be so high, because there are few stimuli present that are directly related to performance, a lot of worry and negative thoughts may occur. Conversely, for someone playing in front of a big crowd at a major venue, but against weaker opponents, cognitive anxiety might be lower, because concerns about performing well or being successful are not great, but somatic anxiety could be quite high, because there are a lot of stimuli present that generate it. Further study is required to investigate the interaction of cognitive and somatic anxiety, as well as to test the predictions about antecedents of each dimension of state anxiety and their relationship to performance.

Although a substantial amount of research has examined the theory of multidimensional anxiety, questions still remain. Antecedents of cognitive and somatic anxiety, interaction of the dimensions, and the relationship between state anxiety and performance are waiting for clearer explanation. Still, the multidimensional conception of anxiety appears to be a promising one. It also could be that the recent emergence of frequency and direction scales, developed by Jones and his colleagues (e.g., Jones, Swain, & Hardy, 1993; Swain & Jones, 1993) will produce more consistent and informative research results.

Measurement of Anxiety

Closely related to definitions and theory of anxiety has been the operationalisation of conceptions of anxiety in terms of its measurement. The measurement of anxiety has been of particular importance, being intimately related to a number of theoretical conceptions, and it is essential for the conduct of research. Measurement tools have developed from the early general anxiety scales to recent multidimensional trait and state inventories specific to sport.

The Taylor (1953) Manifest Anxiety Scale (MAS) was an early method devised to measure different anxiety levels of individuals. Manifest anxiety was a trait conception, considering anxiety to be a general feeling of the individual, which is a predisposition to perceive a variety of situations as threatening. The implication was that the high MAS individual would be chronically higher in anxiety than the low MAS person. The MAS failed to show clear and consistent relationships between an individual's level of anxiety in sport and that individual's performance, probably because it assessed general anxiety-proneness (Martens et al., 1990). Other scales, such as the Test Anxiety Scale (Sarason, 1975) devised for use in educational settings, produced similar research results. It was recognised by researchers (e.g., Mandler & Sarason, 1952; Sarason, Davidson, Lighthall, Waite, & Ruebush, 1960; Spielberger, 1972) that more specific arousal and anxiety measurement scales were required.

Spielberger (1966) proposed the state trait anxiety theory and developed the State Trait Anxiety Inventory (STAI), based on the conception that there are two types of anxiety, state anxiety (A-State), and trait anxiety (A-Trait). The STAI has an A-State scale and an A-Trait scale, each comprised of 20 items. Instructions for the A-State scale ask how the person feels *right now, at this moment in time*, whereas the A-Trait scale instructions ask how the person *generally* feels. Response to each questionnaire is on a four point scale. The trait scale refers to frequency, ranging from never to often, whereas the state scale refers to intensity varying from not at all to a lot. The STAI has been widely used in research and clinical practice.

As a result of the so-called interactionism debate (Bowers, 1973; Carson, 1969; Vale & Vale, 1969), there is an increased awareness of the importance of taking into account, both conceptually and methodologically, the way in which personality traits interact with different situations. This led to a demand for situation specific personality tests. In anxiety research, there has been a trend toward situation specific trait scales (e.g., Mellstrom, Cicala, & Zuckerman, 1976). This kind of advance in the measurement of anxiety has led sport psychology researchers to develop situation specific trait anxiety measures. Martens (1977) developed the Sport Competition Anxiety Test (SCAT), which measures the trait anxiety an athlete generally feels in sport competition. Based on the argument that competitive trait anxiety is specific to sport, Martens proposed that the SCAT would be a more accurate predictor of state anxiety in sport competition than would a more general measure of trait

anxiety. The SCAT is a reliable, valid measure that has been widely used in research (Gould et al., 1987; Martens et al., 1990; Smith, 1983; Vealey, 1986). It comprises 15 items, ten items on anxiety (two reverse scored), and five items which are spurious. Responses are given on a three point scale, which runs from 1 (hardly ever) to 3 (often), thus, again, referring to the frequency with which anxiety is experienced. Congruent with the situation specific approach, the SCAT has been found to be superior to general trait anxiety scales in predicting state anxiety reactions to competition (Martens & Simon, 1976; Simon & Martens, 1977).

Recently, Smith, Smoll, and Schutz (1990) developed the Sport Anxiety Scale (SAS) as a sport specific cognitive and somatic trait anxiety measure. Specifically, the scale measures individual differences in somatic anxiety and in two classes of cognitive anxiety, worry and concentration disruption. Smith et al. stated that although there are already sport specific trait anxiety measurement tools in the field, such as SCAT, the measurement tools are unidimensional. Smith et al. suggested that it is important to develop a trait measurement tool that distinguishes between the cognitive and somatic components of trait anxiety, with the same reasoning that is already evident in recent research using the CSAI-2 to measure state anxiety as multidimensional. The SAS comprises 21 items on a four point scale which runs from 1 (not at all) to 4 (very much so). Nine items refer to the somatic anxiety component, seven items refer to the worry component, and five items refer to the concentration disruption component. Smith, Smoll, and Schutz have tested the

SAS for validation with 379 male and female high school athletes and found strong results to support the reliability and validity of the test, including $\alpha = .93$ for Cronbach's alpha coefficient of internal consistency for the whole scale, and $\alpha = .90$ for the somatic anxiety subscale, $\alpha = .86$, for the worry subscale, and, $\alpha = .80$, for the concentration disruption subscale, as well as a factor structure that clearly distinguished between the three sets of items in an exploratory factor analysis.

Another approach to the measurement of multidimensional trait anxiety in sport competition, which seems intuitively to be an obvious progression, is the development of a trait version of the CSAI-2, which is a multidimensional anxiety state measuring instrument. Albrecht and Feltz (1987) converted the CSAI-2 to a trait measure by changing the instructions from reference to "right now", "at this moment" to refer, instead, to "generally"/ "usually", as in other trait measures. Jones and Swain (1995) adopted the same general approach, but, whereas Albrecht and Feltz only measured intensity of the three dimensions of the CSAI-2 as trait dimensions, Jones and Swain also measured direction of the trait anxiety, demonstrating that some performers, especially at the elite level, usually experience their cognitive and somatic anxiety to be facilitative. It is a little surprising that the approach of administering the CSAI-2 as a trait scale, has not been more widely explored.

Although a number of measures have recently been used to measure trait anxiety, the measurement of multidimensional state anxiety in sport

competition has focused on one instrument, the CSAI-2, since its development around 15 years ago. Martens, Burton, Vealey, Bump, and Smith (1983) developed the Competitive State Anxiety Inventory-2 (CSAI-2) as a sport specific multidimensional measure of competitive state anxiety. They argued that a sport specific A-state measure was needed to enhance sensitivity of measurement and, hence, prediction. The CSAI-2 is a test of multidimensional state anxiety, that measures three subscales: cognitive anxiety, somatic anxiety, and self-confidence. It comprises 27 items, nine items on each component, including one reverse scored item on somatic anxiety (item 14). Results are given on a four point scale, which runs from 1= “not at all” to 4= “very much so”, so the CSAI-2 measures intensity of the anxiety state. It is a reliable and valid measure that has been widely used in research (e.g., Albrecht & Feltz, 1987; Burton, 1988; Gould, Petlichkoff, Simon, & Vevera, 1987; Jones & Swain, 1995; Jones, Swain, & Hardy, 1993; Martens et al., 1990; Weinberg, 1984; Yan Lan & Gill, 1984). The CSAI-2 was tested for its reliability and validity by Martens et al. (1990). It is to be noted that test-retest reliability is not appropriate to examine for the CSAI-2, because responses to the questionnaire would be expected to change from moment to moment, because it is a state measure. High Cronbach’s alpha coefficient correlations of $r=.81$ for cognitive anxiety, $r=.83$ for somatic, and $r=.90$ for self-confidence were found, as well as moderate correlations with the SCAT for each subscale, $r=.40$ for cognitive anxiety, $r=.60$ for somatic anxiety, and $r=-.51$ for self-confidence. Originally, the CSAI-2 was developed to measure cognitive and

somatic state anxiety, but factor analysis of the CSAI-2 revealed a third component of the test, in addition to the expected cognitive and somatic anxiety components. This additional component was identified as self-confidence. Its items were originally included to represent opposites of the cognitive anxiety items or reversed cognitive anxiety items. Martens et al. (1990) proposed that cognitive anxiety and self-confidence represent opposite ends of the same cognitive evaluation continuum. It was hypothesised that cognitive anxiety occurred in the absence of self-confidence and vice versa, but, in subsequent analyses, Martens et al. found that there was only a moderate, negative correlation between cognitive anxiety and self-confidence, which did not entirely support that hypothesis. This raises an issue for the multidimensional theory of state anxiety, namely that it does not make the relationships between the three components clear enough. It should be noted that many authors would avoid referring to the self-confidence scale as a part of competitive state anxiety, rather considering it to be a sub-scale of the CSAI-2 that relates to cognitive and somatic anxiety, especially cognitive anxiety.

To enhance understanding of the nature of state anxiety and to further examine the relationship between state anxiety and performance, the CSAI-2 has recently been modified to test the direction (Jones, Swain, & Hardy, 1993; Jones & Swain, 1994) and frequency dimensions of competitive state anxiety (Swain & Jones, 1993). Jones and colleagues have argued that equivocal results of temporal patterning research and anxiety-performance research using the original intensity version of the CSAI-2 might have arisen, at least in part,

because performers did not differ systematically in terms of intensity, but they experienced more frequent intrusions of cognitive or somatic anxiety as competition approached or preceding inferior performance. Similarly, they have suggested that although intensity might not vary systematically, superior performers might experience their cognitive and somatic anxiety more often as facilitative in its direction. The frequency and direction scales developed by Jones and colleagues are used with the original 27 items of the CSAI-2. The frequency scale simply asks how frequently each symptom, that is, each item, is experienced at the particular time, when response is being made, with responses on a seven point Likert scale from 1 (not at all) to 7 (all the time). The direction scale asks whether the anxiety experienced (“thought or feeling”) is facilitative or debilitating to performance in the subsequent competition, with responses on a seven point scale from -3 (very debilitating) to +3 (very facilitative), with zero indicating no directional effect. Initial studies have shown promise, with Swain and Jones (1993) finding that although intensity of cognitive and somatic anxiety did not change in the days and hours leading to a competition, anxiety intruded more frequently into awareness of performers as competition approached. Several studies have now shown that more elite athletes or superior performers are more likely to interpret their cognitive and somatic anxiety as facilitative than are lesser performers (Jones et al., 1993; Jones, Hanton, & Swain, 1994). Although Jones and colleagues do not cite reliability or validity data in any of these studies, this approach is worthy of further examination.

Jones and colleagues have also employed the CSAI-2 in a trait form, retaining its multidimensional nature and measuring direction as well as intensity of cognitive and somatic anxiety and state self confidence. They cite an earlier such application of the original intensity scale of the CSAI-2 by Albrecht and Feltz (1987). The conversion to a trait scale in both studies simply involved replacing the terms “right now” and “at this moment” in the state version by the word “usually” in the trait version. Using this scale, Jones, and Swain (1995) found that elite cricketers reported a predisposition to perceive their cognitive and somatic anxiety as more facilitative than did non-elite cricketers, although there were no differences in predispositions to experience different intensity of cognitive or somatic anxiety related to expertise. Jones and Swain do not appear to have published any reliability or validity data for the CSAI-2 trait scale, but the comparison of the dimensions of it with the SAS trait anxiety dimensions and with the unidimensional SCAT would be interesting.

The preceding review of theory and measurement of anxiety in sport indicates that despite the equivocal findings of research on the anxiety-performance relationship, the progression of theory and measurement of sport anxiety together has produced a more differentiated conception of anxiety and its assessment.

Research on Anxiety and Performance

The relationship between anxiety and sport performance is an important one for athletes and coaches who want to maximise performance and has long been a key issue in the field of sport psychology. The research that has been done reflects developments in definition, theory, and measurement of anxiety in respect of its effects on sport performance. It is necessary to understand the research that has examined the anxiety-performance relationship in order to fully appreciate the importance of research on the antecedents of anxiety. The relationship between anxiety and performance is, however, not the focus of this thesis, so the research on this issue is not reviewed in detail. Rather, a summary of major stages in the development of that research is presented.

Early work on the anxiety-performance relationship was based on measuring anxiety with general trait scales, such as the Taylor (1953) Manifest Anxiety Scale (MAS). Such research failed to show a clear relationship between anxiety and performance (Martens, 1971, 1974). Spielberger (1966) is credited as the first person who proposed the distinction between momentary anxiety state (state anxiety) and more enduring anxiety trait (trait anxiety). Spielberger also developed the State-Trait Anxiety Inventory (STAI), to measure these two types of anxiety (Spielberger, Gorsuch, & Lushene, 1970). Martens (1971) suggested the need for more sensitive scales, because general trait scales, such as MAS, were inadequate in predicting anxiety and, thus, in relating anxiety to performance and better measurement tools existed. In his

work, Martens (1971) also suggested the need for state and trait anxiety to be distinguished, and suggested the STAI as the most impressive anxiety measurement instrument.

The STAI became the most popular measurement device in research on anxiety and sport performance, because of the belief that state anxiety assessment provided a more sensitive measure of anxiety at the time of performance. For example, Klavara (1978), studied 145 senior high school basketball players throughout the second half of the basketball season to test the inverted-U hypothesis. Klavara emphasised the use of a state anxiety scale to test the hypothesis as opposed to former research conducted using trait anxiety as the independent variable and performance as the dependent variable. Klavara measured state and trait anxiety using the STAI. The A-trait scale was administered before the commencement of the season and the A-state scale was administered half an hour prior to the beginning of each game. The performance level of participants was evaluated by coaches, using a questionnaire that contained three ratings, poor, moderate, and high performance. The study suggested there was an optimal precompetitive A-state level that was generally moderate and that correlated with outstanding performance. Moderately high and moderately low precompetitive A-state produced moderate performance, and impaired performance was produced by high and low levels of precompetitive A-state. The inverted-U hypothesis seemed to be supported by this data. It was also found that the A-trait levels of the athletes was a good indicator of A-state in both stressful and nonstressful

situations. A concern with this study is that the performance level measurement given by coaches was rather crude, subjective, and not tested in terms of reliability. It also seems that Klavora mixed repeated measures on the same individual with scores for different individuals. It is also somewhat surprising that meaningful patterns of A-state were elicited half an hour before performance, when much could happen to influence state anxiety in the 30 minutes before play commenced or during the game.

The research on anxiety and performance, based on general scales like the STAI did not, on the whole, produce such clearcut results as the study by Klavora. A number of researchers found that situation specific anxiety scales predicted behaviour better than did general anxiety inventories (e.g., Mellstrom, Cicala, & Zuckerman, 1976; Sarason et al., 1960; Watson & Friend, 1969). Once again, Martens et al., (1990) attributed this to the lack of sensitivity of the anxiety measurement tools for the sport situation. In order to advance the measurement of anxiety and to promote a trend toward situation specific trait scales, Martens (1977) developed the Sport Competition Anxiety Test (SCAT), which measures the trait anxiety an athlete generally feels about competition. Because competitive trait anxiety is specific competitive activities, it was proposed that it would be a better predictor of state anxiety in sport competition than a more general measure of trait anxiety. Also, during the validation of the SCAT, participants and research assistants involved reported that the A-state scale of the STAI contained items that were not applicable to competitive sport situations, emphasising the need for a sport specific state

anxiety scale. A new state anxiety measurement instrument called the Competitive State Anxiety Inventory (CSAI), which measured the state anxiety an athlete feels at the moment of measurement, was then developed by Martens, Burton, Rivkin, and Simon (1980).

A noteworthy example of a trait-state research design, using these sport specific measures is the research of Sonstroem and Bernado (1982), who conducted a study with 30 female university basketball players, across three games of a tournament, to test the inverted-U hypothesis by examining individual levels of pregame state anxiety. State anxiety levels were tested using the CSAI, administered to participants 20 to 30 minutes prior to each game of the tournament, a time that would now be recognised as rather distant from competition. Trait anxiety levels were measured by using the SCAT, administered to participants before a practice session. Participants were divided into three trait groups, which consisted of low, moderate, and high trait anxiety, based on their SCAT scores. Basketball performance was measured by total points in a game and a game statistics composite which was developed as a composite of overall playing performance. The results showed that, in all three trait groups, participants achieved their own best performance when they reported low and moderate state anxiety levels. Higher state anxiety conditions were associated with a noticeable drop off in performance. It was also found that higher levels of state anxiety tended to be associated with a drop off in level of performance in high trait anxiety participants more than in low and moderate trait anxiety participants. This was not consistent with Klavora's

(1978) results. He found that the optimal state anxiety level was higher for high trait anxiety individuals. Sonstroem and Bernado also introduced the method of using intra-individual performance measures, noting that considering raw performance across individuals lacks meaning, as the same score could represent a poor performance for one person and a good performance for another. Since this recommendation, much anxiety-performance research has still used raw scores or inter-individual analysis, leading Gould and Krane (1992) to repeat the need for the intra-individual measures.

In order to examine the relationship between anxiety and sport performance more precisely, anxiety has, more recently, been viewed by researchers as a multidimensional, rather than a unidimensional, construct. Early work that hypothesised that anxiety comprises cognitive worry and emotional arousal components was done by Liebert and Morris (1967), who conducted a study with 54 students to examine the relationship between worry, emotionality, and performance expectancy. Participants were divided into high, medium, and low expectancy groups, based on their response to a questionnaire. Mandler and Sarason's (1952) Test Anxiety Questionnaire (TAQ) was administered prior to a psychology class examination. The results showed that worry was significantly related to performance expectancy, but emotionality was not. Subsequent study by other researchers (Bokovec, 1976; Davidson & Schwartz, 1976; Endler, 1978) identified similar components of anxiety. This distinction has been applied for both trait and state anxiety with

worry usually called cognitive anxiety and emotionality referred to as somatic anxiety.

The application of this multidimensional conception of anxiety in sport proposed by earlier work (Bokovec, 1976; Davidson & Schwartz, 1976; Endler, 1978; Liebert & Morris, 1967) was supported by Gould, Horn, and Spreeman (1983), who conducted a study with 458 wrestlers to determine if anxiety differences existed between successful and less successful, as well as more and less experienced, wrestlers. Also, the relationships between trait anxiety, age, and competitive state anxiety were examined. Participants' levels of anxiety were rated by asking each wrestlers to indicate his perceived level of anxiety at one week, one day, one hour, and two minutes before competition, during competition with toughest opponent, and during competition with weakest opponent. The questionnaire used consisted of 74 items, designed to assess wrestler anxiety and anxiety related responses. Most of the questionnaire was derived from previous questionnaires designed to assess state anxiety in athletes. Trait anxiety was measured by the SCAT. The results showed that there was no precompetitive and performance anxiety difference between successful and less successful, or between more and less experienced competitors. It was also found that large and consistent cognitive and somatic state anxiety differences existed between high and low SCAT wrestlers, verifying that trait anxiety plays an important role in understanding state anxiety. Another interesting result of this study was that 12% of the participants reported that their anxiety usually hurt their performance, 39% of

the participants reported that anxiety usually helped their performance, and 49% of the participants reported that anxiety sometimes helped and sometimes hurt their performance. It was concluded by the authors that it is important to identify optimal level of anxiety for each athlete and then to use techniques to achieve it, because a large percentage of participants (49%) are sometimes positively and other times negatively affected by anxiety. It was also suggested that there was a need to employ multidimensional measures of anxiety, based on the reasoning that this investigation and other studies conducted in this line of research have employed global self-report measures. Anxiety is multidimensional in nature, and various anxiety subcomponents should be assessed separately.

The research by Gould et al. (1983) was consistent with the multidimensional ideas coming from mainstream psychology. At the same time, Martens, Burton, Vealey, Bump, and Smith (1983) strongly supported distinguishing between cognitive and somatic anxiety and stated that the distinction would help in understanding the relationship between anxiety and performance, and also may help in the treatment of high state anxiety athletes. They developed the Competitive State Anxiety Inventory-2 (CSAI-2) as a sport specific measure of multidimensional state anxiety, that measured two dimensions of state anxiety, cognitive anxiety and somatic anxiety, as well as state self-confidence. This replaced the CSAI which had been found to display limited validity. Also, CSAI-2 were modified from CSAI to account for both components of A-state (Martens et al., 1990).

Gould, Petlichkoff, and Weinberg (1984) conducted two studies to investigate the antecedents, of, relationships between, and temporal changes in the cognitive anxiety, somatic anxiety, and self-confidence components of the CSAI-2 (Martens et al., 1983). They included competitive trait anxiety, perceived ability, experience, and previous match outcome as antecedents. The studies were also conducted to investigate the relationship between performance and subcomponents of the CSAI-2. In their first study, the SCAT and the CSAI-2 were administered to 37 elite intercollegiate wrestlers prior to two different competitions. In the second study, the same measurement tools were administered to 63 high school volleyball players on five occasions prior to a major tournament. The findings of these studies supported the multidimensional nature of state anxiety, as the components showed different patterns of temporal change prior to competition. Somatic anxiety significantly increased as the time of competition approached, cognitive anxiety and state self-confidence remained stable over time. The study did not clearly support the proposal that each component of state anxiety was elicited by a different antecedent, and also, it was found that no single antecedent was strongly related to all three subcomponents. Both studies failed to support the precise predictions of Martens et al. (1983) that cognitive anxiety and somatic anxiety were elicited by different antecedents and should influence performance differently. It should be noted, however, that the antecedents measured, namely perceived ability, experience, and previous outcome, are not the ones later identified by Martens et al. (1990) as the major factors affecting state anxiety,

(i.e., perceived uncertainty and perceived importance). Also, in this study, relationships between performance and subcomponents of the CSAI-2 were not found. The authors suggested that more research was needed to determine how and why specific antecedent factors influence various state anxiety subcomponents, and to test the relationship between state anxiety subcomponents and sport performance.

Gould, Petlichkoff, Simons, and Vevera (1987) conducted a study with 39 police officers from the University of Illinois Police Training Institute to test the predictions made about the relationships between CSAI-2 anxiety dimensions and performance. Gould et al. set up a pistol shooting tournament with a prize and administered the CSAI-2 to participants immediately before they competed. As predicted, they found a shallow inverted-U relationship between somatic anxiety and score in the competition. Shooting performance was not significantly related to cognitive anxiety, however, and self-confidence produced a significant negative relationship, a result for which Gould et al. confessed they could find no explanation. Competition in this study was artificial, and the participants were not high level competitive athletes. A real tournament, involving real competitive pressure might have produced different results.

To test the relationship between anxiety and performance, Burton (1988) conducted a study with two groups. The first group consisted of 15 male and 13 female collegiate swimmers and the second group consisted of 31 male and 39 female collegiate swimmers. The CSAI-2 was used to measure

cognitive anxiety, somatic anxiety, and self-confidence of participants. Performance was measured using an intraindividual performance measure, which meant that the performance record on the date of measurement was compared with the average record of that particular participant, as recommended by Sonstroem and Bernardo (1982). The first group was administered the CSAI-2 three times during separate meets throughout the swim season, and the second group was administered the CSAI-2 twice, first, following a practice session two days prior to the competition and, second, within one hour of their most important race of the meet. It was found that cognitive anxiety was more consistently and strongly related to performance than somatic anxiety, a negative linear relationship was found between cognitive anxiety and performance, a curvilinear (inverted-U) relationship was found between somatic anxiety and performance, and a positive linear relationship was found between self-confidence and performance. These results supported predictions of the multidimensional theory of anxiety. Also, short duration and high and low complexity events demonstrated stronger relationships between somatic anxiety and performance than did long duration or moderate complexity events.

The results of research testing the multidimensional theory, which has focused on the relationships between the dimensions of anxiety, are still equivocal. Many researchers have questioned the independence of the state anxiety components and how each component affects athletes' performance (Hardy & Fazey, 1987; Morris, Davis, & Hutchings, 1981). Cognitive anxiety

and somatic anxiety have frequently been found together in stressful situations, and it is proposed that one is not likely to find a high level of only one component without a high level of the other (Deffenbacher & Dietz, 1978; Holroyd, 1978; Morris & Perez, 1972; Smith & Morris, 1976). Some researchers have proposed that somatic anxiety and cognitive anxiety tend to covary (Borkovec, 1976; Morris, Davis, & Hutchings, 1981), or even interact (Hardy, 1989; Hardy & Fazey, 1987; Jones & Hardy, 1989), rather than independently affect athletes' performance.

Although the effect of anxiety on performance and the interaction of cognitive and somatic anxiety are still unclear, some research has been conducted to examine more deeply the nature of multidimensional state anxiety. For example, Swain and Jones (1993) conducted a study with 49 track and field athletes to test intensity and frequency dimensions of competitive state anxiety at four different times relative to competition. It was found that even though cognitive anxiety intensity did not significantly increase as competition approached, cognitive anxiety frequency progressively increased. Somatic anxiety intensity and frequency also seemed to increase progressively as the time to compete neared. This research has introduced a new dimension to the assessment of anxiety, frequency of anxiety intrusions, that could lead to anxiety being more precisely measured in future research.

Jones and colleagues have identified another aspect of state anxiety that needs to be considered in attaining a full description, namely direction. Jones, Swain, and Hardy (1993) studied 48 gymnasts, who were divided into two

groups, “good” and “poor” performer, in order to examine relationships between anxiety and performance, and the intensity and direction of competitive state anxiety. It was found that there were no differences between the poor and good performance groups on intensity of somatic or cognitive anxiety, but the good performance group reported their high anxiety intensity to be more facilitating than the poor performance group, who reported it as more debilitating. It was also found that the only significant predictor of performance was self-confidence intensity. This study, with its important and exciting findings about direction, may provide further understanding of the relationship between multidimensional state anxiety and performance.

Jones, Hanton, and Swain (1994) conducted a study with 211 elite and non-elite competitive swimmers in order to examine anxiety level and interpretation of anxiety as either debilitating or facilitative. It was found that there were no differences between elite and non-elite swimmers on intensity of cognitive and somatic anxiety, but a larger proportion of the elite versus non-elite performers interpreted cognitive and somatic anxiety as facilitative to performance. Approximately half the latter group found their anxiety to be debilitating. In non-elite group, athletes who reported anxiety as more debilitating also had higher intensity levels. This study introduced the importance of skill level as a variable in studying competitive anxiety and also provided further support for the distinction between intensity and direction of state anxiety. According to this study, although the intensity level of anxiety was the same for both groups, directions were different. This suggested that

anxiety affected each group differently, and, thus, it could also effect each group's performance differently.

It can be concluded that research on the relationship between anxiety and performance in sport is still equivocal, but more evidence has recently supported the suggestion that anxiety is involved at the multidimensional state level. It is still unclear how each component of state anxiety affects sport performance. Also, the antecedents and the independence of each component of anxiety, still cannot be clearly verified. Further study is required to investigate these issues. Nonetheless, the vast anecdotal evidence from performers, and the growing support from research, indicate that state anxiety does affect performance. The effect can be positive or negative (e.g., Jones, Swain, & Hardy, 1993), but is often negative, although less so in the most elite performers. The effect is probably due to a complex interaction of, at least, cognitive and somatic state anxiety with performance, or to independent effects of these dimensions on separate processes involved in performance. Sport psychology practitioners have long applied a range of techniques to manage anxiety in the attempt to optimise performance. This has been based on the assumption that the effects of heightened state anxiety are almost always negative, and the further assumption that not only can the effects of cognitive and somatic anxiety be identified, but also that each can be managed. Research needs to focus on this issue of anxiety management, in the light of the current ideas about the nature and operation of anxiety in relation to sport performance. The issue of the distinction between intensity, frequency, and direction aspects

of the dimensions of state anxiety also needs to be examined further. The need for interventions to be used effectively by practitioners is important in the respect.

Theory on Anxiety Management

An important practical implication of the proposal that the multidimensional components of state anxiety have different antecedents, display different temporal patterns, and have different relationships with performance, is that different anxiety management techniques are required to cope effectively with the different components of state anxiety. Davidson and Schwartz (1976) have coined the term "matching hypothesis" to reflect this process of matching the anxiety management technique to the specific state anxiety component to be controlled. Thus, the techniques may be divided into categories depending on how they fit in with the demands of the two components of state anxiety (Martens, 1983).

According to the matching hypothesis, somatic anxiety can be managed best by using physical relaxation techniques (Davidson & Schwartz, 1975; Jones, 1991; Martens, 1986). Techniques of this type include progressive relaxation, relaxation imagery, biofeedback relaxation training, autogenic training (Martens, 1986), the relaxation response (Benson, 1975), various kinds of meditation (Cox, 1994; Davidson & Schwartz, 1976; Harris & Harris, 1986; Harris, 1986), and breathing techniques (Bunker & Williams, 1986). Martens et

al. (1990) suggested that cognitive anxiety demands cognitive anxiety management techniques that replace negative thoughts and worries with positive thoughts, or thoughts that tend to enhance performance. Cognitive stress management techniques include thought stopping techniques, positive self-talk, rationalisation, cognitive restructuring, imagery to reduce worries, such as imagining oneself performing well in a situation that raises concerns, and goal setting (Bunker & Williams, 1986; Martens, 1986; Weinberg, 1988).

Cognitive and somatic anxiety have been interpreted by researchers as being relatively independent (Martens et al., 1990), but this interpretation is not clearly reflected in the competitive anxiety theory presented in Figure 2.2, which does not refer to cognitive and somatic anxiety, but uses the term “A-state”. Also, according to Parfitt, Jones, and Hardy, (1990), the finding described by Davidson and Schwartz (1976) that cognitive anxiety tends to impair performance on cognitively based tasks and somatic anxiety impairs performance on physiologically and motor based tasks has been found not to be straightforward in a number of studies (Deffenbacher & Dietz, 1978; Holroyd, 1978; Holroyd, Westbrook, Wolf, & Badhord, 1978; Morris & Perez, 1972; Smith & Morris, 1976).

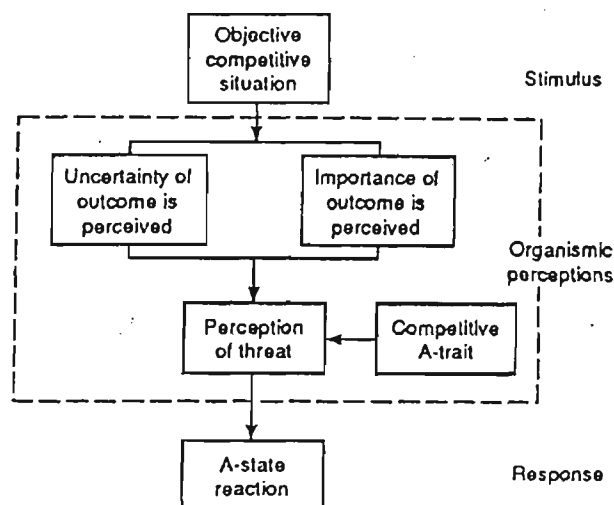


Figure 2.2. Martens et al. (1990) theory of competitive anxiety

These studies suggested that finding experimental conditions that elicit cognitive anxiety but not somatic anxiety or vice versa is difficult. Most situations that are powerful stressors contain stimuli that elicit and maintain both anxiety components. Morris, Davis, and Hutchings (1981) noted that cognitive and somatic anxiety likely covary in stressful situations, because these situations contain elements related to the arousal of each. Martens' (1987) two stress formulae, which can be seen in Figure 2.3, intimated that the components elicit one another. Although some research suggested that somatic and cognitive anxiety are independent, a range of work (reviewed by Hardy & Fazey, 1987) has suggested that somatic and cognitive anxiety seem to work together or interact rather than independently affect performance as stated by Martens et al. (1990).

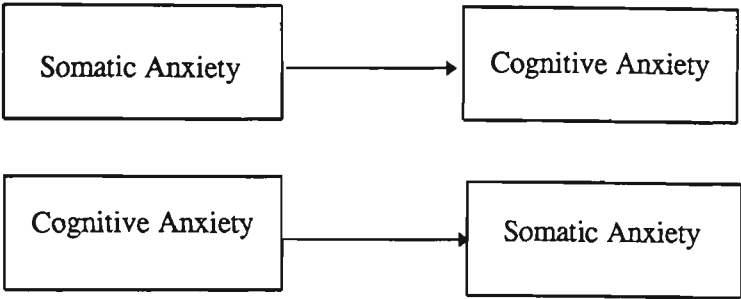


Figure 2.3. Martens (1987) two stress formulae

Martens (Martens, 1986; Martens et al., 1990) has proposed that stress in general can be managed by changing the environment that mediates the stress, and has developed the theory presented in Figure 2.2. The two main components of this theory are the uncertainty athletes have as to whether they can meet the demands of the situation, and the importance of the outcome to them. This subjectively perceived uncertainty, Martens et al. (1990) propose, does not refer to the uncertainty of winning or losing, because uncertainty about the outcome of the competition is inherent in sport and makes sport challenging and fun. Uncertainty that should be removed is the unnecessary uncertainty, which adversely affects certain athletes. Examples of this are, the uncertainty of being embarrassed or being judged as a worthless person.

Perceived importance, refers to the athlete’s perception of the importance of the competition, it being suggested that athletes often percieve that the situation is much more important than it should be. To reduce perceived importance does not mean to try to convince athletes that the situation at hand is not at all important to them, when realistically it is, but to

help athletes perceive the situation realistically, and not exaggerate its importance. Martens (1986) suggested that it is important that the psychologist should reduce the impact of those extrinsic rewards often imposed on athletes that make the intensity of competition excessively high, by affecting such processes as the athletes' perception about the consequence of losing the match. Another important aspect of the environment that can be changed is the reaction of those people who are important to the athlete in terms of the social support they provide. Ensuring that such support is not perceived to be dependent on success is one major way to reduce the perceived importance of the event and, hence, the anxiety associated with it.

Questions still remain concerning the relationship between cognitive and somatic anxiety. It is still uncertain whether high and low levels of cognitive and somatic anxiety are often found together, because many competitive situations contain antecedents of both or whether their covariation occurs because cognitive anxiety leads to somatic anxiety and vice versa, as proposed by Martens (1987) and illustrated in Figure 2.3. Research on covariation versus independence of cognitive and somatic anxiety has been equivocal (Borkovec, 1976; Liebert & Morris, 1967; Morris, Davis, & Hutchings, 1981). It is possible that under some conditions cognitive anxiety can be high and somatic anxiety low or vice versa (Doctor & Altman, 1969; Morris & Engle, 1981; Morris & Fulmer, 1976; Smith & Morris, 1976), whereas on some occasions or under other conditions cognitive and somatic anxiety covary (Deffenbacher & Dietz, 1978; Holroyd, 1978; Morris & Perez,

1972; Smith & Morris, 1977). Research might have over-estimated the extent of covariation for competition in general, because studies often tend to be done prior to important competitions, when the antecedents of cognitive and somatic anxiety are both most likely to be present. Also, it is still uncertain how cognitive and somatic anxiety function in relation to performance, that is whether each component has an independent relationship with performance or whether the two aspects of anxiety interact in their effect on performance.

