# The Dynamic Aspects of Competitive Emotions of Martial Artists

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# ABSTRACT

This thesis examined some dynamic aspects of competitive emotional states. For this purpose, an interactional model of competitive stress that emphasises the temporal dimensions of the athlete-competition relationship has been proposed. Four studies that analysed several methodological and substantial issues pertaining to definition, measurement and determinants of competitive emotional states were conducted. The first study tested the appropriateness of the Experience Sampling Method (ESM), the conventional time-to-competition paradigm and retrospective assessments for the analysis of the dynamic aspects of pre-competitive stress. Results revealed that the ESM constitutes the most appropriate method for the in-depth examination of complex dynamic aspects of the competitive process. With respect to retrospective assessments, it was concluded that they provide a reliable general indication of athletes' pre-competitive emotional states but they cannot reveal finer temporal and qualitative aspects of athletes' emotional experience. The study also showed that, although anxiety symptoms as measured by the modified version Competitive State Anxiety Inventory - 2 (CSAI-2; Jones & Swain, 1992) were on average considered facilitative to performance, substantial intraindividual differences were observed. This suggested that qualitative differences between facilitative and debilitative anxiety patterns, and factors determining them, needed to be analysed and the construct validity of the CSAI-2 needed to be tested. The purpose of the following two studies was to test some of the propositions presented in the interactional model of competitive stress regarding the definition and directional interpretation of competitive anxiety. Results supported the hypothesis that competitive anxiety is not a unitary emotion but a complex changeable emotional state, which is determined by situational and personal factors. Results also suggested that the cognitive subscale of the CSAI-2 has poor construct validity and its use should be avoided. It was concluded that, from a practical and theoretical viewpoint, there is not much sense in focusing on the complex and controversial affective phenomenon of anxiety without considering other important aspects of an individual's emotional experience. The purpose of the fourth study was to integrate and elaborate further the findings from the previous three studies with regard to the interactional model of competitive stress. The ESM was employed to examine some situational and personal determinants of pre- and post-competition discrete emotions in male martial artists. Results showed that the

competitive event was on average one of the most important, stressful and challenging episodes that athletes experienced in the examined period. Temporal proximity to competition, type and cognitive appraisal of sources of concern, expected and actual performance, neuroticism, extraversion and competitive trait anxiety determined magnitude and/or temporal patterns of athletes' pre- and post-competition emotional states. The programme of research conducted in this thesis has provided evidence of the utility of a multivariate multilevel time-based approach to the study of the athlete-competition relationship. It also indicated the necessity to analyse a broad range of easily definable discrete emotions rather than focusing solely on competitive anxiety. Future research will need to detail various aspects of competitive stress from a time-based perspective in both genders and in different sports and age groups.

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# CHAPTER I

## Introduction

### 1.1 Competitive anxiety and other competition-related emotions

Athletic competition is viewed as a stressful event that poses many demands on the participant's physical and psychological resources. The modern athlete is witnessing a steady increase in performance standards, number and quality of opponents and competition-related rewards, which put him/her under ever increasing pressure. In line with mainstream psychology, sport psychologists have mainly focused on one particular stress-related emotional state: anxiety. In the last two decades, anxiety has been viewed as one of the most obvious psychological consequences of stress (Martens, Vealey, & Burton, 1990) and as the major psychological factor affecting athletic performance (Raglin, 1992).

Anxiety is defined as an emotional state characterised by tension, nervousness and apprehension, accompanied by the activation of the autonomic nervous system (Spielberger, 1976). According to Lazarus (1993), anxiety is a basic or fundamental emotion that arises when facing uncertain, existential threat. However, a stressful event, such as athletic competition, is not always perceived as a source of threat. It may be also regarded as a challenge. In fact, Lazarus in 1966 added harm and challenge to the list of possible kinds of stress. Even Selye (1974), who originally postulated a general non-specific reaction to any stressor, acknowledged in his later work the importance of the distinction between a good (eutress) and a bad (distress) kind of stress. In Lazarus' (1966) classification, threat is the anticipation of harm. Harm is the psychological damage that has already been done and challenge represents the reaction to difficult tasks that we feel confident about overcoming. Even relying only on introspection, we can realise that these three kinds of stress are likely to evoke qualitatively different emotional states. The three types of stress represent, in Lazarus' (1993) words, different relational meanings, which constitute the subjective sense of the harms and benefits in a particular person-environment relationship. Furthermore, different relational meanings activate different emotional states. The fact that each emotion arises from a different scenario and history about a person's relationships with the environment gives emotions a great analytic power. Consequently, limiting ourselves to the study of one emotional state such as anxiety as the exclusive marker of psychological response to competition seems inadequate.

Another reason why the study of competitive anxiety should be extended to a wider range of emotional states relates to the fact that the concept of anxiety and the way it is measured is a controversial subject. In the last decade, Jones (1995) has introduced the notion of directional interpretation of competitive anxiety. This concept refers to the way athletes label their cognitive and physiological anxiety symptoms on a debilitative-facilitative continuum. According to Jones (1995), self-confidence and the perceived control over a stressful situation will determine whether an individual will consider his/her experience of anxiety as hindering or facilitating performance. It is obvious that from a phenomenological point of view debilitative and facilitative anxiety are two different emotional experiences. A question that needs to be asked is how appropriate and justified it is to consider two phenomenologically and functionally different emotional states as units of the same class of emotions.

In this regard, the differential emotions theory (DET; Izard, 1977) provides an interesting solution. According to Izard (1977) what we call anxiety is not a single emotion but a set of fundamental emotions including fear and two or more of the basic emotions (e.g., sadness, guilt, shame, interest). Thus, debilitative anxiety could be described as an emotional state in which fear dominates and which is accompanied by other negative emotions. Facilitative anxiety instead could be defined as a set of positive emotions such as happiness and interest accompanied by the emotion of fear of low or moderate intensity. An emotional state can be by definition labelled as anxiety only if a fear component is part of the subjective experience. It has been recently shown by Lane, Sewell, Terry, Bartram and Nesti (1999) that the Competitive State Anxiety Inventory -2 (CSAI-2, Martens et al., 1990) used in the studies on directional interpretation of competitive anxiety is of dubious validity. This suggests that athletes' emotional states may sometimes have been wrongly classified as facilitative anxiety. In fact, Lane et al. (1999) demonstrated that the cognitive anxiety sub-scale of the CSAI-2 could not satisfactorily differentiate between states of positive motivation and worry. Consequently, studies using the CSAI-2 might have confounded states of positive excitement/interest and no fear with states of facilitative anxiety. It is contended that the study of anxiety patterns as sets of fundamental emotions could provide a better assessment and understanding of what we call competitive anxiety and its effects on performance. Additionally, it is contended that the extension of empirical research to competitive emotions other than anxiety will greatly increase the amount and quality of information on athletes' psychological state and, therefore, our understanding and prediction of their behaviour.

## 1.2 Basic emotions in sport

In the last decade, a number of researchers in the field of sport psychology have already recognised the necessity of broadening their interest to competition-related emotional states other than anxiety (e.g., Grove & Prapavessis, 1992; Hanin, 1997; Jackson, 1992; Vallerand, 1983). Some researchers have focused on dimensions of emotions such as hedonic tone and functionality/dysfunctionality from an idiographic perspective (Hanin, 1999). Other sport psychologists have examined specific emotional states such as anger (Isberg, 1999), depression, shame and guilt (McAuley, Russell, & Gross, 1983) from a nomothetic viewpoint. Furthermore, competitive mood as measured by the Profile of Mood Scale (POMS) has been a major topic of investigation in the last seven years (e.g., Lane & Terry, 2000; Prapavessis, 2000). However, a careful analysis of the current sport psychology literature reveals no systematic research on basic or fundamental emotions. This is in contrast to mainstream psychology (e.g., Ekman, 1992; Izard, 1977; Lazarus, 1999; Plutchik, 1994).

The advantages of studying fundamental emotions, as opposed to secondary emotions and/or dimensions of emotions, are attributed to their clarity of meaning (Plutchik, 1994) and the fundamental information about the person-environment relationship that they convey (Lazarus, 1999). Although important for research on the effects of emotional states on performance (Hanin, 1999), the study of dimensions of emotions cannot shed light on the relationship between the individual and the environment. For example, hedonic tone informs us only of whether a person is experiencing pleasure or displeasure. It does not tell us, for instance, if a specific state of mind may be due to an experience of irrecoverable loss (sadness) or unfair insult (anger).

The study of discrete emotions, on the other hand, permits the analysis of the relationship between the individual and his/her environment. However, at the same time, it poses a series of methodological and conceptual problems. The language of emotions is often ambiguous or vague (Plutchik, 1994) and varies from culture to culture (Ekman, 1992), which renders the study of emotions rather difficult. This is particularly true when measuring emotional states that are not considered fundamental, primary or basic (Plutchik, 1994). Basic emotions are characterised by presence in all cultures, distinctive emotional expression and antecedent events, presence in other primates (Ekman, 1992) and distinctive relational action tendencies (Frijda, 1986). In other words, basic emotions are less idiosyncratic in meaning and occurrence than secondary or more complex emotions. This particular feature makes them more suitable for interindividual and intercultural comparison. Consequently, it is contended that the study of basic emotions in sport should be undertaken in conjunction with the already existent lines of research.

## 1.3 Temporal patterns of competitive emotions

Stress is a process. The word process itself implies that something is changing over a period of time. Emotions, appraisal of the situation, coping strategies and situational variables change incessantly as the process of stress develops (Lazarus, 1999). The changes in emotional states that a person experiences during and after a stressful event reflects the meaning of what is happening as the situation develops and the effectiveness of the coping strategies adopted. Consequently, in order to get a better understanding of athletes' behaviour it is necessary to analyse the temporal patterns of competitive emotions. To consider just one period or combine together stages of a stressful event provides a limited picture of what is happening and does not allow an analysis of why something is happening.

The Experience Sampling Methodology (ESM) has been successfully used in the field of organisational and health psychology to study complex phenomena in the participants' natural environment (e.g., Alliger & Williams, 1993; Bolger & Schilling, 1991; van Eck, Nicholson, & Berkhof, 1998). It has been also successfully employed in research on states of flow in a sport setting (Jackson, 1999). Because of the substantial number of repeated measurements in a relatively short period of time, the ESM may provide a potent tool for the study of the temporal changes of competitive emotions and relative correlates. It is necessary, therefore, to ascertain the suitability of the ESM for the study of competition-related emotional states and, eventually, to exploit the advantages that it offers.

## 1.4 Purpose and outline of the thesis

The general purpose of this thesis was to examine some dynamic aspects of competitive stress adopting a multivariate multilevel process-oriented approach that advocates the simultaneous analysis of a broad range of discrete or fundamental emotions. This thesis comprises five ensuing chapters and addresses four main research questions. Each chapter provides a separate review of literature associated with the study in addition to a central review of literature.

Chapter 2 reports a critical overview of current research on the dynamics of competitive emotions, presents an interactional model of competitive stress that emphasises the temporal aspects of the competitive process and proposes an alternative conceptualisation of competitive anxiety.

Chapter 3 examines the appropriateness of the ESM, the conventional time-to-competition paradigm and retrospective assessments for the study of competition-related emotional states and studies the temporal patterns of pre-competitive emotions and cognitive intrusions in male Tae Kwon Do practitioners.

Chapter 4 critically analyses the concept and operationalisation of anxiety and challenges the traditional focal role of this emotional state in the study of the athlete-competition relationship. This chapter also elaborates and tests an alternative conceptualisation of competitive anxiety, which sees anxiety as a changeable set of fundamental emotions rather than a unitary fundamental emotion.

Chapter 5 integrates and elaborates further the findings from the previous studies with regard to the interactional model of competitive stress. The ESM was employed to examine the effect of extraversion, neuroticism and competitive trait anxiety on intensity and temporal patterns of pre- and post-competition emotions and the relationship between some aspects of primary and secondary cognitive appraisal and athletes' emotional responses.

Chapter 6 summarises the results of the four investigations and reflects on these findings as a whole from both theoretical and practical perspectives. The chapter also suggests future research directions.

# CHAPTER II

## Temporal patterns of competitive emotions: A critical review

### 2.1 Introduction

Most of this chapter has been published in the journal article "Temporal patterning of competitive emotions: A critical review" (Cerin, Szabo, Hunt, & Williams, 2000). However, since its publication further work has been undertaken to include recently published material. The literature review begins with a discussion on some conceptual issues regarding the terminology used in the field of competitive emotions. This is followed by the presentation of an interactional model of stress that integrates current research on competitive affects and emphasises the temporal dimensions of the stress process. Empirical findings on the temporal pattern of competitive affects are then discussed. Here, a synthesis and critique of studies on unidimensional and multidimensional anxiety are provided. The critique of a multidimensional approach to competitive anxiety leads to the discussion of alternative models of competitive affects that include a broader range of emotional responses. At this point, the advantages of the study of fundamental or basic emotions in sport are discussed and compared to other approaches. The review continues with the analysis of findings on the temporal patterns of competitive affects other than anxiety. Empirical support for the existence of a significant relationship between emotional states and athletic performance is presented. Finally, investigations on the temporal changes of competitive affects other than anxiety are discussed. In this section, the advantages and shortcomings of the nomothetic and idiographic approach to the study of competitive emotions are analysed. The last section of this chapter presents empirical evidence on the moderators and antecedents of the temporal pattern of competitive emotions. Finally, conclusions are drawn regarding future approaches to the study of athletes' response to competition.