In the present thesis, the effect of Anapanasati meditation and progressive muscle relaxation on cognitive anxiety, somatic anxiety, perceived uncertainty, and perceived importance are studied. Anapanasati meditation, is a technique that, it has been claimed, can affect both cognitive and somatic anxiety (e.g., Vajiranana, 1975), whereas progressive muscle relaxation, is a technique that has been proposed to address somatic anxiety. Thus, the study of the effects of these techniques should resolve some of the equivocality that currently exists, based on the past studies concerning cognitive and somatic state anxiety. The present thesis also test Anapanasati Meditation as an effective anxiety management technique in sport. One important reason why researchers in sport psychology try to clarify the relationship between the components of anxiety and performance in sport is because this would allow them to more effectively prescribe techniques to manage aspects of anxiety in sport and, thus, optimise level of anxiety in athletes. Information on the efficacy of Anapanasati Meditation on anxiety in sport could facilitate the prescription of anxiety management technique.

Research on Anxiety Management Techniques

Another line of research that has been conducted alongside research on the anxiety-performance relationship and the multidimensional theory of state anxiety is research on anxiety management techniques. There is demand from applied sport psychologists, coaches, and athletes for this line of research, because, in order to elicit the best sport performance, effective anxiety management is assumed to be necessary. Identification of effective anxiety management techniques is, thus, an important issue for peak performance. Research that has studied stress and anxiety management in sport is limited, but there are many studies on stress reduction and anxiety management in general psychology (e.g., Alexander, Robinson, Orme-Johnson, & Schneider, 1995; Kabut-Zinn, Massion, Kristeller, Perterson, & Linda, 1992; Miller, Fletcher, & Kabat-Zinn, 1995; Pearl & Carlozzi, 1994; Saito & Sasaki, 1993). Those studies in sport that have been identified are now reviewed.

To investigate three stress reduction techniques, jogging, the relaxation response (Benson, 1975), and group interaction, Berger, Friedmann, and Eaton (1988) conducted a study with 387 college students. A control group was also included. The Profile of Mood States (POMS) and a measure of social desirability were used. Participants completed these inventories before and after group meetings at monthly intervals and practised their stress reduction activity for 12 weeks. Results showed that jogging and the relaxation response helped participants reduce short-term stress, measured by POMS, significantly

more than did group interaction, and all experimental groups reported significantly greater short-term reductions in stress than did the control group. This study is useful in terms of application to the general population, but jogging would not be likely to help elite performers, who do much more demanding physical conditioning work. Also, it did not help much for the examination of theory, because it did not propose or test the mechanisms involved, and did not discuss issues, such as when, why, and how the techniques studied affected the psychological state of participants.

Kerr and Leith (1993) conducted a study with 24 national level gymnasts, using a before and after two group design to investigate the effect of Meichenbaum's (1985) Stress Inoculation Training (SIT) on performance, mental rehearsal, and attentional skills of participants over an eight month period. The experimental group showed superior performance, better mental rehearsal, and better attention skills compared with the control group, and, interestingly, showed significantly higher competitive trait anxiety level also. The authors explained the higher trait anxiety level in the experimental group by claiming that, although the intensity increased, the direction may have been positive rather than negative. Concerns about this study are that the control group was not an attention placebo control group. The measurement tools for measuring participants' performance, mental rehearsal, and attentional skill were self-reported data, which may be inaccurate or biased. Finally, the use of SCAT as the anxiety measurement tool may not be appropriate, because it is not closely related to performance, as is the CSAI-2 or other state measures.

Similar to Berger et al. (1988), this study only tested the effectiveness of a stress management technique, and found that SIT had effects on athletes' performance, but it did not help to clarify any stress management theory. It proposed no explanation of how and when stress management techniques help athletes' performance.

Recently, Maynard and Cotton (1993) reported one of the first studies to directly test the "matching hypothesis" that was developed 20 years ago by Davidson and Schwartz (1976). The matching hypothesis has been implicitly or explicitly involved in much research on sport psychology, particularly on how to treat somatic and cognitive state anxiety (e.g., Burton, 1988; Martens et al., 1990) and has been discussed in some detail by Burton (1990). Maynard and Cotton tested 20 male collegiate field hockey players. They divided the players into a high cognitive anxiety group, a high somatic anxiety group, and a group that had neither high cognitive nor high somatic anxiety, based on CSAI-2 scores. They gave the high cognitive anxiety group a cognitive intervention, positive thought control (PTC), and the high somatic anxiety group a somatic intervention, applied relaxation (AR). The group with no high state anxiety was a "control" (C), and received no intervention. Maynard and Cotton found that PTC and AR was each associated with a reduction in the level of the corresponding component of state anxiety, but no reduction of the level of the alternate component, over a 12 week treatment period, whereas there was no change in the C group. Maynard and Cotton concluded that their results provided support for the matching hypothesis. Unfortunately, with no cross-

over groups, that is, high cognitive anxiety individuals receiving a somatic intervention, and high somatic anxiety individuals receiving a cognitive intervention, nor control groups high to start with but untreated, and showing no reduction in state anxiety, it is not possible to distinguish between treatment effects and regression to the mean. It could be that reductions occurred because the groups high on one aspect of state anxiety at the start of the study simply showed a reduction on that component due change in circumstances or perception of the situation, as both cognitive and somatic state anxiety reflect temporary fluctuations dependent on the situation at that time. At the same time, the absence of a reduction in the untreated anxiety component in each group is hardly surprising, because group selection ensured that levels of that component were initially moderate to low.

In a further study of the matching hypothesis, Maynard, Hemmings, and Warwick-Evans (1995) used a different approach. They tested 17 male soccer players of sub-elite level, within one hour of an important league match, on a version of the CSAI-2, modified to measure direction as well as intensity of state anxiety (Jones & Swain, 1993) and assessed performance, using coaches' ratings. Then they assigned players ($n=9$) to an intervention group, that worked on an eight week applied relaxation (AR) program, or a control group ($n=8$), that received equal attention from the researchers, but worked on goal setting, and skill and fitness exercises thought to be unrelated to stress reduction. One week after the AR program, participants in both groups were tested on the modified CSAI-2, again before an important league match, and

performance was rated. Maynard et al. (1995) reported significant reductions in cognitive anxiety intensity and somatic anxiety intensity in the treated group compared to the control group. They also observed a positive change in somatic anxiety direction for the AR group, relative to the control group. They claimed support for the matching hypothesis because, although both cognitive and somatic anxiety were reduced in the AR group, the reduction in somatic anxiety was twice that of cognitive anxiety (30.9% and 15.9% respectively). Maynard et al. (1995) noted that the AR technique was associated with a reduction in cognitive anxiety, which indicated that the two anxiety systems interact. They also noted the promise associated with the modified CSAI-2, whereby direction of anxiety was important. Experimental participants saw their large decrease in somatic anxiety as facilitative, whereas control participants found their small decrease to be debilitating.

Although the Maynard et al. (1995) study currently appears to be the most substantive published research on the matching hypothesis, there are still problems. Although it draws a conclusion that the conditions of performance measurement did not lead to a successful test of the anxiety-performance relationship, no results appear to be reported for performance. Most important, it seems to share a problem with the previous study by Maynard and Cotton (1993) relating to assignment of participants to experimental conditions. The nine participants assigned to the AR intervention were selected because of high pre-intervention somatic anxiety intensity and direction. They also had higher cognitive anxiety than the control group. Although the control group was given

Results indicated that the multimodal intervention was most effective overall, however, the unimodal compatible treatment was as effective as the multimodal treatment on targeted composite CSAI-2 subscale within a shorter time period. It is to be noted that, in this study crossover effects were found, crossover effects were seen in somatic anxiety intensity and direction due to a cognitive intervention, and also cognitive intensity and direction were influenced by somatic treatment. However, in both cases the crossover effects did not produce significant changes.

To date, unequivocal evidence on the matching hypothesis has not been presented in the literature. In the present study, the matching hypothesis was investigated by examining the effects of a meditation technique, from the point of view that Anapanasati meditation is claimed to be a technique that can cope effectively with all three components of state anxiety.

There is a large amount of research examining the efficacy of various anxiety management techniques out of the sport arena, such as for progressive muscle relaxation (e.g., Jacobson, 1930), applied relaxation (e.g., Ost, 1987), breathing (e.g., Harris, 1984), and the relaxation response (e.g., Benson, 1975), with such populations as sufferers from phobias, panic attack, or those with general anxiety disorder. Although the same techniques were used, it could not be guaranteed that they would work in sport competition, because the studies conducted did not measure competitive state anxiety. Also, non-sport specific anxiety management research has tended to include non-athletes, and this seems to give different results. For example, in the work of Berger et al. (1988)

cited earlier, the relatively low intensity jogging exercise was a beneficial treatment, but, if such research was done with elite athletes there would probably be no effect, because elite athletes, train at a high intensity level most of the time. In order to fully understand the effect of anxiety management techniques in sport and in relation to the matching hypothesis, research needs to be conducted in at least, competitive, sport. In this thesis, two anxiety management techniques, and their effects on somatic and cognitive anxiety, using elite competitive athletes as participants are examined to test the matching hypothesis.

The argument that cognitive and somatic state anxiety generate each other was supported by Martens et al. (1990). The explanation seems unlikely to be adequate to explain all, or even many, of the possible joint effects. It is surprising that Martens et al. (1990) place so much emphasis on this argument, because they cite a lot of research in the same book that shows a low to moderate correlation between cognitive and somatic anxiety, indicating that only under some circumstances, or for some people in some situations, do cognitive and somatic anxiety vary together. Furthermore, there is research (Maynard & Cotton, 1993) where cognitive and somatic anxiety are measured in highly competitive situations and do not covary. Gould and Krane (1992) stated that cognitive and somatic anxiety share only some common variance. It could be occasionally, or more likely for a minority of individuals on any specific occasion, that cognitive and somatic anxiety covary, because those people perceive the presence of both the evaluation antecedent of cognitive

anxiety and the stimuli that raise somatic anxiety, but mostly the levels of cognitive and somatic state anxiety are influenced by separate causes. Thus, to reduce them both, any technique or techniques would need to affect more than one antecedent process.

Although books on applied sport psychology, such as those by Williams (1993) and Martens (1987), infer that practitioners and researchers have generally agreed with the “matching hypothesis”, so that the anxiety management techniques appropriate for each component of state anxiety are clearcut, a number of substantial questions still remain. Martens et al. (1990) made the following statement concerning Davidson and Schwartz's (1976) “matching hypothesis”, reflecting the lack of clarity that still exists:

Are certain stress management techniques better for different types of anxiety? Reports of sport psychologists using progressive relaxation methods with athletes are frequent. But if athletes are experiencing high cognitive A-State, will progressive relaxation (a somatic based treatment) be as effective as will a cognitive-based treatment? Or if athletes experience somatic A-State that is highly conditioned to the situation, will cognitive methods facilitate relaxation as well as will somatic-based methods? It may be that somatic techniques can help reduce cognitive A-State and vice versa...

And also:

Perhaps any effective procedure that reduces cognitive or somatic A-state will be effective in reducing both components of anxiety due to their interrelationship in competitive situations. These questions and other stress management issues await scrutiny by researchers (p. 212).

This raises the question of whether there are any techniques which effectively reduce both components of state anxiety. If these components are more closely related than the recent literature has proposed, then there might be stress management techniques that are effective in controlling both components. This seems unlikely, if the anxiety management technique has one specific effect and the proposal that the antecedents of cognitive and somatic anxiety are different is justified. Again, it is hard to understand why Martens et al. would argue that for most practical purposes, that is “in competition situations” (p. 212) cognitive and somatic state anxiety stimulate each other, so they would be highly correlated, when, in the same text, they have spent a considerable time arguing and citing evidence for their factorial independence and typically low to moderate correlations. Further study is called for on the issue of cognitive anxiety generating somatic anxiety and increases in somatic anxiety leading to similar increases in cognitive anxiety.

The crossover effect of one intervention technique on the supposed alternative aspect of state anxiety, based on the supposed relationship between cognitive and somatic anxiety, is not the only way that techniques could be used to manage both components of anxiety; some techniques may have direct

effects on both components of anxiety at the same time. Techniques, such as meditation, have been claimed to reduce somatic symptoms of anxiety directly, through their breathing and relaxation aspects, and at the same time, to change the person's perspective of the situation, through the clear reflection and insight that occurs in the meditative state, which leads to the reduction of cognitive symptoms of anxiety (Budhathasa, 1990). Research into the effects of such techniques on cognitive and somatic anxiety and the underlying psychological processes by which these effects are produced, including the roles of perceived uncertainty and perceive importance, would help to clarify the currently confused theoretical position. And it may also permit the development of a modified and enhanced version of the Martens et al. (1990) theory of competitive anxiety. In addition, effective exploitation of single techniques that manage both cognitive and somatic anxiety, if such techniques exist, would provide more efficient interventions, and lead to more effective use of time and resources. Thus, one technique would manage both components of state anxiety, so that one component is not left high and still interfering with performance. Such techniques would, thus, be of great value in practice.

Meditation has been catergorised by some researchers as a technique for somatic anxiety management (Harris, 1986; Martens, 1987), but has also been claimed by researchers as an effective cognitive anxiety management technique (Schwartz, Davidson, & Goleman, 1978). According to Davidson and Schwartz (1976) different types of meditation are more effective in managing different components of state anxiety. For example, Zen meditation is more appropriate

for cognitive anxiety reduction, whereas Transcendental Meditation is recommended for somatic anxiety. It is proposed in this thesis that some types of meditation affect both components of state anxiety.

Meditation

Meditation is a class of techniques claimed by some researchers (Jones, 1991; Layman, 1980; Schwartz, Davidson, & Goleman, 1978) to be effective in reducing both cognitive and somatic anxiety. Davidson and Schwartz (1976) hypothesised about meditation and multidimensional state anxiety that:

The theory suggests that the age proven procedure of visualizing and counting sheep to fall asleep when one's mind is racing succeeds because it effectively blocks both unwanted visual and auditory imagery (in the right and left hemispheres) at the same time. Similarly, it is hypothesized that forms of Zen meditation which require that the person count his breathes or say a mantra in synchrony with breathing are particularly effective because they simultaneously attenuate both cognitive and somatic components of anxiety (p. 432).

Meditational techniques have long been used to reduce anxiety and enhance performance among martial arts practitioners. The techniques have not been studied much as anxiety reduction procedures, and have been relatively

neglected by many martial art practitioners in the modern era. In this following discussion, consideration of what is known and claimed about meditation will refer to meditation as one technique. It is acknowledged that there are, in fact, many techniques, which vary in their practice and their aims. They do possess common elements and reference to meditation as a generic term is, thus, justified in the present context.

The effects of meditation on physiological functioning, psychological processes, and behaviour have been claimed to be powerful. Research is limited, but some support is forthcoming. Goleman (1971) referred to Benson's (1969) study at Harvard Medical School, where participants who practised meditation reported losing interest in drugs ranging from marijuana and LSD to heroin, because those feelings which the drugs induced became extremely distasteful compared to the experience during meditation. Goleman (1971) also documented many effects of meditation he found in his own research. He stated that meditation can accomplish the same type of behaviour change as does systematic desensitisation (Jacobson, 1934). He found that meditation reduced symptoms arising from anxiety among those with psychiatric disorders, and also, post-meditation performance in learning and perceptual tasks was significantly improved over pre-meditation performance (Brown, 1970). People who had meditated extensively, compared to non-meditating controls, showed less discrepancy between real and ideal self (Akishige, 1968). Meditators had more energy and needed less sleep, and the meditation produced deep level personality changes in the direction of mental health (Goleman, 1971).

Glasser (1976) studied meditation and state of mind, documenting many introspective reports from meditators about what happened to them. Most meditators experienced relaxation physically and mentally. Cure of negative symptoms and positive improvement in aspects of mental health occurred, similar to those reported by Goleman. Many meditators reported loss of the desire to use drugs, or alcohol, because of their enhanced ability to eliminate worries and negative thoughts about themselves using meditation techniques.

Sekida (1975) stated that stress and anxiety could be eliminated by attaining *Samadhi* through meditational techniques. The word *Samadhi*, as used in some places like Thailand, means “total concentration” or “directed attention”, but the same word has been used in other places, traditions, or literature as much more complex, with a more spiritual level of meaning. *Samadhi* is attained by the relaxation of mind and body together. This total concentration state help eliminate of all thoughts, worries, and stimulation (Buddhathasa, 1990). Vajiranana Mahathera (1975) stated that *Samadhi* is to be understood as a state of one pointedness of mind, a state of pure mind. To avoid confusion, unless used in quotations by the original writers cited, the phrase “*one-pointedness of mind*” will be used in this thesis. The outstanding characteristic of this state is the absence of mental wandering and agitation, the unification of the state of mind that rises with it, is its essential function. Tranquility and knowledge are its manifestation. When this state has been attained, all the mists of passion are dissipated and are replaced by the clearness of insight. Thus, in all respects, the Buddhist term *One-pointedness of*

mind is a positive state as opposed to passive, unconscious absorption, or a hypnotic condition of mind. According to Sekida (1975), in the state of *One-pointedness of mind*, the activity of consciousness is stopped. All thoughts are stopped, producing the state of "off-sensation", in which the individual loses the sense of the whereabouts of their body. Subsequently, by stilling the activity of the mind, a state is reached in which time, space, and causation, which constitute the framework of consciousness, drop away. Sekida called this condition "body and mind fallen off" (1975, p. 33). This state of mind may seem to be nothing but a condition of mere being, but this mere being is accompanied by a remarkable mental power, which Sekida characterised as a condition of extreme wakefulness.

Buddhathasa (1990) stated that, when one is in the state of *One-pointedness of mind* in its most profound phase, no reflective action of consciousness appears. In a more shallow phase of *One-pointedness of mind* a reflective action of consciousness occasionally breaks in and makes one aware of one's *One-pointedness of mind*. Such reflection comes and goes momentarily, and each time, momentarily, interrupts the *One-pointedness of mind* to a slight degree. The deeper *One-pointedness of mind* becomes, the less frequent becomes the appearance of the reflective action of consciousness. Ultimately, the time comes when no reflection appears at all. One comes to notice nothing, feel nothing, hear nothing, see nothing. This experience is common among advanced meditation practitioners. The state of mind developed by meditation is the key to its use as an anxiety reduction technique.

With what is termed inner control *One-pointedness of mind*, the person is capable of maintaining their *One-pointedness of mind* while actually carrying out any task. While sweeping the floor, one becomes sweeping itself, which means the person forgets all other things besides sweeping. While performing in a sport competition, the person becomes the performance itself. Also, with enough training through meditation, one will not be interrupted by any irrelevant external or internal stimuli, neither the competition environment nor one's negative thoughts. Even people who have not practiced meditation before, can be inside their tasks, or thoughts, through *One-pointedness of mind*, which arises from a high level of concentration on the task, like the surgeon who does not notice the earthquake, being completely absorbed in the operation being performed. This phenomenon is similar to the concept of peak performance, or “flow” in sport (Csikzentmihalyi, 1990; Jackson, 1994). Through meditation, having attained *One-pointedness of mind*, it is claimed that this state, and the phenomena associated with it, tend to occur more often, and become more controllable (Sekida, 1975).

One-pointedness of mind can be obtained through most kinds of meditation technique (Buddhathasa, 1990; Conze, 1956; Da Liu, 1976; Sikeda, 1975; Vajiranana Mahathera, 1975). Some techniques require movement as in the moving meditation, Tai Chi, and also in Aikido, whereas others do not require movement but involve a change of strategies used during different stages, or require some particular thought, words, or objects to concentrate on in order to obtain *One-pointedness of mind*. It should be noted that this *One-*

pointedness of mind is only the first stage of most meditation techniques, but it is the most important one, which must be attained in order to reach the ultimate goal in meditation, enlightenment or *Nirvana*. This ultimate state is beyond the present needs in achieving anxiety reduction. In order to use meditation as an anxiety reduction technique, and to improve performance, the person should at least attain the beginning stage that come before *One-pointedness state of mind*, and after some practice time, which varies between individuals, gain the ability to recall this state of mind whenever they want. At this stage, it is claimed that the person can concentrate in a one pointed manner on the task at hand without any effects from either arousal, external or internal stimuli, any form of worries, negative thoughts, or self-doubts (Sekida, 1975). *Anapanasati*, the breathing meditation, is one of the simpler techniques that can be used to attain the *One-pointedness state of mind*. Meditators in *Anapanasati* do not need to change their thoughts or their physical position; from the start of training until enlightenment the practitioners only work on following their own breath. The *One-pointedness state of mind* attained through *Anapanasati* could vary, depending on the practitioners. Experts or fast learners would experience the *One-pointedness of mind* more deeply and to a more stable degree than novices. Novices or slow learners still experience the *One-pointedness state of mind*, but may tend to be easier to distract (Buddhathasa, 1990).

The scheme of meditation known as *Anapanasati*, which translates as "mindfulness in regard to breathing," is expounded in the Buddhist scriptures and elaborated in the associated commentaries and has been in the field of

mental training in Buddhism for several centuries (Buddhathasa,1990; Vajiranana Mahathera,1975). *Anapanasati* is included in the system of meditation as a *kammatthana* or subject of meditation, which may be used in two ways. In the first place, it is practised in combination with other exercises as a means of obtaining calmness of body and mind. Secondly, according to Vajiranana Mahathera (1975), this breathing technique is the only suitable approach for those who are of an imaginative turn of mind, or whose minds are continually disturbed by emotions. It is the method that has been selected as a special path for such individuals. *Anapanasati* meditation has been set forth in sixteen stages. *Anapanasati* have been divided in the Commentaries into four parts, each containing four exercises. Part one includes the preliminary course of training, which is suitable for beginners, while the other three comprise further development of the method of *Vipassana* or full knowledge. *One pointedness of mind* is attained during the practice of part one, which is the only part of *Anapanasati* that needs to be practised in order to reduce anxiety.

Other meditation techniques such as Zen meditation, Taoist meditation, and Transcendental Meditation also claim that they are effective in reducing anxiety. Sekida (1975) stated that through Zazen (zen meditation), practitioners attain *One pointedness of mind*, which results in the "body and mind fallen off" state of mind. It is proposed that the person will then have replaced feelings of anxiety with the joy of the state of *One pointedness of mind*.

Goleman (1971) and Glasser (1976) reported that Transcendental Meditation reduced negative symptoms from anxiety in their studies. Goleman

(1971) also claimed that through meditation, the personality of the person would change positively. Davidson and Schwartz (1976) suggested Zen meditation, Taoist meditation, or Transcendental meditation techniques as anxiety management techniques for coping with the different components of state anxiety.

Meditation techniques have been suggested by researchers (e.g., Benson, 1975; Davidson & Schwartz, 1976; Goleman, 1971) to constitute a strategy which leads to relaxation. It has been clearly evidenced that somatic symptoms of anxiety can be reduced by meditation (e.g., Benson, 1975; Wallace & Benson, 1972), but little research has been published as yet to support meditation as a technique for reducing cognitive anxiety.

One recent clinical and research development relates directly to this issue. Menzies (1996) has developed a breathing meditation technique and applied it in the treatment of generalised anxiety disorders (GAD). The technique involves counting breathes. The meditator sits with eyes closed and mentally counts their first five breaths, from one to five. Then they return to one and count the next six breaths, one to six, then they count seven, eight, nine and 10 breaths, following which, they go back to counting five. If distracting thoughts intrude and the current count is lost the meditator simply starts again at breath one of one to five. This technique is unlike the breathing techniques used to manage somatic anxiety as there is no attempt to use a count within a single breath to affect the rhythm or pace of breathing. It has much more in common with Anapanasati, as both techniques aim to focus attention. For this

reason, and to demystify it, Menzies has called the technique attention control training, presumably unaware that Nideffer's centering breathing technique is part of a procedure he called attention control training (ACT). Menzies specifically claims that ACT is an effective technique for managing worry. His research has shown substantial reductions in the report of worrying thoughts among GAD sufferers following ACT; of course, "worrying thoughts" is the essence of cognitive anxiety. Thus, there is evidence that a technique similar to *Anapanasati*, does reduce cognitive anxiety. It might be argued that *Anapanasati* is likely to be more effective than ACT because by use of attentional counting it would be possible to keep count of breaths and to think about other things, but proper adherence to the *Anapanasati* instruction to attend to the whole course of breath focuses attention wholly on the process of breathing.

Another way in which *Anapanasati* meditation could affect somatic anxiety may be by a direct effect. There are many breathing techniques that are used to reduce somatic anxiety directly (Harris, 1986). The principle underlying these techniques is that short, rapid breathing is associated with anxiety, so controlling breathing to make it long and deep is counter to anxiety. Thus, other autonomic aspects of anxiety cannot exist with "relaxed" breathing, so general relaxation occurs. The instructions of *Anapanasati*, do not attempt to slow down or deepen the breathing, just directing the person to monitor it. The whole process of monitoring or focusing on breathing does tend to slow it

down, however, especially, when considering its path at all points from the tip of the nose to the stomach during inhalation, and vice versa during exhalation.

Study of *Anapanasati* as a meditation technique suggests that it would affect somatic anxiety in the same manner as Transcendental meditation, Zen meditation, and other techniques of meditation, which reduce physiological symptoms associated with autonomic arousal. As the mind calms down, the body automatically relaxes as a result. Thus, tense muscles mediated by such physiological arousal cannot exist, due to the individual's relaxation state.

Other symptoms of somatic anxiety which are mediated by tense muscles are, therefore, eliminated. Vajiranana Mahathera (1975) describes the *One-pointedness state of mind* attained through meditation, noting that it functions as an active faculty of mind in that it controls emotional impulses and excitement. In this way *Anapanasati* meditation can have an indirect effect on somatic anxiety, as well as the direct effect via breathing.

According to the writers on meditation, the mental symptoms of cognitive anxiety, such as worries, negative thoughts, negative self-talk, and negative self-evaluation, are worked out directly by the state of *One-pointedness of mind*, attained by *Anapanasati*. This state of mind functions in the same manner as the thought-stopping technique described by Martens (1986), but is more rigorous in stopping all the thoughts and worries that come into the individual's mind, because thought stopping techniques, which use imaginative cues such as an imagined red flag or stop sign, represent a conscious attempt to stop such thoughts, thus blocking the stream of negative

thought. Through the *One-pointedness state of mind*, the negative thoughts would be stopped unconsciously, as characterised by turning off the valve of the negative thought stream. In the state of *One pointedness of mind*, the individual cannot be affected by internal thoughts or other stimuli because the individual must concentrate and pay attention to only one object, the focus of meditation (breathing).

Once the negative symptoms of cognitive anxiety have been eliminated, the concentration and attention skill attained by practising meditation gives tremendous advantage to the individual in focusing on the "right cue" and/or the task at hand, in the same manner as Nideffer's (1985) centering technique. The centering technique is quite similar to *Anapanasati*, in using the breath of the individual as a cue to focus concentration, and then to turn one's attention to the "right cues" of the sport in the same manner. Nideffer (1985) claimed that his technique, which was modified from the "power of *Ki*," a meditation technique used in Aikido, a Japanese martial art, is effective in reducing both somatic and cognitive anxiety. It was shown to be an effective stress management and performance improvement technique for Tom Petranoff, a world record javelin thrower, who credited the centering technique as one of the important factors in achieving his world record (Nideffer, 1985). Although there are similarities, the centering technique and *Anapanasati* meditation can be distinguished from each other. Because centering is a brief technique aimed to refocus attention. Meditation is more closely parallel with attention control training (Menzies, 1996), that cuts off intruding thoughts, so that it results in

fewer intrusions on a long term basis, that is, cognitive anxiety is reduced, not on one occasion only, but generally.

Anapanasati, and similar meditation techniques, not only function as thought stopping and attentional focus techniques, but also act in a similar manner to rational emotive behaviour therapy (REBT) techniques. Meditation can perform the function of a reframing technique, because it helps the individual combat their exaggerated interpretation of the importance of the situation. REBT is a technique developed in clinical psychology (Ellis, 1962) that has been adapted for use in sport in recognition of the observation that in stressful sport situations, people tend to think irrationally (Bunker & Williams, 1993). For example, in sport the irrational notion that perfection is essential commonly causes problems (Bunker & Williams, 1993). The belief that one should be perfect in everything one does in one's sport is a common reason why athletes worry, that is, it causes cognitive anxiety. Although everyone knows that perfection in performance is almost impossible to achieve, athletes tend to believe it to be true that loss of love and respect will occur with less than perfect performance. Other irrational thoughts suggested by Bunker and Williams (1993) are, catastrophising, believing worth depends on achievement, personalisation, fallacy of fairness, blaming, polarised thinking, and one-trial generalisation. All of these categories of irrational thought could be managed through meditation, as it gives the opportunity to explore and discipline one's own mind, which helps people to understand the reality of their thoughts in relation to the world (situation). As stated by Goleman (1971) :

With the inward turning of attention in meditation, the meditator becomes keenly aware of the random chaos characteristic of thoughts in the waking state. The train of thought is endless, stops nowhere, and has no destination. The meditator witnesses the flow of psychic events, plannings, paranoias, hopes, fantasies, memories, yearnings, decisions, indecisions, observations, fears, scheming, guilt, calculations, exaltations and on and on (p. 5).

Goleman notes that the way in which the meditator explores and understands their own mind, within the discipline of the meditation process, is similar to the process of psychotherapy. Referring to the views expressed by Maslow (1969), Goleman (1971) proposed that:

This parallels the process in psychotherapy of simultaneously experiencing and of self observing one's own experience in a kind of critical or editorial or detached and removed way so that one can criticize it, approve or disapprove of it and assume control, and therefore, the possibility of changing it exists (p. 57).

Not only does this process minimise cognitive anxiety based on irrational thoughts by increasing the individual's capacity to realistically evaluate themselves and their actual situation, but the process achieved through meditation also helps the individual to understand that there are certain things beyond their control, and, thus, encourages them to act to replace worrying

thoughts about such uncontrollable aspects of life by more controllable, constructive thoughts similar to the process of the cognitive restructuring. It should be stressed that it is not claimed here that meditation is equivalent to a substantial program of REBT or cognitive restructuring, rather that during meditation cognitive processes of a similar kind are claimed by its adherents.

It is also proposed in this thesis that self-confidence is enhanced by *Anapanasati* meditation. During meditation, the goal of which is attaining the *One-pointedness state of mind*, practitioners will experience joy, happiness, and the feeling of understanding their environment. Feeling one understands the situation and the environment and knows what to do, tends to increase self-efficacy and self-confidence (Buddhathasa, 1990; Conze, 1969; Vajiranana Mahathera, 1975). Also, Goleman (1971) stated that one of the beneficial side-effects of meditation is self-confidence which occurs upon development of better self image, through the process of deep relaxation, and unstressing of the nervous system. Goleman suggested that the person who meditates will undergo, on a profound, nonverbal level, those major changes that psychotherapies aim for.

It is also claimed that using *Anapanasati* meditation can help people cope with the causes of state anxiety shown in Figure 2.2. As stated by Goleman (1971), meditators increase the ability to perceive their situation and other people positively. Others (Buddhathasa, 1991; Layman, 1980) have suggested that meditators tend to perceive their environment more positively than non-meditators. If so, meditational techniques should minimise negative

perception of the environment, such as exaggeration of perceived uncertainty and perceived importance of the outcome. Not only would the situation be perceived more objectively, but although one would perceive the situation as important and uncertain, it would be recognised that there is nothing one can do about it at that moment. For perceived importance, what is perceived to be important and the relation of behaviour to achievement in important situations might both change. For example, the meaning of winning a trophy may not be the same for the individual because the person would gain greater perception that the more they emphasise importance of the game, the less they play well, so stressing importance is not an effective way of trying to achieve. For perceived uncertainty, the person would create more realistic assessment of opponents, less tendency to overestimate or underestimate one's opponent, and the person would have a more realistic reaction to circumstances, including less catastrophising and less personalising. For example, an athlete who perceived that the consequences of winning are associated with higher self-esteem and the consequences of losing are associated with losing self-esteem, not only would be uncertain about the outcome of the match, but would also be uncertain about what their psychological state would be after that competition. That is, because the outcome was uncertain, they would not be sure whether they would lose their self-esteem or not. The person who does not link self-esteem to outcome of performance removes a considerable source of perceived uncertainty and perceived importance.

Another way in which meditation can reduce state anxiety reactions is that through meditation, one's attention will be directed to the task at hand rather than other unnecessary cues, such as those associated with perceived importance and perceived uncertainty. This is consistent with the prediction that cognitive anxiety has a negative, linear relationship with performance. Because attention is distracted from the task as one worries about the outcome and the importance of the performance (Wine, 1980). It is interesting to note that Nideffer (1976) employs the notion of attention distraction as a central aspect of the theory of attentional style. In that conception, the distracting influence of bodily sensations associated with arousal or somatic anxiety, is claimed to be a common cause of distraction. Under pressure the individual tends to create a cyclical relationship between their thoughts and feelings, or between cognitive and somatic anxiety. The increased level of anxiety in a particular situation will create effects on one's behaviour, such as tense muscles, distractability, and narrowing of attention. These behavioural effects then mediate negative thoughts and worries about one's own symptoms, which lead to further increases in arousal and so on. Meditational techniques help break this particular cycle by either cutting off the negative thoughts that lead to increased physiological arousal or by directly acting as a relaxation strategy that cuts off the arousal. The cyclical relationship as proposed by Nideffer (1985) between somatic and cognitive anxiety is then eliminated.

It is proposed in this thesis that *Anapanasati* meditation, not only reduces cognitive and somatic anxiety, but also could be a technique that moderates

athletes' perceived uncertainty and perceived importance. Anecdotal evidence suggests that the *One-pointedness of mind* state attained through the practice of this meditation technique certainly affects the meditators mental state, and this needs to be examined in further research. In this thesis, the effects of *Anapanasati* meditation training on practitioners' anxiety levels and state self-confidence will be examined, as well as its effects on perceived uncertainty and perceived importance.

The Present Thesis

The present thesis examined several aspects of current theory relating to anxiety, particularly in the context of sport competition. The matching hypothesis (Davidson & Schwartz, 1976) suggested that it is necessary to match the intervention technique with the dimension of state anxiety which is causing problems. It has been argued here that meditation can simultaneously address both aspects of competitive state anxiety, cognitive and somatic state anxiety, and can enhance state self-confidence. The thesis tested this proposition, which has major implications for the effective use of anxiety management techniques.

It has also been proposed here that the literature, especially the writing of Martens and his colleagues, does not make it entirely clear whether the dimensions of state anxiety are independent. This is demonstrated in Martens' (1987) stress formulae, which were presented in Figure 2.3, where somatic and

cognitive anxiety are each depicted leading to the other. The suggested uncertainty about the independence of state anxiety dimensions is also apparent in the theory of competitive anxiety (Martens et. al., 1990), shown in Figure 2.2, where antecedents of anxiety are seen to lead to generalised “A-state”, rather than cognitive or somatic state anxiety. Martens et al. do not make it clear whether this “A-state” variable refers to one or the other dimension of state anxiety, or to some additive or multiplicative combination of them both, or even to a combination of all three aspects measured by the CSAI-2.

To examine these issues, this thesis included comparison of the effects of interventions based on meditation and progressive muscular relaxation over a 10 week period. The thesis examined the notion that each anxiety management technique could address at least one dimension of state anxiety. It also considered the independence of the dimensions of state anxiety, in that, if the dimensions are not independent, it is more likely that any anxiety management intervention will alter them both. Thus, the thesis aimed to advance theory, as well as effective practice. Further, the thesis aimed to test the theory of competitive anxiety by testing the original model based on the idea of a generalised A-state. This was compared with a model in which cognitive and somatic anxiety are considered to be independent. At the same time, this modelling analysis permitted the thesis in examination the proposed roles of perceived importance and perceived uncertainty in the theory. Figure 2.2 implies a multiplicative contribution and Martens et. al. (1990) note that the influence of each is not likely to be felt substantially, unless the other has at

least a moderate level. This proposition can be modelled against the “alternative” model where each variable has an independent effect.

To permit these issues to be addressed first within a culture where meditation is traditional, the research in this thesis was conducted in Thailand. The thesis first reports studies that tested the reliability and validity of Thai language versions of the SCAT and the CSAI-2. Because, at the time when the research was planned and executed, there were no reliable and valid measures of perceived importance and perceived uncertainty in the literature, the thesis then reports studies undertaken to develop and validate such measures with a Thai sample. Next, the thesis reports an intervention study, comparing the effects of a meditation intervention (Anapasati meditation), and a muscular relaxation intervention (progressive muscle relaxation), with a control condition on perceived uncertainty, perceived importance, and the three dimensions measured by the CSAI-2, that is, cognitive anxiety, somatic anxiety and self-confidence. Finally, the thesis describes structural equation modelling analyses, based on the Martens et. al. (1990) theory of competitive anxiety, which compared models reflecting different combinations of perceived importance and perceived uncertainty, modelling their effects on different representations of state anxiety. The specific predictions associated with various aspects of this research are presented in brief introductions to the relevant chapters.

CHAPTER 3:
DEVELOPMENT AND VALIDATION OF THE SPORT COMPETITION
ANXIETY TEST-THAI VERSION (SCAT-T) AND THE COMPETITIVE
STATE ANXIETY INVENTORY-2 THAI VERSION (CSAI-2T)

Introduction

The discipline of sport psychology has developed rapidly in the last twenty years. From its foundations in North American university physical education departments, it has now become a professional specialism of psychology taught in many psychology departments and practiced widely in elite sport. It has also attracted interest from other cultures which for traditional, political, or economic reasons are striving for world sport success. One implication of the introduction of western sport psychology into other cultural traditions, such as that of Thailand, is the need or desire to translate standard western materials that have shown high reliability, validity, and broad application, into the host language for their widespread use in research and practice. For the present thesis, it was necessary to translate the Sport Competition Anxiety Test (SCAT), developed by Martens (1977), and the Competitive State Anxiety Inventory-2 (CSAI-2), developed by Martens, Burton, Vealey, Bump, and Smith (1983) into the Thai language.

The role of the SCAT and the CSAI-2 as research measures necessitated prior demonstration of sound psychometric properties for the Thai language

versions, particularly test-retest reliability, internal consistency, and construct validity for the SCAT and internal consistency, factor structure, and construct validity for the CSAI-2. Although the psychometric properties of English language versions of these instruments are well established, these characteristics of the new Thai language versions cannot be assumed. This chapter briefly reviews the measurement of anxiety in sport and then reports the methods, results, and conclusions of processes of psychometric validation of Thai language versions of SCAT and the CSAI-2.

Sport Anxiety Measurement Tools

Martens (1977) developed the Sport Competition Anxiety Test (SCAT), which measures trait anxiety, which is the anxiety an athlete generally feels or an athlete's proneness to become anxious in a variety of sport situations. The SCAT has sound psychometric properties, according to Martens et al. (1990). Support for the reliability and internal consistency of the SCAT was obtained using test-retest, Analysis Of Variance (ANOVA), and KR-20 correlational analyses to test for internal consistency. Construct validity of SCAT was obtained from evidence gathered in 11 experimental and field studies that supported the construct validity of the SCAT as a measure of competitive trait anxiety by providing results in accordance with theoretical predictions (Martens et al., 1990). The SCAT has been widely used in sport psychology research (Andersen & Williams, 1987; Cooley, 1987; Lanning & Hisanaga, 1983;

Passer, 1983; Scanlan, 1977; Vealey, 1986; Weinberg & Genuchi, 1980) and has become the standard measure of trait anxiety in sport (Martens et al., 1990).

Recently, Smith, Smoll, and Schutz (1990) have developed the Sport Anxiety Scale (SAS) as a sport specific cognitive and somatic trait anxiety measure. Specifically, the scale measures individual differences in somatic anxiety and in two classes of cognitive anxiety, worry and concentration disruption. Smith, Smoll, and Schutz (1990) stated that although there is already a sport specific trait anxiety measurement tool in the field, that is Martens (1977) Sport Competition Anxiety Test (SCAT), the measurement tool is still unidimensional. Smith, Smoll, and Schutz (1990) suggested that it is important to develop a trait measurement tool that distinguishes between the cognitive and somatic anxiety components with the same reasoning that is already evident in recent research using the CSAI-2. Although it appears to have promise as a research tool, SAS is still a new measurement tool in the field and there is a need for further examination of the discriminant validity of the SAS in relation to affective responses other than anxiety. Another source of concern is the failure of concentration disruption to relate significantly to confusion and the relation of SAS to depressed affect in the reported psychometric work (Smith, Smoll, & Schultz, 1990). In addition, there is not yet a large body of psychometric evidence supporting the SAS and most of that in the literature was produced by its authors. Also, the relationship of SAS subscales to CSAI-2 subscales has not been clearly demonstrated. It was decided to use the well established SCAT in the present research, not only

because the SAS is not as well validated, but also because of the well-documented relationship of the SCAT to the CSAI-2 scales.

Martens, Burton, Vealey, Bump, and Smith (1983) developed the Competitive State Anxiety Inventory-2 (CSAI-2), after the CSAI proved not to be valid. The CSAI originated from Spielberger's (1970) State Anxiety Inventory (SAI), on the basis that the SCAT is a sports specific A-trait scale, and a sport specific A-state measure was also needed to enhance sensitivity of measurement and prediction (Martens et al., 1990). The CSAI did not have sound psychometric properties, so Martens et al. (1983) developed the CSAI-2. The CSAI-2, unlike its predecessor, was based on theoretical conceptions distinguishing between cognitive anxiety or worry and somatic anxiety or emotional reactions (Davidson & Schwartz, 1976; Liebert & Morris, 1967). The inventory has been subjected to analysis for its reliability and validity. A factor analysis produced, not only separate cognitive and somatic anxiety subscales, but also a state self-confidence component (Martens et al., 1990). According to Martens et al. (1990), the main method of estimating reliability for the CSAI-2 was by examining the internal consistency of the whole scale and also the internal consistency of each subscale. Cronbach's alpha coefficient was computed and showed coefficients which ranged from .79 to .90 for the whole scale, and from .79 to .90 for each subscale, demonstrating a sufficiently high degree of internal consistency. Martens et al. (1990) stated that construct validity of the CSAI-2, as a measure of sport specific state anxiety, was supported through a systematic progression of research. Moderate correlations

were found between the SCAT and the CSAI-2. Higher CSAI-2 scores were found in higher trait anxiety group, high anxiety condition. Lower CSAI-2 score were found in lower trait anxiety groups and lower anxiety conditions.

Generally, the development of the CSAI-2 represents a significant advance in the measurement of competitive anxiety in sport, because of its sport specific and multidimensional nature, as well as its relationship to the SCAT and its sound psychometric properties. The number of published studies using the CSAI-2 has increased rapidly (e.g., Burton, 1988; Gould, Petlichkoff, Simons, & Vevea, 1987; Jones, Swain, & Hardy, 1996; Karteroliotis & Gill, 1987; Krane & Williams, 1987; Maynard & Cotton, 1993; Maynard, Hemmings, & Warwick-Evans, 1995; Swain & Jones, 1996; Vealey, 1986; Weinberg, Seabourne, & Jackson, 1987; Yan Lan & Gill, 1984), and it has become the standard measure of state anxiety in sport.

In Thailand, the majority of the population cannot read, speak, or understand English efficiently. An attempt to use the English versions of the SCAT and the CSAI-2 in Thailand for Thai participants would be ineffective. The SCAT has been translated into many languages such as, Spanish, French, German, Russian, Japanese, and Hungarian (Martens et al., 1990), but not Thai. Martens et al. cite no equivalent translations of the CSAI-2. Kirkby (1993, personal communication) has recently translated the CSAI-2 into Chinese. Although the experience of anxiety appears to be universal, cultural factors may influence those situations that promote state anxiety. Thai versions of the SCAT and the CSAI-2 need to be developed to be used with Thai participants in the

present study, because they are well established measures and their use will permit cross-cultural comparisons to be made. This paper reports a study executed to examine these issues.

Methods

Participants

Thai athletes from various sports volunteered as participants. There were 200 participants, whose competition level ranged from collegiate to international level. Specifically, there were 50 athletes who compete at international level, 78 athletes who compete at national level, and 72 athletes who compete at collegiate level. Track and field provided 57 athletes, 36 athletes were from soccer, 11 were from basketball, 12 were from volleyball, nine were from boxing, and 75 athletes were from judo. In this study, 125 athletes were male, and 75 were female. Range of participants age was from 18 to 30 years old. Participants were volunteers who were told what the study involved and they were invited to participate. Also, they were told that they were free to withdraw from the study at any time.

Design

The study used a correlational design, where data were obtained on two occasions from participants for the SCAT-T, and on three occasions from participants for the CSAI-2T. The first occasion was three weeks before major competition, when SCAT-T and CSAI-2T were administered. On the second

occasion, one week before the competition only CSAI-2T was administered.

The third occasion was 15 to 20 minutes before performance at the major competition and here SCAT-T and CSAI-2T were administered. Due to the repeated data collection process in this study, however, it was necessary to administer SCAT at that time to ensure sufficient time from original administration of SCAT, while limiting the number of occasions on which busy athletes were asked to give time. This data collection process permitted several comparisons to be made. These were:

- i) SCAT-T on Occasion 1 and Occasion 3 for test-retest reliability.
- ii) SCAT-T internal consistency on each occasion.
- iii) SCAT-T on Occasion 1 & 3, with CSAI-2T subscales on Occasions 1 & 3 for construct validity.
- iv) CSAI-2T subscale internal consistency, on each occasion.
- v) CSAI-2T subscale intercorrelations for construct validity.
- vi) Confirmatory factor analyses of CSAI-2T on each occasion, for factor structure.

Means, standard deviations, and various correlations were also compared with norms from the English language versions for each scale.

Measures

Trait Anxiety. The Sport Competition Anxiety Test (Martens, 1977) comprises 10 questions on anxiety (two reversed scores) and five questions that are spurious, that is, not measuring anxiety and included to disguise the nature of the test, in a 15 item scale. Responses are made on a three point scale from 1

= (hardly ever) to 3 = (often). The scoring range is, thus, 10 to 30 for the whole scale. The scale is usually presented as the Illinois Competition Questionnaire or similar, local name, to avoid reference to anxiety in its title. The SCAT is presented in Appendix A.

State Anxiety. The Competitive State Anxiety Inventory-2 (Martens et al., 1983, 1990) is a test of multidimensional state anxiety, which includes three subscales: cognitive anxiety, somatic anxiety, and self-confidence. It comprises 27 questions, nine questions on each component, including one reversed question on somatic anxiety (question 14). Responses are made on a four point scale, which runs from 1 = (not at all) to 4 = (very much so). The range for each scale is thus, 9 to 36. The test is usually presented as the Illinois Self Evaluation Questionnaire or local alternative, to avoid reference to anxiety in its title. The CSAI-2 is presented in Appendix B.

To convert the SCAT and the CSAI-2 to the Thai language, two Thai sport psychologists, who speak fluent English, translated the instructions, scale description (e.g., not at all) and items into Thai verbatim. An Australian, who speaks fluent Thai, translated the scales back into English, blind to the nature of the tests and the English language originals. This procedure demonstrated that the originals were translated clearly. There was one item for which direct Thai translation does not make sense. For “My heart is racing” the Thai equivalent “My heart is dancing” was employed, as opposed to a verbatim translation, the phrase “is dancing” imparting the same meaning to Thai people that “racing” does to English speakers. The intended meaning of these items was clearly

understood by the English translator in questioning after he had completed the retranslation. This procedure supported the validity of the scales and gave assurance that the questions would be understood 100 percent by Thai athletes, so testing could commence.

Procedure

The nature of the study was explained to participants and their questions were answered. The duration of the study and the nature of the tests were also described to the participants. In addition, they were told that their responses to the questionnaires would be kept confidential; only group results would be published, and their names would be represented by code numbers in the records. Participants were tested for their trait anxiety, using the Thai version of Martens' (1977) SCAT (SCAT-T), on two occasions, first, three weeks before a specific competition and, second, approximately 15 to 20 minutes before the competition. Their cognitive and somatic state anxiety as well as their state self-confidence were tested using the Thai version of the Martens et al. (1990) CSAI-2 (CSAI-2T) on three occasions. First, three weeks before competition, second, one week before competition, and finally, approximately 15 to 20 minutes before competition. In the case of some sports such as track and field or Judo, where events take all day. The CSAI-2T were administered 15 to 20 minutes before the first event of that day. The standard instructions were used on each occasion. Following the final administration, participants were debriefed, their questions were answered, and they were thanked for their participation.

Results

Means and standard deviations for both occasions for SCAT-T and three occasions for CSAI-2T, compared to the SCAT and CSAI-2 norms presented in Martens et al. (1990) are shown in Table 3.1.

Table 3.1
Mean and Standard Deviation of SCAT-T and Subscales of CSAI-2T (N=200)

Measures	Present Study		Martens et al.norms	
	Mean	S.D.	Mean	S.D.
SCAT-T				
SCAT1	18.99	4.44	17.04-20.91	3.71-4.95
SCAT2	21.17	4.45		
Cognitive Anxiety				
COG1	18.54	4.89	16.50-21.61	4.80-6.47
COG2	19.85	5.36		
COG3	21.41	5.72		
Somatic Anxiety				
SOM1	16.03	5.00	15.31-19.90	4.11-6.02
SOM2	17.73	5.27		
SOM3	21.14	5.90		
Self-Confidence				
SC1	26.32	4.99	22.50-26.27	4.81-5.90
SC2	25.79	5.15		
SC3	24.64	5.07		

Means and standard deviations for SCAT-T and CSAI-2T were similar to the norms for SCAT and CSAI-2 presented by Martens et al. The mean for SCAT on Occasion 2 was higher than the range cited for the English language version by Martens et al. This was probably because SCAT-T was administered shortly before the competition on this occasion.

The highest scores for CSAI-2T scales (lowest for the self-confidence scale) were on the occasion shortly before a major competition, which would be expected to produce extreme scores and which is not a typical condition for testing for the English language norm. The increments and decrements of CSAI-2T subscales matched prediction. That is, cognitive and somatic anxiety levels of athletes were expected to increase and state self-confidence was expected to decrease from three weeks before to the time of competition, according to the temporal patterns research discussed by Jones (1996).

The Pearson Product Moment correlation between SCAT-T on the two occasions, three weeks apart, produced a high value of $r = .84$, $p < .001$, which means that SCAT showed acceptable test-retest reliability, even though the conditions of testing were different between the two occasions. SCAT-T was retested under competitive conditions rather than practice conditions, although this is not recommended, because of limited access to participants and a desire to examine the maximum delay between initial test and retest.

The results of the intercorrelations are shown in Table 3.2. Construct validity of SCAT-T on Occasion 1 and SCAT-T on Occasion 2 were examined by correlation of both sets of scores on the test with each subscale of all three

Internal consistency of the CSAI-2T was examined using Cronbach's alpha coefficient. Cronbach's alpha coefficients of each subscale for each occasion of measurement are shown in Table 3.3. All alphas for the three occasions of testing CSAI-2T, including all subscales from every occasion of testing the CSAI-2T, were high, only that for self-confidence on the third occasion, right before competition, falling marginally below 0.7. Results showed high internal consistency for the subscales of the CSAI-2. It is to be noted that the Cronbach's alpha coefficient value was highest for somatic anxiety.

Table 3.3
Cronbach's Alpha Coefficients for CSAI-2T Subscales. (N=200)

Measures	Alpha
COG1	.7187
COG2	.7341
COG3	.7627
SOM1	.8381
SOM2	.8263
SOM3	.8417
SC1	.7311
SC2	.7334
SC3	.6937

The intercorrelation matrix of CSAI-2T subscales, is presented in Table 3.4. It reflects the construct validity for CSAI-2T on all three occasions. Results of cognitive anxiety Occasion 1, 2, 3 correlations, somatic anxiety Occasion 1,

2, 3 correlations, and state self-confidence Occasion 1, 2, 3 correlations show mostly moderate correlations, with some slightly higher. Intercorrelations between cognitive anxiety and somatic anxiety, cognitive anxiety and state self-confidence, and somatic anxiety and state self-confidence were moderate, with higher correlations on the same occasion, and negative correlations for state self-confidence. These correlations support the construct validity of the CSAI-2T. Because the CSAI-2T subscales measure state anxiety, which fluctuates from occasion to occasion depending on individual perceptions of threat, only moderate correlations are expected between occasions for the same subscale. Previous research on the subscales has consistently shown moderate correlations between the scales (Martens et al., 1990), indicating that they do tend to increase and decrease together to some extent, even though they are considered to be independent. This is explained by noting that situations which induce higher levels of somatic anxiety will often contain the stimuli which affect cognitive anxiety, while worrying (cognitive anxiety) is likely to be associated with reductions in self-confidence and vice versa (Marten et al., 1990).

Table 3.4

Inter-Correlations of CSAI-2T Subscales for all Three Occasions. (N=200)

	cog1	cog2	cog3	som1	som2	som3	sc1	sc2	sc3
cog1	X	.6469	.5660	.7247	.5319	.4271	-.4972	-.4959	-.3140
cog2		X	.7625	.4306	.7074	.5622	-.4456	-.5496	-.4112
cog3			X	.4411	.6638	.6597	-.4136	-.5011	-.5510
som1				X	.5797	.5310	-.5127	-.4299	-.3039
som2					X	.7584	-.4458	-.5686	-.4952
som3						X	-.3840	-.5046	-.5798
sc1							X	.7802	.5914
sc2								X	.7264
sc3									X

Results of means across three occasions for each subscale of the CSAI-2T are shown in Table 3.5. One-Way Analyses of Variance (ANOVA) showed that there were significant differences between Occasions 1, 2, and 3 for all three subscales of the CSAI-2T. Significant difference between levels of somatic anxiety, $F(2, 595) = 12.75, p < .001$, cognitive anxiety, $F(2, 595) = 13.60, p < .001$, and lower self-confidence, $F(2, 595) = 12.30, p < .001$, were found. Newman-Keuls post hoc test revealed that there were higher level of

cognitive and somatic anxiety, and lower of self-confidence from Occasion 1, three weeks prior to performance, to Occasion 2, one week prior to performance, higher levels of somatic and cognitive anxiety, and lower self-confidence from Occasion 2 to Occasion 3, immediately prior to performance, and higher levels of somatic and cognitive anxiety, and lower self-confidence from Occasion 1 to Occasion 3. Results supported the construct validity of the CSAI-2T, as it would be predicted that there would be significantly higher levels of somatic, and cognitive anxiety, and lower self-confidence as performance approaches. It should be noted that the absolute size of the changes is not large, but that it is larger for the increases from Occasion 2 to Occasion 3 and for the increase in somatic anxiety from Occasion 2 to Occasion 3. The increase in somatic anxiety from Occasion 2 to Occasion 3 was also larger than the increase in cognitive anxiety. These results would be expected from previous research on temporal patterns of A-state dimensions (e.g., Gould et al., 1984; Gould et al., 1987; Martens et al., 1990) which have shown that cognitive anxiety does not change greatly as competition approaches, but somatic anxiety increases substantially shortly before major competition.

Table 3.5

Means for CSAI-2T Subscales Across Three Occasions. (N=200)

	Occasion 1	Occasion 2	Occasion 3
Cog	18.54	19.85	21.41
Som	16.03	17.73	21.14
SC	26.32	25.79	24.64

Confirmatory factor analysis was used to test the CSAI-2T factor structure. Confirmatory factor analysis is a factor analysis method, in which the factor structure is determined before calculation. The loading of items predetermined by theory or previous research to represent each factor is then examined, rather than allowing factors to emerge from the analysis, and then trying to identify them, as in exploratory factor analysis. Thus, confirmatory factor analysis is more appropriate in situations where theory, test construction, and/or previous research already indicate a predicted structure. Separate confirmatory factor analyses were conducted for each of the administrations of the CSAI-2T, using the LISREL program. Definite factors emerged for cognitive anxiety, somatic anxiety, and self-confidence on each occasion. Results of confirmatory factor analyses for Occasion 3 for each subscale of the CSAI-2T are shown in Table 3.6. Only the table of the third testing is presented

because the results were very similar for all occasions. The similarity across testing occasions demonstrated the stability of the factor structure of the CSAI-2T. The magnitude of the factor loadings were mostly above 0.65. The three lowest items were still above .45.

Table 3.6.

Confirmatory Factor Analysis of The CSAI-2T for Occasion 3. (N = 200)

Title	Cognitive	Somatic	Self-Confidence
1	.723		
4	.795		
7	.766		
10	.736		
13	.607		
16	.775		
19	.492		
22	.631		
25	.764		
2		.618	
5		.705	
8		.757	
11		.658	
14		.539	
17		.676	
20		.757	
23		.744	
26		.810	
3			.672
6			.632
9			.718
12			.458
15			.669
18			.765
21			.675
24			.473
27			.600

All of these loadings were significant as indicated by their t values. For example, factor loadings were all at least twice the size of the corresponding standard error. None of the items across three occasions changed by as much as 0.15; items that were consistently lower than others across three occasions were item 19, 14, 24, and 12, but these were still considered to reach acceptable levels.

The value of the Goodness of Fit Index (GFI) from the confirmatory factor analysis was .702, the Adjusted Goodness of Fit Index gave a value of .649, and the Root Mean Square Residual (RMSR) value was .088. These values, although not exceptionally strong are sound for a test with as many as nine items on each subscale.

Discussion

Evidence gathered on the reliability and validity of the SCAT-T and the CSAI-2T from three weeks before a major competition, one week prior to the competition, and immediately before the competition, supported the test-retest reliability, construct validity, and internal consistency of the SCAT-T and the internal consistency, construct validity, and factor structure of the CSAI-2T. By providing results in accordance with theoretical predictions, these analyses led to the conclusions that SCAT-T is a valid measure of competitive A-trait, and

that CSAI-2T is a valid measurement of competitive A-state, including cognitive anxiety, somatic anxiety, and state self-confidence.

Test-retest reliability between the two occasions of testing on the SCAT-T supported its reliability. Because CSAI-2T is a test intended to measure state anxiety levels, which vary from time to time, test-retest reliability analysis would not be an appropriate test to use here. Internal consistency of both tests and the three subscales of the CSAI-2T was confirmed by the level of Cronbach's alpha coefficients. Results revealing high alphas, which mean high internal consistency of tests, were found for SCAT-T on both occasions, and for CSAI-2T on each subscale for each occasion. This replicated the same analyses three times under different competitive conditions. As stated earlier in this section, test-retest reliability is inappropriate for examining the state scales, so examining the internal consistency of the scale was the most valid method used to estimate reliability of the CSAI-2T. The results are consistent with the internal consistency examination of the CSAI-2 by Martens et al. (1990), supporting the reliability of the CSAI-2T subscales.

Results supporting the construct validity of SCAT-T were provided through correlations with CSAI-2T subscales. Both measures of SCAT-T were moderately correlated with each subscale of the CSAI-2T on all three occasions, with higher correlations on the same occasion, and negative correlations with self-confidence subscales. This would be expected if the SCAT-T is a trait measure of proneness to perceive situations as threatening and to respond with large increases in A-state. Construct validity of the CSAI-2T was also

supported. Correlations between pairs of subscales on all three occasions were moderate because testing was conducted in different conditions. Correlations of cognitive anxiety with somatic anxiety, cognitive anxiety with self-confidence, and somatic anxiety with self-confidence were moderate as predicted. These findings are in accordance with past research (e.g., Deffenbacher, 1977, 1978, 1980; Liebert & Morris, 1967; Morris & Liebert, 1970; Morris & Perez, 1972; Morris, Davis & Hutchings, 1981), which discovered low to moderate correlations between cognitive and somatic anxiety, and has been interpreted by researchers as evidence of relative independence, because most situations that are powerful stressors contain stimuli that elicit and maintain both anxiety components independently (Martens et al., 1990). Higher correlations on the same occasion, and negative correlations for self-confidence were also found. One-way Analysis of Variance also supported construct validity of the CSAI-2T. Significant increases were found between occasions on the cognitive anxiety scale and the somatic anxiety scale, especially from Occasion 1, a non-stressful practice session to Occasion 3, immediately before a major competition. Significant decreases were also found between these occasions on the state self-confidence subscale. Results that One-way ANOVA provided are in accordance with the theoretical predictions (Martens et al., 1990), that cognitive and somatic anxiety levels increase and self-confidence level decreases when competition approaches. Confirmatory factor analysis was used to test the CSAI-2T factor structure. Definite factors emerged for cognitive anxiety, somatic anxiety, and self-confidence on each occasion.

It has been indicated by these reliability and validity results, that the Thai versions of the Sport Competition Anxiety Test (SCAT) and the Competitive State Anxiety Inventory-2 (CSAI-2) produced similar results to the original tests (Martens et al., 1990), reflecting sound reliability and validity. This study, examining the reliability and validity of the SCAT-T and the CSAI-2T, has supported the reliability and validity of the tests in all analyses. These results, thus, increase confidence that both tests are measuring the same constructs as the original English language versions, and are appropriate to be used to examine the effects of progressive muscle relaxation and Anapanasati meditation interventions on anxiety in sport.

CHAPTER 4:

THE DEVELOPMENT AND VALIDATION OF PERCEIVED IMPORTANCE OF COMPETITION TEST

Introduction

In the main study in this thesis, the Buddhist conception of meditation, called Anapanasati was used as the intervention to test the matching hypothesis (Davidson & Schwartz, 1976). The study also examined aspects of the theory of competitive anxiety in sport developed by Martens, Vealey, and Burton (1990). The study included the Sport Competition Anxiety Test Thai version (SCAT-T) and the Competitive State Anxiety Inventory-2 Thai version (CSAI-2T) as measurement instruments. Participants in the main study completed all tests before, during, and after treatments to compare the efficacy of Anapanasati meditation and progressive muscle relaxation over a 10 week period. To examine the Martens et al. theory, it was essential to monitor perceived uncertainty levels and perceived importance levels on a number of occasions during this period. Because no validated measure existed in the literature at the time the study was conducted, it was necessary to develop and validate a measure of perceived importance of competition and a measure of perceived uncertainty of competition.

The Perceived Importance of Competition Test (PICT) was developed to measure an athlete's perception of the importance of an impending

competition. According to Martens et al. (1990), uncertainty of the outcome and importance of the outcome are the two main components of the environment that mediate state anxiety. Martens et al. postulated that competition is an evaluative process that creates a perception of threat about the outcome before the actual competition. The greater the uncertainty and the importance of the outcome, the greater the perceived threat. They also stated that, for threat to exist, there must be substantial uncertainty about an outcome, and the outcome must be important to the person. According to this statement, uncertain situations without importance, or important situations without uncertainty, would not produce perception of threat and/or increased state anxiety response. Martens et al. also proposed that uncertainty and importance influence each other in some circumstances. When uncertainty level is low, importance may be diminished; on the other hand, when importance is high, uncertainty level may increase. Perceived uncertainty level in athletes is considered to arise from the uncertainties athletes have as to whether they can meet the demands of the situation, such as the ability to perform up to the level that they consider to be satisfactory. Perceived importance levels are related to the importance of the outcome or consequences of the competition to the athletes. Tests of perceived uncertainty and perceived importance in sport were required for examination of the model proposed by Martens et al. It was necessary to develop these tests, because none existed at the time when this research was carried out. The reliability and validity of these instruments also had to be tested. This study reports the development and initial validation of an

inventory to detect the athletes' perceived importance of the contest, the Perceived Importance of Competition Test (PICT).

Measurement Instrument

Perceived Importance of Competition Test (PICT)

Because no validated test was available at the start of this research, to measure athletes' perceived importance, a brief measure for the variable was developed. The test for perceived importance comprised two statements. One statement would seem to be sufficient to reflect perceived importance, because the aspect of perceived importance is straightforward. To check consistency of response, two statements appeared more appropriate. More than two items would seem to be unnecessary to establish a clear impression of perceived importance, because it is a simple variable.

The first statement asked each performer "How important is this match to you". The second statement, "The outcome of this match means a lot to me", asked for a degree of agreement by the athlete to the statement that the outcome of the match meant a lot to them. Both statements were developed based on the Martens et al. (1990) theory of competitive anxiety that specifically stated perceived importance is determined by the individual's perception of the value of the rewards potentially attainable in the particular situation. Athletes will perceive the situation to be important or not, depending on their perception about the significance of the rewards, both intrinsic and extrinsic. Some

athletes perceive that the situation is important depending on extrinsic rewards such as trophies, medals, or praise from a significant other. Some athletes “live and die” by how well they play sport; a poor performance brings on great despair and a good performance immense joy. Their feelings of self-worth and competence are closely linked to how they play sport. These are intrinsic rewards. In most cases, both intrinsic and extrinsic rewards influence an athlete’s perception of importance, questions concerning overall importance should demonstrate both intrinsic and extrinsic aspects of importance athletes perceived .

The two items employed different formats to elicit the individual’s perception of overall importance of any specific sporting event, without making it very obvious that they measured the same variable. Response to each question was made on a five point scale, from 1 = (Not Important) or (Strongly Disagree) to 5 = (Extremely Important) or (Strongly Agree). Participants who rated the match to be extremely important to them, and strongly agreed with the statement about the outcome received the highest score of five on each item. Participants who scored the match as not important and strongly disagreed with the statement were given the lowest score of one for each item. Thus, the range of the scale was two to 10. The English language version of the PICT is presented in Appendix C, along with the instructions given to respondents.

The measurement instrument was translated into Thai by me and back translated by a bilingual (Thai and English) individual, naive to the research, to check that the meaning was not changed. It was pilot tested for clarity and

comprehension with athletes not involved in the reliability and validity study. It was then tested and validated by having participants complete the test within 15 minutes of the start of a minor competition and within 15 minutes of the start of a major competition. The hypothesis proposed to test construct validity was that level of importance in a major competition would be higher than level of importance in a minor competition, so responses to the Perceived Importance of Competition Test would be significantly higher for the major competition. The reasoning was that the consequence of the outcome in a minor competition, such as a practice match between two institutes, is not as important to the athletes as that of a match in a major knockout competition, where the outcome determines whether the team has an opportunity to compete in the championship round of the competition. First, there were no extrinsic rewards in the practice match, whereas medals and status were on offer in the major competition. Second, the intrinsic rewards of self-worth and perceived competence will generally be perceived to be greater in the competition leading to a championship than in a practice match. Hence, athletes would be expected to perceive the major competition to be more important than the minor competition.

The nature of the PICT is that it is a state measurement instrument, which varies from time to time. It was not appropriate to use a test-retest method to test the stability. Also, because there are only two items in the PICT, the split half reliability method was not appropriate. In order to test the stability of the PICT, the correlation between the two occasions of testing was

employed. The level of perceived importance in one situation was predicted to be different to that in the other situation, as previously argued. Nonetheless, a high correlation between the two occasions of testing would indicate that, although scores changed in the different circumstances, the order of respondents' perceptions of importance remained relatively stable. For example, relatively high scores in situation one become very high scores in situation two. Moderate scores in situation one become moderately high in situation two. Low score in situation one are still the lowest, but increase their rating of importance a little.

Although it was not appropriate to test internal consistency, in the usual manner, using Cronbach's alpha coefficient, because there are only two items in the PICT, it was predicted that the two items were measuring the same construct, perceived importance, so they should be highly correlated. A Pearson's Product Moment Correlation coefficient was calculated for scores on item 1 and item 2 on each occasion separately, to examine this proposition.

Methods

Participants

Thai athletes from collegiate basketball and volleyball teams volunteered as participants. There were 31 participants (male = 16, female = 15), aged between 20 and 25 years, with approximately equal numbers from basketball ($n = 16$) and volleyball ($n = 15$). Participants were told what the

study involved, that they were free to withdraw from the study at any time, and that their data would be confidential.

Design

The study used a repeated measures research design, where data was obtained on two occasions from participants for the Perceived Importance of Competition Test (PICT).

1. How important is this match to you?

1

2

3

4

5

Not

Somewhat

Important

Very

Extremely

Important

Important

Important

Important

Please circle the number which most accurately reflects your level of agreement with the following statement:

2. The outcome of this match means a lot to me.

1

2

3

4

5

Strongly

Disagree

No strong

Agree

Strongly

Disagree

Feeling

Agree

Figure 4.1 The Perceived Importance of Competition Test

The first occasion was immediately before a minor competition, which was a practice match against another institute, and the second occasion was immediately before a major competition, which was the second round match in a championship tournament between many institutes. This permitted a comparison of importance level perceived by athletes between a minor and a major competition. It was predicted that scores on the PICT would be significantly higher for the championship match than the practice match.

Measures

The Perceived Importance of Competition Test comprised two questions on perceived importance. The items of the test are shown in Figure 4.1. To translate the test into Thai language, I translated the instructions, scale description, and items into Thai, verbatim. An Australian non-sport psychologist who speaks fluent Thai translated the scales back into English, blind to the nature of the test and the English language original. It was found that the re-translated English version retained the same meaning as the original. This procedure demonstrated that the original items were translated clearly into Thai, supported the face validity of the scale, and gave assurance that the questions would be understood by Thai athletes. Thus, testing could commence.