### 2.2 Affective constructs: Conceptual issues

Before reviewing the literature on the temporal patterns of competitive emotions, some conceptual issues related to the definition of affective phenomena need to be addressed. Psychological states and processes related to affective phenomena are referred to in a variety of ways. This variety is reflected in the distinction made between emotions, feelings, moods, sentiments and temperaments. These concepts differ along several dimensions: duration, reference to an object, origin and intensity. Thus, emotions tend to be of short duration (from few seconds to an hour or so), have an identifiable cause and be object-focused (Ekman, 1994). Moods, instead, can persist for days or even months and have no apparent triggering stimulus (Vallerand & Blanchard, 1999). Furthermore, in moods, action readiness is not object-focused (Frijda, 1994). This means that an anxious mood can be understood as a diffuse persistent negative affect and a generalised tendency to perceive the environment as threatening with no focused action aimed at changing the situation. Feelings refer to the subjective experience of emotion and mood without physiological or behavioural changes and can last from a few moments to days (Vallerand & Blanchard, 1999). Sentiments are long-term affective phenomena (years or lifetime) comprising dispositions to respond affectively to particular objects or events (Frijda, 1994). Finally, temperaments or emotional personality traits denote a relatively stable disposition to experience certain emotions or moods (Goldsmith, 1994).

In sport psychology, the usage of words denoting affective phenomena has been mainly determined by the instruments employed in the research. Thus, studies using the Positive Affect Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) talk about "competitive affect" (Crocker, 1997). Studies using the POMS describe "competitive mood" (Lane & Terry, 2000), although, as discussed later, they most probably examine affective states that are closer to the definition of emotion than to the definition of mood. In this chapter, and throughout the rest of my thesis, I will mainly talk about emotions or emotional reactions. My decision is based on the fact that I will be trying to analyse athletes' response to competition and, therefore, psychological states that have an identifiable cause, which is found in the relationship between the athlete and the competitive event. When possible, I will avoid the term of *"competitive mood"* (Lane & Terry, 2000), because mood by definition is an affective state that has no apparent triggering stimulus and, as such, should not be related or ascribed to competition.

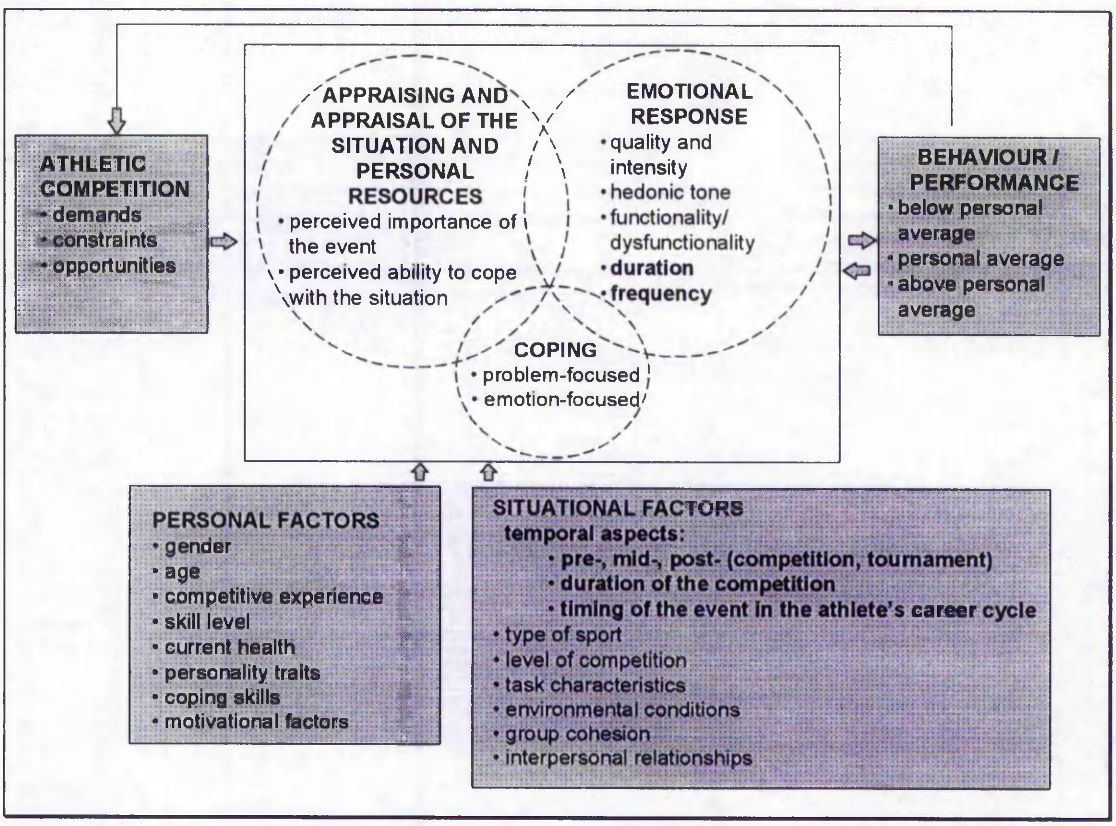
## 2.3 Competition as a stressful event

Athletic competition places many demands on the participants' physical and psychological resources. The large number of people involved in competitive sport, and the significance of victories and defeats related to it, render modern athletic competition extremely stressful. To explain and predict the effects of competition on athletes' behaviour, sport performance and emotional reactions, an interactional approach to the study of this form of stress has been adopted by several researchers (e.g., Hardy, Jones, & Gould, 1996; Jones, 1990; Sanders, 1983).

Stress is conceptualised as a process of transaction between individuals and their environment (Lazarus, 1999; Lazarus & Folkman, 1984). The current review introduces an interactional model of competitive stress that integrates research on competitive emotions and emphasises the temporal dimensions of the stress process (Figure 2.1). The stress and coping aspects of the model are an adaptation of interactional models of stress of Lazarus (1999) and Hardy et al. (1996). Some of the temporal components of Hanin's (1997) individual zones of optimal functioning (IZOF) model have also been adopted.

**Figure 2.1**

**Interactional model of stress as applied to athletic competition**




The interactional model of competitive stress (Figure 2.1) encompasses the relations among the competitive situation, the athlete's appraising and appraisal of it and the athlete's emotional response, coping and performance. The competition is defined by three situational variables - demands, constraints and opportunities. Demands consist of the set of behaviours, level of skill and attitudes that are necessary for a successful performance. Constraints define what an athlete should not do. These are also backed up with punishment if violated. For instance, with the exception of the Davis Cup, tennis players are not allowed to seek help or suggestions from their coaches during the course of a match. In most sports, players are not allowed to voluntarily inflict harm on their opponents. Opportunities arise from fortunate timing or depend on the individual's ability to recognise an opportunity and relate to the positive consequences for the athlete's future life and career derived from a successful performance.

All these characteristics of the competition influence the athlete's emotional reaction through the process of appraisal. Appraising constitutes the set of conscious and unconscious processes of evaluating the subjective importance of the competitive event and the ability to cope with it (Lazarus, 1999). Appraisal is thought to influence the quality and intensity of the emotions evoked by a competitive event, which in turn affects the athlete's behaviour and performance (Jones, 1995; Lazarus & Folkman, 1991). Lazarus, Kanner and Folkman (1980) defined emotions as complex, organised psychophysiological reactions to events, agents or objects, consisting not only of cognitive appraisals, but also action impulses and patterned somatic reactions. These three components are postulated to operate as a unit rather than as separately. The patterning of these components is considered to reflect the quality and the intensity of the emotion.

Coping, the third component of the athlete's psychological reaction, relates to the way the athlete manages competitive conditions that are stressful. There are two major types of coping. Problem-focus coping relates to actions that have the purpose of changing the reality of the troubled person-environment relationship. In this case, the coping actions may be directed to either the self or the environment (Lazarus, 1999). To illustrate, an athlete who predicts defeat in a future competition may work on his/her skills or try to improve the equipment. In contrast, emotion-focused coping is aimed at regulating the emotions tied to the stress without changing the realities of the stressful situation. For instance, the athlete may try to avoid thinking about the competition or may try to reappraise its importance.

The model in Figure 2.1 views stress, emotion and coping as existing in a part-whole relationship. They belong together and form a conceptual unit. Separating them is justified only for convenience of analysis because the separation distorts the phenomena as they appear in nature (Lazarus, 1999).

Psychological reactions to competition vary considerably from one individual to another (Jones, 1990). These individual differences are moderated by both personal and situational factors. The former include, for example, personality traits such as competitive trait anxiety (Gould, Petlichkoff, & Weinberg, 1984; Nordell & Sime, 1993) and perfectionism (Hall, Kerr, & Matthews, 1998), sex (Jones & Cale, 1989; Jones, Swain, & Cale, 1991; Singh & Brar, 1988), skill level (Huddleston & Gill, 1981; Perkins & Williams, 1994), perceived readiness (Lane, Rodger, & Karageorghis, 1997) and achievement goals (Hall et al., 1998). Situational factors include the type of sport (Krane & Williams, 1987; Mann, Singh, Sadhu, & Brar, 1988), level of competitive stress (Man, Stuchlikova, & Kindlmann, 1995; Nordell & Sime, 1993), environmental conditions (Jones, Swain, & Cale, 1990; Lane et al., 1997), personal relationships and group cohesion (Prapavessis & Carron, 1996).

One of the fundamental assumptions of the interactional model of stress is that stress and the individual reactions to it are to be considered as a process that unfolds over time. This is because emotions, appraisal, coping strategies and situational variables during a stressful encounter are characterised by change. For instance, an individual may initially feel scared and then, after a few moments, angry, then guilty, then distressed (Folkman & Lazarus, 1985). The sequence of feelings experienced reflects the changing meaning of what is happening as the stressful encounter unfolds and the effectiveness of the coping strategies adopted. To consider just one time period or combine together stages of a stressful encounter provides a limited picture of what is actually happening and would not allow an analysis of why something is happening.

As illustrated in Figure 2.1, beside stress itself being considered an ever-changing process that unfolds over time, all of the components of the model include a temporal dimension. First, opportunities that characterise a competitive event depend on the timing of the event with respect to the athlete's career stage, current readiness and health (Lazarus, 1999). Secondly, specific emotional reactions vary in duration and frequency (Hanin, 1997). Individuals differ in the tendency (frequency and duration) to experience a particular emotional state or set of emotional states in competitive situations. Thirdly, athletes' emotional states and coping depend on the timing of the assessment(s) with respect to the competitive event (pre-, mid- or post-competition). Fourthly, personal variables such as age, skill level and competitive experience, which are thought to influence appraisal and, therefore, emotional experience, develop and change over time. Finally, the duration of the competitive event is thought to determine the accuracy of prediction of self-referenced performance from athletes' pre-competitive emotional state (Terry, 1995) and the quality and variability of athletes' emotional experience during the competition (Hanin, 1995). All the above emphasises the need to explore the various ***temporal aspects*** of the stress process in athletic competition, from the temporal aspects of emotional responses to the temporal dimensions of the antecedents and correlates of emotional responses.

Consequently, the main aim of this review is to provide a critical synthesis of the literature on the temporal patterns of competition-related emotional states and, on these grounds, to develop an interactional model of stress in line with the existing psychological frameworks. Since investigations have mainly focused on pre-competitive anxiety, much of the current chapter discusses conceptual and methodological issues related to this specific emotion. Because, until recently, researchers have neglected other competition-related emotions, not much empirical evidence could be analysed in this regard. This lack of information can be informative. By comparing the interactional model of stress (Figure 2.1 and 2.2) with the empirical findings presented here, issues needing further investigation can be identified.

## 2.4 Temporal patterns of competitive anxiety

### *2.41 Unidimensional approach*

Among the various affects experienced by athletes facing a competition, most research has focused on anxiety, defined as an emotional state characterised by tension, nervousness and apprehension, accompanied by the activation of the autonomic nervous system (Spielberger, 1976). In the 1980s, research was based on a unidimensional approach that acknowledged the necessity of distinguishing between anxiety as a trait or disposition and anxiety as a transient state.