Procedure

The general purpose of the study was explained to participants at the beginning of the study. The specific issue under examination was not revealed, and any questions were answered. The duration of the study and the nature of

the tests were also described to the participants, at this time. They were also told that their responses to the questionnaires would be kept totally confidential, only group results would be published, and their names would be represented by code numbers in the records. Additionally, they were told that they were free to withdraw from the study at any time, and informed consent forms were signed by all participants. Participants were tested for their perceived importance using PICT, first, fifteen to twenty minutes before the minor competition, the practice match between two institutes. Second, they were tested fifteen to twenty minutes before the second round match in a national university student competition. They were then thanked for their participation.

Results

To test the stability of the PICT, a correlation was calculated between PICT test score on Occasions 1 and 2. The correlation between occasions was, $r = .78$, $p < .001$. This indicated that participants largely retained their position in order of rating. Thus, although participants typically increased their score for the more important match, as reflected by the means [$\bar{M}_1 = 6.29$; $\bar{M}_2 = 7.77$], their responses reflected stability in the order of perceived importance for participants.

To examine the consistency between the two items and hence the PICT test, the correlation between items was calculated separately on each occasion.

For Occasion 1, the correlation was, $r = .74$, $p < .001$, while, for Occasion 2 it was, $r = .58$, $p < .001$. These values indicated that on each occasion the participants responded in a consistent manner to the two items in the PICT.

Means and standard deviations for both occasions of administration of the PICT were $M_1 = 6.29$ ($SD = 1.21$) for the practice match, and $M_2 = 7.77$ ($SD = 1.05$) for the second round match. Visual inspection of the scores revealed that the normality assumption was satisfied. Results of a t test for the PICT showed significantly higher levels of perceived importance before the major competition than the minor competition, $t(30) = 10.74$, $p < .01$.

Discussion

Direct examination of the PICT for stability was not appropriate using the standard test-retest or split half methods, because the nature of perceived importance changes from situation to situation. That is, use of a test-retest reliability analysis was not strictly appropriate. Also, with only two items, the split half reliability method was not appropriate to test the stability of the PICT. The stability of the PICT was tentatively examined by correlating across the two occasions overall. There the correlation of $r = .78$, indicated stability of the PICT, because participants largely retained their position over the two occasions.

A high correlation between the items was found on Occasion 1, $r = .74$, $p < .001$, and a moderate correlation was found on Occasion 2, $r = .58$, $p < .001$.

.001. This suggested that the two items were measuring the same construct. The reason for using simple correlation instead of a standard internal consistency test, such as the Cronbach's alpha coefficient was because the Cronbach's alpha coefficient is a measure of internal consistency that represents an average of the correlations between all pairs of items in a subscale. There were only two items in the scale, so assessment of internal consistency was not appropriate, a bivariate correlation is equivalent.

Construct validity of the PICT was supported by a significant difference between occasions of testing. The results showed that the levels of importance athletes perceived immediately before a major competition were significantly higher than those immediately before a minor competition. It should be noted that on a scale of two to 10, the scale point six is the mid point. Thus, in absolute terms the "minor" competition was seen to be of moderate importance ($\bar{M}_1 = 6.29$). This is consistent with the view of inter-institute competition where starting teams are predetermined, that is typical among college athletes who have strong identity with their institution and their team and so want to represent it well in any match against other institutions. Although significantly higher, the "major" competition mean was not substantially higher in absolute terms ($\bar{M}_2 = 7.77$), the difference being 1.48 on a scale varying from 2 to 10. The "important" match was a second round match and finals would be expected to raise the importance score higher. Thus, overall, players did not use the highest ratings of 9 and 10, as more important competitions could be conceived. Nonetheless, as predicted, participants' scores on the PICT reflected

the situation, that is, the tournament match was perceived to be significantly more important than the practice match.

Even though college athletes do perceive non-tournament, inter-institution competition to be important, it was anticipated that the mean score for the practice match would fall in a lower range than it did. A comment of explanation is called for here. It would appear likely that participants were affected by the items which seemed positively loaded, encouraging affirmative responses, or responses reflecting agreement. This is especially the case with item two, which asked participants to “agree” with the positive statement “This match means a lot to me”. Acquiescence is common in such situations and might be more likely in the context of the Thai culture, where disagreement is often considered impolite. It is likely that both the perception that practice matches have some importance and the loaded item contributed to the mean for the practice match being slightly above the midpoint of the scale. It should also be noted that even though limited use of the extreme ratings on the PICT might be of some concern in psychometric terms, in practice, the responses of the two occasions were significantly different. This suggests that participants consistently perceived the practice match to be less important and provides some rationale for the use of the PICT to distinguish between levels of perceived importance reported by elite athletes in real competitive situations.

The design of this study was somewhat limited, because, in the data collection phase, all the participants did the PICT immediately before a minor competition first and immediately before a major competition on the second

occasion. The design would have been stronger if half of the participants had done the PICT immediately before a minor competition and the other half immediately before a major competition on each occasion. According to the nature of the competition, it was not possible to have participants do that, because practice matches took place before the real competition. In any event, familiarity with the test would have been likely to lead to lowered scores on Occasion 2, acting against the prediction for construct validity proposed here.

It should be noted that this test of validity was independent of the main study and used different participants. It also used different participants from the validation studies on the SCAT-T and the CSAI-2T reported in Chapter 3, and from those who participated in the validation of the test of perceived uncertainty in Chapter 5. This is different from trends in some research, where data from the same group of participants is used both as the main examination of reliability and validity and to test a hypothesis, a practice that is methodologically flawed. It is suggested that the use of separate samples for validation work on different tests and for the main study strengthens the argument for the validity and reliability of the tests developed in this thesis.

There have been few published studies that have devised measures of perceived importance, as conceived by Martens et al, in the context of the theory of competitive anxiety. Lox (1992) developed a two-item measure of perceived importance where one item measured importance concerning outcome and the other item measured perceived importance related to personal

performance. These items were employed in a study with 52 female intercollegiate volleyball players, whose cognitive and somatic state anxiety and state self-confidence were measured one hour before a competition, along with the items on perceived importance and two parallel items on perception of uncertainty of outcome and personal performance. Pearson product moment correlations between the two importance items was significant as were their correlations with the two uncertainty items. Because Lox did not demonstrate discriminant validity for the perceived importance items, with respect to perceived uncertainty, it cannot be determined whether these correlations indicate that perceived importance and perceived uncertainty covaried in the competitive context or whether the items simply did not discriminate importance from uncertainty. Both importance items correlated negatively with self-confidence state, and both showed a significant correlation with somatic anxiety and self-confidence. Neither item correlated with cognitive anxiety. In that study, data collection was done one hour prior to the competition, which has shown not to reflect pre-competition levels, especially of somatic anxiety, in temporal patterning studies (Jones, 1996). Also, Lox did not state any validity or reliability for the measurement tool. Nonetheless, the two item measure of perceived importance developed by Lox appeared to measure perceived importance, as reflected in the significant correlations with CSAI-2 and self-confidence subscales.

It was concluded that the PICT demonstrated the capacity to distinguish between sports events of different objective importance, and, thus, expected

perceived importance. The items showed a degree of consistency and the scale showed some stability across occasions. The PICT was, thus, considered appropriate for the purpose of this thesis, which was to measure athletes' perception of the importance of various sports situations to examine predictions of the Martens et al. (1990) theory of competitive anxiety.

CHAPTER 5:

THE DEVELOPMENT AND VALIDATION OF THE PERCEIVED UNCERTAINTY OF COMPETITION TEST

Introduction

The Perceived Uncertainty of Competition Test (PUCT) is a measurement tool that was necessary to develop for this thesis, along with the Perceived Importance of Competition Test, which was described in Chapter 4. The PUCT was developed to measure an athlete's perceived uncertainty of outcome of an impending competition. According to Martens, Vealey, and Burton (1990), uncertainty of the outcome is one of the two main components of the environment that elicit perception of threat and state anxiety. Martens et al. proposed that uncertainty, such as being uncertain whether the outcome will be a win or a loss, is impossible to remove from competition. Only other sources of uncertainty, such as athletes' uncertainty about their own or their opponent's ability, or the effect of the outcome's consequence on them, are appropriate to modify in order to manage athletes' state anxiety. Perceived uncertainty also relates to the uncertainties that athletes have as to whether they can meet the demands of the situation, such as an athlete's ability to perform up to their capabilities. Both perceived uncertainty and perceived importance tests were necessary to test the theory of competitive anxiety proposed by Martens et

al. This chapter deals with the development of a test of perceived uncertainty of competition.

Measurement Instrument

A brief measure for the variable was developed, based on the Martens et al. (1990) competitive anxiety theory, which specifically stated that there are several sources of uncertainty, which are based on:

- a) information about the quality of the standard to which the performance will be compared,
- b) information about the self's performance capability,
- c) estimates of the probability that actual performance will approximate performance capability, and
- d) estimates of the probability that actual performance will determine performance outcome.

(Martens et al., 1990, p. 227)

The test for perceived uncertainty comprised three statements asking an athlete about their perception of the level of goal they aim to achieve or their opponent's performance level in the competition, their perception about their own ability to perform in the competition, and their perception of how important their performance was to the outcome of the competition. The precise wording of these three questions is presented in Figure 5.1. It is

important to note that item number three was a reversed item. Whereas circling 1 for the first two items gets the highest score of five, circling 1 for the last item gets the lowest score of one. The reason for reversing an item in the test was to ensure that participants thought about their responses. The response format was a five point Likert scale, from 1 = (nothing) to 5 = (a lot), for the first item, from 1 = (not at all), to 5 = (extremely certain), for the second item, and from 1 = (extremely important), to 5 = (not at all), for the third item.

1. What do you know about the difficulty of this competition or the standard of your opponent in this competition?

1

2

3

4

5

Nothing

a little

a moderate amount

Quite a lot

A lot

2. How certain are you about your ability to perform in this competition?

1

2

3

4

5

Not at all

Little

Moderate

Certain

Extremely certain

3. How crucial is your performance to the outcome of this match?

1

2

3

4

5

Extremely important

Important

Moderate

Little

Not at all

Figure 5.1. The Perceived Uncertainty in Competition Test

Participants who scored “nothing” and “not at all” about their perception of level of goal to achieve or their opponent’s performance level, or how certain they were about their own ability to perform, received the highest score of five from the uncertainty test, as did participants who scored “not at all” about how important their performance was to the outcome. Participants who scored “a lot”, “extremely certain”, and “extremely important” for the questionnaire items, got the lowest score of one. A high score on the test reflected a higher level of uncertainty perceived by athletes about the upcoming competition.

It should be noted that the first question was dual purpose, because the test was designed to measure perceived uncertainty in various kinds of sport. Some sports involve competition against an opponent, whereas others involve competition against a standard or one’s own best previous performance. To cover all kinds of competition types, the question needed to be dual purpose. The questionnaire was developed based on the existing theory of competitive anxiety (Martens et al., 1990). The first question referred to information, and thus, uncertainty, about the standard of the goal to achieve or the skill level of the opponent, uncertainty aspect (a) proposed by Martens et al. The second question examined information concerning uncertainty about one’s own ability, uncertainty aspect (b) proposed by Martens et al. The third question did not directly assess any of the four aspects of uncertainty proposed by Martens et al. Rather the rating of the importance of player’s performance to the outcome required players to estimate the probability that the outcome would depend on

their performance, uncertainty aspect (d) in the list of Martens et al. In addition, to judge the importance of their performance to the outcome, players would be likely to estimate the probability that they would perform up to their capability, uncertainty aspect (c), since, especially in team sport, if they performed well their performance would be more likely to influence the outcome than if they performed badly.

The measurement instrument was validated by having participants complete it 15 to 20 minutes before a competition, for which coaches and participants were relatively certain of the results and outcome. These were matches against weak opponents. Responses in that competition were compared with those given 15 to 20 minutes before a competition for which coaches and participants were highly uncertain of the result and consequences. These were matches against challenging opponents. In uncertain condition matches, such as the later rounds of a championship, athletes who have reached that stage have already defeated many opponents with skill levels lower than themselves. Thus, most opponents that athletes confront in the later rounds will have similar skill levels to them, creating an atmosphere of more difficulty, which would be likely to raise athletes' feelings of uncertainty about the outcome or their skill level compared to their opponent. Hence, athletes should be more uncertain about the outcome in higher round matches, than in lower round matches. To test the construct validity of the PUCT, it was predicted that ratings for a challenging match would be significantly higher

than those for a match against a weak opponent, whom they would expect to beat.

Methods

Participants

Thai athletes from basketball, boxing, soccer, and volleyball volunteered as participants. There were 50 participants aged 18 to 25 years (male = 38, female = 12), all collegiate level, basketball ($n = 12$), boxing ($n = 4$), soccer ($n = 22$), and volleyball ($n = 12$) athletes. Participants were volunteers who were told what the study involved, and they were invited to participate. Also, they were told that they were free to withdraw from the study at any time.

Design

The study used a repeated measures design, where data were obtained on two occasions from the same participants. The first occasion was 15 to 20 minutes before a lower round match against a weak opponent, and the second occasion was 15 to 20 minutes before a match against a challenging opponent. According to the nature of this study, the first occasion had to be before a match against weak opponents for all the participants. It was not possible to arrange challenging opponents in the lower round matches which come first, or to find weak opponents in the later rounds. Thus, a design in which orders of perceived uncertainty were balanced could not be used. As in the study of the

PICT, lower scores might be expected on the PUCT on Occasion 2 when participants are familiar with the test, and this would act against the prediction made to examine construct validity of the PUCT. To make sure that athletes perceived more uncertainty on the second occasion, participants and their coaches, independently, were verbally asked to confirm their level of certainty of the outcome and consequences on both occasions. All of participants and their coaches confirmed that their level of uncertainty were higher for the second occasion than the first occasion. The time between occasions was approximately one week.

Measures

To translate the test into Thai language I translated the instructions, scale description, (e.g., not at all), and items into Thai, verbatim. An Australian non-sport psychologist, who speaks fluent Thai, translated the scales back into English, blind to the nature of the test and the English language original. It was found that the translated material was consistent with the original. This procedure demonstrated that the originals were translated clearly, supported the face validity of the scales, and gave assurance that the questions would be understood by Thai athletes, so testing could commence. The English language version of the PUCT is presented in Appendix C, along with the instructions given to respondents.

Procedure

The general purpose of the study was explained to participants, although the specific issue under examination was not revealed, and their

questions were answered. The duration of the study and the nature of the tests were also described to the participants. They were also told that their responses to the questionnaires would be kept totally confidential, only group results would be published and their names would be represented by code numbers in the records. They were told that they were free to withdraw at any time and they signed consent forms. Participants were tested for their perceived uncertainty using the PUCT, on two occasions, first, 15 to 20 minutes before a match against a weak opponent, for which it was independently confirmed by coaches and athletes, verbally, prior to the match, that they were relatively certain of the outcome and consequences. Second, participants were tested 15 to 20 minutes before a match against a challenging opponent, for which it was verbally confirmed independently by coaches and participants, prior to the match, that they were relatively uncertain of the outcome and consequences of the competition.

Results

Direct examination of the PUCT for stability was not possible using the standard test-retest or split half methods. Because perceived uncertainty is a state variable, that is, the nature of perceive uncertainty changes from situation to situation, use of a test-retest reliability analysis was not strictly appropriate. Also, with only three items, the split half reliability method was not appropriate to test the stability of PUCT.

To test the stability of the PUCT, a correlation was calculated between test score on Occasion 1 and 2. The correlation between occasions was high, $r = .92$, $p < .001$, indicating that participants retained their positions but increased their scores, for the challenging match, reflecting greater uncertainty in that situation.

To estimate the internal consistency of the PUCT test, Cronbach's (1951) alpha coefficient was calculated for each occasion separately. The alpha value of, $\alpha = .90$, on Occasion 1, and, $\alpha = .75$, for Occasion 2, indicated that on each occasion participants responded in a highly consistent manner to the three items in the PUCT.

Means and standard deviations for both occasions of testing were, $M_1 = 9.76$ ($SD = 2.87$), for the weak opponent or more certain match, and, $M_2 = 12.32$ ($SD = 2.70$), for the challenging opponent or less certain match. Visual inspection of the difference scores revealed that the normality assumption was satisfied. A dependent samples t test was used to examine the difference between pre- and post-test scores. Results for the PUCT showed significantly higher levels of perceived uncertainty before the match against challenging opponents, than before the match against weak opponents, $t(49) = 16.05$, $p < .001$.

Discussion

The state nature of the PUCT meant that the use of standard test-retest methods was inappropriate. Perceived uncertainty changes from situation to situation, so a test-retest reliability analysis was not conducted. Also, with only three items, the split half reliability method would not be appropriate to test the stability of the PUCT.

The stability of the PUCT was supported by a high correlation across the two occasions overall. The correlation of, $r = .92$, $p < .001$, indicated stability of the PUCT, because it showed that participants largely retained their position across the two occasions, even though they typically perceived the more challenging opponent as representing a higher level of uncertainty, as reflected in the mean rating of $M_1 = 12.32$ before the game against the equal skilled opponent, compared with the mean rating of $M_2 = 9.76$ for the weaker opponent.

Internal consistency of the PUCT was supported by high values of Cronbach's alpha coefficient on both occasions. It should be noted that only three items in the PUCT is rather few to use Cronbach's alpha coefficient. Nonetheless, the results found on both occasions did give some indication of sound internal consistency. The lower level of consistency found for Occasion 2 might have occurred because the sources of increased uncertainty were not equally affected by the change in conditions. For example, although participants might have been more uncertain about their capability of being

successful, they might have been aware that their opponents would be more competent than in the lower rounds. Nonetheless, the values of the alpha coefficients were above the standard criterion of 0.7 on both occasions, demonstrating sound internal consistency for the PUCT.

Construct validity of the PUCT was supported by the significant difference between administrations of the test under varying levels of predicted uncertainty. The test showed that levels of uncertainty that athletes perceived immediately before a challenging match were significantly greater than those immediately before a match against weaker opponents. It was concluded that the study revealed the PUCT to show characteristics of a valid test to measure athletes' perception of uncertainty in sport competition.

The mean for the relatively certain condition was above the midpoint, which is nine, indicating level of uncertainty was moderate, even in a fairly certain condition against weak opponents. The reason for the moderate uncertainty score in relatively certain conditions may be because participants did the test for the first time. Thus, uncertainty about the test itself could cause increase in uncertainty level. This competition situation was also not devoid of uncertainty. Everyone occasionally loses to objectively weaker opponents and sometimes performs below their capabilities. Early in a tournament, some uncertainty about how all individuals and teams will perform is not surprising. It is also not possible to be completely certain about the contribution one will make to the team, as for example, others might perform exceptionally well and contribute most to success of the team on that occasion. It should also be noted

that the challenging match did not produce extreme uncertainty in the sample as a whole. Again, this was not the most uncertain situation that most participants could envisage, which is consistent with it being a difficult game, but one in which players knew who the opposition was and were also aware who the opposition had previously beaten in the competition, and by what margin. Also, it is likely that they had some expectation of how they would play and how their performance was likely to affect the outcome, especially in boxing, an individual sport. Further, competent athletes, who had played several games in the competition would be expected to have some idea about their own capabilities and how well they were performing in that event. Thus, they had several sources of information to moderate their level of uncertainty.

Similar to the PICT test, the PUCT was examined using an independent sample from that which participated in the main study and the other studies examining the psychometric qualities of tests (Chapter 3 and 4). This avoided any methodological problems associated with validation of a test on the same data used to test hypotheses. It also avoided any confounding of the perceived importance and uncertainty variables which could have occurred had both PICT and PUCT tests been validated on the same participants in the same situation.

Few published studies have reported measures of perceived uncertainty and perceived importance, as by Martens et al. conceived them in the context of the theory of competitive anxiety. Lox (1992) developed a two-item measure of perceived uncertainty where one item measured uncertainty concerning

outcome and the other measured uncertainty about personal performance.

These items were employed in a study with 52 female intercollegiate volleyball players, whose cognitive and somatic state anxiety and state self-confidence were measured one hour before a competition, along with the two items on perceived uncertainty and two parallel items on perception of importance of outcome and personal performance. Pearson product moment correlations between the two uncertainty items was significant as were the correlations with the two importance items. As noted in Chapter 4, it is not clear whether this shows that perceived uncertainty and importance covaried in a competitive situation, as Martens et al. (1990) claimed they often do or whether the items simply do not discriminate between PU and PI. Both uncertainty items correlated negatively with self-confidence, but neither showed a significant correlation with somatic anxiety. Only uncertainty about performance correlated with cognitive anxiety and the size of this correlation was relatively small to compared the others mentioned here although it was significant. In the study, data collection took place one hour prior to the competition. This has been found to be too distance to reflect pre-game levels in temporal patterning research (Jones, 1996). Lox did not test the validity or reliability of PU items. Neither did he state any reason for using those two items, unlike the present study, where the three items were devised to reflect the Martens et al. statement of the elements of perceived uncertainty. Nonetheless, the PU items developed by Lox appeared to measure perceived uncertainty, as shown by the significant correlations with CSAI-2 and self-confidence subscales.

Since this research was conducted, Prapavessis, Cox, and Brooks (1996) have reported the development of a similar test of perceived uncertainty. Statements in that study consisted of four items which were developed based on the Martens et al. (1990) theory of competitive anxiety. The four items in the Prapavessis et al. test of perceived uncertainty were devised carefully, based on the four sources of uncertainty stated by Martens et al. (1990). Although the four items did not explicitly ask participants to respond to the four sources of uncertainty mentioned in the theory of competitive anxiety, to answer the questions, participants were required to refer to the four sources of uncertainty in the theory. Prapavessis et al. also presented the four perceived uncertainty items randomly combined with their items proposed to measure perceived importance. They then performed an exploratory factor analysis. They showed that two relatively independent factors emerged, one consisting of the perceived uncertainty items and the other comprising the perceived importance items. It should be noted that although this supports the consistency of the two sets of items, it does not provide information on validity. Although the development method for these items seemed to be substantive, the data used to test for reliability and validity of the measurement tool was the same as that used to test the model of competitive anxiety, a practice that was avoided in the present thesis, as it is claimed that it is methodologically flawed.

In the present thesis, through the processes described in this chapter, the test of validity and reliability of the Perceived Uncertainty in Competition Test conducted here, suggested that the PUCT was a sound measure of perceived

uncertainty to use in the examination of the matching hypothesis and the theory of competitive anxiety.

CHAPTER 6: MEDITATION, PROGRESSIVE RELAXATION AND MULTIDIMENSIONAL STATE ANXIETY

Introduction

In this study, the matching hypothesis, proposed by Davidson and Schwartz (1976) was partially examined by comparing the effects of a meditation procedure and a relaxation procedure on cognitive and somatic state anxiety. Aspects of the model of competitive anxiety in sport, developed by Martens, Vealey, and Burton (1990) were also examined. According to Martens et al. (1990), state anxiety should be viewed as multidimensional rather than unidimensional. The multidimensional approach to anxiety was first proposed by Liebert and Morris (1967). They noted the distinction between worry and emotionality components of test anxiety. These components were identified by Davidson and Schwartz (1976) as cognitive anxiety and somatic anxiety, respectively. Cognitive anxiety is characterised by negative expectations, lack of concentration and disrupted attention, whereas somatic anxiety refers to a person's perception of the physical symptoms of autonomic arousal, such as rapid heart rate, shallow, rapid breathing, butterflies in the stomach, and tight muscles. According to Davidson and Schwartz (1976), cognitive anxiety tends to impair performance on cognitively based tasks or cognitive components of complex tasks, largely through its effect on attentional processes. Somatic anxiety impairs performance on physiological and motor tasks through its

effects on the autonomic nervous system. They proposed that coping with these two components of state anxiety requires different stress management techniques for each component. Matching hypothesis was the term Davidson and Schwartz (1976) used to reflect the process of matching the stress management technique to the specific state anxiety component to be controlled. The Davidson and Schwartz (1976) matching hypothesis stated that somatic anxiety can be managed by using physical relaxation techniques, such as progressive muscle relaxation, EMG biofeedback training, hypnosis, meditation, and autogenic training. Cognitive anxiety can be managed by using cognitive techniques, such as thought stopping, goal setting, positive self-talk, and cognitive restructuring.

Martens, Burton, Vealey, Bump, and Smith (1990) developed the Competitive State Anxiety Inventory - 2 (CSAI-2) as a sport specific multidimensional measure of the cognitive and somatic components of competitive state anxiety. Factor analysis of their scale revealed a third component in addition to the expected cognitive and somatic components. This component was identified as self-confidence. Martens et al. (1990) proposed that cognitive anxiety and self-confidence represent opposite ends of the same cognitive evaluation continuum. They hypothesised that cognitive anxiety occurred in the absence of self-confidence and vice versa, but, in subsequent studies they found that the two components were only moderately negatively correlated to each other. Although Davidson and Schwartz (1976), Martens et al. (1990), suggested that according to the matching hypothesis, each

component of state anxiety requires specific stress management techniques to control it. The question of whether there are any techniques that effectively reduce both components of state anxiety, cognitive and somatic A-state, still remains to be resolved. Martens et al. (1990) stated

Perhaps any effective procedure that reduces cognitive or somatic A-state will be effective in reducing both components of anxiety due to their interrelationship in competitive situations. These questions and other stress management issues await scrutiny by researchers (p. 212).

In addition to effects on one dimension of state anxiety through alteration of the other, it is possible that some techniques might directly alter both cognitive and somatic state anxiety. It could be that such techniques capable of changing environment that mediates the stress could alter both components of state anxiety at the same time.

Stress, in general, can also be managed by changing the environment that mediates the stress. Martens et al. (1990) proposed a theory of competitive anxiety in sport. The two main components of this theory are the level of uncertainty athletes perceive as to whether they can meet the demands of the situation, and the importance of the outcome to them. Changing athletes' point of view about the two main components, or, in other words, changing athletes' perceptions about the uncertainty of the situation and the importance of the outcome, would also be an effective way to reduce the anxiety associated with

competition, according to the competitive anxiety theory. This relationship is depicted in Figure 2.2 in Chapter 2. Specific techniques and procedures to manage stress through athletes' perceived uncertainty and perceived importance were also proposed by Martens et al. (1990).

Two aims of the present study, were to examine the Davidson and Schwartz (1976) matching hypothesis, and the competitive anxiety theory (Martens et al., 1990). Two benefits of examining the propositions are that it might help to test and clarify the current theoretical position with respect to matching stress management techniques to the type of state anxiety manifested and might suggest refinements or modification to the theory of competitive anxiety (Martens et al., 1990). Also, the effective exploitation of a single technique that can manage both components of state anxiety at the same time would be of great value in practice.

Meditation is a class of techniques that has been claimed by researchers (Jones, 1991; Layman, 1980; Schwartz, Davidson, & Goleman, 1978) to be effective in reducing both cognitive and somatic anxiety. Meditation techniques have long been used to reduce anxiety and enhance performance, under the eastern philosophy of the mind and body coordination among martial arts practitioners (Hyans, 1982). Stress management through meditation would be acquired by putting oneself in a one pointedness state of mind, which is the common goal in most kinds of meditation techniques (Buddhathasa, 1990). Through the one-pointedness state of mind, practitioners would stop any thoughts, either positive or negative, and also relax their physical body at the

same time (Sekida, 1975; Vajiranana Mahathera, 1975). It is also proposed that meditation can cope with the two antecedents of state anxiety in athletes, proposed by the theory, namely perceived uncertainty and perceived importance (Martens et al., 1990). As stated by Goleman (1971), meditators increase the ability to perceive their situation and other people logically. Others (Buddhathasa, 1991; Layman, 1980) have suggested that meditators tend to perceive their environment more positively than non-meditators. If so, meditational techniques should minimise negative perception of the environment, such as overt high levels of perceived uncertainty and perceived importance of the outcome.

Statement of Hypotheses

Based on these characteristics of meditation, it was hypothesised in this study that:

The meditation group would display a significantly greater decrease in cognitive anxiety, perceived uncertainty, and perceived importance than the relaxation and control groups.

Decrease in somatic anxiety in the meditation and relaxation groups would be significantly greater than in the control group.

Increase in state self-confidence in the meditation group would be significantly be greater than in the relaxation and control groups.

Methods

Participants

Forty-eight elite and sub-elite weightlifters (male = 24, female = 24), between 18 and 30 years of age, who were supported and trained in the project run by the Sport Authority of Thailand in preparation for the 1998 Asian Games, volunteered as participants. These athletes participated by permission and cooperation of the Sport Authority of Thailand. Participants signed consent forms and were told what the study involved and that they were free to withdraw from the study at any time, and .

Design

The study adopted a traditional experimental design with a meditation condition ($N = 16$), compared to a relaxation condition ($N = 16$), and a control condition ($N = 16$), which was a flexibility program of equal duration to the meditation and relaxation groups, a procedure used to control for attention given to the participants. A pre-test/post-test design was employed to check for changes in competitive anxiety dimensions, as well as athletes' perceived importance and perceived uncertainty resulting from the intervention. Repeated measures of competitive anxiety, perceived importance, and perceived uncertainty were also taken each week during the ten week training period to observe the progression of changes in competitive anxiety dimensions, as well as to note progressive changes in perceived uncertainty and perceived importance.

Measures

The measures of trait and state anxiety were Thai language versions of the Sport Competition Anxiety Test (SCAT; Martens, 1977) and the Competitive State Anxiety Inventory-2 (CSAI-2; Martens et al., 1990). The perceived importance and perceived uncertainty measures were devised for the present research based on the description of perceived importance and perceived uncertainty in Martens et al. (1990), as there were no published, validated measures at the time of testing.

Trait Anxiety. The Sport Competition Anxiety Test (Martens, 1977) is a reliable, valid measure, which has been widely used in research (Gould et al., 1977; Martens et al., 1990; Smith, 1983; Vealey, 1986). It comprises 15 questions, ten statements on anxiety, and 5 statements which are spurious. Results are given on a three point scale, which runs from 1 (hardly ever) to 3 (often). It is usually presented as the Illinois (or other location) Competition Questionnaire to avoid expectancy effects associated with the term “anxiety”. A Thai language version (SCAT-T) was created as described in Chapter 3. Tests of the reliability and validity of the Thai language version of the SCAT, presented in Chapter 3, supported the construct validity of SCAT-T. Test-retest reliability between both occasions when the SCAT-T test was completed by the same athlete were high, which confirmed the reliability of the test. Internal consistency of the test was confirmed by Cronbach's alpha coefficient analysis. Results of high alphas, which indicate high internal consistency of tests were found for the ten scoring items of SCAT-T. SCAT-T measures were moderately

correlated with each subscale of the CSAI-2T on all three occasions, with higher correlation on the same occasion, and negative correlations with self-confidence subscales. It was concluded that the SCAT-T had sound test-retest reliability, sound internal consistency, and sound construct validity, based on the results of the tests shown in Chapter 3.

State Anxiety. The Competitive State Anxiety Inventory-2 (Martens et al., 1983) is a test of multidimensional state anxiety, consisting of three subscales: cognitive anxiety, somatic anxiety, and self-confidence. It comprises 27 questions, nine questions on each component. It is a reliable and valid measure that has been widely used in research (Burton, 1988; Gould, Petlichkoff, Simon, & Vevera, 1987; Martens et al., 1990; Weinberg, 1984; Yan Lan & Gill, 1984). Results are given on a four point scale, which runs from 1 (not at all) to 4 (very much so). A Thai language version was created as described in Chapter 3. Tests of the reliability and validity of the Thai language version of the CSAI-2 (CSAI-2T) are presented in Chapter 3. For reliability, internal consistency, and construct validity for the SCAT-T and the CSAI-2T, see Chapter 3. It was concluded that the CSAI-2T had sound reliability, sound internal consistency, and acceptable construct validity, based on the results of the tests shown in Chapter 3.

Perceived Importance of Competition Test (PICT). No valid test of perceived importance was located, so a test was developed to measure athletes' perception of the importance of an impending competition. It comprised of two questions, based on the characteristics of perceived importance as described by

Martens et al. (1990), the first, asking athletes how important the competition is to them, and the second asking their level of agreement with the statement “the outcome of this match means a lot to me”. items were rated on five point scales, from 1 (not important) and (strongly disagree) to 5 (extremely important) and (strongly agree). The validity of the PICT was examined in Chapter 4.

Perceived importance is situation specific, so it was not appropriate to examine test-retest reliability. Comparison of scores obtained before a major competition and those before a minor competition using a paired t-test, showed that those before the major competition were significantly higher, supporting the construct validity of the scale (see Chapter 4). A high correlation between occasions suggests that the PICT test is reliable.

Perceived Uncertainty of Competition Test. As no validated test was located in the literature to measure this variable, a measure was developed to assess perceived uncertainty of outcome of an impending competition. The Perceived Uncertainty of Competition Test (PUCT) comprised three questions based on the characteristics of perceived uncertainty as described by Martens et al. (1990), asking the athletes how certain they were of: their knowledge of the goal to attain, or their opponent’s ability; their knowledge of their own ability in the competition; and how important their performance was to the outcome of the competition. Items are rated on five point Likert scale, from 1 (nothing), (not at all), or (extremely important) to 5 (a lot), (extremely certain), or (not at all). Participants who score nothing and not at all about their perception of level of goal to achieve or their opponent’s performance level, or how certain they are

about their own ability to perform, get the highest score of five from the uncertainty test, as do participants who score not at all about how important their performance is to the outcome. Participants who score a lot, extremely certain and extremely important for the questionnaire items, get the lowest score of one. The validity of the test was examined in Chapter 5. Because perceived uncertainty is situation specific, test-retest reliability was not considered.

Comparison was made of PUCT scores for a game against opposition agreed to be relatively weak by coaches and players, and scores against opponents agreed to to relatively strong or challenging. A paired t-test indicated, as predicted, that perceived uncertainty was significantly higher for the challenging opposition. It was concluded that the PUCT was a valid measure of perceived uncertainty in sport competition.

Treatments

Three intervention conditions were employed in this study; progressive muscle relaxation, Anapanasati meditation, and a control condition, consisting of stretching exercises. Participants were assigned to groups on the basis of their SCAT-T score by distributing even numbers of high and low SCAT-T participants in each group. The duration of the intervention for each group was 10 weeks.

Progressive Muscle Relaxation

Jacobson's (1930) progressive muscle relaxation (PR) consists of a series of exercises that involve contracting a specific muscle group, holding the contraction for several seconds, then relaxing. The exercise progresses from one muscle group to another in a systematic order from the feet upwards to the head and face. The tensing and relaxing procedure helps people to recognise the difference between tension and relaxation. At the beginning of each session in this study, participants were asked to sit comfortably in a quiet, undisturbing environment. They were asked to inhale deeply, and exhale slowly for two or three breath cycles. They were then required to tense and relax each muscle group, and while maintaining the relaxation of the particular muscle group, progress to tensing and relaxing another muscle group, and so on. In each session, the instructor read a script which led athletes in tensing and relaxing each major muscle group throughout the whole body (see Appendix E). The participants tensed each muscle group for approximately 10 seconds and then relaxed each muscle group for approximately 30 seconds. Once relaxation of the whole body was achieved, participants in the group maintained the relaxed state for two or three minutes. Again, they were asked to inhale deeply, and exhale slowly for two or three breath cycles. The relaxation group practised their technique for thirty minutes, three times per week under the guidance of instructors. Participants were expected to practice on their own on the remaining days of the week. They completed training logs every time they practised, so that a check could be made on the frequency of their independent

practice. Emphasis was placed on monitoring the progress of the technique, in justifying completion of the log every time the players practised.

Anapanasati Meditation

Anapanasati meditation (AM) should also be practised in a quiet environment. The session started by having people sit in a comfortable position, preferably a cross legged sitting position. Athletes closed their eyes, and were told to relax all muscles in their body. Then they started meditation. The instructor informed athletes before each session to breath through their nose and focus their concentration on their breathing. Athletes were asked to focus their attention to follow their breath by visualising their breath as smoke in a clear glass tube which ran from the tip of their nose, all the way inside their body and ending at their navel. A breath counting technique was also used to help athletes concentrate. Athletes were required to count slowly from one to five from the beginning to the end of each inhalation, and slowly count one to five from the beginning to the end of each exhalation. Athletes were told by the instructor to cut off all thoughts and concentrate only on breathing. They were also told that distracting thoughts or mind wandering were to be expected and did not mean that the technique was performed incorrectly: They were told to redirect their thoughts back to their breathing, once they realised that they had lost concentration. At the beginning of the session, athletes were told to concentrate on long deep breaths until they realised the feeling associated with the long breath, then shift to concentrating on short shallow breathing until they realised the feeling associated with the short breath. Then they were required to

concentrate on regular breathing until the end of the session. The meditation group practised their technique for thirty minutes, three times per week under the guidance of instructors. Participants were expected to practice on their own on the remaining days of the week. They completed training logs to permit a check to be made on the frequency of their independent practice.

Stretching Exercise

Stretching exercises, in this case were designed for use as a placebo for the control group (C). In each session, the instructor led athletes in stretching each body part throughout the whole body. Exercises used were normal stretching procedures that are used in warming up and cooling down for sports, but the emphasis was placed more on the duration of each exercise. The control group practised this technique for thirty minutes, three times per week under the guidance of instructors. Participants were expected to practice on their own on the remaining days of the week. They completed training logs to permit a check to be made on the frequency of their independent practice. After each session, a heart rate monitor was used to monitor each athlete's heart rate, in order to increase the feeling of attention given to the control group.

Procedure

The nature of the study was explained to participants and questions were answered. Participants were informed of the duration of the study, the nature of the tests, and the intervention they were to be given. They were also told that

the results would be confidential and they could withdraw from the study at any time. Those who volunteered to take part signed an informed consent form.

Data collection started three months before a major competition. The Thai language version of the Sport Competition Anxiety Test (SCAT-T), was given to participants at the beginning and at the end of the study. Participants were matched on the basis of their SCAT-T score, and then randomly assigned to one of three groups, which were the meditation group (AM), the progressive relaxation group (PR), and the control group (C). The Thai language version of the Competitive State Anxiety Inventory-2 (CSAI-2T), the Perceived Uncertainty of Competition Test, (PUCT) and the Perceived Importance of Competition Test (PICT), were given to participants in all three groups every week 20 minutes prior to competition, or the weekly lift test. This lifting test was a regular challenge, which was conducted in a stressful atmosphere to simulate competition. The meditation and relaxation groups practised their respective technique for thirty minutes, three times per week under the guidance of instructors. Participants were expected to practice on their own on the remaining days of the week. They completed training logs each time they did practice, to check on frequency of independent practice. The control group were introduced to stretching exercises and physiological measures as a placebo, and worked on these three times per week for thirty minutes, every week under the guidance of instructors. They were also encouraged to practice independently every day and completed a similar training log to the other participants. The study extended over ten weeks from the pretesting until the end of intervention.

The ten week period of intervention was decided based on giving sufficient time for PR and AM to take effect. According to other studies and the literature on stress management in sport (Maynard, Hemmings, & Warwick-Evans, 1995; Morris & Summers, 1995), it has been suggested that stress management techniques such as PR or applied relaxation can become very effective in less than ten weeks, especially when practised regularly. During the period of training and testing, to minimise the possibility of interaction with other participants, both from the same and from the other two conditions, participants were asked not to talk to others about the study until their involvement was over. In any event, the design included an equal amount of attention given to participants in each group and equally plausible activities, so any effect of demand characteristics should have been negligible.

Results

Introduction

This results section first includes the self-report of practice of the assigned intervention, reflected in the training logs completed by participants to check on equivalence of the treatment manipulations. The patterns of perceived importance, perceived uncertainty, somatic anxiety, cognitive anxiety, and self-confidence are then summarised in terms of means and standard deviations. The main section of the chapter follows, in which, perceived importance, perceived uncertainty, somatic anxiety, cognitive

anxiety, and self-confidence scores are statistically analysed to examine the effects of the interventions.

Practice of Assigned Treatment

Prior to considering the statistical results for state anxiety and its antecedents, it should be noted that the results from the training log showed that participants in all three groups had done trainings on their own, the time of independent training being equivalent across groups. Participants practised five times per week including the three 30 minutes sessions with the instructor. In the early stages of training, both meditation and relaxation groups frequently reported cramp and numbness of leg muscles. This problem was reported less and less as training time passed. The training log, thus, established equivalence of practice time for the three conditions, so it was considered to be justifiable to examine differences in treatment effects.

Summary of Descriptive Data

For perceived importance and perceived uncertainty, the means and standard deviations for all 10 occasions are presented in Table 6.1. The means and standard deviations for the AM, PR, and C groups for somatic anxiety, cognitive anxiety and self-confidence on all 10 occasions are presented in Table 6.2.

Table 6.1

Means and Standard Deviations for Perceived Uncertainty and Perceived Importance, on Occasion 1 to 10 for AM, PR, and C Groups (N = 48).

Variable	Occ.	AM		PR		C	
		Mean	SD	Mean	SD	Mean	SD
Perceived Importance	1	7.31	1.01	7.12	1.36	7.31	1.45
	2	6.68	1.01	6.69	1.08	6.94	1.53
	3	6.62	1.02	6.69	0.95	6.62	1.59
	4	6.75	0.93	6.52	0.96	6.62	1.63
	5	7.75	1.53	8.25	1.06	8.31	1.01
	6	6.69	1.19	6.50	1.09	6.69	1.54
	7	6.50	1.26	6.50	1.09	6.62	1.62
	8	6.31	0.95	6.50	0.52	6.69	1.70
	9	6.19	1.17	6.56	1.15	6.81	1.47
	10	6.12	1.15	7.62	1.31	8.12	1.26
Perceived Uncertainty	1	10.19	2.14	10.06	1.65	10.18	2.17
	2	10.06	2.38	10.25	2.21	9.87	1.82
	3	10.06	2.32	10.31	2.12	9.87	2.15
	4	10.31	2.60	10.31	2.18	10.18	1.76
	5	10.37	2.85	11.37	2.12	11.25	2.62
	6	9.75	2.62	10.19	1.90	10.12	1.86
	7	9.81	2.56	10.06	1.98	10.06	1.77
	8	9.44	2.19	10.06	1.87	10.06	1.84
	9	9.25	2.26	10.31	1.62	9.93	1.65
	10	9.18	2.26	10.69	1.62	10.50	1.67

Mean perceived importance scores in Table 6.1 were typically moderate on a scale from 2 to 10, with some notable fluctuation for Occasion 5. Whereas the scores remained relatively stable across the 10 occasions for PR and C groups, there was a consistent reduction in perceived importance for the AM group across occasions, with an increase prior to the competition on Occasion 5. There were noteworthy increases in perceived importance for PR and C groups on another competition day, Occasion 10. For perceived uncertainty, the mean

scores in Table 6.1 were generally moderate, with some clear fluctuations for Occasion 5 and for Occasion 10 for the PR and C groups

Table 6.2
Means and Standard Deviations for Somatic Anxiety, Cognitive Anxiety, and Self-confidence on Occasion 1 to 10 for AM, PR, and C Groups (N = 48).

Variable	Occ.	AM		PR		C	
		Mean	SD	Mean	SD	Mean	SD
Somatic Anxiety	1	19.31	7.29	19.50	5.25	18.56	4.52
	2	17.37	6.47	19.06	5.57	18.87	4.69
	3	16.31	6.15	18.56	5.39	19.00	5.03
	4	14.56	5.24	17.44	6.32	19.19	5.05
	5	14.50	6.10	15.37	6.03	21.00	4.30
	6	14.56	5.73	15.69	5.21	19.87	5.38
	7	13.87	6.14	16.00	5.55	19.12	5.02
	8	12.19	3.85	15.44	5.23	19.06	4.71
	9	12.87	4.88	13.81	4.13	19.25	4.65
	10	12.75	4.72	14.06	4.20	19.37	4.69
Cognitive Anxiety	1	20.62	7.25	19.37	5.57	19.62	5.12
	2	18.75	7.58	20.25	5.35	20.06	4.78
	3	16.87	7.24	21.06	5.98	20.50	5.44
	4	16.12	7.10	20.87	6.94	20.18	5.32
	5	15.75	7.71	19.81	6.32	22.37	4.74
	6	15.68	7.30	19.69	5.36	20.81	5.54
	7	15.12	7.13	19.81	5.65	20.31	5.27
	8	13.75	4.72	21.12	6.74	20.56	5.23
	9	13.50	4.93	20.69	5.94	20.31	5.09
	10	13.37	5.11	20.31	6.12	20.43	5.36
Self-Confidence	1	25.81	5.45	22.56	4.23	27.50	4.73
	2	26.37	5.35	24.06	4.88	27.69	4.44
	3	25.62	5.52	24.31	5.20	27.87	4.90
	4	27.19	6.06	23.62	5.44	27.62	4.81
	5	27.37	6.41	24.75	5.01	26.18	4.80
	6	27.18	5.47	25.00	4.33	27.62	4.83
	7	26.94	5.36	25.37	4.54	28.00	4.44
	8	27.87	5.75	25.37	5.25	28.00	4.40
	9	28.81	5.59	25.37	4.95	27.81	4.66
	10	29.18	5.13	26.06	4.51	28.12	4.30

. Once again the AM group showed a systematic reduction in perceived uncertainty across occasions with a temporary increase on Occasions 4 and 5.

The mean somatic anxiety scores in Table 6.2 were generally moderate for the C group, whereas, for AM and PR groups, means started at a moderate level, but declined gradually from Occasion 1 to Occasion 10, reaching a low level on the later occasions. Mean cognitive anxiety scores were in the mid-range for all groups at the start. Means remained stable for PR and C groups over the 10 occasions. They declined steadily for the AM group across occasions, again reaching a low level on Occasions 8, 9, and 10. For self-confidence, the mean scores on Occasion 1 varied between intervention groups, a pattern not found for the other dependent variables. The self-confidence mean on Occasion 1 for the PR group was considerably lower than that of the C group, which was relatively high at the start, with the AM group between the two. Across occasions, mean scores for the C group remained steady at the relatively high level, except for competition on Occasion 5, where the mean self-confidence for this group dropped a little. Mean scores for AM and PR groups increased steadily with small fluctuations on Occasion 3 and Occasion 7 for the AM group. By the tenth occasion of testing, the level of self-confidence for the PR group was quite high, whereas the level for the AM group was the highest of any group on Occasions 9 and 10, being in the high range of the scale. The means for perceived importance, perceived uncertainty, somatic anxiety, cognitive anxiety, and self-confidence all showed patterns of change

which varied between treatments. It was necessary to determine whether these variations were statistically significant.

Effects of Treatments

The most widely-used statistical method for analysing the effects of interventions, when a pre-test/post-test design has been used, is the mixed design Analysis of Variance (ANOVA), with repeated measures on occasions and the interventions as a between groups factor. Huck and McLean (1975) have pointed out that this design tends to underestimate the F value for the intervention effect. This is because the ANOVA model assumes that the interventions operate on all occasions, so the pre-test scores, which most researchers aim to match across groups, are tested as part of the intervention effect, reducing the actual effect, which occurs only at post-test. For the same reason, the interaction effect in a 2×2 mixed design ANOVA actually represents the main effect of the intervention.

To avoid the underestimate of the intervention effect, Huck and McLean suggest two alternatives to ANOVA can be used, these being gain scores and covariance analysis. In gain score analysis, participants' scores at pre-test are subtracted from their post-test scores and ANOVA is then used to examine differences in the resulting gain scores. Alternatively, covariance analysis tests can be used to test for differences in treatment scores at post-test, with the pre-test score as the covariate. Huck and McLean argue that ANCOVA is marginally the preferred method, because more information results from an

ANCOVA analysis and it does not require more stringent assumptions to be met.

Huck and McLean, do not discuss the use of ANCOVA with state measures as covariates. Research on state variables has become much more common in psychological research since their paper was written more than 20 years ago. ANCOVA assumes that a covariate exerts a relatively stable effect on the dependent variable, such as trait anxiety might have on state anxiety. State anxiety, by definition, does not exert a stable effect, instead varying from time to time. Because pre-test scores on the state anxiety measures do not reflect stable variables to use as covariates, the following examination of main effects of interventions on occasions, after pre-test, employed gain scores. This has the disadvantage of losing some information, particularly concerning interaction. For each variable, pre-test score was subtracted from post-test score on each occasion of measurement after the interventions commenced (week 2 to 10) and the resulting scores were analysed using Two-way repeated measures ANOVA, to determine any intervention effects. There were three levels of the independent groups factor, intervention, namely, AM, PR, and C for each separate occasion, Occasions 2 to 10, and nine levels of the repeated Occasions measure. The results of these analyses for perceived importance, perceived uncertainty, somatic anxiety, cognitive anxiety, and self-confidence are presented separately. Because of the use of gain scores, all figures in this section illustrate pre-test as zero gain on Occasion 1. This represents a baseline from which positive and negative gains arise.

Perceived Importance

As shown in Figure 6.1, perceived importance level in the AM group decreased more than that for the PR and C groups. Perceived importance level in all three groups was higher on Occasions 1, 5, and 10, because these were measures taken before actual competitions, as opposed to lifting tests. The gain scores for the other occasions were between -0.7 and 0, except for the AM group gain score means on Occasions 7, 8, and 9, which were between -0.7 and -1.3.

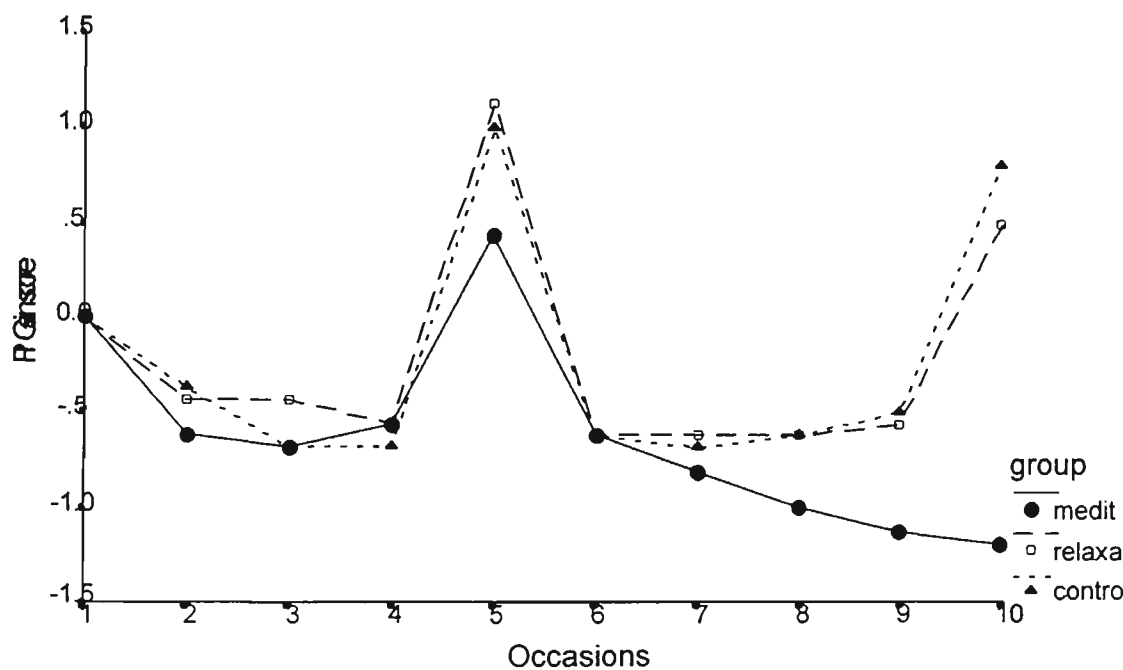


Figure 6.1. Perceived importance gain scores on Occasions 1 to 10 for the AM, PR, and C groups (N=48).

The raw scores in Table 6.1 showed that the lifting tests were perceived to be important, but not as important as the competitions. Perceived importance showed a smaller positive gain for the AM group than the PR and C groups on

Occasion 5, which was one of the two major competitions during the time between pre- and post-test. On Occasions 6 and 7, perceived importance gain for the AM group was in the same range as that for the PR and C groups, but it became more negative on Occasions 8, 9, and 10. On Occasion 10, it was clear that perceived importance gain for the AM group was at its greatest negative level, whereas, that for the PR and C groups, rose sharply from their levels on Occasion 9, to reach high positive gain levels. On the basis of visual inspection, it can be stated that the large negative gain in perceived importance on later occasions occurred in the AM group only, especially on Occasion 10, which was a major competition. On Occasion 10, the perceived importance gain for the AM group reached a greater negative value than at any other time during the study, while perceived importance gain was more positive for PR and C groups than at any other time, except for Occasion 5, another important competition. On Occasions 5, 8, and 9 lower levels of perceived importance for the AM group were also observed.

A two-way mixed design ANOVA was conducted on gain scores from Occasion 1 to each of the nine occasions during the intervention. This two-way ANOVA comparing the three interventions on each occasion separately showed that there was no significant difference between the interventions for perceived importance or between occasions, but there was a significant interaction effect, $F(16, 360) = 5.26, p < .001$, effect size = .45, power = 1.0. Post-hoc Scheffe tests revealed that there were significant differences ($p < .05$) on Occasion 1 and

Occasion 10 for the AM group, but no significant differences between Occasion 1 and any occasion for the PR and C group.

Perceived Uncertainty

Figure 6.2 shows little variation in gain scores for perceived uncertainty for Occasions 2, 3, and 4. On Occasion 5, an important competition, perceived uncertainty showed substantial gains relative to pre-test in the PR and C groups, whereas there was no change of the AM intervention group from the value recorded for Occasions 2 to 4. Perceived uncertainty returned to pre-test levels on Occasions 6, 7, 8, and 9 for the PR and C groups, but increasingly negative gain scores for the AM group indicated that perceived uncertainty was reduced on these occasions, the negative gains being of the order of $-.5$ or greater. Finally, on Occasion 10, another important competition, PR and C groups showed noteworthy positive gain scores, whereas the AM group recorded its largest drop, representing the lowest scores on perceived uncertainty for any group on any occasion.

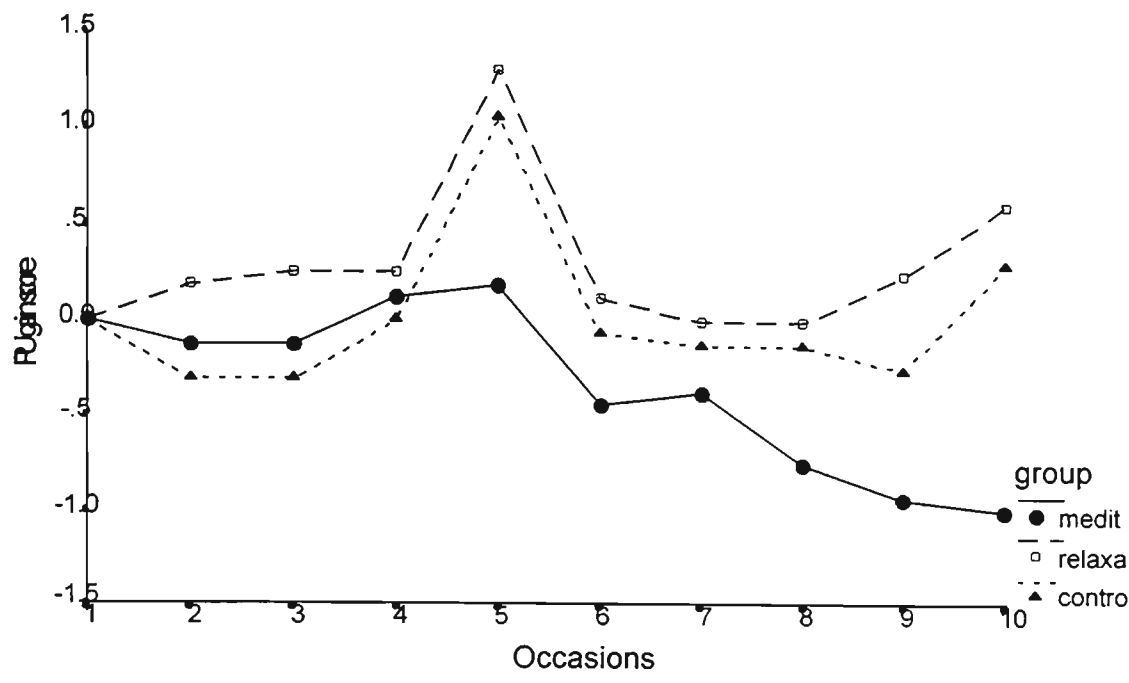


Figure 6.2. Perceived uncertainty gain scores on Occasion 1 to 10 for AM, PR, and C groups (N=48).

Examination of the two-way mixed design ANOVA on gain scores showed that there were significant differences between interventions for perceived uncertainty, $F(2, 45) = 3.34, p < .05$, effect size = .13, power = .60. Post-hoc Scheffe tests revealed that, for perceived uncertainty, there were significant differences ($p < .05$) on Occasion 10 between the AM and the PR and C groups. Also, there was a significant interaction effect, $F(16, 360) = 2.70, p < .001$, effect size = .11, power = .99. Post-hoc Scheffe tests revealed that there was a significant difference between the AM and the PR and C groups on Occasion 10.

Somatic Anxiety

Figure 6.3 showed that somatic anxiety gain score increased positively on Occasion 5 for the C group, and otherwise it remained stable for that group. In both AM and PR groups, somatic anxiety gain score moved steadily in a negative direction from the pre-test across Occasions 2 to 10, with a plateau on Occasions 4 to 7 for AM and 5 to 8 for PR.

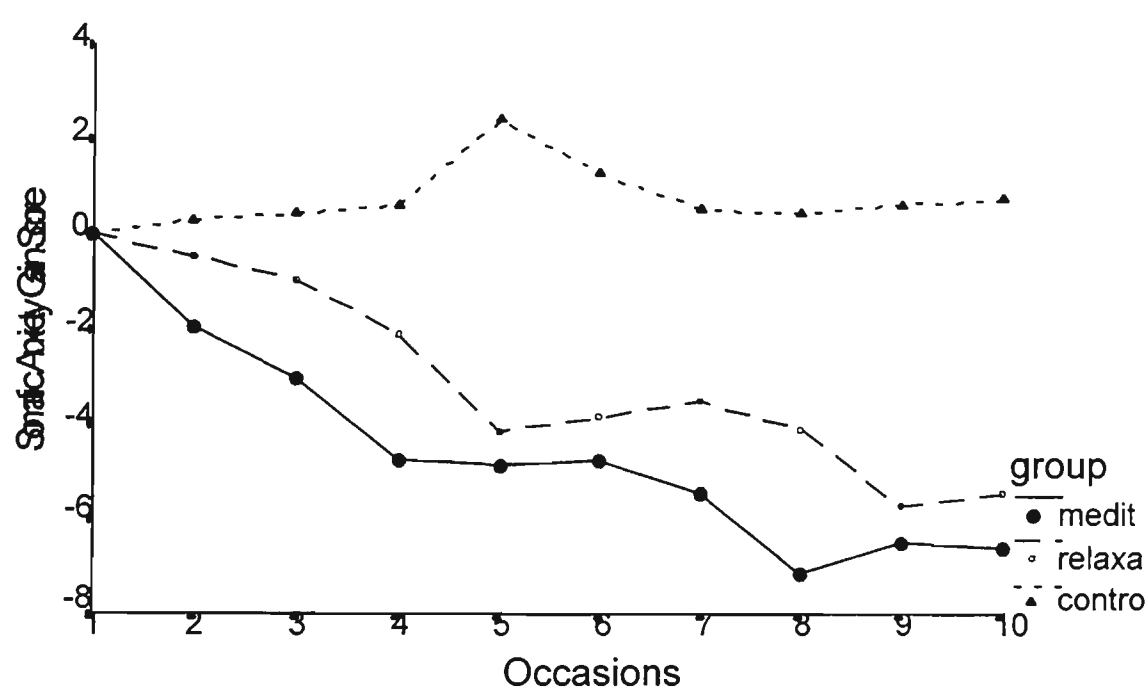


Figure 6.3. Somatic anxiety gain score on Occasion 1 to 10 for AM, PR, and C groups (N=48).

Examination of the two-way mixed design ANOVA for gain scores for Occasions 2 to 10 showed that there were significant differences between the interventions for somatic anxiety, $F(2, 45) = 12.73, p < .001$, effect size = .36, power = .99. The differences between the C group and the AM and PR groups

over time reflected decreases in somatic anxiety as the AM and PR treatments progressed. A post-hoc Scheffe test indicated a significant difference ($p < .05$) between the C group and the AM and PR groups. There was also a significant interaction effect, $F(16, 360) = 6.04$, $p < .001$, effect size = .21, power = 1.0. Post-hoc Scheffe tests revealed that the AM group was significantly different ($p < .05$) from the PR and C groups on Occasion 4, and the AM and PR groups were significantly different from the C group on Occasions 5 to 10.

Cognitive Anxiety

Figure 6.4 shows that cognitive anxiety gain score in the AM group dropped, substantially and consistently, from pre-test through the nine occasions of further testing. The PR and C groups did not show any trend for negative gain of cognitive anxiety. It is clear from Figure 6.4, that from Occasion 3 onward, cognitive anxiety level for the AM group was much lower than that for the PR and C groups.

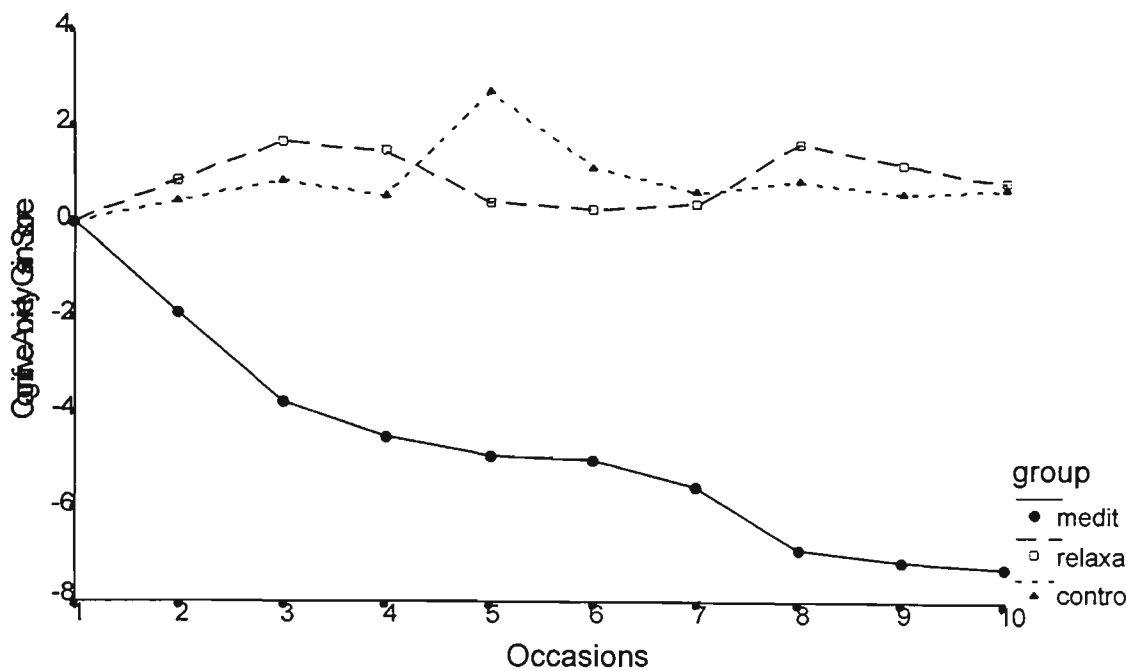


Figure 6.4. Cognitive anxiety gain score on Occasion 1 to 10 for AM, PR, and C groups (N=48).

Examination of the two-way mixed design ANOVA for Occasions 2 to 10 showed that there was a significant difference between the interventions for cognitive anxiety, $F(2, 45) = 28.72, p < .001$, effect size = .56, power = 1.0. Post-hoc Scheffe tests revealed that there were significant differences ($p < .05$) between the AM intervention and both the PR and C interventions for cognitive anxiety. This difference reflected that cognitive anxiety was lower for the AM group. There was also a significant interaction effect, $F(16, 360) = 4.87, p < .001$, effect size = .18, power = 1.0. Post-hoc Scheffe tests revealed that the cognitive scores for the AM group were significantly different ($p < .05$) from the PR and C groups on Occasions 4 to 10, reflecting lower levels of anxiety.

Self-confidence

Figure 6.5 indicates that self-confidence level showed a negative gain on Occasion 5 for the C group, which otherwise reflected a constant level. In the PR group, there was a positive gain in self-confidence from Occasion 2 to 10, with several brief plateaux. Self-confidence for the AM group had a notable positive gain on Occasion 4, then a plateau at the increased level on Occasions 5, 6, and 7. Finally, from Occasion 8, the AM group showed a steadily increasing positive gain in self-confidence, to the same level as the PR group on Occasions 9 and 10.

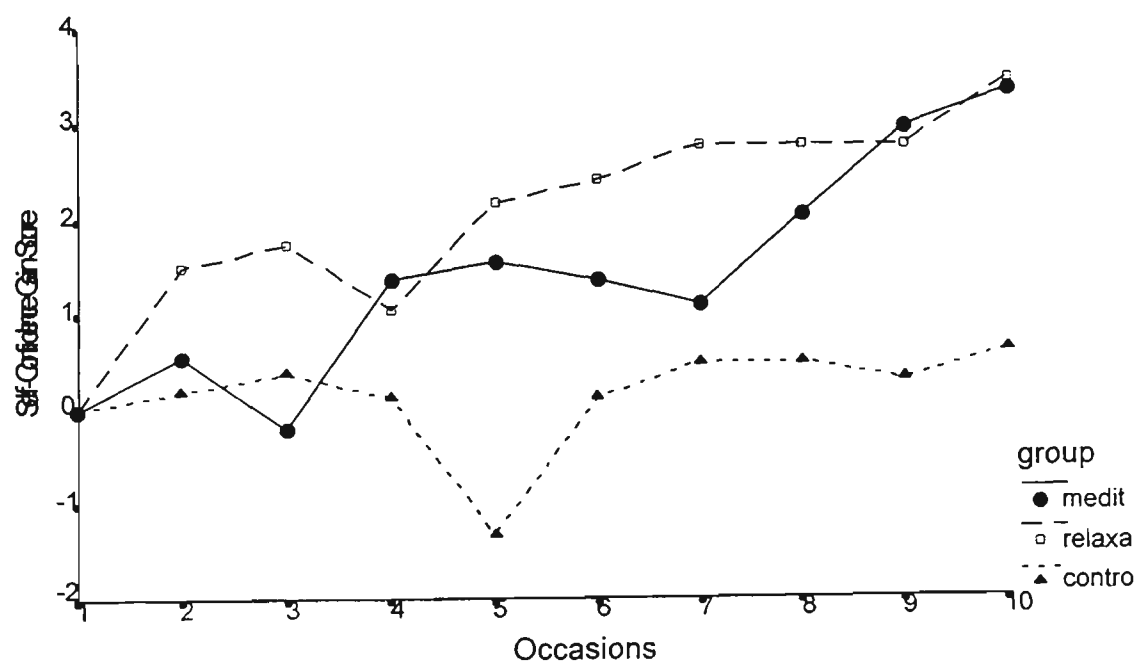


Figure 6.5. Self confidence gain score on Occasions 1 to 10 for AM, PR, and C groups (N=48).

Examination of the two-way mixed design ANOVA for gain scores showed that there was no significant difference between the interventions or between occasions for self-confidence ($p < .05$), but there was a significant interaction effect, $F(16, 360) = 5.57$, $p < .05$, effect size = .11, power = 1.0. Post-hoc Scheffe tests revealed no significant differences between any occasion for the AM, PR, and C groups, despite the significant F value. This might have been related to the relatively small effect size.

Discussion and Conclusions

The effects revealed in this study are summarised and issues which they raise are discussed in this section. Perception of importance appeared to remain stable in the three conditions until after the major competition in the fifth week. After this point, the perception of importance steadily declined in the AM group only, while in the PR and the C groups, the perception of importance remained at the same level, except on the last occasion when the perception of importance in both the PR group and in the C group dramatically increased. All groups were approaching a major competition in the immediate post-test period. Because there were no differences between perceived importance for the three groups on the first four occasions, but such differences did emerge for Occasion 5, it is suggested that the AM intervention influenced perception of the importance of the competition. At this point, the AM intervention affected both perceived uncertainty and perceived importance,

which are proposed in the Martens et al. (1990) model of competitive anxiety to be two of three important sources of state anxiety.

Results showed that the mean perceived uncertainty in the fifth week for the AM group was much lower in comparison to the PR and the C groups (see also Figure 6.1). Of note is the apparent rise of uncertainty which occurred among the PR and the C groups, at the fifth week mark immediately prior to a major competition. Increase of perceived uncertainty in the AM group was lower. It is particularly interesting that, in the AM group, perceived uncertainty was lower still on Occasion 10, showing an even larger difference from the PR and C groups than on Occasion 5. On Occasion 10, before another important competition, perceived uncertainty for the PR and C groups rose substantially again. In the Martens et al. (1990) model, perceived uncertainty is one of the three factors which mediate state anxiety. In the current study, it has been shown that meditation can lower the perceived uncertainty level of participants in elite level competition, compared to PR and C. According to the theory, this should be reflected in an effect of AM on somatic and/or cognitive state anxiety.