Table 2.1 summarises the results of studies that examined the temporal patterns of anxiety from a unidimensional perspective. Most of these studies used Spielberger's State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1970) or the Competitive State Anxiety Inventory (CSAI - Martens, Burton, Rivkin, & Simon, 1980). The latter is a version of the STAI adapted to sport settings. Table 2.1 reports the average intensity of anxiety observed at different times pre-, mid- or post-competition, the statistical significance of change in anxiety intensity between assessments and the moderators that were found to be related to the intensity or the temporal pattern of competitive anxiety (if available). This information is crucial because it permits a better understanding of the development of athletes' pre-competitive emotional experience and the factors and the mechanisms that are related to it. Furthermore, a better understanding of the temporal changes of athletes' emotional states and the underlying appraisal and coping processes facilitates the planning of psychological interventions aimed at optimising individual performance and well-being.

To illustrate, the *time X locus of control and time X success-failure* interaction effects observed by Hall (1980) (Table 2.1) constitute a valuable piece of information when planning psychological interventions or predicting individual responses to competition. Hall noted that internals (i.e. individuals who perceive their own behaviour as the determinant of rewards or punishments), exhibited a lower intensity of pre-competitive anxiety than externals (i.e. individuals who perceive their life outcomes as not related to personal effort or skill). This means that, in general, externals may benefit more than internals from anxiety-reduction techniques in the pre-competition period. However, the opposite tendency was observed post-competition for individuals who experienced failure. Internals scored significantly higher than externals on post-competitive anxiety after failure. Additionally, externals showed no significant differences whether succeeding or failing. Consequently, in terms of intervention planning, it is likely that failing internals rather than failing externals would benefit from an anxiety-reduction programme. Furthermore, the fact that locus of control may differentially modulate the emotional response at various stages of the competition indicates that the two types of individuals use different coping strategies or base their appraisal on different beliefs and hierarchies of motives. A further exploration of the factors provoking these individual differences in emotional reaction would shed light on the mechanisms underlying individual adaptation to competitive stress (Hall, 1980). This example illustrates that an analysis of the temporal changes in competitive emotional states and their moderators permits a better understanding of what is actually happening and the reasons why it is happening. In doing this, it opens the door to intentional and planned change for the better.

In general, analysis of the temporal pattern of unidimensional competitive anxiety shows that, over a one-week pre-competitive period, the level of state anxiety increased as competition neared (Donzelli, Dugoni, & Johnson, 1990; Durtschi & Weiss, 1984;

Gal-or, Tenenbaum, & Shimrony, 1986; Huband & McKelvie, 1986; Huddleston & Gill, 1981) (Table 2.1). Gal-or et al. (1986) reported a significant increase in anxiety from one week to one day before the competition. Further increments were seen one hour and immediately before the start of the event. Also, Durtschi and Weiss (1984) found that athletes' anxiety levels declined once the competition started. Interestingly, significant temporal changes were detected on the Distance Runner Questionnaire (DRQ; Durtschi & Weiss, 1984), but not on the CSAI. However, no data on the validity of the DRQ were reported. With regard to post-competition, a reduction in anxiety has been reported immediately (Huband & McKelvie, 1986; Sanderson & Reilly, 1983) and one day (Huband & McKelvie, 1986) after the event. Personal variables (e.g., sex, experience, trait anxiety and skill level) and situational variables (e.g., level of competitive stress and favourable versus unfavourable judging) moderated the intensity of competitive anxiety. Performance outcome affected the level and temporal pattern of post-competitive anxiety. Finally, the amplitude of temporal changes in intensity of anxiety appeared to be modulated by state anxiety, performance outcome, locus of control, experience and sex. The effect of these factors on the temporal patterns of anxiety or other competition-related emotional states will be examined in greater detail in the section pertaining to antecedents and moderators of competitive affects.

**Table 2.1. Summary of studies on the temporal pattern of a unidimensional concept of competitive anxiety (means)**

| Author(s) (year) | N | Sport | Instrument | Time of assessment | | | | | | | | Moderators |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Pre-competition | | | | | During competition | Post-competition | | |
| | | | | 1 week | 1 day | 12 h | 1 h | i.b. | | i.a. | 1 day | |
| Donzelli, Dugoni, & Johnson (1990)* | 233 m,f | Running | 7-point one-item scale | 2.12 | 3.27 | 3.57 | 4.42 | 4.87 | 3.61 | | | Sex$^{+i}$, A-trait$^{+i}$, experience$^{+i}$, success$^{+i}$ |
| Durtschi & Weiss (1984) | 66 m,f | Running | Distance Runner Q. | x | ↑ | | ↑ | = | ↓ | | | Skill level$^{+}$ |
| Gal-or, Tenenbaum, & Shimrony (1986) | 59 m,f | Orienteer-ing | 10-point one-item scale | 1.59 | 3.02↑ | | 4.90↑ | 4.43 | | | | Skill level$^{+}$ |
| Hall (1980)$^{N}$ | 64 m,f | Motor task | STAI | | | | | 39.22 | | 41.31 | | Locus of control$^{i}$, A-trait$^{+}$, success$^{+i}$ |
| Huband & McKelvie (1986) | 42 m, f | Basketball, hockey | CSAI | | 16.12 | | | 21.36↑ | | 18.32↓ | 13.29↓ | A-trait$^{+i}$ |
| Huddleston & Gill (1981) | 19 f | Track & field | CSAI | 18.87 | | | | 29.4↑ | | | | Training vs. competiton$^{+}$ |
| Sanderson & Reilly (1983) | 64 m, f | Running | STAI | | | | | 47.96 | | 36.84↓ | | A-trait$^{+}$, race result (position)$^{+i}$ |

*(continued)*

**Table 2.1.** - *continued*

| Author(s) (year) | N | Sport | Instrument | Time of assessment | | | | | | | | Moderators |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Pre-competition | | | | | During | Post-competition | | |
| | | | | 1 week | 1 day | 12 h | 1 h | i.b. | compe-tition | i.a. | 1 day | |
| Vura, Noeny, Sipos, & Sipos (1985)$^{N}$ | 17 m | Wrestling | STAI-H<br>CSAI | | | | | 43.52<br>22.35 | 43.35<br>23.11 | 40.14<br>20.12 | | Success vs. failure$^{+i}$, favour. vs. unfavour. judging$^{+i}$ |

Legend:

N = number of subjects; m = males; f = females; STAI = State-Trait Anxiety Inventory; CSAI = Competitive State Anxiety Inventory; $^{N}$ = time main effect not tested; i.b = immediately before; i.a. = immediately after; $^{+}$ = moderator significantly affects anxiety level; x = initial time of assessment with no mean available; $^{i}$ = interaction between moderator and time of assessment; * = significant main effect of time of assessment, but significance of inter-assessment change not reported; ↑ = significant increment; ↓ = significant reduction; "=" = no significant change

### *2.42 Multidimensional approach*

In the 1990s, investigations in the area of competitive anxiety shifted from a unidimensional to a multidimensional conceptualisation of competitive state anxiety as a result of the work of Martens et al. (1990). These researchers developed the Competitive State Anxiety Inventory - 2 (CSAI-2), which was originally designed to measure the cognitive and somatic components of competitive state anxiety. However, during the development of the questionnaire, the authors encountered a third factor, which they subsequently labelled "self-confidence". Since the late-1980s the CSAI-2 has been the most frequently used tool in this field of research.

Table 2.2 shows the findings of studies on the temporal patterns of the three sub-scales of the CSAI-2. When available, mean level for somatic anxiety, cognitive anxiety and self-confidence at different assessments, the statistical significance of change between assessments and the moderators that were found to be related to the intensity or temporal patterns of the three dimensions of competitive anxiety are reported.

#### *2.421 Somatic anxiety*

Empirical findings concerning the temporal patterns of the CSAI-2 sub-components show that somatic anxiety tends to increase rapidly close to the start of the competitive event and dissipate once the competition is over (Karteroliotis & Gill, 1987; Slaughter, Selder, & Patterson, 1994). However, Caruso, Dzewaltowski, Gill and McElroy (1990) did not observe a reduction in somatic anxiety after competition even in a successful group of competitors. To explain the unexpected results, Caruso et al. (1990) suggested that the task to which their participants were exposed (45-second cycling at maximal speed) might have produced a sustained increase in the levels of physiological arousal. This observation questions the discriminant validity of the somatic sub-scale for the assessment of the physiological components of anxiety. Moreover, it is noteworthy that, contrary to theoretical assumptions, Karteroliotis and Gill (1987) found that the somatic anxiety measure of the CSAI-2 was not related to selected physiological measures of arousal. Indeed, the difficulty of determining a subjectively perceivable and reportable pattern of autonomic nervous system activity that is unique to specific emotions has been acknowledged many times (e.g., Levenson, 1992). A rapid increase in heart rate, for example, is by no means a physiological reaction exclusive to anxiety. It is also associated with anger, sadness (Levenson, 1992), joyful expectation, pleasant excitement and unemotional states such as physical effort or increased attention (Frijda, 1986). It is possible that some athletes who report intense physiological symptoms accompanied by low levels of cognitive anxiety actually do not experience anxiety at all, but rather anger, deep interest, excitement, increased effort or attention. Therefore, it is possible that the current somatic anxiety sub-scale assesses physiological arousal associated with more than one type of emotion or even non-emotional states. Consequently, it should not be interpreted as a measure of the intensity of ***somatic anxiety*** but rather as a measure of ***perceived autonomic arousal.*** Unless clear perceivable differential somatic symptoms of anxiety are identified, the use of the concept of "somatic anxiety" is not justified because it cannot be clearly defined. Notably, while many contemporary researchers of emotions agree that specific biological changes accompany and provide the substrate for different emotions, they also believe, with the exception of Levenson (1994), that it is unlikely that the autonomic nervous system will show much evidence of emotion-specific patterns, especially for complex emotional states such as anxiety (e.g., Davidson, 1994; LeDoux, 1994).

Accordingly, it is suggested that the assessment of a general autonomic and somatic activity may be meaningful only if considered as an ***indirect index of the intensity*** of emotional states that are contingent upon some situation with features of urgency or difficulty (e.g., fear, interest, anger). It should by no means be interpreted as an indicator of the presence of a specific emotion. In order to evaluate the ***quality*** of the emotional experience, cognitive appraisal (Lazarus, 1999) and action readiness (Frijda, 1986) have to be examined. However, as noted earlier, in our attempts to analyse emotional experience, we should never forget that the three components of emotions are postulated to operate as a unit and that separating them is justified only for convenience of analysis (Lazarus, 1999).

In summary, the findings from the examined studies (Table 2.2) indicate that athletes tend to experience a rapid increase in their level of autonomic arousal close to the competitive event, which dissipates once the competition is over. However, no conclusion can be drawn about the emotion(s) that underline the increase in arousal. The same level of arousal might be provoked by fear, anxiety, anger, positive excitement, shame-embarrassment or a combination of two or more emotions.

**Table 2.2. Summary of studies on the temporal patterns of a multidimensional concept of competitive anxiety**

| Author(s) (year) | N | Sport | A.C. | Time of assessment | | | | | | | | | Moderators |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Pre-competition | | | | | | | D.C. | P.C. | |
| | | | | 2 wks | 1 wk | 2 dys | 1 day | 2 h | 1 h | i.b. | during | i.a. | |
| Campbell & Jones (1995) | 103 ? | Various | C | | x | | | ↑ | | = | | | Skill level wheelchair sport participants +i |
| | | | S | | x | | | = | | = | | | |
| | | | SC | | x | | | = | | = | | | |
| Campbell & Jones (1997) | 103 m, f | Various | C | | 19.18 | | | 20.68↑ | | 21.65 | | | Disability |
| | | | S | | 13.64 | | | 17.59↑ | | 27.72↑ | | | |
| | | | SC | | 24.81 | | | 26.85↑ | | 23.33↓ | | | |
| Caruso, Dzewaltowski, Gill, & McElroy (1990) | 24 m | Various | C | | | | | | | 11.83 | 12.42 | 12.17 | Noncompetition vs competition +i, success vs failure +i |
| | | | S | | | | | | | 12.6 | 15.17↑ | 15.82 | |
| | | | SC | | | | | | | 24.65 | 20.85↓ | 20.75 | |
| Davis & Gill (1995) | 22 m | Hockey | C* | | | 15.5 | | 16.9 | | 18.0 | | | Levels of competitive stress+i |
| | | | S* | | | 10.4 | | 13.7 | | 15.1 | | | |
| | | | SC* | | | 29.6 | | 28.1 | | 27.3 | | | |