One interesting observation can be noted, relating to the effects of the meditation technique on perceived uncertainty and perceived importance. It was found in this study that, even though somatic anxiety was reduced by both the AM and the PR interventions, the AM intervention was the only technique that was effective in reducing cognitive anxiety. It might be suggested that perceived importance and perceived uncertainty which are both cognitive

processes, are antecedents of cognitive anxiety only, because, both perceived importance and perceived uncertainty were reduced by the AM intervention, and cognitive anxiety was also reduced. It would seem unlikely that the decrease in somatic anxiety observed for the AM intervention group resulted from the decreased levels of perceived importance and perceived uncertainty, because, in the PR intervention group, the somatic anxiety level was decreased in the same manner as it was in the AM intervention group, whereas the level of perceived importance and perceived uncertainty in the PR group did not change. These propositions could not be tested by these ANOVA analyses, so a multiple regression analysis was conducted. It is reported in the next chapter, which examines models based on the Martens et al. theory of competitive anxiety in sport.

In the area of cognitive anxiety, only one significant variation occurred for the C group, with none for the PR group. At the fifth week when an important competition was due, cognitive anxiety rose notably for the C group, but fell on week 6, after the competition and did not change again. For the AM group, a reduction of cognitive anxiety occurred progressively over the period of the nine week intervention program. The reduction of cognitive anxiety for the AM group was substantial from the fourth occasion onward, which suggested that for the meditation technique to take effect in this group of athletes, at least four weeks of practice was needed, including three formal sessions and two individual sessions each week. Results also showed that the

longer the technique was practiced, the larger was the reduction in cognitive anxiety.

The level of somatic anxiety in the C group remained stable throughout the whole period of testing, except on Occasion 5, when it rose substantially. Both the AM and the PR groups showed marked reductions in somatic anxiety level from the beginning to the end of the intervention period. Although this was predictable for the PR group, because this technique has previously proven to be effective for the reduction of somatic anxiety (e.g., Davidson & Schwartz, 1976), what was particularly interesting was the similar reduction of somatic anxiety experienced by the AM group. The finding for PR and somatic anxiety, allied to that for PR in relation to cognitive anxiety, is in accordance with the Davidson and Schwartz (1976) matching hypothesis, that PR, being a somatic technique, is effective for the reduction of somatic anxiety only and has no effect on cognitive anxiety. The present findings also contrast with the matching hypothesis, because the AM intervention proved to be effective for reducing both somatic anxiety and cognitive anxiety. Also, the finding that PR was effective for reducing somatic anxiety, but not cognitive anxiety, whereas the AM intervention reduced both, does not agree with Martens et al. (1990), who stated that cognitive and somatic anxiety often covary, especially in competitive situations. Although both components were reduced by the AM intervention, reducing somatic anxiety in the PR condition did not lead to the reduction of cognitive anxiety. From this observation, it is suggested that reduction of cognitive anxiety for the AM intervention group probably was not

a result of any relationship between the two components, as stated by Martens et al. (1990). Rather, although the basic element of meditation, which involves breathing related to calming of the mind and the body, might well have been responsible for the somatic anxiety reduction, it is proposed that the capacity of AM to alter the way the person perceives the world, reducing disruptive negative thinking, was likely to be responsible for the reduction in cognitive anxiety. In order to conclusively test whether the effect of meditation on cognitive and somatic anxiety result from separate mechanism, rather than covariation or Martens (1987) stress formulae, it is necessary to compare the effects of meditation with those of a cognitive anxiety only technique.

In the area of self-confidence, statistically, there were no significance differences between AM, PR, and C groups. Noteworthy here, was the difference between the groups at the beginning of the study. In particular, the levels of self-confidence differed substantially between the PR and C groups at the start of the testing, which made it difficult to test for statistical differences. As time progressed, upward trends could be seen for the AM and PR groups, whereas no real difference occurred for the C group, aside from the reduction in state self-confidence on Occasion 5, the week of the most important competition during the study, according both to the informal judgement of coaches and to the perceived importance values recorded. For both AM and PR groups, levels of self-confidence tended to increase steadily from the beginning to the end of the testing period, whereas such a tendency did not occur for the C group. Also, on Occasion 5 there was a notable decline in self-confidence for

the C group, but no decline was shown in the AM and PR groups. It is possible that PR reflected a regression to the mean, because initial scores were lower than those for the AM and particular for the C group. It could be proposed that the interventions helped athletes in both the AM and PR groups to maintain their levels of self-confidence during the competition compared to C group participants, who suffered a decline in confidence at that point (Occasion 5). This finding is in accord with Martens et al. (1990), that reducing anxiety should increase self-confidence level, especially for the AM group, in which both somatic and cognitive anxiety were reduced.

According to Martens et al. (1990), self-confidence is more closely related to cognitive anxiety than it is to somatic anxiety, so it was interesting to observe that self-confidence levels also increased for the PR group, which only showed a reduction in their somatic anxiety. This might be explained in terms of regression to the mean for the PR group, because self-confidence level for that group at the beginning of the study was much lower than for the other two groups. This might have been a chance, transitory reduction, so that a return to typical levels of self-confidence for this group of elite weightlifters would have occurred regardless of the introduction of any intervention. Two observations make this explanation seem unlikely. First, it is difficult to explain why those assigned to the PR group on a matched basis with the AM and C conditions, using SCAT, should be so much lower as a group at the start, if it was just due to chance fluctuations. Second, the regular week by week increase in self-confidence for the PR group suggests an intervention effect, rather than

transitory fluctuations, which might be expected to return to a more typical level over one or two occasions, rather than showing a monotonic increase in self-confidence over several occasions of testing. There was nothing else that was systematically affecting this group alone, nor the whole sample, as shown by the stability of self-confidence scores for the C group, with the understandable exception of Occasion 5. The increase in PR group state self-confidence only raised its absolute level to around 26 on the self-confidence scale, around the starting level for the AM group and below the level for the C group at any time.

It can be concluded from the above summary, that the use of meditation did reduce cognitive and somatic state anxiety and increased self-confidence state of athletes. The difference between meditation and the relaxation technique used in this study was the reduction of cognitive anxiety over the test period. The relaxation technique (PR) along with the meditation technique (AM) led to a reduction in somatic anxiety during that period. The study, thus, suggested the potential advantage of the use of the meditation technique as a precompetition preparation method, for the reduction of state anxiety, when both somatic and cognitive state anxiety need to be reduced. The often claimed value of the progressive relaxation technique as a method to reduce somatic anxiety was also supported, while its role in relation to state self-confidence is still equivocal.

The matching hypothesis (Davidson & Schwartz, 1976) proposed that to control or reduce cognitive anxiety a cognitive technique is needed, while to

control somatic anxiety a somatic technique is required. This study has shown that the matching hypothesis was partially supported in that the reduction of somatic anxiety was achieved by use of either the relaxation or the meditation technique, both of which have commonly been claimed to be somatic techniques (Davidson & Schwartz, 1976; Harris, 1986). Further, the study demonstrated that progressive relaxation did not reduce cognitive anxiety, defining it as a somatic technique only and further supporting the matching hypothesis, as the use of relaxation to control cognitive anxiety would be considered to be a mismatch. The study also showed that meditation was effective for both cognitive and somatic anxiety state reduction, which is in conflict with the general conception of the matching hypothesis that techniques affect only one dimension of state anxiety. In their writing, Davidson, Goleman, and Schwartz (1976) were among the few researchers in mainstream psychology to actually propose that meditation might affect cognitive anxiety. Also, the basic tenet of the matching hypothesis as applied in sport psychology has been somewhat simplified from their original conception (Davidson & Schwartz, 1976), which predicted four categories of match, depending on difference in brain hemispheric functioning, as well as source of state anxiety, that is, whether it is cognitive or somatic.

Although research on the efficacy of various anxiety reduction methods is one of the most interesting and practically important fields in sport psychology, only a small amount of research has been conducted on the efficacy of various techniques, especially in a theoretical framework like the matching

hypothesis. Maynard and Cotton (1993) reported one of the first studies to directly test a cognitive and a somatic technique based on the matching hypothesis. In their research, Maynard and Cotton tested 20 male collegiate field hockey players. They divided the players into a high cognitive anxiety group, a high somatic anxiety group, and a group that had neither high cognitive nor high somatic anxiety, based on CSAI-2 scores. They gave the high cognitive anxiety group a cognitive intervention, positive thought control (PTC), and the high somatic anxiety group a somatic intervention, applied relaxation (AR). The group with no high state anxiety was a “control” (C), and received no intervention. Maynard and Cotton found that PTC and AR was each associated with a reduction in the level of the corresponding component of state anxiety, but no reduction of the level of the alternate component, over a 12 week treatment period, whereas there was no change in the C group. Maynard and Cotton concluded that their results provided support for the matching hypothesis. Unfortunately, with no cross-over groups, that is, high cognitive anxiety individuals receiving a somatic intervention, and high somatic anxiety individuals receiving a cognitive intervention, nor control groups high to start with but untreated, and showing no reduction in state anxiety, it is not possible to distinguish between treatment effects and regression to the mean from their results.

Maynard, Hemmings, and Warwick-Evans (1995), in a similar study to Maynard and Cotton (1993) examined the matching hypothesis using somatic technique only. The studies shared a problem relating to assignment of

participants to experimental conditions. The nine participants assigned to the Applied Relaxation (AR) intervention in the Maynard et al. study were selected on the basis of high pre-intervention somatic anxiety intensity and direction. They also had higher cognitive anxiety than the Control group, the other eight participants, whose pre-intervention somatic anxiety was lower. Although the Control group was given a sound placebo for amount of attention from the researchers, it could be that the high levels of pre-intervention anxiety in the AR group simply regressed to the same levels as the Control group by post-intervention. This possibility is strengthened by the substantial reduction in cognitive anxiety found by Maynard et al. (1995), for which the AR intervention had no planned effect. Studies which employ the acceptable approach of applying interventions to those high on a target variable at pre-test, especially with state variables, such as cognitive and somatic state anxiety, must show that high levels of anxiety do not reduce when there is no intervention or when a mis-matched intervention is used, to confidently claim effectiveness for an intervention. Neither of the studies reported by Maynard and colleagues did this.

A more recent study by Maynard, Hemmings, Greenlees, Warwick-Evans, and Stanton (1996) was conducted in order to compare various types of sport anxiety interventions. Participants were 41 undergraduate students of the Chichester Institute of Higher Education, who regularly participated in "Invasion Game" team sport activities. Participants completed a composite version of the CSAI-2, which assessed both intensity and direction of state

anxiety, within one hour of a competitive Invasion Game. Then they were assigned to different treatment groups, which consisted of a multimodal stress management treatment group (treatments of both cognitive and somatic anxiety), a unimodal compatible stress management treatment group (treatment of the type of anxiety experienced by participants), a unimodal non-compatible stress management treatment group (treatment of the type of anxiety not experienced by participants), and a placebo tasks control group. Following a six week intervention, participants again completed the same measurement instruments before a second Invasion Game. Results indicated that the multimodal intervention was most effective overall, however, the unimodal compatible treatment was as effective as the multimodal treatment on the targeted CSAI-2 subscale within a shorter time period. It is to be noted that, in this study crossover effects were found, in somatic anxiety intensity and direction, due to a cognitive intervention, and also in cognitive intensity and direction, which were influenced by a somatic treatment. However, in both cases the crossover effects did not produce significant changes.

In the present study, participants were assigned to groups based on matching trait anxiety score. This resulted in three groups matched for initial somatic and cognitive anxiety levels, but not for self-confidence. Neither did any group have unusually high somatic or cognitive state anxiety at the start, but each group represented a range from low to high cognitive and somatic anxiety. This excluded the regression to the mean explanation, because the average cognitive and somatic anxiety for these groups was around moderate mean

levels at the start. It also made it more difficult to achieve a statistically significant reduction in somatic or cognitive state anxiety by application of any intervention, because many players already had low to moderate anxiety levels. Also, in this study, it was shown that level of somatic and cognitive state anxiety did not reduce when there was no intervention that matched the type of state anxiety displayed, that is, there was no reduction in cognitive anxiety for the PR group, nor any reduction in cognitive or somatic anxiety for the C group. The finding that the PR condition did not produce a reduction in cognitive anxiety, is not consistent with the incidental reduction in cognitive anxiety found in the Maynard et al. (1995) study. Maynard et al. (1995) invoked the Martens et al. argument that in real competitive situations somatic and cognitive anxiety are likely to covary, so reducing one will reduce the other. While this argument does have some plausibility, it confounds the issue of whether some techniques reduce somatic anxiety, whereas others reduce cognitive anxiety. In the present study, where somatic and cognitive anxiety were not artificially high, PR did not reduce cognitive anxiety at all. At the same time, the strong effect of meditation on cognitive anxiety, can confidently be attributed to a direct mechanism, because the PR and C groups were totally unaffected in terms of cognitive anxiety.

The effect of meditation on somatic anxiety state in this study is in accordance with Benson (1975), who claimed that meditation could reduce somatic anxiety, and with Puente and Beiman (1980), who found that a meditation intervention was as effective in reducing somatic anxiety as the

Progressive Muscle Relaxation technique. These researchers arrived at a similar conclusion to that cited in most applied sport psychology texts, namely that meditation is a somatic technique (e.g., Bunker & Williams, 1986). It was shown in the present study that cognitive anxiety could also be reduced effectively through a meditation intervention. This provides support for the claims of Buddhathasa (1990) and Varijanana Mahathera (1975), as well as Davidson and Schwartz (1976) themselves, who also classify meditation as a cognitive technique.

At the time when this research was developed, the Sport Competition Anxiety Test (SCAT; Martens, 1977) was the only test of trait anxiety in sport which was well validated. SCAT is a unidimensional measure of sport competition trait anxiety, whereas state anxiety is conceived and measured as a multidimensional concept. Recently, Smith, Smoll, and Schutz (1990) have developed a multidimensional measure of trait anxiety, the Sport Anxiety Scale (SAS). SAS consists of 21 items on three subscales, somatic anxiety, cognitive worry, and concentration disruption. The descriptions of somatic trait anxiety and cognitive trait worry by Smith et al. (1990) indicate that they are conceived as trait equivalents of somatic and cognitive state anxiety respectively. Concentration disruption is considered to reflect the inability to stay focused on a task whilst competing. Because the conception and measurement of state anxiety is multidimensional, use of a trait measure which is also multidimensional would appear to hold some promise. Nonetheless, the SCAT has shown moderate correlations to all three subscales of the CSAI-2 over many

studies (see Martens et al., 1990 for a review), as would be predicted for a general trait measure related to state measures on any specific occasion. In addition, it was considered to be most appropriate to employ the SCAT to test the theory of competitive anxiety (Martens et al., 1990), which was a primary aim of this thesis, as the theory was based on the SCAT conception of trait anxiety. In terms of allocation of participants to intervention conditions on a matched basis, the SCAT was very effective for cognitive, as well as somatic anxiety, even though the items on SCAT are predominantly somatic in orientation, but the large differences in pre-intervention self-confidence made it difficult to draw conclusions about the effects of the interventions on this variable. Also in favour of use of the SCAT in this research, there was, at the time the study was conducted, little reliable evidence associating the SAS subscales with cognitive and somatic state anxiety, especially as measured by the CSAI-2.

Research relating the SAS subscales to cognitive and somatic state anxiety measured by the CSAI-2 was recently reported by Prapavessis, Cox, and Brooks (1996). In their research, 199 athletes completed the SAS, CSAI-2, items related to perceived uncertainty, and items related to perceived importance in order to test the Martens et al. (1990) theoretical model of competitive anxiety. Prapavessis et al. claimed that the original model was not a good fit to their data in a LISREL structural equation modelling analysis, although they did not actually test the original Martens et al. model, for a number of reasons considered elsewhere in this thesis (see Chapter 7). They

proposed that a better fit was reflected in an alternative model, where cognitive trait anxiety, measured by SAS, linked strongly to cognitive state anxiety, measured by the CSAI-2, and somatic trait anxiety was strongly related to somatic state anxiety. In fact, these associations were the main basis for that superior fit and the principal useful finding of the study was that the SAS trait subscales for cognitive and somatic anxiety were associated with the corresponding CSAI-2 state subscales. Thus, in future research, matching based on a multidimensional trait anxiety measures might be even more effective than was matching the SCAT.

The research in the present thesis was conducted amongst nationals of the Kingdom of Thailand, who, it could be reasonably claimed, are more predisposed towards the underlying beliefs, as well as the specific concepts of meditation, than people of Western cultural extraction. Meditation is embedded into Thai culture and tradition, so that the expectancy of participants might have been more positive, with respect to the meditation condition, than would be the expectancy of Western sports performers. Similarly, the meditation skills of the participants in this study might have been partially developed either through previous training in the Anapanasati technique or through use of a similar technique in religious practice, so that the AM and PR groups might not have started their training from equivalent positions. It would, thus, be unwise to read too much into the somewhat earlier significant effect for AM than PR for somatic anxiety. The results provide greater support for the effect of AM on cognitive anxiety, where a significant effect was seen on Occasion 4, and

cognitive anxiety continued to decrease right through to Occasion 10, whilst there was no reduction at all for PR from Occasion 1 to Occasion 10. To examine the universal nature of the meditation effects observed here, a replication of the study amongst Westerners would provide a test of whether the conclusions of the present study are generalisable across cultures. In any event, further research with Asian samples is needed before the conclusions of a single study are applied widely within the Eastern cultural and spiritual tradition. It should be noted that Menzies (1996) found that a meditation breath-counting technique reduced worrying thought, which is a concept closely related to cognitive anxiety.

The present study provides perhaps the first unequivocal support for part of the matching hypothesis. The studies of Maynard and Cotton (1993) and Maynard et al. (1995) attempted to do this, but failed to provide adequate control conditions. The study of Maynard et al. (1996) did provide such controls, but its finding of noteworthy changes for mismatched state anxiety variables is of some concern. The present study predicted significant effects of meditation on cognitive and somatic anxiety and of progressive relaxation on somatic anxiety only, and these were the only changes in anxiety that were observed. At the same time, and probably more notably, the present study supports the claims of those who have argued that meditation affects somatic and cognitive anxiety state (e.g., Bhuddathasa, 1990; Davidson & Schwartz, 1976; Vajiranana Mahathera, 1976). Replication within other cultures, with other sports, and with athletes of different ages and genders is needed before

strong conclusions can be drawn. Should such research support the present results, the implications for practice need to be examined. Meditation would appear to be a very useful technique, which can help athletes manage somatic and cognitive anxiety at the same time. Although the results for the present study were not conclusive, they suggested that it might also enhance self-confidence. Nonetheless, meditation should not be considered to be the technique of choice in all circumstances. When time permits a substantial training program (4-6 weeks minimum) to be instituted and there are no negative implications of reducing both somatic and cognitive anxiety at the same time and, perhaps, increasing self-confidence, meditation training would seem to be a most economical approach. An obvious example would be where a coach invites a sport psychologist to do a two to three month close season program to prepare the team for the next season, at least for team members whose cognitive and somatic anxiety are both debilitatively high.

Situations where meditation would not be the appropriate technique might be where no reduction in cognitive anxiety is needed, just a somatic anxiety reduction. Here, it might be that some somatic only techniques, such as a simple breathing exercise, might be easier to introduce and quicker to have an effect. Even when only cognitive anxiety needs to be reduced, care should be taken to ensure that an incidental reduction in somatic anxiety will not be detrimental. In such a case, a cognitive only technique, such as cognitive restructuring would be preferable. Possibly more common, would be a situation where a coach asks a sport psychologist to help an athlete who is showing signs

of increasing anxiety two weeks before a major championship. Insufficient time for the meditation program to be effective seems likely to be the most common reason for choosing an alternative technique. As sport psychologists, in the future, more frequently communicate to coaches, administrators, and athletes that long term, systematic sport psychology programs, especially those with substantial input during non-competition periods, represent a sound strategy, the potential to employ meditation is likely to increase.

The question of whether meditation will be effective with Western athletes needs further study. In a recent pilot project with a state women's volleyball team, using the same Anapanasati meditation technique employed here, under the guidance of the same Anapanasati instructor, no problems were encountered in acceptance of the technique by the elite players. The results of the study were equivocal with respect to the reduction of somatic anxiety, cognitive anxiety, and self-confidence over a period of five weeks, with two sessions every week (Stoove, 1996). It should be noted, in the context of previous comments, that the program did have a limited duration of five weeks, for logistical reasons, and this might have been two to three weeks too short for a clear cut result to emerge. Also, regular independent practice might have been more difficult to instigate with this group. Adherence to mental training programs has often been found to be problematic with elite athletes. It is also possible that there was not as much practice of the meditation procedure each week or that the Thai athletes had the advantage of a foundation in the principles of Anapanasati. Thus, with more time and perhaps an approach that

provides an educational foundation and tighter supervision of early training, there are grounds for believing that such meditation techniques can also be effective with Western elite athletes, as they have been with Western participants in other areas of psychology (e.g., Menzies, 1996; Miller, Fletcher, & Kabat-Zinn, 1995; Saito & Sasaki, 1993).

The study reported in this chapter employed carefully developed and translated measures to examine the effects of two thoroughly implemented treatments and a sound attention control on perceived uncertainty, perceived importance, cognitive and somatic state anxiety, and self-confidence. The study was not subject to the design criticisms of most of the previous investigations of aspects of the matching hypothesis. The efficacy of the meditation technique for moderating perceived uncertainty, and perceived importance, as well as for reducing cognitive and somatic state anxiety was clearly shown. There was also unequivocal support for the progressive muscle relaxation technique as a somatic technique, consistent with the matching hypothesis. These findings are of real value to the understanding of anxiety and its management.

CHAPTER 7: TESTING OF THE MARTENS ET AL., (1990) THEORY OF COMPETITIVE ANXIETY

Introduction

The theory of competitive anxiety was proposed by Martens et al. (1990) in an attempt to explain specifically the way in which sport competition state anxiety is generated. Such a theory should not only predict the level of state anxiety among people who differ in competitive trait anxiety in various situations, it must also specify the causes of competitive anxiety. The theory was developed from the general formulation of McGrath (1970), who specified the antecedents of threat and help generate state anxiety. He proposed that there must be uncertainty that the demand can be met, and it must also be the case that failure to meet the demand is perceived to be important.

Martens et al. (1990), following McGrath (1970) proposed that state anxiety reactions are the responses made to the perception of danger or threat, and that uncertainty of the outcome and importance of the outcome are the two factors that are the main antecedents of perception of threat and, hence, state anxiety. Martens et al. proposed that competitive state anxiety and its precursor, the perception of threat, would also be influenced by athletes' trait anxiety. It was proposed that competition is an evaluative process that creates uncertainty about the outcome before the actual competition. The greater the uncertainty and the importance of the outcome, the greater the threat.

Uncertainty and importance were hypothesised to have a multiplicative relationship, which means that both uncertainty and importance must be present in order to cause perception of threat. If either one is absent, no threat is expected to exist. Assessment of uncertainty and importance involves cognitive processes, which are based on an individual’s previous experiences. Thus, it is the uncertainty and importance perceived by the individual which is important, not any objective assessment of uncertainty or importance.

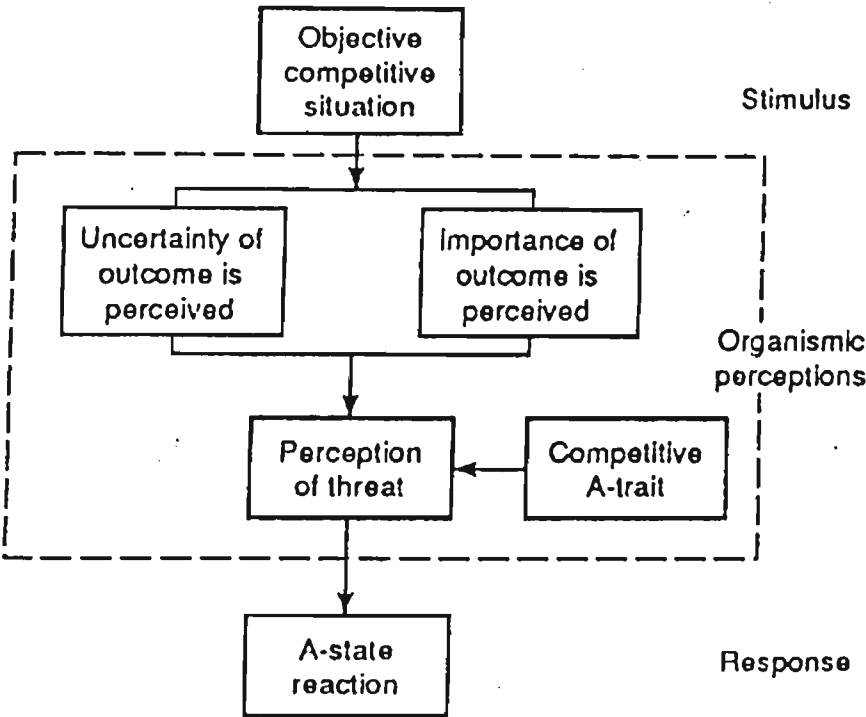


Figure 7.1. Martens et al. (1990) theory of competitive anxiety

According to Martens et al., the perception of threat in competitive situations varies from person to person. They proposed that a person with a higher level of trait anxiety perceives a greater number of competitive

situations to be threatening than does a person with a lower level of trait anxiety. The Martens et al. theory of competitive anxiety is shown in Figure 7.1

Martens et al. (1990) observed that, although this uncertainty is viewed as a source of threat in competitive situations, it is the same uncertainty that causes the competition to be a challenge. Challenge can be considered positive because most individuals seek some challenge in their life (Ellis, 1973). The way to make a particular situation challenging is to maximise the uncertainty of that situation. Berlyne (1960) stated that individuals will try to keep uncertainty at an optimal level. Uncertainty could, thus be viewed as positive challenge or negative threat depending on how the person perceives uncertainty in that particular situation.

Martens et al. (1990) finally, considered that perceived importance is one of the major factors that affect perceived threat and state anxiety in athletes before and during the competition. Importance of the outcome, according to Martens et al., is a situation specific perception reflecting the value an individual places on obtaining a particular outcome. The value that each individual perceives, could be extrinsic, such as money and medals, or intrinsic, such as feelings of competence, personal satisfaction, or increased self-esteem. Martens et al. stated that importance is a combination of both extrinsic and intrinsic value held by the individual for obtaining a positive outcome.

Martens et al. (1990) proposed that in order to reduce competitive state anxiety, perceived threat must be minimised by reduction of perceived uncertainty and perceived importance of the outcome in athletes. Uncertainty could be reduced by obtaining information about the athlete's own ability, the opponent's ability, and other situational factors that may influence assessment of the probable outcome. Importance of the outcome could be reduced by changing an athlete's perception or value system about the significance of rewards, either intrinsic or extrinsic, or both extrinsic and intrinsic. Martens et al. argued that by testing a theory of competitive anxiety, a clearer understanding could emerge of the processes by which anxiety is generated, leading to the more effective application of anxiety management procedures.

According to the model proposed by Martens et al. (1990), trait anxiety independently affects perception of threat, whereas uncertainty and importance affect perception of threat in a multiplicative fashion. This means that if the athlete is highly uncertain about the competitive situation, but the situation is not important, or the athlete is very certain even though the situation is highly important, perception of threat and state anxiety will be very low. Perception of threat will be high only if both uncertainty and importance are present. In contrast, Martens et al. stated that uncertainty and importance influence each other in certain situations, which means that when uncertainty is very high, importance may be diminished, as a defense mechanism, to cope with the likely failure, and when uncertainty is low, importance level may rise, to

increase the challenge. Further study is required to examine how uncertainty and importance influence each other in competitive sport situations.

The multiplicative relationship of perceived uncertainty and perceived importance proposed by Martens et al., although it offers some understanding of the antecedents of state anxiety, is still unclear in several respects. It is understood that in the absence of one component, either perceived uncertainty or perceived importance, it is proposed in the theory that state anxiety would not be high. But it is still not clear from the theory, how much of each component needs to be present in order to stimulate state anxiety. It is not explained whether a high level of perceived uncertainty with just a minimal amount of perceived importance or a high level of perceived importance with a small amount of perceived uncertainty would create state anxiety. Another question that can be raised about the theory as stated, concerns the role of trait anxiety. It is clear in the Martens et al. model that trait anxiety independently influences perceived threat. Prapavessis, Cox, and Brooks (1996) attempted to test this model, but actually tested an alternative model, in which trait anxiety directly influenced the combination of perceived uncertainty and perceived importance. Strong support was not found for either model. Whether trait anxiety influences perceived threat, or influences its proposed precursors, perceived uncertainty and perceived importance, is still an issue that needs to be examined.

The relationship between perceived uncertainty, perceived importance, and the different aspects of state anxiety, namely cognitive and somatic state

anxiety, is another issue where examination is needed. Based on many studies that have investigated differences between cognitive and somatic anxiety in terms of antecedents, temporal patterns, and effects on performance, the effects on performers are different depending on the type of anxiety experienced (i.e., cognitive anxiety, somatic anxiety, or both). It is surprising that Martens et al. did not discuss differences between how perceived uncertainty and perceived importance influence cognitive anxiety and somatic anxiety.

Nonetheless, it is proposed that a strong case can be made that cognitive anxiety and somatic anxiety should be considered separately. In the book where the theory of competitive anxiety was proposed (Martens et al., 1990), the content of the second half of the book was concerned with demonstrating that state anxiety is multidimensional, with at least two components, cognitive anxiety and somatic anxiety. In contrast, at the end of the book, when proposing the model, Martens et al. proposed state anxiety as one factor without distinguishing any components. An obvious weakness of this conception of global state anxiety is that a participant who has a high level of cognitive anxiety and a low level of somatic anxiety would receive the same score as a person who scored low on cognitive anxiety and high on somatic anxiety, and those two persons also would receive the same score as another person who scored moderately on both components. Bearing in mind the distinctions between the antecedents of cognitive and somatic state anxiety proposed in the CSAI-2 section of that book, that is, somatic anxiety is proposed to be a conditioned response to stimuli associated with competition,

whereas cognitive anxiety is based on cognitive evaluation. Big difference would be expected between what it means to have high cognitive anxiety with low somatic anxiety and to have high somatic anxiety with low cognitive anxiety, or to have a moderate level of both. Persons displaying those three patterns would be expected to be different in terms of temporal patterns of cognitive and somatic anxiety, and would demonstrate different anxiety-performance relationships in terms of Hardy and Fazey's (1987) catastrophe theory, for example.

Others who have examined the theory have considered this issue. Lox (1992) study that measures perceived uncertainty and perceived importance, each correlated with the cognitive and somatic anxiety subscales, of the CSAI-2. Prapavessis et al. (1996) found no significant causal paths from a combination of perceived uncertainty and perceived importance to either cognitive anxiety or somatic anxiety, again measured by the CSAI-2. Marchant (1996) concluded from three studies that perceived uncertainty and perceived importance had associations with both cognitive and somatic state anxiety, but that the link of each with cognitive anxiety was stronger. Thus, at present the research is equivocal on the question of the relationship of perceived uncertainty and perceived importance with cognitive and somatic state anxiety, but there are grounds for predicting differential associations.

There is a need to examine the model reflected in the theory of competitive anxiety proposed by Martens et al., because it is important in terms of athlete anxiety management to be able to predict when, and fully understand

how, athletes get anxious. If the mechanisms of how and when athletes get anxious can be determined, then it may be possible to prescribe interventions more effectively in managing state anxiety. In the present thesis, Martens et al. model of competitive anxiety, was examined using all of the variables that were measured before the beginning of any treatments in the main study. This procedure allowed examination of the original model and comparison of it with alternative models that address the issues raised in this section, by using all the variables unaffected by any experimental manipulation.

The aim of this modelling analysis of the theory of competitive anxiety was to test the predictions of the theory that perceived uncertainty and perceived importance multiplicatively influence state anxiety, whereas trait anxiety independently influences state anxiety. These predictions were tested against an alternative model in which perceived uncertainty and perceived importance independently influence state anxiety. The alternative proposes that when a sports performer perceives a situation as uncertain, state anxiety is provoked, whether or not it is a highly important situation. Similarly, perception of importance is likely to raise perception of threat, because something of value is at stake and total certainty is unlikely to be subjectively perceived under such circumstances. Further, in practice, competitive situations are unlikely to be either highly certain in terms of perceived outcome, as described by Martens et al., nor are they likely to be perceived to have negligible importance.

In addition, the Martens et al. (1990) model proposed that the effects of perceived uncertainty and perceived importance would influence on total state anxiety. This seems at odds with the second half of their competitive anxiety book. In the book, these authors suggested the existence of at least three dimensions of state anxiety. A case can be made that perceived importance and perceived uncertainty are cognitive processes that are likely to influence more directly cognitive anxiety, a cognitive evaluative process. This proposition gains some support from the work of Marchant (1996). It is reasonable to propose that self-confidence, the other extreme of the cognitive evaluation continuum will be influenced by perceived uncertainty and perceived importance more directly than somatic anxiety.

Thus, this chapter reports a multiple regression analysis of the original theory of competitive anxiety in sport, where perceived uncertainty and perceived importance multiplicatively affect state anxiety, whereas trait anxiety exerts an independent effect on state anxiety. It is to be noted that perception of threat was omitted because perception of threat was not measured directly but rather inferred from anxiety measures. That model is compared to one in which the effects of perceived uncertainty and perceived importance are independent, each exerting an influence on A-state reaction.

In the third model, trait anxiety, perceived uncertainty, and perceived importance independently affect cognitive anxiety and somatic anxiety. This model, again, proposes that uncertainty and importance do not have to be both present; uncertainty or importance alone can produce state anxiety. In addition,

in this model, the conception of a global A-state reaction is replaced by separate cognitive and somatic state anxiety levels. This separation is consistent with the argument of Martens et al. in earlier chapters of their competitive anxiety book that cognitive and somatic state anxiety are distinguishable and, most important, that each has different antecedents. The implication is that perceived uncertainty and perceived importance have independent effects on cognitive and somatic anxiety. This means that, perception of threat is omitted not only because it was not measured directly, but also to produce a more realistic model for testing, because it does not make sense for two independent cognitive processes, perceived uncertainty and perceived importance, to both enter a unitary perception of threat process and through it, to produce different effects on cognitive and somatic anxiety states. Instead, the perception of uncertainty and importance are predicted to each directly affect cognitive and somatic state anxiety in different ways, their stronger effects being on cognitive anxiety.

Methods

Participants

Forty-eight elite and sub-elite weightlifters (male = 24, female = 24), between 18 and 30 years of age, who were supported and trained in the project run by the Sport Authority of Thailand in preparation for the upcoming 1998 Asian Games, volunteered as participants. These athletes participated by

permission and cooperation of the Sport Authority of Thailand. Participants were told what the study involved and they were invited to participate. Also, they were told that they were free to withdraw from the study at any time, and they signed consent forms. These were the same participants as in the study of meditation and progressive relaxation reported in Chapter 6.

Design

The data from the first occasion (week 1) of the study described in the design and analysis sections of Chapter 6 was used to examine the original Martens et al. model and two alternative models of the relationship of perceived uncertainty, perceived importance, and trait anxiety with cognitive anxiety and somatic anxiety. The reasoning applied for using the first occasion was that any subsequent occasions would be affected by the treatments used in the study. By using the first occasion, data gained was the pre-treatment measure of SCAT, CSAI-2, PUCT, and PICT. No influence of any of the interventions used in the main study were present at pre-test. all variables involved in the Martens at al. model (except perception of threat) were measured at that time, allowing the modelling analysis to be free of any effect from the intervention.

Measures

The measures used were those described in the Measures sub-section of Chapter 6.

Procedure

The data collection procedure was described in the Procedure section of Chapter 6.

Analysis

The first model analysed was based directly on the original model of competitive anxiety proposed by Martens et al. (1990). Martens et al. proposed that perceived uncertainty and perceived importance multiplicatively influence perceived threat and thus, state anxiety. By stating that the two components are multiplicative Martens et al. indicated that both have to be present to mediate perceived threat and state anxiety. This means that if one of the two factors is absent, although the other might be very high, neither of the two factors will affect state anxiety. For the purposes of modelling, scores for perceived uncertainty and perceived importance were multiplied and the product represented the multiplicative effect of perceived uncertainty and perceived importance. Because the perceived uncertainty scale was scored from three items, and the perceived importance scale was scored from two items, each item being rated on a five point Likert scale, the product of the raw perceived uncertainty (with a potential maximum of 15) and perceived importance (with a potential maximum of 10) scores would produce a value weighted in favour of perceived uncertainty. To account for this, the raw score for perceived uncertainty was divided by three and the raw score for perceived importance

was divided by two in order to ensure equivalence. The resulting scores were then multiplied to derive a product of perceived uncertainty and perceived importance.

In the model, one other factor was proposed to affect state anxiety, namely trait anxiety. Martens et al. proposed that trait anxiety independently influences state anxiety. That is, its effect is separate from that of perceived uncertainty and perceived importance combined. The other important aspect of the original model is the proposition of “A-state reaction” (p. 218). The model proposed an undifferentiated or global A-state variable, rather than separate cognitive and somatic state anxiety variables. Martens et al. did not state exactly how they proposed that A-state reaction should be operationalised. For this study, it was considered that A-state reaction referred to anxiety state, which is reflected in the cognitive and somatic scales of the CSAI-2, so the self-confidence data were omitted. Because no case has been made that cognitive and somatic state anxiety can only exist in the presence of each other, as with perceived uncertainty and perceived importance, the sum of cognitive and somatic anxiety scale scores was used, rather than the product. Cognitive and somatic anxiety are both measured on 9 to 36 point scales, so no weighting in favour of either would arise from their measurement scales. The original model is illustrated in Figure 7.1, which was presented earlier in this chapter.

Another issue arises in attempting to test the original model proposed by Martens et al. This concerns operationalisation of the variable “perceived threat.” From the writing of Martens et al., it seems that this concept was

transferred directly from McGrath's (1970) general model of stress. Although perceived threat is conceptually distinguishable from state anxiety, operationally and, thus, for modelling purposes, the two are identical. That is, there is no separate measure of perceived threat in sport, but perceived threat is reflected in level of state anxiety. This issue has not been explicitly addressed in the previous research. Lox (1992) simply ignored perceived threat, correlating perceived uncertainty and perceived importance with cognitive and somatic state anxiety. Marchant (1996) adopted a similar approach to examine the influence of perceived uncertainty and perceived importance, and trait anxiety on cognitive and somatic state anxiety. Prapavessis et al. (1996) multiplied perceived uncertainty and perceived importance, called that combination perceived threat and then investigated the influence of trait anxiety on that, and, further examined the influence of the new variable on cognitive and somatic state anxiety. Figure 7.1 shows that the Prapavessis et al. approach is not a test of the original model, nor does their operationalisation of perceived threat as perceived uncertainty multiplied by perceived importance reflect the conception of perceived threat in the original model, which includes the influence of the predisposition to feel threatened, that is, trait anxiety. Because perceived threat is not independently measured by any of the variables in the present work or that of other researchers in this field, and it is both operationally and mathematically equivalent to state anxiety, perceived threat has been omitted from the models examined here. The form of the model actually tested, based on the original Martens et al. model, is presented in

Figure 7.2. This model and those that follow, express relationships between perceived uncertainty, perceived importance, and trait anxiety as independent variables, and global A-state or cognitive and somatic state anxiety as dependent variables. These relationships can be examined effectively using multiple regression analysis. Thus, the present analysis supports the approach taken by Marchant et al. (1996). It should also be noted that until and unless a measure of perceived threat is developed that has demonstrated discriminant validity from major measures of state anxiety, the model as originally stated cannot be tested. For the purposes of clear discussion, the model in Figure 7.2 is hereafter referred to as Model 1.

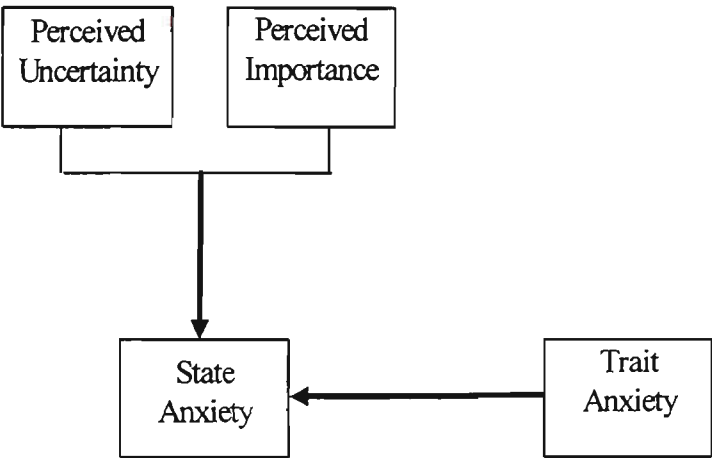


Figure 7.2. The modification of the original Martens et al. (1990) model (Model 1).

There may be some weaknesses in the original model proposed by Martens et al. (1990). One important issue is that perceived uncertainty and

perceived importance may have separate effects on state anxiety (e.g., Lox, 1992; Marchant, 1996). It could also be that perceived uncertainty and perceived importance have separate or differential effects on each component of state anxiety (e.g., Lox, 1992; Marchant, 1996; Prapavessis et al., 1996). For example, both perceived uncertainty and perceived importance are recognised to be cognitive processes, so it would be reasonable to expect that their influence on cognitive anxiety would be greater than their influence on somatic anxiety. Thus, in the first alternative model, referred to here as Model 2 (Figure 7.3), perceived uncertainty and perceived importance were considered as independent antecedents of state anxiety. The global, general state anxiety variable in the original model proposed by Martens et al. and included in the model based on the original here (Model 1) was, again, represented by the sum of cognitive anxiety and somatic anxiety from the data gathered, because Martens et al. did not make it clear how “A-state reaction” should be operationalised. In Model 2, where perceived uncertainty and perceived importance were separated, state anxiety was still operationalised as the sum of cognitive and somatic state anxiety, because this is what Martens et al. seem to have intended.

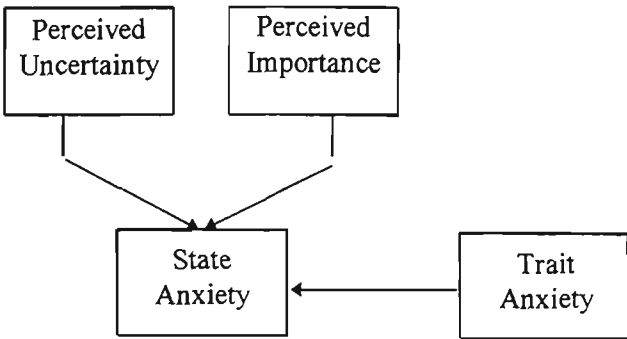


Figure 7.3. The first alternative model (Model 2).

The third model analysed (Model 3), distinguished between cognitive and somatic state anxiety, while also considering perceived uncertainty and perceived importance separately, to permit any differential effects of perceived uncertainty, perceived importance, and trait anxiety on cognitive and somatic state anxiety to be examined. This model is illustrated in Figure 7.4.

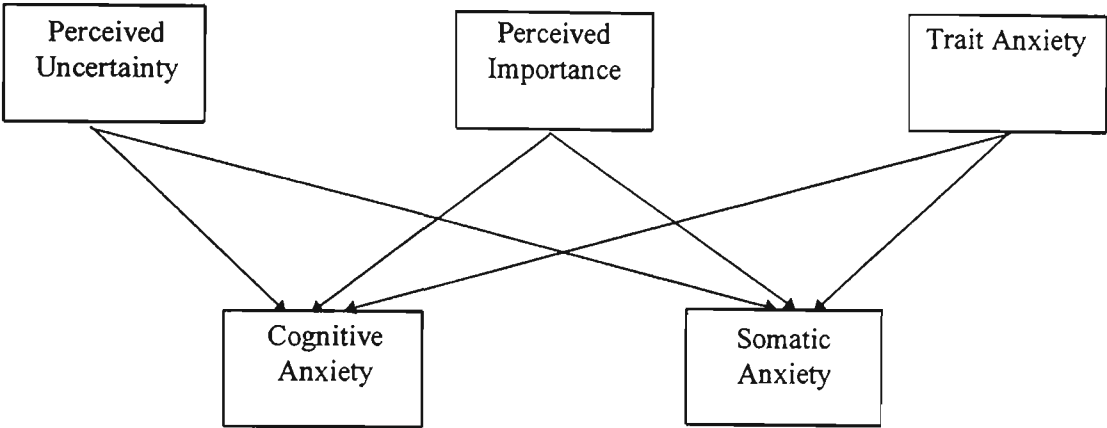


Figure 7.4. The second alternative model (Model 3).

Results

The present analysis examined the variance accounted for (R^2) by the first model (Model 1), based on of the original model proposed by Martens et al. The standardised regression coefficients (β) for perceived uncertainty multiplied by perceived importance, and trait anxiety, in relation to A-state reaction, were also examined. Then, the two alternative models were compared with the original for the amount of variance accounted for and the strength of the standardised regression coefficients between perceived uncertainty, perceived importance, trait anxiety, and global A-state or cognitive and somatic state anxiety. Path analyses were conducted, but results did not produce resolutions because all the variables are not measured, particularly “perceived threat”, nor are there multiple measures of any variables. Regression analysis was a more effective approach in this case.

Results from the the PUCT, the PICT, the SCAT-T, and the CSAI-2T at the start of the study of meditation and relaxation, reported in Chapter 6, were submitted to multiple regression analyses in the SPSS 6.1 for Windows system. Data from the first occasion of testing was introduced into the statistical modelling package, specifying the model based directly on the Martens et al. model (Model 1), which is presented in Figure 7.2. The results of this analysis are shown in Figure 7.5, which includes an R^2 value that indicates the amount of variance accounted for by the variables in this model, and standardised path coefficients (β) identified by this model, that reflects the strengths of relationships between independent and dependent variables. As in all results figures, significant standardised regression coefficients (β) in Figure 7.5 are represented by bold arrows. Results indicated that $R^2 = .60$, suggesting that a large amount of the variance in A-state was accounted for by perceived uncertainty, perceived importance, and trait anxiety in this model. The standardised path coefficients for the product of perceived uncertainty and perceived importance to A-state, $\beta = .49$ ($t = 4.6$, $p < .001$) and trait anxiety to perceived threat, $\beta = .40$ ($t = 3.8$, $p < .001$) suggest that the product of perceived uncertainty and perceived importance was a significant predictor of A-state reaction, and trait anxiety was also a significant causal variable of A-state reaction.

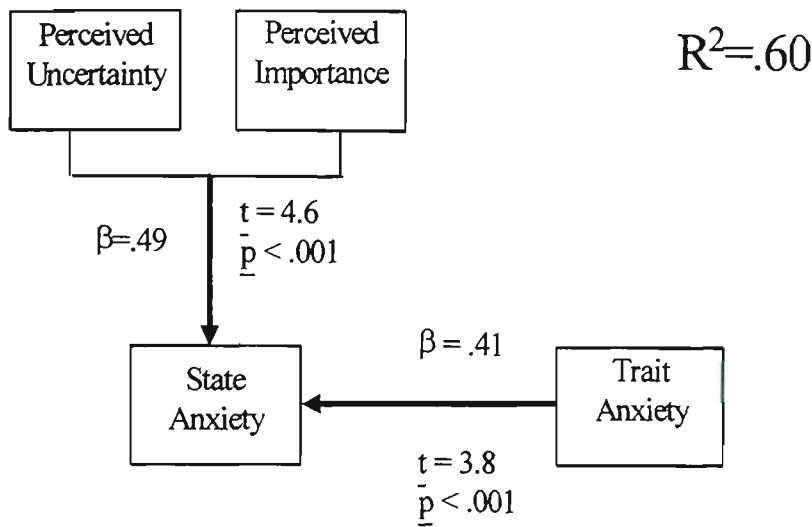


Figure 7.5. Multiple regression analysis of the modification of the original Martens et al. (1990) model (Model 1).

Results of the analysis of the first alternative model (Model 2), in which it was proposed that perceived importance and perceived uncertainty independently influence state anxiety, are represented in Figure 7.6. The standardised regression coefficients for the same data were derived from this model, using multiple regression analysis. Results indicated that $R^2 = .63$, suggesting again that a substantial amount of variance was accounted for by this model, slightly larger than that for Model 1, accounting for around 3% more of the variance. The path coefficients for perceived uncertainty to A-state, $\beta = .42$ ($t = 3.9$, $p < .001$), for perceived importance to A-state, $\beta = .20$ ($t = 1.9$, $p = .057$), and trait anxiety to A-state, $\beta = .38$ ($t = 3.6$, $p < .001$), suggest that perceived uncertainty was a significant predictor of A-state reaction, perceived importance, with a smaller relationship that only approached

significance, was a less strong predictor of A-state reaction, whereas trait anxiety was also a significant predictor of A-state reaction. These multiple regression analysis statistics suggest that, although Model 2 represents only 3% more variance accounted for than does Model 1, so too much should not be read into these results the suggested independent influences of perceived uncertainty and perceived importance together, combined with the trait anxiety influence, reflect more clarity on the relationship of these three variables with state anxiety than does a global measure of perceived uncertainty and perceived importance, combined with trait anxiety.

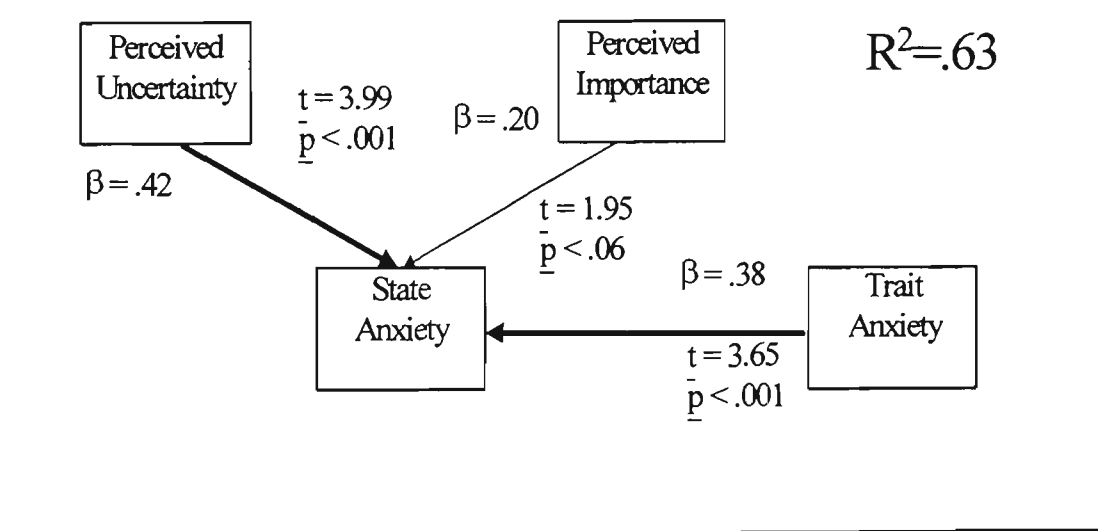


Figure 7.6. Multiple regression analysis of the first alternative model (Model 2).

Analysis of the second alternative model (Model 3), in which perceived importance, perceived uncertainty, and trait anxiety independently influence

cognitive anxiety and somatic anxiety, which are modelled separately, is presented in Table 7.1 and Figure 7.7. This includes the standardised regression coefficients and the variance accounted for by the same data using multiple regression analysis.

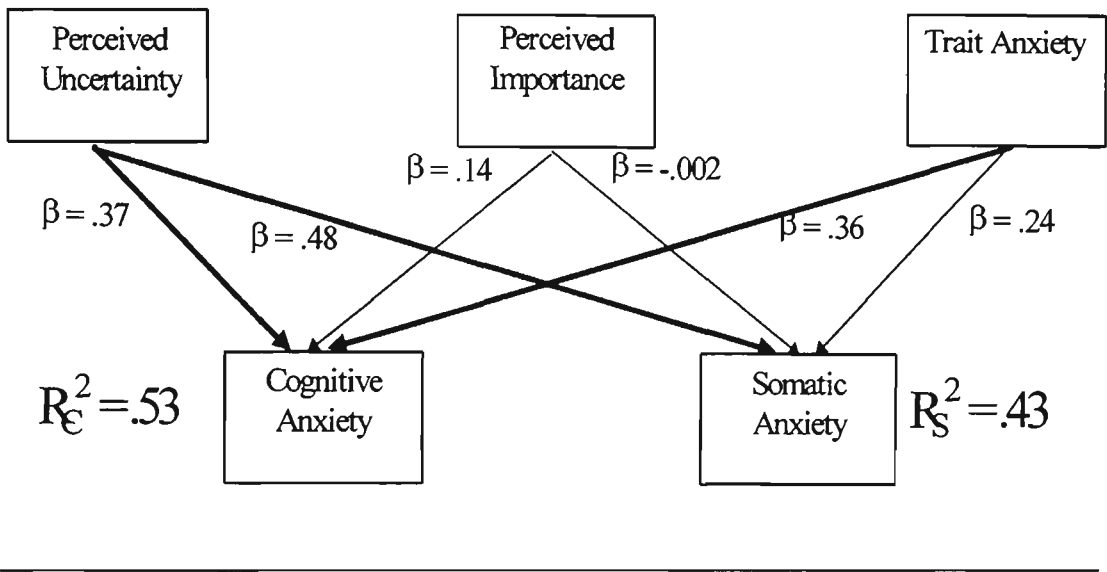


Figure 7.7. Multiple regression analyses of the second alternative model (Model 3).

This model was generated by calculating two separate multiple regression equations, one for cognitive anxiety and the other for somatic anxiety. In the first analysis, the data for perceived uncertainty, perceived importance, and trait anxiety were regressed onto cognitive anxiety. In the second, the same perceived uncertainty, perceived importance, and trait anxiety data were regressed onto somatic anxiety. Results indicated that the variance accounted for was, $R^2_{\text{c}} = .53$, for cognitive anxiety, and $R^2_{\text{s}} = .43$, for somatic

anxiety. The t-values and probabilities for the standardised regression coefficients in Figure 7.7 are presented in Table 7.1.

Table 7.1
t-test Values and Significance Levels for the Multiple Regression Analyses for Model 3

		t-value	Significance
PU →	Cognitive Anxiety	2.9	.005
	Somatic Anxiety	3.4	.001
PI →	Cognitive Anxiety	1.2	.211
	Somatic Anxiety	-.01	.986
Trait →	Cognitive Anxiety	2.9	.005
	Somatic Anxiety	1.7	.089

The separate standardised regression coefficients from perceived uncertainty, perceived importance, and trait anxiety to cognitive anxiety and somatic anxiety suggest that perceived uncertainty was a significant predictor of both cognitive anxiety and somatic anxiety. Perceived importance was neither a significant predictor of cognitive nor somatic anxiety. Trait anxiety was a significant predictor of cognitive anxiety, but not somatic anxiety.

Discussion

The model based on the original Martens et al. (1990) model with perceived threat removed did account for a substantial amount of variance in the data analysed here. The R^2 value of 60% of the variance accounted for was quite impressive for three predictors explaining a complex variable like state anxiety. The beta weights from the product of perceived uncertainty and perceived importance to A-state ($\beta = .49$) and from trait anxiety to A-state ($\beta = .41$) were both significant, suggesting that these variables were meaningful. For the first alternative model (Model 2), the results were very similar, the model did account for slightly more variance than the original model. The standardised regression coefficients did shed more light than those from the first model. Although the standardised regression coefficient for trait anxiety hardly changed from that for Model 1, separating perceived uncertainty and perceived importance produced standardised regression coefficients that suggested that perceived uncertainty was strongly related to A-state ($\beta = .42$), but perceived importance was less closely linked ($\beta = .20$). Model 3 showed that the stronger relationship of perceived uncertainty than perceived importance to state anxiety was probably due to its important influence on both cognitive anxiety and somatic anxiety, whereas perceived importance was not significantly related to cognitive or somatic anxiety. The standardised regression coefficients in Model 3 also indicated that perceived uncertainty had a slightly stronger relationship to somatic anxiety than to cognitive anxiety,

whereas trait anxiety had a stronger link with cognitive than with somatic state anxiety.

The theory of competitive anxiety in sport, proposed by Martens et al. (1990) stimulated research on issues to do with the underlying factors that affect state anxiety. Such research is needed, because it can provide information that can be used to manage state anxiety more effectively. In this thesis, multiple regression analyses of the data gathered at the start of the main study did give strong support for a model based directly on the original model proposed by Martens et al., but with perceived threat removed. In this model, nonetheless, it could be that multiplying perceived uncertainty and perceived importance is a weakness, because information concerning the differential effects of perceived uncertainty and perceived importance is lost during the process. In practice, it seems unlikely that perceived uncertainty or perceived importance will ever be totally absent. There would rarely be a situation where there is no importance at all in a competition, and there would rarely be a situation in which uncertainty was not present in a sport setting. It has, thus, been proposed in this thesis that perceived uncertainty and perceived importance should be examined separately, because important information about each is lost when they are combined in a single score.

The results for Model 2 support the proposal that splitting perceived uncertainty and perceived importance adds information. Surprisingly, the most important information seems to be that, in this case, perceived importance was not a significant influence on global state anxiety. The standardised regression

coefficients for perceived uncertainty and perceived importance to A-state in Model 2 provide more information than the single standardised regression coefficient from perceived uncertainty multiplied by perceived importance to perceived threat in Model 1. Model 2 still seems to limit the information provided by the variables measured, because it combines the measurement of cognitive anxiety and somatic anxiety into one score. As noted earlier, there are grounds for proposing that perceived uncertainty and perceived importance have differential effects on cognitive and somatic state anxiety. Also, the broad acceptance of the multidimensional nature of state anxiety based on the substantial original work of Martens and colleagues in developing, validating, and using the CSAI-2, make it imperative to examine each component of state anxiety in relation to perceived uncertainty and perceived importance.

The results found for Model 3 support these proposals, with impressive amount of variance accounted for by the two multiple regression analyses. The standardised regression coefficients for perceived uncertainty to cognitive anxiety and somatic anxiety were both significant. While this suggests that perceived uncertainty affected both cognitive and somatic state anxiety, the stronger association was with somatic state anxiety, which was unexpected. The standardised regression coefficients from perceived importance to cognitive and somatic anxiety were not significant, but the standardised regression coefficient from perceived importance to cognitive anxiety did show a trend, whereas that to somatic anxiety was negligible. This suggests that the perceived importance of the situation might have some influence on a

performer's thoughts and concerns, but it is unlikely to influence their bodily reactions, a conclusion that is contrary to experience. Performers often experience unusually strong bodily reactions before important matches. The standardised regression coefficients from trait anxiety to cognitive anxiety and somatic anxiety showed significant correlations between trait anxiety and cognitive state anxiety only. Again, this was not expected, because the items on the SCAT are predominantly somatic in nature.

These results are encouraging in that, it was evident that perceived uncertainty and perceived importance should be considered as separate variables that differentially influence cognitive and somatic state anxiety, as shown in Model 3. Further study of the relationship of perceived uncertainty and perceived importance to cognitive and somatic state anxiety separately is needed. Future studies might also include other antecedents of cognitive and somatic state anxiety in order to fully explain the mechanisms that underlie the components of state anxiety.

One weakness of the current regression analysis is that there was a limited number of measures, and those measures were not unequivocally the strongest that could possibly be developed. Future research should use multiple measures of perceived uncertainty and perceived importance, and multiple measures of cognitive and somatic state anxiety. It is also worth considering use of not only multiple measures of trait anxiety, but also the use of multidimensional measures, as employed by Prapavessis et al. (1996). It needs to be acknowledged that the items used to assess perceived uncertainty

and perceived importance in this research, although adequate indicators of these variables, might not have been sufficient in number.

Martens et al. (1990) have emphasised the need for experimental verification of the theory of competitive anxiety they proposed. To date, few published studies have been conducted to test the Martens et al. model. Lox (1992), found that uncertainty of outcome was more closely associated with cognitive anxiety, whereas importance of outcome related more to somatic anxiety. Because there was no effort to actively manipulate the variables (perceived uncertainty and perceived importance), or measure player perception on more than one occasion, the results are only suggestive of an underlying relationship and support the need for further study. It should be noted, however, that the relationship between perceived importance and somatic state anxiety found by Lox, was not replicated here.

The research on perceived uncertainty and perceived importance to date is limited, but there is some suggestion that perceived uncertainty and perceived importance are linked in different ways to cognitive and somatic state anxiety. Such an impression is given further support by the present regression analyses, which, like the work of Lox (1992), Prapavessis et al. (1996), and Marchant (1996), suggests that perceived uncertainty and perceived importance are related to cognitive and somatic state anxiety in different ways. The conclusions drawn from the different studies vary, however, with some suggesting a stronger role for perceived uncertainty and some for perceived importance, with Marchant et al. actually proposing a reinterpretation of

perceived uncertainty to perceived confidence. Each study to date has used different measures of perceived uncertainty and perceived importance. This is the most obvious explanation for the variation in findings. For one thing, it is plausible that, when measures of perceived uncertainty are not valid, perceived importance appears to be the stronger antecedent of cognitive and somatic state anxiety. Thus, there is a need for further studies in which perceived uncertainty and perceived importance are modelled or regressed separately onto separate cognitive and somatic anxiety scales, using a number of carefully validated measures of all these variables.

The findings in this thesis and in earlier research are equivocal. It was difficult to compare results from previous studies because different measures and analyses were used. For example, Marchant (1996) measured perceived uncertainty of the outcome and perceived importance of the outcome without measuring perceived uncertainty and perceived importance of performance. In terms of analyses, Lox used simple correlations, Prapavessis et al. used structural equation modelling, and Marchant used multiple regression analysis. It could be that because various measures and analyses were used, inconsistent results were found. In the study by Lox, perceived uncertainty was more closely associated with cognitive anxiety and perceived importance was more closely associated with somatic anxiety. In contrast to the findings of Lox, Marchant found that perceived importance more strongly influenced cognitive anxiety, and perceived uncertainty influenced both cognitive and somatic anxiety in a lesser degree. In this thesis, perceived importance was not

significantly related to cognitive or somatic anxiety, although having a stronger link to cognitive anxiety than to somatic anxiety. Perceived uncertainty in this thesis was found to be related to both cognitive and somatic anxiety, with a slightly stronger relationship to somatic anxiety. Still, research in the area, including this thesis, gives some suggestion that aspects of the model are meaningful, and all agree that the original model proposed by Martens et al. should be reconsidered and probably revised.

According to Martens et al. (1990), they did not mean the model they proposed to be considered as the all encompassing answer to the antecedents of state anxiety. They proposed it as their “best guess” at that particular moment, in the circumstances in which the model was developed, as stated:

The theory of competitive anxiety is parsimonious, can be operationalised, and implicates a number of testable hypotheses. At present it lacks direct experimental verification, but such is the nature of a new theory. We invite sport psychologists to test the theory and, as is inevitable with all theories, to replace it with a better one.

They claimed that the reasoning for developing the model was to stimulate further research and discussion. Martens et al. appear to seek more theoretically-driven research rather than random forms of study. The end result they envisaged was that further research would result from concepts or propositions generated in such models.

More research is certainly called for in those areas that relate to the concepts of perceived uncertainty and perceived importance, which the limited work to date suggests are important variables that relate to state anxiety.

Perhaps perceived uncertainty and perceived importance relate to both cognitive and somatic anxiety in different degrees. They may have stronger relationships with cognitive anxiety than is presently understood, because perceived uncertainty and perceived importance represent cognitive processes.

These issues await further research. The results of the regression analyses in this chapter do provide some support for this type of research in general and for further research on the relationship of perceived uncertainty and perceived importance to cognitive and somatic state anxiety, as well as the consideration of other potential antecedents of multidimensional state anxiety.

CHAPTER 8: GENERAL DISCUSSION

Introduction

The research reported in this thesis involved conversion of established measures of trait and state anxiety into the Thai language using one sample, and the application of these measures in a major intervention study. Similarly, measures of perceived importance and perceived uncertainty were developed with separate samples and then used with another sample, the weightlifters, in the intervention study. Examination of the effects of different interventions on perceived importance, perceived uncertainty, somatic anxiety, cognitive anxiety, and self confidence, permitted a test of parts of the matching hypothesis to be carried out, while a subset of data from the main study was subjected to multiple regression analysis to examine the Martens et al. (1990) theory of competitive anxiety.

The sequence of test development, examination of interventions, and modelling analysis raised a number of issues in this chapter. Chapter content includes a summary of the conclusions, the relationship of the present results to theory and previous research, methodological issues, and implications of the current work for future research and for practice.

Summary of Conclusions

Thai Version of SCAT and CSAI-2.

Evidence was presented earlier that the Thai version of SCAT and of the CSAI-2 were successfully translated from the English language original versions. Results from respective analyses demonstrated that the Thai instruments were reliable and valid.

Thai Language Tests of Perceived Uncertainty and Perceived Importance.

The Perceived Uncertainty of Competition Test (PUCT) and the Perceived Importance of Competition Test (PICT) were developed first in English, based on the definition of perceived uncertainty and that of perceived importance proposed by Martens et al. (1990). The PICT and the PUCT were then translated into Thai. Tests of reliability and validity were conducted and it was shown that the PICT and the PUCT were reliable and valid. It should be noted that these two tests of reliability and validity were conducted with separate samples.

Effect of Meditation and Progressive Muscle Relaxation on Perceived Uncertainty and Perceived Importance.

The meditation intervention in this study had a significant effect on both perceived uncertainty and perceived importance, whereas the progressive muscle relaxation intervention and the stretching exercises did not have any effect of those variables. In particular, meditation moderated the reaction of participants to a relatively important and uncertain competition.

Effect of Meditation and Progressive Muscle Relaxation on Cognitive, and Somatic State Anxiety and Self-confidence.

Both meditation and progressive muscle relaxation interventions had significant effects on somatic anxiety, producing notable reductions, whereas no significant effect on somatic anxiety occurred for the stretching exercises intervention. For cognitive anxiety, only the meditation intervention had a significant effect, whereas the other two interventions did not reduce cognitive anxiety. Meditation and progressive muscle relaxation interventions significantly enhanced self-confidence, whereas stretching exercises did not affect self-confidence at all.

Modelling Analysis related to Martens et al. (1990) Theory of Competitive Anxiety.

Results from the multiple regression analyses revealed that the directly measureable variables in the Martens et al. original model account for a relatively large amount of the variance. The first alternative model proposed in this thesis, where perceived uncertainty and perceived importance effects was considered separately, resulted in slightly larger amount of variance accounted for. The second alternative model, in which perceived uncertainty and perceived importance were examined separately and cognitive and somatic anxiety were separate dependent variables, accounted for a substantially greater amount of the variance than the other two models. Consideration of the standardised beta (path) coefficients in this model suggested that by examining perceived uncertainty and perceived importance separately, and examining

cognitive and somatic anxiety separately, more information could be gathered about their relationships. Perceived uncertainty and perceived importance related differently to cognitive and somatic anxiety. In particular, perceived uncertainty strongly related to both cognitive and somatic anxiety, whereas perceived importance was not significantly related to cognitive anxiety or somatic anxiety, although it showed a trend with cognitive anxiety. Trait anxiety related to both somatic anxiety, and cognitive anxiety.

Relationships to Theory and Research

The results of this thesis suggest that the progressive muscle relaxation intervention did not significantly effect perceived uncertainty or perceived importance, whereas the meditation intervention did influence both variables. This finding might suggest that perceived uncertainty and perceived importance are more closely linked to cognitive anxiety than to somatic anxiety. The reasoning for such a claim is that meditation and progressive muscle relaxation both influenced somatic anxiety, but only the meditation intervention influenced cognitive anxiety, and only the meditation intervention influenced perceived uncertainty and perceived importance. This finding supported the earlier proposal in this thesis that meditation should influence perceived uncertainty and perceived importance, because both variables refer to cognitive processes, and if meditation influences cognitive anxiety, which is worrying thoughts or cognitions, it should also influence the cognitive

processes associated with both perceived uncertainty and perceived importance. Although the finding seems promising, it could not be concluded that perceived uncertainty and perceived importance are antecedents of cognitive anxiety, based on this observation, because significant reduction in cognitive anxiety occurred earlier in the treatment than reduction in perceived uncertainty and perceived importance in the present study.

This thesis has partially supported the matching hypothesis in finding that the progressive muscle relaxation technique, which is proposed to be a somatic anxiety management technique, was effective in reducing somatic anxiety. This finding is in accord with previous research by Maynard and Cotton (1993). Their study directly tested a cognitive and a somatic technique based on the matching hypothesis. It was also shown, in the present study, that progressive muscle relaxation did not affect cognitive anxiety, something most previous research has not demonstrated.