*(continued)*

**Table 2.2** - *continued*

| Author(s) (year) | N | Sport | A.C. | Time of assessment | | | | | | | | | Moderators |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Pre-competition | | | | | | | D.C. | P.C. | |
| | | | | 2 wks | 1 wk | 2 dys | 1 day | 2 h | 1 h | i.b. | during | i.a. | |
| Diez & Rosa (1996)** | 28 m,f | Skiing | C | | | | 18.2 | 20.6↑ | | 24.9↑ | | | Type of race |
| | | | S | | | | 12.7 | 14.07↑ | | 20.85↑ | | | |
| | | | SC | | | | 24.65 | 20.85↓ | | 20.75 | | | |
| Gould, Petlichkoff, & Weinberg Study 2 (1984) | 63 f | Volleyball | C | | x | = | = | = | | = | | | Experience |
| | | | S | | 15.09 | 15.02 | 14.49↓ | 16.24↑ | | 18.32↑ | | | |
| | | | SC | | x | = | = | = | | = | | | |
| Hall, Kerr, & Matthews (1998) | 119 m,f | Cross-country running | C* | | 17.68 | 17.72 | 19.08 | | | 20.36 | | | Perfectionism +i |
| | | | S* | | 14.88 | 14.98 | 17.78 | | | 19.54 | | | |
| | | | SC* | | 24.52 | 25.77 | 22.83 | | | 21.91 | | | |
| Jones & Cale (1989) | 40 m,f | Various | C* | 14.78 | 15.6 | 16.28 | 17.23 | 17.73 | | 18.53 | | | Sex +i |
| | | | S* | 10.63 | 10.43 | 10.88 | 11.6 | 13.75 | | 16.2 | | | |
| | | | SC* | 30.35 | 30.18 | 30.4 | 29.78 | 28.65 | | 27.55 | | | |

*(continued)*

**Table 2.2** - *continued*

| Author(s) (year) | N | Sport | A.C. | Time of assessment | | | | | | | | | Moderators |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Pre-competition | | | | | | | D.C. | P.C. | |
| | | | | 2 wks | 1 wk | 2 dys | 1 day | 2 h | 1 h | i.b. | during | i.a. | |
| Jones & Cale (1997)[N] | 44 m,f | Perceptual speed task | C | | | | | | | 11.28 | 13.6 | 12.93 | Goal setting$^{+i}$, subjective goal difficulty$^{+}$ |
| | | | S | | | | | | | 11.16 | 11.75 | 11.12 | |
| | | | SC | | | | | | | 28.33 | 26.77 | 28.05 | |
| Jones, Cale & Kerwin (1988) | 12 m | Cricket | C | | | x | = | | = | = | | | None |
| | | | S | | | 10.92 | 12.00 | | 14.58↑ | 18.33↑ | | | |
| | | | SC | | | 26.58 | 25.25 | | 25.17 | 22.42↓ | | | |
| Jones, Swain & Cale (1991) | 56 m,f | Various | C* | | 19.27 | 19.13 | 19.07 | 20.25 | | 21.15 | | | Sex $^{+i}$, readiness$^{+}$, importance of match$^{+}$, winning possibility$^{+}$ |
| | | | S | | 12.16 | 11.48 | 12.24 | 15.52↑ | | 18.29↑ | | | |
| | | | SC* | | 27.68 | 27.97 | 27.52 | 25.81 | | 24.82 | | | |
| Karteroliotis & Gill (1987) | 41 m | Motor task | C | | x | | | | | 13.14 | 14.8↑ | 13.39↓ | None |
| | | | S | | x | | | | | 12.51 | 13.68↑ | 10.97↓ | |
| | | | SC | | x | | | | | = | 26.65↓ | 28.53↑ | |

*(continued)*

**Table 2.2** - *continued*

| Author(s) (year) | N | Sport | A.C. | Time of assessment | | | | | | | | | Moderators |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Pre-competition | | | | | | | D.C. | P.C. | |
| | | | | 2 wks | 1 wk | 2 dys | 1 day | 2 h | 1 h | i.b. | during | i.a. | |
| Krane & Williams (1987) | 80 f | Gymnastics | C | | | | x | | = | = | | | Type of sport[+i] |
| | | Golf | S | | | | x | | ↑ | = | | | |
| | | | SC | | | | x | | = | = | | | |
| Martens et al. (1990) | 45 m | Wrestling | C | | | 18.29 | 17.2 | 16.86 | 16.49 | 17.16 | | | None |
| | | | S | | | 16.3 | 16.6 | 18.42 | 18.27 | 21.89↑ | | | |
| (study 1) | | | SC | | | 25.16 | 24.84 | 24.33 | 24.98 | 23.67 | | | |
| Martens et al. (1990) | 40 f | Gymnastics | C | | | 18.28 | 17.15 | 16.5 | | 17.1 | | | None |
| | | | S | | | 14.08 | 13.85 | 17.53↑ | | 16.8 | | | |
| (study 2) | | | SC | | | 24.35 | 25.75 | 24.25 | | 24.83 | | | |
| Masters, Witting, Cox, Scallen, & Schurr (1995) | 22 m,f | Various | C | 17.52 | | | 19.4↑ | | | | | | None |
| | | | S | 12.97 | | | 14.75↑ | | | | | | |
| | | | SC | 27.75 | | | 23.6↓ | | | | | | |

*(continued)*

**Table 2.2** - *continued*

| Author(s) (year) | N | Sport | A.C. | Time of assessment | | | | | | | | | Moderators |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Pre-competition | | | | | | | D.C. | P.C. | |
| | | | | 2 wks | 1 wk | 2 dys | 1 day | 2 h | 1 h | i.b. | during | i.a. | |
| Nordell & Sime (1993) | 20 f | Swimmers | C | | | | 16.25 | | 17.58↑ | | | | Levels of competitive stress+ |
| | | | S | | | | - | | - | | | | |
| | | | SC | | | | - | | - | | | | |
| Perkins & Williams (1993) | 18 ? | Abseiling | C | | x | | ↑ | | = | = | | | Novices vs experienced+i |
| | | | S | | x | | ↓ | | = | = | | | |
| | | | SC | | x | | ↓ | | = | = | | | |
| Slaughter, Selder, & Patterson (1994) | 110 m,f | Basketball | C | | | x | ↓ | ↑ | ↑ | | ↓ | ↓ | Sex+i |
| | | | S | | | x | ↓ | ↑ | ↑ | | ↓ | ↓ | |
| | | | SC | | | x | ↑ | ↓ | ↓ | | ↑ | ↑ | |
| Swain & Jones Study 1 (1990) | 60 m | Track and field | C | | x | = | = | = | | ↑ | | | None |
| | | | S | | x | = | = | ↑ | | ↑ | | | |
| | | | SC | | x | = | = | ↓ | | ↓ | | | |

*(continued)*

**Table 2.2** - *continued*

| Author(s) (year) | N | Sport | A.C. | Time of assessment | | | | | | | | | Moderators |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Pre-competition | | | | | | | D.C. | P.C. | |
| | | | | 2 wks | 1 wk | 2 dys | 1 day | 2 h | 1 h | i.b. | during | i.a. | |
| Swain & Jones | 49 ? | Track and field | C | | | x | = | = | | ↑ | | | None |
| Study 2 (1990) | | | S | | | x | ↑ | ↑ | | ↑ | | | |
| | | | SC | | | x | = | = | | = | | | |
| Swain & Jones (1993) | 49 m,f | Track and field | C | | | 16.53 | 16.88 | 17.37 | | 17.65↑ | | | Sex[+] |
| | | | S | | | 10.44 | 11.44↑ | 15.33↑ | | 18.59↑ | | | |
| | | | SC | | | 25.78 | 25.41 | 25.07 | | 25.07 | | | |
| Swain & Jones (1991) | 97 m,f | Track and field | C* | | 16.97 | 17.76 | 18.17 | 19.01 | | 19.72 | | | Gender endorsement[+i] |
| | | | S* | | 10.32 | 10.88 | 12.14 | 16.08 | | 19.27 | | | |
| | | | SC* | | 26.76 | 26.62 | 26.06 | 24.27 | | 23.17 | | | |
| Wiggins | 91 m,f | Various | C | | | | 18.66 | 18.60 | 18.97 | | | | Sex[i] |
| (1998) | | | S* | | | | 13.64 | 15.32 | 16.47 | | | | |
| | | | SC | | | | 25.54 | 25.08 | 24.79 | | | | |

*(continued)*

Legend:

C= cognitive anxiety; S = somatic anxiety; SC = self-confidence; N = number of subjects; m = males; f = females; $^{N}$ = time main effect not tested; D.C. = during competition; P.C. = post-competition; i.b = immediately before; i.a. = immediately after; $^{+}$ = moderator significantly affects anxiety level; x = initial time of assessment with no mean available; $^{i}$ = interaction between moderator and time of assessment; * = significant main effect of time of assessment, but significance of inter-assessment change not reported; ↑ = significant increment; ↓ = significant reduction; "=" = no significant change; ** = second time of assessment was 12 hours prior to competition

2.422 *Cognitive anxiety*

Although theory predicts a rapid increase in the intensity of physiological symptoms as the athlete approaches the competitive event, the cognitive sub-component of the CSAI-2 is believed to remain stable over time unless the expectations of success change (Martens et al., 1990). Analysis of the temporal changes of cognitive anxiety led to different findings. In some cases, the intensity of cognitive anxiety remained stable over time (Caruso et al., 1990; Gould et al., 1984; Wiggins, 1998), while in others it increased with the nearing of the evaluative event (Davis & Gill, 1995; Diez & Rosa, 1996; Hall et al., 1998; Slaughter et al., 1994; Swain & Jones, 1993). Moreover, when present, the changes on the cognitive sub-scale were far less pronounced than were those on the somatic sub-scale (Table 2.2). These results apparently support the contention of Martens et al. that cognitive anxiety is more stable over time than somatic anxiety. The conflicting findings can be attributed in the main to two sources: changes in athletes' expectations of success or poor psychometric characteristics of the instrument used. With regards to the first source, only one study has directly analysed the temporal changes in expectancy of success together with changes on the CSAI-2 sub-scales (Table 2.2). Jones et al. (1991) showed that male athletes did not exhibit significant changes in cognitive anxiety over the week preceding the competition, while female athletes did. However, both males and females reported a significant change in their expectations of success. The rating of the strength of their opponents tended to increase as the competition approached, while their perceived readiness for the competition remained stable.

Further inspection of the data reported in Table 2.2 shows that the moderators analysed in the reported studies do not account for the difference in findings. Therefore, it is possible that the differences observed are the result of poor psychometric characteristics of the CSAI-2 or the effects of other moderators that have yet to be identified. Indeed, the validity of the CSAI-2 as a measure of competitive anxiety has recently been questioned. For instance, Lane et al. (1999) noted that the process of validation of the CSAI-2 was based on four exploratory factor analyses using principal component analysis with oblique and varimax rotations, in which the ratio of participants to items was below the recommended minimum of 5:1. With regard to this, it has been shown that exploratory factor analysis tends to result in spurious factors, especially in conditions of low participant-to-item ratio (Bryant & Yarnold, 1998), as it was the case in Martens et al.'s (1990) studies. Confirmatory factor analysis, instead, is more sophisticated and offers the possibility of testing data against *a priori* models and assessing the fit of the models using more stringent criteria (Bryant & Yarnold, 1998). Thus, Lane et al. (1999) evaluated the factor structure of the inventory using confirmatory factor analysis and observed that the three-factor model hypothesised by Martens et al. (1990) showed poor fit indices. Lane et al. (1999) suggested that a limitation of the cognitive anxiety sub-scale might derive from phrasing items around the word "concerned" rather than "worried". Concern about an impending competition does not necessarily mean that an athlete is experiencing negative thoughts. It could also mean that the athlete is acknowledging the importance and difficulty of the competition and is trying to mobilise resources to cope with it. In light of these findings, Lane et al. (1999) concluded that data obtained using the CSAI-2 are not to be trusted until further validation studies have been completed and possible refinements to the inventory have been made.

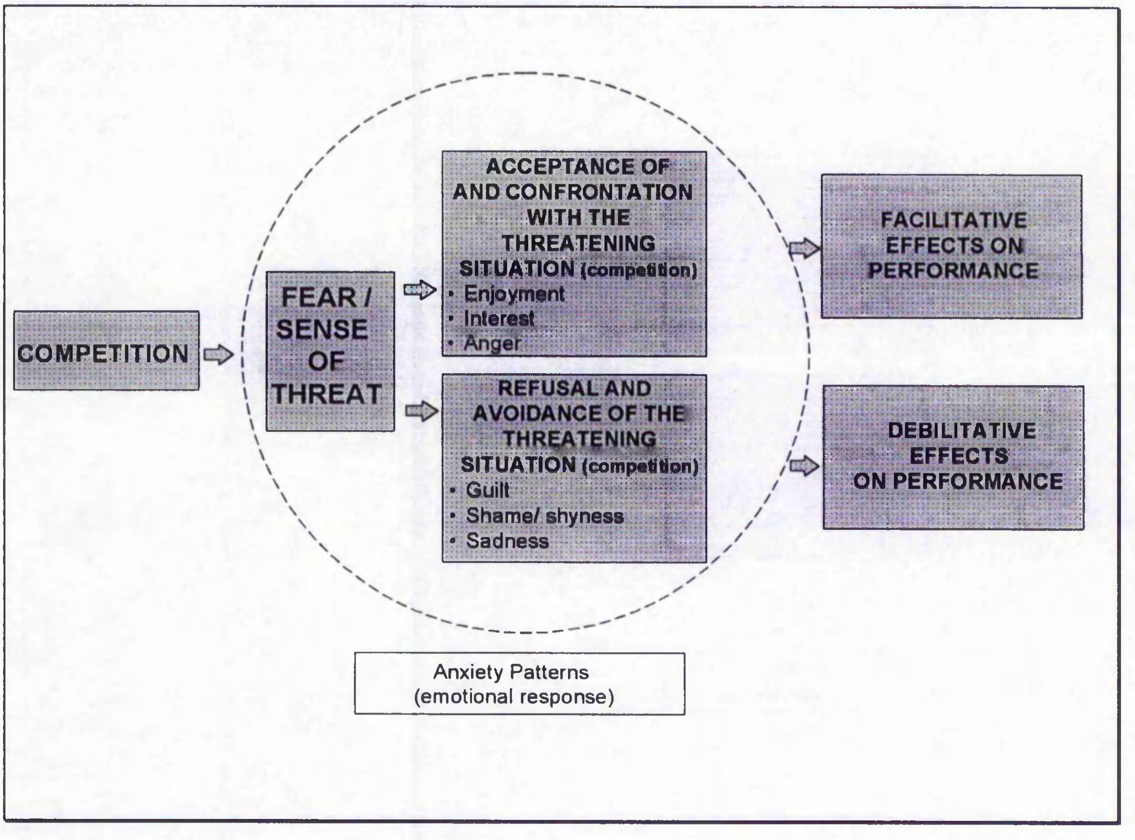
To complicate the issue of the definition and measurement of multidimensional competitive anxiety further, a number of studies have revealed that not all athletes consider the experiences listed in the CSAI-2 to be negative. Jones and Swain (1992) found that sometimes athletes perceived them as facilitating performance. Moreover, they showed that highly competitive athletes viewed their cognitive anxiety to be more facilitative and less debilitative than less competitive athletes. In an attempt to explain the new findings, Jones, Swain and Harwood (1996) examined the dispositional antecedents of the directional interpretations that individuals tend to attach to their cognitive and somatic anxiety. They showed that positive affect played a key role in the interpretation of both cognitive and somatic anxiety. However, Jones et al. did not mention that a different interpretation of cognitive and somatic symptoms of anxiety might indicate the presence of two qualitatively different emotional experiences. Indeed, anxiety has been used to describe an extremely broad continuum of states ranging from panic and immobilisation to exhilaration (Jones, 1995). As Burton and Naylor (1997) noted, we are confronted with the need to develop a more conceptually explicit definition of competitive anxiety. There is a compelling urgency for the identification of measurement strategies that would separate anxiety from other more positive emotions with similar symptoms (challenge). Therefore, the common and differential components defining emotional states of threat and challenge should be identified.

The solution to this problem is already available. Namely, to account for the individual and situational differences in experienced anxiety, Izard (1977) defined anxiety not as a single emotion, but rather as a ***pattern of emotions*** including fear and two or more of the emotions of sadness, anger, shame/shyness, guilt and interest. Although fear is considered to be an essential component of the pattern of anxiety, the other fundamental emotions are postulated to be variable elements. It is hypothesised that individuals differ in terms of the emotions they experience, as part of their anxiety pattern, except that fear is always included. Moreover, the combination of emotions constituting anxiety is thought to vary with relation to time, situations, personality, and intensity and frequency of subjective perceptions. Empirical research (Bartlett & Izard, 1972) lends support to the premise that fear is central to the experience of anxiety, and that interest, guilt, anger, and shame/shyness are frequent components. Anxiety involves a cluster of emotions that may motivate both approach and avoidance behaviours (Buechler & Izard, 1980). Factor analytic studies have shown that terms used to describe anxiety, as well as items from clinical anxiety scales such as the STAI, consistently correlate most highly with fear and share the next largest amount of variance with a combined sadness/guilt factor (Izard & Youngstrom, 1996). Moreover, an empirical test of Cattell's hypothesis that anxiety represents a higher order factor onto which more discrete emotions and cognitions load, provided support for the possibility of variations in the anxiety pattern (Izard & Youngstrom, 1996). The study discovered a second-order factor that contained substantial loadings for both fear and at least two of the other emotions commonly accompanying fear in anxiety profiles. These emotions are interest, sadness, guilt and shyness, with surprise, anger and disgust being less frequent. The observed patterns of shared variance support the differential emotions theory assumption that anxiety is a variable pattern of emotions and that fear is the key emotion within the normative anxiety profile.

Accounting for differences in intensity of perceived symptoms, these findings suggest that individuals assigning different interpretations to anxiety may in fact experience different patterns of anxiety. Additionally, it may be hypothesised that, different patterns of anxiety may affect performance in a different way. In fact, Frijda (1986) suggested that emotions are identified with action tendency change. Different modes of action readiness correspond to different emotions, with many emotions being defined by such modes. For instance, anger is the urge to attack or, more properly, the urge to regain freedom of action and control. Thus, it can be hypothesised that fear accompanied by interest or anger may lead to proactive behaviour or be a sign of acceptance of, and confrontation with, the competitive challenge (Figure 2.2). Conversely, fear accompanied by guilt, shame or sadness may be a sign of perceived inability to cope, producing avoidance behaviour, increased self-focus and poor concentration on the task, thereby having a negative effect on performance. Whether fear is accompanied by shame, guilt, interest, anger, sadness or other emotions depends on personal and situational factors (Figure 2.1), which in turn determine the appraisal of the importance of the situation and the individual's ability to cope. Note that Figure 2.2 is part of the interactional model of stress (emotional response component) and represents only two of the many possible patterns of emotions that an athlete can experience during or before a competition. Other emotional patterns could be more positive, represent a sense of challenge, and have instead "interest/excitement" as their dominant component, accompanied by feelings of enjoyment, surprise, anger or contempt.

**Figure 2.2**

**Patterns of competitive anxiety and their effect on sport performance**




## 2.5 Patterns of emotions and/or moods

Some authors have recently acknowledged the importance of the analysis of patterns and interactions of competitive emotions (Hanin, 1999) and moods (Lane & Terry, 2000). Thus, Lane and Terry (2000) have proposed a conceptual model of mood according to which certain moods interact to influence athletic performance. Depression is viewed as the most important mood dimension which influences the intensity of mood responses and the interrelationship among other mood dimensions. Depressive mood acts as a catalyst for confusion, fatigue, anger and tension and moderates mood and performance relationships for anger and tension.

Although initial tests have provided support for some of these propositions (Lane & Terry, 2000), several fundamental issues pertaining to the way the model has been conceptualised need to be addressed. Because this field of research focuses on affective states and processes that are triggered by a specific object or event (competition), it seems more appropriate to term the phenomena studied "emotions" rather than "moods" (Frijda, 1994). This is particularly true for findings based on assessments conducted immediately before, during or immediately after the competition. In this period, athletes usually experience sudden changes in the quality and intensity of their affective state that are caused by clearly identifiable factors (e.g. certain defeat, opponent's provocative behaviour or unfavourable draw). Notably, the findings that Lane and Terry (2000) report in support of their model pertain to measurements close to the start of the competition. This suggests that Lane and Terry have been most probably referring to athletes' emotions and, therefore, have been using the word "mood" incorrectly. Admittedly, Lane and Terry (2000) provide their own definition of mood, which is meant to explain their interpretation and usage of the term. However, their definition does not include the elements that distinguish emotions or set of emotions from moods: duration, intensity and relationship with an object. They state that mood is "a set of feelings, ephemeral in nature, varying in intensity and duration, and usually involving more than one emotion" (p. 17). This definition does not differ from that of a pattern of emotions (Izard, 1991) and probably reflects the authors' opinion that it is difficult to differentiate emotions from moods on the basis of scores on inventories such as the POMS, the inventory they used in their research. However, although mood and emotions cannot be always clearly distinguished in practice, using identical definitions for both affective phenomena is not justified. This may only create unnecessary confusion in the research field. If emotions cannot be distinguished from moods, the use of these words should be avoided. In such case, these affective phenomena could be, for instance, studied under the common name of emotional experiences. Alternatively, if we are convinced of the importance of differentiating between emotions and moods, efforts should be directed towards the development of instruments of better construct and discriminative validity.

Another conceptual issue that deserves consideration pertains to the structure of the model. As stated earlier, the model is based on the mood sub-scales of the POMS: depression, anger, fatigue, confusion, tension and vigour. Depression is viewed as a moderator of the relationship between performance and anger and tension, and as a catalyst for anger, fatigue, tension and confusion. One of the merits of this model is that it is expected to have good predictive validity for athletic performance. Indeed, the results of a recent meta-analysis (Beedie, Terry, & Lane, 2000) showed that fatigue, confusion and depression were associated with poorer performance in open-skill sports. Close-skill sports seemed to be positively affected by vigour and negatively affected by depression. Overall, vigour had a positive and confusion a negative effect on performance. Moreover, the strength of association between performance and the specific sub-scales of the POMS seemed to depend on the type of sport (e.g. close-skill versus open-skill sports, short duration versus long duration sports), which supports one of the hypotheses of the interactional model of stress (Figure 2.1).

Although having a practical value for the prediction of athletic performance, Lane and Terry's model (2000) is theoretically problematic. The components of the model (sub-scales of the POMS), which are termed "mood dimensions", represent psychological phenomena of different nature. Thus, anger is a basic or fundamental emotion (Frijda, 1986; Plutchik, 1994). Fatigue is essentially a non-emotional state (Izard, 1991). Confusion may refer to a non-emotional cognitive state, whereas depression is a very complex set of fundamental emotions and non-emotional states (Izard, 1991; Plutchik, 1994). For instance, empirical research showed that the fundamental emotions involved in the phenomenology of depression are sadness, anger, fear, guilt, shyness, contempt and disgust (Izard, 1991). Other factors that accompany depression are fatigue, decreased sexuality, decreased physical well-being (Izard, 1991) and impaired cognitive functions (Gotlib, Roberts, & Gilboa, 1996). Therefore, it is not surprising that, as postulated in Lane and Terry's model, depression is characterised by higher levels of anger, confusion, fatigue and tension and stronger intercorrelations among them. In fact, anger, confusion, fatigue and tension are elements of the phenomenology of depression itself.

It is contended that a model based on fundamental emotions would provide a clearer and more informative framework than one based on the POMS. First, fundamental emotions are distinguishable unitary affective states. This means that they are not components or sub-factors of other fundamental emotions. Thus, anger is not a component of sadness, happiness, fear or shame. Sadness is not an element of guilt, fear, shame or shyness. Consequently, the information gathered though the assessment of fundamental emotions is not redundant. Secondly, fundamental emotions provide information about the relational meaning of a situation, i.e. the person's sense of the harms and benefits in a particular person-environment relationship. This does not apply to "mood dimensions" such as confusion and fatigue. Even the assessment of depression, without an analysis of its constituents, cannot provide enough information on the relational meaning of an event. For example, the loss of a dear friend will provoke a state of depression in most people. However, depending on the circumstances, some individuals will and some others will not feel responsible for the event. It is noteworthy that although the relational meanings of these two situations are different they are associated with the same complex emotional state: depression. However, if we define depression as a pattern of fundamental emotions and assess the emotional experience through an appropriate scale, we will discover that the two situations yield two different profiles of emotions. The first profile will be characterised by increased levels of sadness, guilt, self-hostility and/or shame, whereas the second will show increased levels of sadness and/or anger, but no guilt, shame or self-hostility. Consequently, an analysis of fundamental emotions, as opposed to the assessment of depression as a unitary concept, will provide information about the relational meaning of the situation. In other words, the analysis of depression as a pattern of fundamental emotions will tell us more about how the individual feels and perceives the situation than the score on a depression scale.