The meditation intervention applied in this thesis, Anapanasati, was found to be effective for managing both cognitive and somatic state anxiety. This finding supported many writers and researchers in meditation who have claimed that meditation is a class of technique that can reduce both cognitive and somatic anxiety, and a technique that can relax the mind and body accordingly (e.g., Buddhathasa, 1990; Goleman, 1971; Sekida, 1975; Vajiranana, 1975). The finding contradicts the categorisation of meditation as a somatic anxiety only technique in most sport psychology applied writing

(e.g., Martens, 1983; Harris, 1986), as well as the claims of some that it is a cognitive only technique (e.g., Goleman, 1971).

Self-confidence was found to be enhanced in the meditation group and in the relaxation group in this study. This partially supported the concept of Martens et al. (1990), who defined self-confidence as one end of a cognitive evaluation continuum where cognitive anxiety is the opposite extreme. Thus, increase in self-confidence for the meditation group could be explained by the substantial reduction in cognitive anxiety. Increase in self-confidence in the relaxation group, which showed the same amount of increment as the meditation group, was not predicted. One possible explanation for this was that self-confidence in the relaxation group at the beginning of the study was considerably lower than that of the other group. It may be the case that increase in self-confidence for the relaxation group was a case of regression to the mean. The final level of self-confidence in the progressive muscle relaxation group was around the initial level in the AM and C groups. Although Martens et al. theoretically linked self-confidence with cognitive anxiety, they also reported that research has consistently found correlations between somatic anxiety and self-confidence to differ little from those between cognitive anxiety and self-confidence, typically being of a moderate level.

Another possibility is that the progressive muscle relaxation intervention did lead directly to increased self-confidence, through the relationship of interpretation of somatic symptoms to confidence. Many performers feel more or less confident depending on their experience of such

somatic symptoms. Reduction of somatic symptoms could lead such individuals to interpret their somatic state as more appropriate for effective performance. Thus, self-confidence would increase.

Considering the Martens et al. (1990) model based on the theory of competitive anxiety, it was found in this thesis that the combination of perceived uncertainty and perceived importance, along with trait anxiety in the original model accounted for a relatively large amount of the variance in state anxiety. An alternative model with perceived uncertainty, perceived importance, and trait anxiety independently influencing global state anxiety accounted for slightly more of the variance than the original model. A third, where perceived uncertainty, perceived importance, and trait anxiety independently influence cognitive and somatic state anxiety also accounted for substantial variance for cognitive and somatic anxiety, but with different patterns of influence for perceived uncertainty, perceived importance, and trait anxiety. These findings support earlier research examining the Martens et al. model that has suggested that the multiplicative relationship between perceived uncertainty and perceived importance should be reconsidered. Lox (1992) found that an item measuring perceived uncertainty correlated with cognitive anxiety and one measuring perceived importance correlated with somatic anxiety, where cognitive and somatic anxiety were measured separately by using the CSAI-2. Also, Prapavessis et al. (1996) found no significant causal paths from a combination of perceived uncertainty and perceived importance to either cognitive anxiety or somatic anxiety, measured by the CSAI-2. Similar

to the finding in the present thesis, Marchant (1996) concluded from three studies that perceived uncertainty and perceived importance had associations with both cognitive and somatic state anxiety, but that the link of each with cognitive anxiety was stronger. Thus, it could be concluded from the findings in the present thesis and earlier research together that the relationship of perceived uncertainty and perceived importance should not be considered to be multiplicative and also, that cognitive and somatic state anxiety, should be considered separately. In fact, the theoretical and research bases for considering cognitive and somatic anxiety independently are clearly presented by Martens et al. (1990).

Methodological Issues

In this thesis, SCAT was the trait anxiety measurement instrument. Although SCAT is a unidimensional measurement scale, the thesis used it to follow the Martens et al. proposal of the theory of competitive anxiety, which was clearly based on this unidimensional notion of trait anxiety. It is to be noted that there are alternative measures of multidimensional trait anxiety, such as the Sport Anxiety Scale (Smith, Smoll, & Schutz, 1990), and the trait version of the CSAI-2 (Jones & Swain, 1995). At the time when the research in this thesis was designed and conducted, these instruments were not yet well-established. Recent research such as that by Prapavessis et al. (1996), which was published three years after data collection in this thesis, has begun to use

the SAS, but there is still not a large amount of such work published. There has been very little use of the trait version of the CSAI-2, since its original use by Albrecht and Feltz (1988), despite its intuitive appeal, especially where relationships with the state version of the CSAI-2 are sought. It is proposed that future research on the theory of competitive anxiety should use multidimensional trait measures, such as the SAS or the CSAI-2 trait version, alongside the SCAT for the purposes of comparison and elucidation.

The CSAI-2, has been modified recently and used to test the frequency and direction of state anxiety components (Jones, Swain, & Hardy, 1993; Swain, & Jones, 1993). Again, when data collection in this thesis was conducted, there was very little research published on this modification. The work of Jones and colleagues has suggested that often intensity of cognitive or somatic state anxiety might not be a key factor in distinguishing its effects, but its frequency or direction could relate to temporal patterning or the relationship each component has with performance. In future work, using the CSAI-2 modified to measure frequency and direction of state anxiety, as well as intensity might provide a clearer picture of anxiety phenomena, related both to anxiety management and to the modelling of anxiety. Clearly, this is also likely to produce more complex models and sets of relationships between the antecedents of state anxiety and its components and dimensions.

The validation of the conversion of both the state and trait anxiety tests to Thai language could have been enhanced by expanding the number and types of participants used, although use of 200 participants from various sports

was considered to be adequate. Drawing participants from the specific source used, that is, university sport, limited the study largely to persons aged 18 to 25 years, with well developed skill and engaged in a high grade of competition, but not typically elite. Inclusion of persons of differing ages, skills, and competition levels, might have made for a more valid and generalisable test of the instrument. For example, 60 year olds engaged in sport for health and longevity reasons will focus on that instrumental aspect and thus might have lower anxiety levels compared to 20 year olds engaged in Olympic level competition. Obviously, the variation in skill level between such groups would also be extensive. The expectations on the part of the older group to achieve higher performance scores would be less than among the younger group. Accordingly, anxiety levels and self-confidence would be likely to differ.

The measures for perceived uncertainty and perceived importance developed in this thesis raise several questions. The number of items is one interesting issue. It was decided that three items could encompass the measurement of the aspects of uncertainty defined by Martens et al. Similarly, it was considered that only two items were needed to reflect importance. Although this did result in reliable and valid measures, it could be that the inclusion of more items to measure each variable would have been preferable. Obviously, for perceived uncertainty items, the three items in the PUCT did not explicitly cover the whole range of perceived uncertainty that Martens et al. suggested. For perceived importance items, no distinction was made between

intrinsic and extrinsic aspects of importance, rather the internal and external aspects were implicitly combined in each item.

In the development of tests for perceived importance and uncertainty, the challenge was that at the time of development there were no other recognised tests in the literature that were useful in making a comparison with this study's testing method. The only published work, that of Lox (1992) used one item to reflect perceived uncertainty of outcome and one item to assess perceived importance of outcome, one item to assess perceived uncertainty of performance, and one item to assess perceived importance of performance, with some success. Greater confidence in the present testing method could be provided by repeating the psychometric testing studies of PUCT and PICT with other athletes, and in other situations, or with a larger number of athletes than the 50 used to test each measure here. Applying the test to athletes of different competition gradings or in sports other than those used might also improve confidence in the general applicability of the PICT and PUCT, because what was undertaken in this study was limited to a small range of sports and competition levels. By expanding the range of participants, different results may be revealed because people in different types of sport or different competition levels, might perceive the uncertainty and importance of competition differently. Re-structuring of the actual questions used might alleviate the problem experienced whereby the means of the first testing were higher than expected. It is suspected that this was partly the result of the structure of the questions, which encouraged an affirmative or positive reply.

In the study of Prapavessis et al. (1996), similar measurement tools were developed. These measures could be used, post facto, as a comparison with the measurement employed in the present study. In Prapavessis et al.'s study, each scale consisted of four items developed and based on the Martens et al. (1990) model of competitive anxiety. Having four items for each scale gave an advantage in terms of testing for reliability, whereas in the present study, testing for reliability was limited, especially with respect to internal consistency. Only correlations between the two occasions and between each item on the same occasion could be used to examine perceived importance, whereas use of the alpha coefficient with the three perceived uncertainty items applied this measure of internal consistency at its lowest level. There is still lack of clarity in the measurement of perceived uncertainty and perceived importance, despite the efforts of Lox (1992), Marchant (1996), and Prapavessis et al. (1996). In the study by Lox (1992) perceived uncertainty and perceived importance were measured using two items for perceived uncertainty and two items for perceived importance. In each case, one item referred to outcome and the other referred to performance, whereas, in Prapavessis et al., all items referred to outcome in terms of interpretation of the variable in the study. Nonetheless, the items in the PICT and the PUCT were generated from the conceptualisation of perceived uncertainty and perceived importance, respectively, by Martens et al. Each was examined using a separate sample, and samples independent of that used in the main study, something that none of the previous studies have done. Analyses indicated that the PICT and the

PUCT had satisfactory internal consistency and their construct validity was supported in tests comparing more and less important competitions for the PICT and easy (more certain) versus difficult (less certain) opposition for the PUCT. Further, the clear distinctions between pre-competition scores (Occasions 1, 5, and 10) and scores for the lifting tests, for both perceived uncertainty and perceived importance tests in the main study, provide additional construct validity for these two short scales.

The design of the study on techniques for anxiety reduction in this thesis seemed to be sound in terms of testing for intervention effects, with three conditions and using the stretching exercises as a placebo for attention purposes. This ensured that all three conditions received the same amount of attention in terms of time with instructor. It was interesting to find that stretching exercises, which are intended to relax or loosen the muscles and might, thus, be expected to produce some effect, at least on somatic anxiety, did not have any effect.

Unlike some research in this area, particularly by the Maynard group, this thesis did not select high scorers in a particular area and give them all the matched treatment, which loads the situation somewhat in favour of the research hypothesis. In doing that, it would be difficult to distinguish an effect of regression to the mean from an actual intervention effect. This thesis involved participants from the whole range of trait anxiety and matched them into the three intervention groups. It was shown in the pre-test that cognitive and somatic state anxiety were matched. They also showed substantial

variability with means in the moderate anxiety range. For some reason, SCAT matching did not produce matched groups in terms of self-confidence. It is not entirely surprising that matching on one trait variable, SCAT, did not result in matches on three state variables at the same time. Future research should employ a better way of matching groups to get a more clear cut result on all variables. In the event, only self-confidence which was a variable of more peripheral interest in this thesis, was not adequately matched by the trait anxiety matching process.

It was fully appreciated prior to the study that the lifting test on Occasions 2 to 4, and 6 to 9 would produce different results to the competitions on Occasions 1, 5, and 10. The lifting tests were conducted under formal conditions, with scrutiny by officials and were generally reported by the participants to be stressful. Nevertheless, it was clear that competitions were more stressful than lifting tests from the results for perceived uncertainty and perceived importance over occasions. Also, when looking at the effect of meditation on perceived uncertainty and perceived importance on each occasion, it was evident that, on the more uncertain and important occasions (Occasions 5 and 10), the effect of meditation in moderating perceived uncertainty and perceived importance and thus, state anxiety was largest. It could be argued that this provides some support for the proposition that there is likely to be a bigger effect of interventions on cognitive and somatic anxiety, when there are higher levels of perceived uncertainty and perceived importance. Put another way, the value of an intervention such as AM is likely

to be greatest, right when it is most needed, in important competition against tough opponents.

The use of a larger number of participants would generally have enhanced the study, although most results were clear cut. Involvement of participants of a nationality other than Thai, preferably Western, would have broadened the generalisability of the results. The use of Thai nationals, who were likely to have a cultural predisposition towards one of the interventions (i.e., meditation), restricts the generalisability of the conclusions that can be drawn. Another restricting factor, also acknowledged, was that only national level competitors of an elite nature in the sport of weightlifting were used, which may have had an effect different than using a lower level of competition, non-elite performers, and other sports. National level competitors tend to have higher motivation for improving their performance and would participate enthusiastically in any technique they believed to be capable of giving them an extra edge. The selection of weightlifters was based on their availability. As a sport that is frequently cited to require among the highest levels of arousal for peak performance (e.g., Landers & Boutcher, 1986), it might be that results found for this sport might not apply to sports with a large amount of physical activity, like team ball games, where arousal can be dissipated by that physical activity, or those where arousal levels need to be low, such as archery or shooting.

This discussion has identified a number of ways in which the tests of validity and reliability, methods of the main study, and the analyses, could be

improved. The majority of the methods and the design of the main study functioned effectively, producing relatively clearcut and meaningful results. The general approach is, thus, supported and recommended for future work. The inclusion of a genuine control condition or the use of mismatched treatments, such as PR for cognitive anxiety is essential to fully demonstrate treatment effects on state anxiety components. The main study used both of these elements of design.

Implications for Research

In this study, meditation and relaxation techniques were examined in terms of their effect on state anxiety levels. To examine state anxiety, a multidimensional measure was used, whereas to monitor trait anxiety a unidimensional test was used. In future research, multidimensional trait measures should be use alongside with the unidimensional SCAT.

Weightlifting is one of the premiere sports in Thailand, and the 48 participants were among the elite sports performers in the country. Their Thai cultural background could also have affected their reactions to the interventions, particularly increasing both their expectancies of the meditation intervention and the degree to which they were accustomed to the methods and perspectives of meditation. Future research needs to involve interventions in a variety of cultures to determine the extent, if any, to which such expectancy and prior experience influence the efficacy of various techniques. Further,

application of the interventions in a range of sports, representing different levels of physical and psychological demand, would clarify whether the nature of the sport activity affects the efficacy of interventions. Weightlifting is a sport that requires short bursts of extreme, but controlled, power to be exerted. It is likely that tight muscles and limited oxygen flow, associated with somatic state anxiety, as well as doubts and concerns about performance, linked to cognitive anxiety, would be detrimental to performance, but a high degree of somatic relaxation might not be conducive either. In competition (the national championship) that immediately followed the tenth week of this study, participants from the meditation treatment broke eight national records, whereas those in the progressive muscle relaxation and control groups broke no records. Although no conclusions can be drawn from this observation, the assignment of weightlifters to one of the three groups to match trait anxiety across groups, with all other variables randomised, makes these performance differences, in terms of lifting records, suggestive.

Amplly demonstrated as part of this study was the reduction in both cognitive and somatic state anxiety, which resulted from the meditation intervention. Comparison was made between meditation and progressive relaxtion as somatic techniques. A future direction might be to compare a range of cognitive techniques or a package which includes both somatic and cognitive techniques together against meditation. The results of such future studies might clarify the role of meditation and its effectiveness in the control of somatic and cognitive anxiety.

One implication from the intervention study for future research would be its replication with a wider group of Thai nationals and, more importantly, using a wide selection of non-Thais, in particular those from Western culture. Also, future research should examine other types of meditation, as well as other types of non-meditational technique, to see if there are parallel results.

Meditation was selected for study in this thesis because of its potential to affect both somatic and cognitive state anxiety. Progressive relaxation was chosen as a presumed somatic technique that would provide a comparison, being expected to influence somatic anxiety, while having no effect on cognitive anxiety. It was argued that this tested aspects of the matching hypothesis.

First, the demonstration that a somatic technique affects somatic state anxiety, but not cognitive state anxiety, was examined by the progressive muscle relaxation intervention. Second, the meditation intervention was proposed as an exception to the matching hypothesis that would reduce both cognitive and somatic state anxiety. Although both of these predictions were clearly supported, the study represents only a partial test of the matching hypothesis, because there was no cognitive intervention, that is, an anxiety management technique that is expected to reduce cognitive state anxiety, but not to affect somatic state anxiety. It is, thus, important to compare a cognitive type of anxiety management technique, such as cognitive restructuring, with meditation and with a somatic technique.

Further, it was argued by Martens et al. (1990), following the “stress formulae” proposed by Martens (1987), that under some conditions, somatic

anxiety can lead to cognitive anxiety and cognitive anxiety can lead to somatic anxiety. The results for the progressive muscle relaxation intervention clearly contradict this for the proposition that somatic anxiety leads to cognitive anxiety, because the substantial reduction of somatic anxiety in this group was accompanied by no effect on cognitive anxiety for the progressive muscle relaxation group. It is difficult to know, in terms of the results of this present thesis, whether somatic anxiety reduction resulted from cognitive anxiety reduction, in the meditation group, because the meditation intervention did reduce cognitive and somatic anxiety, and, as noted, this was not compared with a technique that is considered to be a cognitive technique only. Future research is needed that compares a meditation intervention such as Anapanasati with another cognitive technique. If the other cognitive technique reduces both cognitive and somatic state anxiety, that would support the Martens et al. proposal that cognitive anxiety leads to somatic anxiety, whereas if the other cognitive technique reduced only cognitive anxiety, that would support the proposal of the matching hypothesis, that cognitive techniques reduce cognitive anxiety only. It would also contradict the stress formula that suggests alternations in cognitive state anxiety lead to changes in somatic state anxiety. If meditation was, again, associated with reductions in both cognitive and somatic anxiety, it would provide further support for the suggestion in this thesis that meditation has separate effects on the two components of state anxiety.

It was predicted that Anapanasati meditation is both a cognitive and a somatic technique and that prediction was supported by the marked effects of meditation on the cognitive and somatic state anxiety of 16 elite weightlifters. This raises several issues worthy of future study. First, the result here needs to be replicated with other samples. Second, based on theoretical conceptions, further research is needed to examine whether this dual capacity is specific to Anapanasati meditation, applies to all types of meditation, or operates for a particular category of meditation techniques, but not for others. Third, again by considering their conceptual basis, research should examine any other anxiety management techniques that might be expected to affect both cognitive and somatic anxiety.

While the measures of intensity of cognitive and somatic anxiety, did response sensitively to anxiety management treatments in the present thesis, the frequency and direction dimensions of state anxiety should be a focus of future research. This may help in refining further the effect of meditation and other anxiety management techniques. It might also help in examining the Martens et al. model and the relationships within it. For example, it is unclear whether trait anxiety, perceived uncertainty, or perceived importance, or some combination, would be most likely to be antecedents of the directional or frequency dimensions of cognitive or somatic state anxiety. The Jones and Swain (1995) finding that the CSAI-2 trait version can be used to identify predispositions to perceive anxiety as facilitative or debilitating suggests that the trait measurement for future study of this theory should not only be

multidimensional, but should also consider the direction of cognitive and somatic trait anxiety.

It is, thus, important to examine the model of competitive anxiety further, with stronger modelling with multiple, high quality measures of each variable, such as using various multidimensional trait anxiety measurement tools. In future research, perceived uncertainty and perceived importance should be looked at separately. Also, the components of state anxiety should be viewed separately, as well as the intensity, direction, and frequency of each component. In order to construct a comprehensive model in future research, trait anxiety should be viewed as multidimensional. Finally, more variables should be added into the model, as stated in Lox (1992) and Marchant (1996), who argued that there may be other important variables not included in the original model. That is, the proportion of the total variance accounted for in most research on the competitive anxiety model to date suggests that other noteworthy antecedents of cognitive and somatic state anxiety might exist. This possibility needs to be explored, based on a revised model, specified by separate perceived uncertainty and perceived importance variables, separate multidimensional trait anxiety variables, and separate multidimensional state anxiety variables, both components (cognitive and somatic) and dimensions (intensity, frequency, and direction).

The area of anxiety has been widely studied by sport psychologists, yet there is still only limited understanding of how anxiety is generated. Further, there is little research to indicate if, when, or how best to manage various

aspects of anxiety in relation to competitive sport. The results of the intervention study and the examination of the relationships in the theory of competitive anxiety in this thesis suggest that these are important directions for the development of theory and for the refinement of the practise of anxiety management, especially when linked to the recent developments in the conception and measurement of trait and state anxiety in sport.

Implications for Practice

In order to understand how anxiety management techniques can be applied more fully, so they can be employed more effectively, the present research supports the proposal that perceived uncertainty and perceived importance are two important variables to monitor. It is likely that perceived uncertainty and perceived importance exert considerable influence on state anxiety. It may be the case that fully understanding perceived uncertainty and perceived importance and then directing efforts at control on perceived uncertainty and perceived importance would be a particularly effective route to control anxiety. The measurement of perceived uncertainty and perceived importance for a competition well in advance could provide early information about whether someone is likely to get anxious and what kind of anxiety they are likely to experience. It might then be possible to prescribe more precisely the appropriate anxiety management interventions or to indicate the use of techniques that have already been learned. At this stage, the research certainly

indicates that when the intensity of cognitive anxiety is high and it is experienced to be debilitating, moderation of perceived uncertainty and perceived importance could be an effective anxiety management technique.

It has been found that progressive muscle relaxation is a sound somatic anxiety intervention technique. It is clearly a somatic technique, in terms of the matching hypothesis. Meditation was found to be at least as effective as progressive muscle relaxation in reducing somatic state anxiety, but it was also effective in lowering cognitive state anxiety. In terms of perceived uncertainty and perceived importance, meditation was found to be effective for moderating both variables, lowering levels of perceived uncertainty and perceived importance, whereas progressive muscle relaxation did not appear to have any effect. In a situation where both cognitive and somatic state anxiety need to be reduced, and/or a situation in which perceived uncertainty and perceived importance need to be moderated, meditation would be an appropriate technique.

A major indication of this study for practice is that athletes should learn specific techniques, which they can apply, depending upon the component of state anxiety which they are experiencing. If they are primarily rating high on somatic anxiety, then progressive relaxation would be appropriate, whereas an athlete experiencing somatic anxiety and cognitive anxiety may benefit more from meditation. Meditation has the advantage of being less time-consuming than many other techniques used in sport psychology; it requires no equipment, it is easily understood by athletes, and it is simple to use. The study by Stooze

(1995) applied the same meditation intervention to Australian athletes and no problem was reported with the acceptance of the Thai meditation technique in that study. There may be some danger of using meditation in some situations such as those where only one component of anxiety needs to be reduced. Because meditation reduces both components, it might do more harm than good, by reducing the other component. In some situations, such as where cognitive anxiety needs to be reduced and somatic anxiety is low, the meditation intervention might be appropriate, because meditation would not substantially reduce a component when it is already low. Also, results in this thesis have shown that the stretching exercise program did not have a significant effect on any component of the CSAI-2. In fact, the results for stretching exercises were noteworthy for their stability, leading further support to the claims that the effects for the AM and PR groups, were caused by the treatments. Stretching exercise may be effective in creating muscular relaxation in non-athlete population, but for elite sports performers who had long used the exercise as part of preparation and warm-up, any effects on somatic anxiety symptoms would be unlikely.

The work done in this thesis on the use of the SCAT and the CSAI-2 has immediate application for their use in Thailand. Translation, testing, and validation of these tests mean that they are available for use in future research on sport psychology in Thailand. The SCAT-T and the CSAI-2T are now being widely used in practice by sport psychologists working with Thai elite sports, to assess levels of trait and state anxiety. These two measurement

instruments are currently the only two psychological assessment tools that are used by sport psychologists servicing the elite athletes in Thai national squads, through the Sport Authority of Thailand. There is also potential for the measurement of perceived uncertainty and perceived importance in Thai athletes, as a means of anticipating certain antecedents of anxiety and introducing techniques to moderate them. Although more work still needs to be done on the validation of measures of perceived uncertainty and perceived importance, generally, the results of the studies reported in Chapter 4 and 5, combined with the patterns of perceived uncertainty and perceived importance observed in the main study, suggest that the present instruments are effective for use with Thai athletes.

Final Comments

Although there is a vast amount of research on anxiety, that research has shown that the construct of anxiety is more multi-faceted and variable in its action and effects than had been thought. This thesis has certainly added to the understanding of several aspects of anxiety and its management. It also points clearly to a number of areas of research that should prove fruitful.

Research examining techniques proposed to reduce anxiety, is limited in the field of sport psychology. There is no doubt that further research in this line is very much needed. The published research of Maynard and Cotton (1993), Maynard et al. (1995), and Maynard et al. (1996) is the only work that

has tried to further determine how or when a relaxation technique helps reduce cognitive anxiety or somatic anxiety, on the basis of the widely cited and applied matching hypothesis. Thus, previous research and the present thesis, taken together, certainly suggest that further exploration of the matching hypothesis is warranted.

It is hoped that sport psychology researchers will take up the challenge of further testing the matching hypothesis. In the future, research must consider that demonstrating that a “matched” technique, according to the hypothesis, produces a decrease in anxiety, is not enough. It must also be demonstrated that the “mismatched” technique, that is, a cognitive technique, when the high anxiety is somatic or a somatic technique when the high anxiety is cognitive, or at least a no intervention control condition for a high anxiety group, be it cognitive anxiety or somatic anxiety, does not produce a similar reduction. Then it can be strongly stated that the reduction of a particular type of anxiety results from the effectiveness of the intervention, as was the case in the intervention study in this thesis.

The results of this thesis, although they do not resolve either the validity of the matching hypothesis or that of the theory of competitive anxiety, do provide information both in terms of anxiety management and the refinement of the theory. Both the matching hypothesis and the theory of competitive anxiety are probably not totally correct, but each has some merit in promoting research and directing practice. In terms of the theory of competitive anxiety in sport, the amount of variance explained by just three

antecedents of cognitive and somatic state anxiety was impressive. This holds great promise when it is considered that a unidimensional trait anxiety measure was used to predict multidimensional state anxiety and that there was some concern about the precision of the measures used with the other two antecedents, perceived uncertainty and perceived importance. Therefore, further research in both areas is important. The present research is not an end in itself, but its largely encouraging results, concerning the role of perceived uncertainty and perceived importance in the generation of cognitive and somatic state anxiety and the efficacy of meditation and relaxation intervention techniques, should stimulate further research in this important area for enjoyment and performance in sport.

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APPENDICES

APPENDIX A	The Sport Competition Anxiety Test
APPENDIX B	Competitive State Anxiety Inventory - 2
APPENDIX C	Perceived Importance Test
APPENDIX D	Perceived Uncertainty Test
APPENDIX E	Progressive Muscle Relaxation Script

APPENDIX A

The Sport Competition Anxiety Test

Direction: Below are some statements about how persons feel when they compete in sports and games. Read each statement and decide if you **HARDLY EVER**, or **SOMETIMES**, or **OFTEN** feel this way when you compete in sports and games. If your choice is **HARDLY EVER**, blacken the square labeled A, if your choice is **SOMETIMES**, blacken the square labeled B, and if your choice is **OFTEN**, blacken the square labeled C. 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 competing in *sport and games*.

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

The 10 test items (2, 3, 5, 6, 8, 9, 11, 12, 14, and 15) are scored according to the following directions, whereas the spurious items (1, 4, 7, 10, and 13) are not scored:

1 = Hardly ever, 2 = Sometimes, 3 = Often

Scoring for Items 6 and 11 is reversed according to the following key:

1 = Often, 2 = Sometimes, 3 = Hardly ever

APPENDIX B

Competitive State Anxiety Inventory - 2

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

	Not at All	Somewhat	Moderately So	Very Much So
1. I am concerned about this competition	1	2	3	4
2. I feel nervous.	1	2	3	4
3. I feel at ease.	1	2	3	4
4. I have self-doubts.	1	2	3	4
5. I feel jittery.	1	2	3	4
6. I feel comfortable.	1	2	3	4
7. I am concerned that I may not do as well in this competition as I could.	1	2	3	4
8. My body feels tense.	1	2	3	4
9. I feel self-confident.	1	2	3	4
10. I am concerned about losing.	1	2	3	4
11. I feel tense in my stomach.	1	2	3	4
12. I feel secure.	1	2	3	4
13. I am concerned about choking under pressure.	1	2	3	4
14. My body feels relaxed.	1	2	3	4
15. I'm confidence I can meet the challenge.	1	2	3	4
16. I'm concerned about performing poorly.	1	2	3	4
17. My heart is racing.	1	2	3	4
18. I'm confidence about performing well.	1	2	3	4
19. I'm concerned about reaching my goal.	1	2	3	4
20. I feel my stomach sinking.	1	2	3	4
22. I'm concerned that others will be disappointed with my performance.	1	2	3	4
21. I feel mentally relaxed .	1	2	3	4

23. My hand 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

The CSAI-2 is scored by computing a separate total for each of the three subscales, with scores ranging from a low of 9 to a high of 36. The higher the score, the greater the cognitive or somatic A-state or the greater the state self-confidence. No total score for the inventory is computed.

The cognitive A-state subscales is scored by totaling the responses for the following 9 items: 1, 4, 7, 10, 13, 16, 19, 22, and 25. The somatic A-state subscales is scored by adding the responses to the following 9 items: 2, 5, 8, 11, 14R, 17, 20, 23, and 26. Scoring for item 14 must be reversed in calculating the score for the somatic A-state subscales as indicated below:

- 1 = 4
- 2 = 3
- 3 = 2
- 4 = 1

The state self confidence subscales is scored by adding the following items: 3, 6, 9, 12, 15, 18, 21, 24, and 27.

Inventory that are missing no more than one response per subscale can still be scored, but any inventory in which two or more items from any one subscale are omitted should be invalidated. To obtain subscale scores when an item has been omitted, compute the mean item score for the eight answered items, multiply this value by 9, and then round the product to the nearest whole number.

APPENDIX C
Perceived Importance Test

Two possible items to be piloted with instructions are as follows:

Please circle the number which most accurately reflects your feeling about the following questions.

1. How important is this match to you?

1	2	3	4	5
Not	Somewhat	Important	Very	Extremely
Important	Important		Important	Important

Please circle the number which most accurately reflects your level of agreement with the following statement.

2. The outcome of this match means a lot to me.

1	2	3	4	5
Strongly	Disagree	No Strong	Agree	Strongly
Disagree		Feeling		Agree

APPENDIX D
Perceived Uncertainty Test

Three possible items to be piloted with instructions are as follows:

Please circle the number which most accurately reflects your feeling about each of the following questions.

1. How likely do you think it is that you will win this match?

1	2	3	4	5	6	7	8	9
Certain		Likely		Highly		Likely		Certain
Loss		Loss		Uncertain		Win		Win

2. How would you rate your skill compared with that of your opponent?

1	2	3	4	5	6	7	8	9
Highly		Somewhat		Skill		Somewhat		Highly
Inferior		Inferior		Level Equal		Superior		Superior

3. How well do you expect to perform in this match?

1	2	3	4	5	6	7	8	9
Very		Poorly		Moderately		Well		Very
Poorly								Well

APPENDIX E

Progressive Muscle Relaxation Script

Get in a comfortable position and relax. Clench your right fist, tighter and tighter, studying the tension as you do so. Keep it clenched and feel the tension in your fist, hand, and forearm. Now relax. Feel the looseness in your right hand, and notice the contrast with the tension. Repeat this procedure with your right fist again, always noticing as you relax that this is the opposite of tension. Relax and feel the difference. Repeat the entire procedure with your left fist, then both fists at once.

Bend your elbows and tense your biceps. Tense them as hard as you can and observe the feeling of tension. Relax, straighten out your arms. Let the relaxation develop and feel that difference. Repeat the procedure all over again.

Wrinkle your forehead as tight as you can. Now, Relax and smooth it out. Frown and notice the strain spreading throughout your forehead. Let go. Allow your brow to become smooth again. Close your eyes, squint them, tighter. Look for the tension. Relax your eyes. Let them remain closed gently and comfortably. Clench your jaw, bite hard, notice the tension throughout your fow. Relax, let the lip slightly parted. Appreciate the contrast between tension and relaxation. Press your tongue against the roof of your mouth. Feel the tension in the back of the mouth. Relax. Relax your lip. Notice that your forehead, scalp, eyes, jaw, tongue and lips are all relaxed.

Press your head back as far as it can comfortably go and observe the tension in your neck. Roll it to the right and feel the changing locus of stress. Roll to the right and roll to the left. Straighten your head and bring it forward, press your chin against your chest. Feel the tension in your throat, the back of your neck. Relax. Allow your head to turn to a comfortable position. Let the relaxation deepen. Shrug your shoulders. Keep the tension and shrug some more. Relax your shoulders. Drop the shoulders back and feel the relaxation spreading through your neck, troat and shoulders. Fell the relaxation deepen more and more.

Breathe in and completele fill your lungs. Hold your breath. Notice the tension, then relax. Relax by exhale, let the chest become loose, let the air out. Continue relaxation, and repeat the procedure several times. Tighten your stomach and hold. Note the tension, then relax. Place your hand on your stomach. Breathe deeply into your stomach, pushing your stomach up. Hold, and relax. keep the rest of the body relax. Relax deeper, and deeper.

Tighten your buttocks and thighs. Flex your thighs by pressing down your heels as hard as you can. Relax and feel the relaxation. Curl your toes down, tense your claves. Notice the tension and then, relax. Push the toes up, keep the tension, then relax again.

Feel the heaviness throughout your lower body as the relaxation deepen. Relax your feet, ankles, claves, shins, knees, thighs, and buttocks. Let the relaxation deepen more and more. Experience the relaxation all over your body. Notice the looseness of your head, upper body, and your lower body.

APPENDIX F

Informed Consent Form

Nature of the Study

We are interested in your feelings about and reactions to a particular Meditation/ Relaxation/ Exercise program. To find out your feelings we would like you to take part in the program for about ten weeks. This will mean coming to group sessions for thirty minutes three times a week, where an instructor will lead you through the activities. Then you should practice them daily on your own for thirty minutes per session. Each week during the program you will be asked to fill in a number of short and straightforward questionnaires, about your thoughts and feelings and to keep a record of your personal practice on a log sheet..

Your responses to all of the questionnaires will be kept totally **confidential**. Nobody will see them except you and me. Only group results will be published and you will be represented by a code number in the records.

You will be **free to withdraw** from the study **at any time** and you may also ask questions at any time if things are not totally clear.

The program you will follow may assist your performance, but there is no guarantee of that. Also, any improvement may take some time to show in your performance. What would you like to ask about right now?

Informed Consent

I acknowledge that the research procedures have been explained to me

I acknowledge that I have been given the chance to ask questions

I acknowledge that I may ask further questions at any time

I understand that my results will be confidential

I understand that I am free to withdraw at any time

Signed:..... **Date:**.....

APPENDIX G

INSTRUCTIONS FOR TRAINING LOG

1. Fill in this log every time you do a Meditation or Relaxation session.
2. In the first column headed date, note the date of the session (eg. 3/11/92).
3. In the second column headed time, note the time of day of the session (eg. 10.15am).
4. In the third column headed start time, note the time exactly before you start the session.
5. In the forth column headed end time, note the time immediately after you finish the session.
6. In the fifth column headed duration, note the duration of the session, to the nearest five seconds (eg. 28 mins 35 secs). To do this subtract the start time from the end time.
7. In the sixth column headed comments, note any brief comments about that session eg. very relaxing, deeper than normal, many distractions, could not get focussed, deep concentration.

MEDITATION AND RELAXATION TRAINING LOG

Name: _____

[illegible]