## 2.6 Basic emotions in sport

Because of the current confusion and lack of satisfying operational definitions of complex emotions such as competitive anxiety and depression, it is suggested that future research should examine secondary emotions as patterns or sets of discrete basic emotions (Izard & Buechler, 1980). Discrete basic, primary or fundamental emotions are thought to be characterised by distinctive universal signs (emotional expression) and antecedent events, presence in other primates, relative coherence among response systems, distinctive physiology (Ekman, 1992), presence in all cultures (Plutchik, 1994) or distinctive relational action tendencies (Davidson, 1992; Frijda, 1986). Thus, for instance, fear and anger have distinctive universal facial expressions that can be easily recognised by members of literate and preliterate cultures all over the world. Additionally, there is some evidence for similar facial expressions in other primates (Ekman, 1992). There is also evidence for distinctive patterns of autonomic nervous system activity for fear and anger (Levenson, 1994). As far as universal antecedents are concerned, if primary emotions evolved to deal with fundamental life-tasks, then it is sensible to expect that there will be some common elements in the contexts in which emotions are found to occur. Admittedly, there must be substantial inter- and intra-individual differences in the social context that call forth an emotion, which is attributable to social learning experiences. However, this learning is likely to be biologically primed in the sense that the responses are much more easily attached to one type of stimuli than others. In the case of fear, the universal antecedent event that triggers it is perceived physical or psychological danger (Izard, 1977). Anger can instead be experienced upon exposure to a demeaning offence against the self (Lazarus, 1999), including psychological and physical restraint that blocks one's freedom of action, or upon exposure to painful stimuli (Izard, 1977). In terms of action readiness, fear is characterised by the urge to separate oneself from aversive events, whereas anger is the urge to attain or regain freedom of action and control (Frijda, 1986). Because of these characteristics, words expressing basic emotions are less likely to be misunderstood or differently interpreted than those for complex or secondary emotions (Plutchik, 1994). Therefore, the assessment of primary or fundamental emotions in competitive sport settings should facilitate inter-individual comparison. Although different lists of basic or primary emotions have been proposed, it is also true that considerable agreement exists regarding the fundamental nature of several emotional states: anger, fear, sadness, disgust, joy, surprise and interest (e.g., Ekman, 1992; Emde, 1980; Izard, 1977; Plutchik, 1980; Tomkins, 1962, 1963). Given the above, it is suggested that research on competitive emotions could follow two parallel lines. The first, initiated by Hanin (1995, 1997), would focus on the description of a vast set of basic and complex emotional states that reflect the idiosyncratic emotional experience and vocabulary of the athlete. The second would examine the profile of basic emotions experienced throughout the competition, and would focus on individual and situational differences and factors determining those differences. The integration of the two approaches could lead to a better understanding of whether, how and why individuals differ in the interpretation of specific secondary emotions and their effect on performance. Moreover, it would also permit the analysis of intraindividual variations in labelling secondary emotions with respect to different competitive contexts and temporal aspects (e.g. anticipatory anxiety versus performance anxiety and post-performance anxiety).

To illustrate the value of the second line of research, the findings of a study on unidimensional pre- and post-competitive anxiety are reported and then an example of how to analyse the difference in patterns of pre- and postcompetition anxiety as sets of basic emotions is given. Vura, Noenyi, Sipos and Sipos (1985) determined the anxiety level of wrestlers two days before and after a competition. They analysed the effect of winning or losing, favourable versus unfavourable draws and judging on the athletes' anxiety level (Table 2.2). They showed that post-competitive anxiety decreased compared with pre-competitive anxiety when favourable judging was accompanied by good competition results and when bad competition results were accompanied by unfavourable judging. Conversely, the level of post-competitive anxiety showed a relative increase when successful performance was accompanied by unfavourable judging. The highest intensity of post-competitive anxiety was observed when favourable judging was accompanied by unsuccessful performance. The results obtained in this study are not particularly informative. Given the different circumstances, it is justifiable to hypothesise that wrestlers who performed badly despite favourable judging experienced a qualitatively different pattern of anxiety - if anxiety at all - than the type they experienced pre-competition. While the former scenario might have triggered feelings of guilt, inward hostility, tension and maybe fear, the latter might have been dominated by feelings of worry, interest and expectation. Moreover, it can be also hypothesised that the pattern of post-competitive anxiety experienced by athletes who did well but encountered unfavourable judging was different from that reported by athletes who were unsuccessful but encountered favourable judging. Again, although the former might have been dominated by feelings of anger, the latter probably included feelings of inward hostility, self-blame and guilt. To elucidate the findings of Vura et al. (1985) further, the relationships between pre- and post-competition anxiety as measured by the STAI and profiles of primary emotions as measured by the Differential Emotions Scale - IV (DES-IV; Izard, Libero, Putam, & Heynes, 1993) should be established. Furthermore, post-competition patterns of anxiety should be analysed with respect to such moderators as success versus failure, favourable versus unfavourable judging and locus of control.

## 2.7 Temporal patterns of other competitive emotions

Recent research has acknowledged the necessity to shift the emphasis from anxiety and stress to a more encompassing concept of "emotion" in predicting and explaining psychological and behavioural reactions to environmental demands (Gill, 1994; Hanin, 1997; Jones, 1995; Lane & Terry, 2000; Lazarus, 1993; Robazza, Bortoli, Zadro, & Nougier, 1998). According to this view, analysis of the intensities, qualities, antecedents and processes of emotions will be more informative than focusing exclusively on stress (threat, challenge, harm) and anxiety. To date, two approaches have been used – nomothetic and idiographic. The first involves the use of nomothetic standardised scales, is based on group averages and focuses on inter-individual and inter-group comparisons. The latter, promoted by Hanin (1995, 1997), uses individualised scales with athlete-generated items. This includes sampling of personally relevant sets of positive and negative emotions based on the athlete's previous performance experiences.

Many inquiries into the relationship between sport performance and emotional states support the utility of this latter line of investigation (e.g., Cockerill, Nevill, & Lyons, 1991; Hanin, 1997; Hanin & Syrjä, 1995a; Prapavessis, 2000; Prapavessis & Grove, 1991; Robazza et al., 1998; Terry, 1995). However, the predictive validity of pre-performance affective states seem to depend on the type of sport, the use of self-referenced performance criteria and homogeneity of the participants in terms of ability and fitness (Terry, 1995). Indeed, it can be hypothesised that individual differences in skill and level of fitness will contribute more to sport performance than variations in emotional states. Accordingly, in circumstances in which differences in physical characteristics are substantial, the athletes' profiles of pre-competitive emotional states cannot represent a good predictor of performance outcome. Therefore, the interactional model of stress (Figure 2.1) posits that emotional states will predict performance based on self-referenced criteria rather than absolute performance outcome.

Indeed, recent research has confirmed that self-referenced performance criteria substantially facilitate prediction of sport performance from pre-competition emotional states. Self-referenced performance is based on athletes' self-rating of whether they under-performed or performed to their expectations. Thus, for example, athletes have to identify their expected finish position one day before the competition. They are then categorised as having "performed to expectations" if they finish in their expected position or higher, or as having "underperformed" if they do not. Using this method, Terry (1993) correctly classified 70.9% of performances at World and Olympic level on the basis of mood profiles in the sports of rowing and bobsledding. In later studies, replications of this strategy led to 100% (Hall & Terry, 1995) and 64.7% (Terry, 1995) discriminatory success.

Similarly, Cockerill et al. (1991) used the POMS to successfully predict the cross-country running performance of experienced male athletes. Race times from two competitive events were plotted against each of the six mood factors. Using the data from the first race, a multiple-regression model, which included the interdependence of tension, anger and depression, was able to predict rank order of finishing position for the second race with acceptable accuracy.

However, the predictive validity of the POMS seems to depend on the type of sport examined. Pre-game emotional pattern showed no discriminatory capability among the England cricket team during three matches against Australia (Terry, 1994). Similarly, pre-performance scores on the POMS were not helpful in predicting performance of a soccer team that played in the women's premier league in Sweden (Hassmén & Blomstrand, 1995). According to Terry (1995) and Hanin (1995), the contrasting results obtained in examining different sports are attributable to the duration of the competition. Rowing, wrestling and bobsledding last less than ten minutes, while soccer lasts 90 minutes and a cricket test match lasts for five days. Since the probability of fluctuations of emotions during performance increases with performance duration, the predictive ability of pre-competition emotional states will decrease accordingly.

These findings are supported by a recent meta-analysis on the relationship between pre-competitive emotions measured with the POMS and athletic performance (Beedie et al., 2000). Moderate effect sizes were observed for the sub-scales of vigour, confusion and depression, small effect sizes for anger and tension, and very small for fatigue. Effects were larger in sports of short duration, in open-skill sports and where self-referenced criteria were used to determine performance. In order to account for the larger effect sizes in open-skill sports, Beedie et al. (2000) suggested that an optimal pre-competitive emotional state may be required to cope successfully in an ever-changing environment. Alternatively, they suggested that it is possible that different sports require different optimal profiles of pre-competitive emotional states.

Indeed, substantial variation between sports in terms of desirability of specific affective states for performance is to be expected. For instance, running, a task of low cognitive complexity in which no fine motor control is involved, requires a relatively high level of arousal (Schmidt, 1991). Other sports of greater cognitive complexity, such as tennis, archery and fencing, might benefit from emotional states accompanied by lower levels of physiological arousal. Moreover, empirical data show that, like cross-country running (Cockerill et al., 1991), success in karate appears to be associated with elevated anger (Terry, 1995). The scarcity of research in this area indicates that there is a need for further investigations on the differences of desirability of specific emotional states in various sports.

### *2.71 The nomothetic approach*

Few nomothetic studies have addressed the temporal patterns of pre-competitive affect. The first study that examined the changes of mood in a period prior to a competition compared pre-competitive emotional states with basal mood responses in 115 college rodeo athletes (Meyers, Sterling, LeUnes, Elledge, & Tolson, 1990). The difference between pre-competitive and baseline emotional patterns approached statistical significance ($p = 0.06$). Twenty minutes before the rodeo competition, the athletes reported higher than baseline tension and vigour, with parallel decreases in depression, anger and fatigue.

Prapavessis and Grove (1994) administered the abbreviated version of the POMS (Grove & Prapavessis, 1992) to 75 male and 31 female competitive rifle shooters 48 hours, 24 hours, 12 hours and 15 minutes before a competition. Significant time-to-competition effects were evidenced for all mood state sub-scales. Tension and vigour gradually decreased as the competition approached and then sharply increased just before the event. Esteem-related affect decreased across the entire pre-competitive period, with a brisk decline occurring just before competition. Fatigue decreased from the first to the second assessment, increased from the second to the third assessment, and decreased from the third to the last assessment. Depression increased gradually in the first three periods and then decreased 15 minutes before the competition started. Finally, confusion and anger remained relatively stable as competition approached, but in the last measurement anger increased while confusion declined. Self-handicapping, trait-sport confidence, hardiness and neuroticism were found to exert a significant main effect on various mood states, but no interaction with time-to-competition was observed. Since this study was one of the few that has tried to determine the temporal patterns of pre-competitive emotions other than anxiety, the authors suggested that replicative research was needed before any valid conclusion could be drawn. However, despite recent recommendations and calls for investigations in this specific area of research (Gill, 1994; Jones, 1995), little progress has been made over the last five years.

### 2.72 *The idiographic approach*

The individual zones of optimal functioning model (Hanin, 1997) represents an idiographic approach and was originally proposed as a tool to determine competitors' optimal level of pre-competitive anxiety. The model states that the optimal anxiety bandwidth is specific to the individual and that there is a great interindividual variability in the bandwidth among the athletes. Hence, pre-competition anxiety has to be individually examined. Recently, the IZOF model has been extended to pre-competitive emotions other than anxiety. This approach advocates the use of individualised scales with athlete-generated items. It is suggested that the use of standardised inventories and self-report scales is not as pertinent and sensitive to the individual emotional experience as individualised assessments (Hanin, 1997). Research in various sports has shown that athletes reported idiosyncratic positive and negative affect patterns and self-defined their intensity (Hanin, 1997; Hanin & Syrjä, 1995a). These studies also revealed that positive and negative emotions may be facilitating, debilitating or both depending on the individual's attributed meaning and intensity.

As researchers applying the IZOF approach have mainly been interested in examining the relationship between sport performance and emotions experienced immediately prior to competition, examination of the temporal patterns of idiosyncratic pre-competitive emotional states has only recently been undertaken. Robazza, Bortoli and Nougier (in press) monitored anxiety components, self-confidence and idiosyncratic emotions in 13 Italian archers at the 1995 World Championship, 15 minutes prior to practice sessions and competition. The first monitoring was carried out two days before the competition, before a practice session, whilst the final assessment was completed immediately before the individual elimination round, the most critical stage of the World Championship. "Determined", "willing", "focused", "calm" and "motivated" were the items that were most frequently chosen as facilitating emotions, whereas "fatigued", "concerned", "discouraged" and "insecure" were identified as inhibiting emotions. "Aggressive", "calm" and "satisfied" were reported by different archers as having both facilitating and debilitating effects on performance. With regard to temporal patterns of emotions, results showed that worry reached its peak in the final round, tension was slightly below or above the optimal level across assessments, whilst self-confidence and positive emotions remained relatively stable across time.

The reasons why different athletes, even within the same sport, disagree on the functionality/dysfunctionality of specific emotional states and their optimal intensity have yet to be explored. It is suggested that an attempt to define secondary emotions as patterns of basic emotions could shed light on the individual differences in labelling subjective emotional states. Furthermore, the relationship between situational (task characteristics) and personal variables (personality, skill level) and individual optimal intensity of specific emotions should be analysed. For instance, Larsen and Diener (1987) found that differences in emotion intensity are highly stable over time and consistent across situations with different hedonic values. They showed that individuals scoring high on the Affect Intensity Measure (AIM; Larsen, Diener, & Emmons, 1986) tend to be less physiologically aroused, more sociable, more impulsive and more extraverted. Larsen and Diener (1987) attempted to explain these findings in terms of the modulation-of-arousal theory. This theory postulates a common objective optimal level of arousal for all individuals. However, because individuals differ in their base level of arousal, they incessantly attempt to modulate their own level of arousal to keep it close to the optimum. According to this theory, affect intensity, extraversion and sensation seeking originate from individual differences in the base level of arousal and exemplify various adjustment mechanisms designed to modulate arousal in different ways. Therefore, individuals with a low level of base arousal would report fairly high optimal intensity of arousal, whereas over-aroused individuals would prefer lower intensities of arousal. However, it is possible that the two reports refer to exactly the same objective arousal and the apparent differences are a reflection of different individual bandwidths of arousal and individual needs. Additionally, recent research revealed that emotion intensity is a complex construct involving independent or partially independent components (Frijda, Ortony, Sonnemans, & Clore, 1992). Consequently, because we cannot be sure that the participants use a stable criterion in making intensity judgements, interpretations of assessments based on the emotional intensity dimension have to be treated with caution.

In addition to intensity, other quantitative dimensions of emotions can be assessed. It is useful to think of the overall impact of an emotion not only in terms of its magnitude but also in terms of its temporal aspects, such as duration and frequency (Figure 2.1). Frequency and duration of emotional states are dimensions that can be more reliably measured and are far less influenced by subjective criteria. Research on performance-related emotions has examined frequency and intensity of multidimensional competitive anxiety. Notably, frequency and intensity are interrelated but separate dimensions that contribute to the affective experience. In forming average levels of specific affects, it is suggested that they combine with each other in an additive manner (cf. Kardum, 1999). Results of competitive anxiety research have shown that frequency of negative thoughts (cognitive anxiety) is more variable across time than intensity and tends to follow the changes in the intensity of physiological symptoms (Campbell & Jones, 1997; Swain & Jones, 1993). Since researchers have been mainly concerned with emotion intensity, it is suggested that future investigations need to examine the temporal dimensions of frequency and duration of athletes' emotional experience. Such an expanded approach would contribute to a clearer and more reliable picture of athletes' reaction to competition.

## 2.8 Moderators and antecedents of competition-related emotional states

As stated earlier, the interactional stress model (Figure 2.1) proposes that the way in which the individual interprets a competition determines the emotional response. Cognitive appraisals are postulated to be influenced by the interaction of personal (e.g., personality characteristics, sex) and situational (e.g., type of sport, competitive environment, group cohesion) factors (Jones, 1990).

Recent research on competitive state anxiety has examined several personal and situational variables that supposedly moderate and mediate the magnitude and the temporal patterns of anxiety or its sub-components as measured with the CSAI-2 (Table 2.2). Since this article focuses on the temporal patterns of emotional states, the current findings related to the mediators and moderators of the ***magnitude*** of pre- and post-competitive emotional states will not in be examined in detail (for details, see Jones, 1995). The discussion below instead revolves around the interpretation and the description of interactions between time-to-competition and other personal and situational variables that have been reported in a number of recent studies. Since researchers have been primarily concerned with competitive anxiety, the discussion will in the main be limited to the moderators of this specific performance-related emotional state.

### *2.81 Sex and gender role endorsement*

Sex has been identified as a moderator variable of the temporal patterns of anxiety in several studies (e.g., Donzelli et al., 1990; Jones & Cale, 1989; Jones et al., 1991; Swain & Jones, 1993) (Table 2.2). Jones and Cale (1989) found that males showed no changes on the cognitive and self-confidence sub-scales of the CSAI-2 during the pre-competition period. However, females reported a gradual elevation in scores with a simultaneous increase in the intensity of the somatic symptoms and a decline in self-confidence. The authors, who adopted a multidimensional view of anxiety, found it difficult to explain the obvious correlation between the different aspects of the anxiety response reported by females athletes. They suggested that the findings could be related to sex differences in the willingness to report feelings of an unpleasant nature and to socialisation factors (Bradburn, 1969; Durkin, 1987). It is also possible that males tend to interpret the items that form the CSAI-2 cognitive sub-scale in a different way than females, giving them a less emotional and more motivational meaning. Clearly, these hypotheses should be verified empirically.

In a later replication of the study, Jones et al. (1991) found similar differences between females and males on the cognitive sub-scale. The results on the other two sub-scales differed slightly from those obtained in the earlier study; namely, males reported a reduction in self-confidence on the day of competition. The authors proposed that the observed differences might have arisen because the first study examined individual sportsmen and women, whereas the latter investigated only participants from team sports. With regard to this, Martens et al. (1990) demonstrated that because individual sports maximise individual responsibility for performance, they yield higher levels of pre-competitive anxiety than team sports. Additionally, Krane and Williams (1987) demonstrated that the temporal pattern of anxiety could be a function of the type of sport. The authors observed that with the nearing of the competition, golfers reported a reduction in anxiety and an increase in self-confidence, whereas gymnasts experienced an increment in anxiety accompanied by a decrease in self-confidence. In a more recent investigation, Slaughter et al. (1994) confirmed the differential patterns between males and females on all sub-scales of the CSAI-2. It appears that differences in state competitive anxiety between sexes is one of the most consistent findings in this area of research.

Some researchers have recently shifted their attention to the relationship between gender role endorsement and competitive anxiety (Swain & Jones, 1991). They suggest that the distinction between males and females on a biological basis may not have the same predictive validity as a distinction based on the individual's psychological traits of masculinity and femininity. This standpoint derives from the cognitive orientation of contemporary stress models that emphasise the role of personal characteristics in the cognitive appraisal of the person-environment relationship (Lazarus & Folkman, 1991). In this case, gender role orientation constitutes a more flexible and cognitively based concept than sex. Indeed, research suggests that gender orientation moderates the pre-competition temporal patterns of anxiety. In a study by Swain and Jones (1991) masculine (independent, assertive, forceful) males remained stable on cognitive anxiety throughout the pre-competition period, whereas feminine (affectionate, sympathetic, compassionate) males tended to report elevations as competition neared. Also, feminine (affectionate, sympathetic, compassionate) females reported a progressive increase in cognitive anxiety, whereas that of masculine (independent, assertive, forceful) females tended to remain relatively stable (Table 2.2). These differences suggest that gender role orientation, as a personality variable, may be more adequate for describing and predicting competitive anxiety than biological sex.

Despite their value in predicting athletes' behaviour and emotional responses, these findings do not explain what causes different patterns of anxiety. Whether the cause is a different interpretation of the inventory, the difficulty in obtaining reliable assessments of unpleasant emotions using self-report, the difference in patterns of motivation or in beliefs about oneself and the world that actually determines the current findings, is still to be examined. Future research should focus on exploring the cognitive processes that precede and define the quality and intensity of emotional reactions to competition.

### *2.82 Skill level*

Skill level was shown to be a factor that may determine the development of competitive state anxiety. Gal-or et al. (1986) examined the temporal patterns of anxiety in 59 orienteers of different levels of ability. Significant differences among the three groups were observed immediately before the competition, with the less skilled orienteers exhibiting higher levels of state anxiety than their counterparts (Table 2.1). It was also observed that better orienteers exhibited an early increase in anxiety followed by a decline to a more moderate level prior to the actual performance. The less skilled group displayed an increase in state anxiety up to the time when competition started. Similar results have been reported for different populations of athletes by Durtschi and Weiss (1984) and Campbell and Jones (1995). In contrast, Huddleston and Gill (1981) failed to observe a relationship between the two variables. However, they concluded that their results were most probably due to low statistical power or small differences in skill level among the participants.

### *2.83 Sport experience*

Although sport experience is probably to a certain degree correlated with skill level, from a scientific standpoint it is important to make a clear distinction between the two. The definition of skill level is based on objective individual abilities and performance, which in turn affect self-confidence and self-efficacy (Martens et al., 1990). Thus, the relationship between skill level and competitive state anxiety derives mainly from the mediating effect of perceived self-efficacy and self-confidence (Bandura, 1977). The notion of sport experience, however, also includes the element of familiarity or unfamiliarity with the sporting environment. Perkins and Williams (1994) conducted a study that examined the effects of a complete lack of specific sport experience on state anxiety. The CSAI-2 was repeatedly administered to 18 experienced and novice abseilers before three consecutive descents. Although no difference between the two groups was observed one week before the first descent, an increase in the cognitive and somatic aspects of anxiety in novice abseilers occurred 24 hours before the event. The differences disappeared in the subsequent trials. In this case, the degree of unfamiliarity with the sport and the risks involved in abseiling exerted a substantial effect on the athletes' level of state anxiety. It is probable that the same principle applies to competition. For example, the time course of competitive anxiety may also depend on the athletes' degree of familiarity with competition in general or with specific competition settings (e.g. standard of competition, place of competition). However, research has yet to be conducted to elucidate this issue.

It is important to emphasise that the relationship between sport experience and competitive anxiety often yields contrasting results. For example, Gould et al. (1984) found no relationship between sport experience and competitive state anxiety in a sample of 63 female volleyball players. They ascribed this to the restricted range of experience and the type of sport studied. In contrast, Donzelli et al. (1990) observed that anxiety increased in non-elite runners in parallel with their experience. These researchers attributed the findings to the most experienced runners also being the most successful and, therefore, supposedly the most committed in their sample. It is possible that the less experienced and less successful runners viewed the race as being less important than their more successful counterparts.

### *2.84 Success versus failure*

Performance outcome undoubtedly affects the athletes' emotional experience (Martens & Gill, 1976). In support of this contention, Caruso et al. (1990) observed a significant increase in cognitive anxiety from pre-competition to post-competition in failure conditions, but a decrease in conditions of success. Notably, somatic anxiety increased in both situations. Self-confidence decreased in the failure situation, but remained stable in participants experiencing success. As noted earlier, Vura et al. (1985) also noted an increase in state anxiety in elite wrestlers following poor performance. However, the effect of failure was also mediated by the quality of judging. A relative increase in state anxiety was noted when good competition results were coupled with unfavourable judging; the highest post-competition anxiety level occurred when a bad performance was accompanied by favourable judging. It can be assumed that the latter circumstances constituted a greater threat to the athletes' self-esteem and, consequently, yielded greater post-performance anxiety. The effect of performance outcome on athletes' psychological state not only depends on situational factors, but also on personality traits. As noted earlier, Hall (1980) showed that locus of control mediates the emotional response to failure and success in competitive events. Internals are affected much more by unfavourable outcomes than externals.

### *2.85 Type of sport*

The athletes' affective response to competition is thought to depend also on the characteristics and requirements of their sport (Beedie et al., 2000; Hassmén & Blomstrand, 1995; Jones et al., 1991; Krane & Williams, 1987; Martens et al., 1990). Research indicates that individual-based sports tend to produce higher level of competitive anxiety than team sports, as do subjectively scored and contact sports (Martens et al., 1990). A recent meta-analysis on the predictive validity of the POMS for athletic performance (Beedie et al., 2000) showed that performance in open-skilled sports could be predicted with greater accuracy than performance in closed-skilled sports. It was concluded that one of the possible explanations for the finding could be that the types of emotion measured with the POMS affected athletes' ability to cope with changes in the environment. Furthermore, there is evidence that different sports may require different patterns of desirable pre-competitive affective states (Cockerill et al., 1991; Friend & LeUnes, 1990; Prapavessis & Grove, 1994; Terry, 1995). Future research should try to determine the similarities and differences in the pre-competitive patterns of emotional states in various sports and different tasks within sports.

### *2.86 Personality characteristics*

Stable personal characteristics that have been shown to be significant in determining the temporal pattern of competitive anxiety include gender role orientation (Swain & Jones, 1991), competitive trait anxiety (Donzelli et al., 1990; Huband & McKelvie, 1986), perfectionism (Hall et al., 1998) and locus of control (Hall, 1980). Donzelli et al. (1990) reported a similar level of state anxiety in high and low trait-anxious athletes one week prior to competition, but more intense anxiety in the high trait-anxious group on the following assessments. In examining team sports athletes, Huband and McKelvie (1986) noted that the level of anxiety in low trait anxious athletes did not change one day before, just before and one day after the event, whereas that of highly anxious athletes' peaked just before the competition. The level of anxiety decreased in both combined groups just after and one day after the competition.

Hall et al. (1998) examined the links between perfectionism, achievement goals and the temporal patterns of multidimensional state anxiety in 119 school runners. They reported that perfectionism was a significant predictor of cognitive anxiety. Perceived ability predicted confidence, while ego and task goals predicted cognitive anxiety and confidence, respectively. Participants with high scores in perfectionism reported significantly more cognitive anxiety on all four assessments than those exhibiting low perfectionism scores. Furthermore, these differences became more prominent as the competition approached (Table 2.2).

Several other personality characteristics have been examined for their effect on the magnitude of competitive state anxiety (e.g., Jones & Swain, 1992; Yang & Pargman, 1993), but not with regard to the time course of pre-competitive anxiety. As far as other pre-competitive emotional states are concerned, Prapavessis and Grove (1994) examined several individual general dispositions, which have been theoretically and empirically linked with emotionality and could moderate an athlete's pre-competitive emotional response. Self-handicapping, trait-sport confidence, hardiness and neuroticism were found to exert a significant main effect on various mood states, but no interaction with time-to-competition was observed. The paucity of findings in this particular area of research suggests a need for further investigation. For instance, research in mainstream psychology showed that five global dimensions of personality (extraversion, neuroticism, openness to experience, conscientiousness and agreeableness; Costa & McCrae, 1992) were related differentially to the two global dimensions of emotions (positive emotionality and negative emotionality) and to certain specific emotions (Watson & Clark, 1992). The strongest and most consistent correlations were the ones between positive emotionality and extraversion and that between negative emotionality and neuroticism. Positive emotionality also showed a low to moderate correlation with conscientiousness. Additionally, Watson and Clark (1992) found that their specific scales for fear, sadness, guilt and hostility were also strongly related to neuroticism. Each of their positive emotion scales was associated to two or more of the five personality factors. These findings indicate that future research should consider examining the moderator effects of the five global dimensions of personality (Costa & McCrae, 1992) on intensity and temporal patterns of competitive emotions.

### *2.87 Cognitive factors*

Cognitive appraisal is postulated to determine the athlete's emotional response to competition (Figure 2.1). Recent research has focused on uncovering the cognitive and evaluative processes that precede the onset and modulate the course of competitive state anxiety. According to the multidimensional theory of anxiety, the antecedents of cognitive anxiety and self-confidence are hypothesised to be related to perceived importance (Marchant, Morris, & Andersen, 1998) and uncertainty of outcome. The latter would include perception of one's own and one's opponent's ability and the external competitive environment. However, recent research indicated that threat of defeat is more important for state anxiety than the degree of uncertainty about the outcome (Cooley, 1987; Jones et al., 1991; Marchant, Andersen, & Morris 1997; Prapavessis et al., 1996). For example, Marchant et al. (1997) reported a higher level of concern among golfers who were certain to lose than among those who were placed in a highly uncertain situation. Notably, the somatic aspect of anxiety, as measured through the CSAI-2, did not differ - apart from the last assessment - between highly unpredictable, highly predictable positive and highly predictable negative conditions. This again reinforces doubts of the utility and discriminant validity of the somatic sub-scale of the CSAI-2.

Antecedents of somatic anxiety are thought to be of shorter duration and consist mainly of conditioned responses to stimuli, such as pre-competition routines (Martens et al., 1990). Although there appears to be no dispute regarding the duration of the somatic symptoms (e.g., Marchant et al., 1997; Slaughter et al., 1994), no evidence has been found for the hypothesised antecedents (Hanton & Jones, 1995; Jones et al., 1991; Lane et al., 1997; Lox, 1992). Overall, the cognitive antecedents of the various aspects of anxiety tend to vary depending on sex (Jones et al., 1991; Slaughter et al., 1994), sport (Hanton & Jones, 1995) and skill level (cf. Jones, 1995). For example, antecedents in females are more related to personal goals and standards, whereas males show a tendency to react to interpersonal comparison (Jones et al., 1991). Moreover, the different sub-scales sometimes do and sometimes do not share similar antecedents (Lane et al., 1997; Lox, 1992), indicating that the multidimensional theory of anxiety may not constitute the best approach for explaining and exploring athletes' response to competition.

The equivocal findings pertaining to the relationship between competitive state anxiety and other variables are an indication of the degree of complexity of the issue. Obviously, many interacting moderators and mediators, such as personality traits and type of sport, determine the magnitude and time course of competitive affects, making accurate prediction difficult (Figure 2.1). As noted earlier, another probable reason why the current situation appears to be so intricate is the lack of precision in defining and measuring anxiety.

## 2.9 Conclusions

This review of literature has attempted to critically analyse research on the temporal patterns of competitive emotions. One of the main ideas discussed in this chapter is that competitive stress is a complex process that unfolds over time and is characterised by incessant change. An interactional model of competitive stress that integrates current research on competitive affects and emphasises the temporal aspects of the stress process has been proposed (Figure 2.1). Close inspection of the current literature reveals that there has been little research on the temporal aspects and mediators of nomothetic and idiographic performance-related emotions other than anxiety. Investigation has mainly focused on emotion intensity, neglecting temporal dimensions such as frequency and duration of emotions.

Equivocal findings on temporal patterns and interpretation of competitive anxiety (Table 2.2) indicate the need to develop a more conceptually explicit definition of this particular performance-related emotional state. Most emotion theorists consider anxiety to be a complex, secondary emotion. Since words expressing basic emotions are less likely to be misunderstood or differently interpreted, the analysis of competitive anxiety and other complex emotions as a set of patterns of basic emotions (Izard, 1977) has been proposed (Figure 2.2). In relation to the last point, it is proposed that, for the sake of a thorough and deep understanding of athletes' experience and behaviour, research on competitive affects should be based on the integration of two approaches. The first, the idiographic approach (Hanin, 1995, 1997), focuses on the idiosyncratic emotional experience and vocabulary of the athlete. This approach deals with the final product (verbal reports of idiosyncratic emotional experiences) of unique individual "psychobiosocial" conditions and is of indisputable practical value. The second, mainly nomothetic, is centred on the analysis of basic emotions throughout the stress process and deals with inter-individual comparison, but can also permit the analysis of intraindividual variations in labelling secondary emotions in different phases of competition. It is hoped that the integration of the two approaches will shed light on whether, how and why individuals differ in the interpretation of the meaning and functionality of specific secondary performance-related emotions. Finally, these improvements in the assessment of emotional states should facilitate the analysis of the stress process and all its temporal aspects.

The interactional model of competitive stress (Figure 2.1) posits that athletes' emotional response to competitive stress is determined by their subjective interpretation or appraisal of the situation, which, in turn, is influenced by various situational (e.g., type of sport, level of competition, interpersonal relationships) and personal factors (e.g., gender, age, skill level, motivation). To date, research has focused primarily on the mediators of competitive anxiety. Very little has been done to identify the factors that moderate other competition-related emotional states. In this regard, the proposed model of stress is meant to provide some ideas for future studies.

# CHAPTER III

## Study 1: Appropriateness of the experience sampling method for the analysis of the temporal patterns of pre-competitive emotions: A comparison between three methodologies[3.1]

### 3.1 Introduction

The previous chapter has introduced an interactional model of stress which defines competition, and athletes' reaction to it, as a complex process that is characterised by constant changes. In accordance with this idea, it has been concluded that, for the sake of a thorough understanding of athletes' experience and behaviour, it is necessary to analyse the temporal aspects of athletes' psychological reactions to competition and identify their antecedents and moderators.

To date, research on the temporal patterns of competitive emotions has mainly relied upon the conventional time-to-competition paradigm, which usually involves three to six assessments in the week preceding a competition (e.g., Donzelli et al., 1990; Gould et al., 1984; Jones et al., 1991). This methodology has been proven to be efficient for the study of temporal patterns of pre-competitive emotions and their relationship to some stable personal and situational variables such as gender (Jones et al., 1991), type of sport (Krane & Williams, 1987), skill level (Gal-or et al., 1986) and perfectionism (Hall et al. 1998). However, this method is not particularly suited for detecting more fine-grained temporal relationships between emotions and changeable antecedents and moderators (e.g., sources of stress, cognitive interpretation, coping strategies) (van Eck et al., 1998). For this purpose, the experience sampling method (ESM) is considered to be more appropriate. The ESM has been successfully employed to investigate emotional states and their relative correlates in other research fields (e.g., Alliger & Williams, 1993; Barge-Schaapveld, Nicholson, Berkhof, & deVries, 1999; Bolger & Schilling, 1991). The use of

[3.1] The content of this chapter has been largely published in the journal article "Is the experience sampling method (ESM) appropriate for studying pre-competitive emotions?" (Cerin, Szabo, & Williams, 2001).

the ESM also presents some problems that may question its suitability for the study of competitive emotions. Because this method involves a substantial number of repeated measurements (usually more than 20), its implementation may artificially increase the intensity of negative affects and frequency of competition-related thoughts and, thus, influence the temporal patterns of competitive emotions (Hormuth, 1986; Schwarzer & Wicklund, 1991).

Considering the potential advantages and limitations of the ESM, the main purpose of this study was to determine the suitability of this method for the analysis of the dynamics of competitive emotions. Intensity and temporal patterns of pre-competitive emotions collected with the ESM were compared with those obtained through less intrusive methodologies, these being retrospective assessment and the conventional time-to-competition paradigm involving four repeated momentary measurements. Because retrospective assessments can be affected by memory distortions, recall accuracy was also analysed. Therefore, besides testing the appropriateness of the ESM, this study provides information on the reliability and validity of retrospective measurements.

An additional purpose of this investigation was to examine the temporal patterns of pre-competitive emotions in male Tae Kwon Do practitioners. Here, two issues pertaining to the selection of instruments and participants need to be discussed. Despite what has been said in the previous chapter (p. 25-26), this investigation still relied on data from a modified version of the CSAI-2 (Swain & Jones, 1993) and a checklist of mixed primary and secondary emotions (Gauvin & Szabo, 1992). As explained later, the choice of instruments has been largely determined by the main purpose of the study. Namely, in order to test the suitability of various methodologies for analysing competitive emotions and compare the results with previous research, it was necessary to opt for an instrument that has been extensively used in earlier studies.

As far as the selection of participants is concerned, the decision to analyse Tae Kwon Do practitioners was not fortuitous. Martens et al. (1990) have shown that athletes participating in individual, contact and subjectively scored sports tend to exhibit higher levels of anxiety and lower self-confidence than those taking part in team, non-contact and objectively scored sports. This is thought to be due to greater personal responsibility for mistakes and less social support in individual sports, less control over the situation in subjectively scored sports and increased threat arising from personal confrontation in contact sports. It was hypothesised that the potential effects of frequent repeated measurements on pre-competitive emotions would be easier to detect in sports that evoke higher levels of threat-related emotions, such as boxing, wrestling and martial arts. In other words, it was suggested that the possibility of detecting changes in emotions triggered by thoughts about a forthcoming competition would be higher in sports that are usually associated with emotions of greater intensity. Consequently, this study examined a sample of martial artists, specifically Tae Kwon Do practitioners.

## 3.2 Review of literature

### 3.21 Temporal patterns of pre-competitive emotions

Several factors at different levels make athletic competition a stressful event. One key assumption of the interactional model of stress is that stress is a process that unfolds over time (Lazarus, 1999). Emotions, appraisal of the situation, coping strategies and situational variables change incessantly. The sequence of emotions experienced reflects the effectiveness of the coping strategies and the changing meaning of what is happening as the stressful event unfolds. Consequently, the importance of studying the temporal patterns of pre-competitive emotions is warranted.

The growth of research in this area stems largely from the series of studies conducted by Fenz and associates who examined the pattern of physiological arousal in parachutists of different skill levels (Fenz, 1975; Fenz & Epstein, 1967; Fenz & Jones, 1972). They showed that the temporal pattern of physiological response before a sky dive could differentiate more experienced from less experienced parachutists. Most importantly, no differences in average intensity of arousal between the two groups were detected. Taken collectively, these investigations highlighted the importance of studying patterns of change as opposed to intensity of reactions. Moreover, as noted by Mahoney and Avener (1977), these early studies suggested that the more successful or experienced performers were able to reduce or control their arousal levels at crucial moments, while those less experienced were not.

This line of research proceeded with the study of self-reports of pre-competitive emotional experiences with particular focus on competitive anxiety. Differences in temporal patterns of anxiety were found in gymnasts (Mahoney & Avener, 1977), wrestlers (Highlen & Bennett, 1979), orienteers (Gal-or et al., 1986) and runners (Donzelli et al., 1990; Durtschi & Weiss, 1984). Successful performers appeared to have a greater capacity to control their anxiety just before and during performance. With regard to this, Gal-or et al. (1986) reported that top orienteers used more self-efficacy statements and directed their thoughts more often to solving difficulties prior to competition than less successful orienteers. Although these findings suggest that skill level differences may mediate the temporal patterning of anxiety responses, some studies failed to support this contention (Gould, Horn, & Spreeman, 1983; Gould, Weiss, & Weinberg, 1981; Huddleston & Gill, 1981). Several factors might have caused these equivocal findings. For example, Huddleston and Gill (1981), in their study on the effects of skill level on state anxiety, suggested that their inability to find a significant skill by time interaction might have been due to the small number of participants (N=19) and the small differences in skill level between qualifiers and non-qualifiers. Most importantly, they also suggested that other personal variables such as age and experience might have modified the relationship between skill level and competitive anxiety. In fact, in their study, some of the more successful athletes were also the younger and less experienced ones. These findings highlight the degree of complexity of the process of competitive stress. Indeed, research suggests that, apart from skill level, many other factors may moderate the intensity and temporal pattern of pre-competitive anxiety. For example, it has been shown that changes in the level of anxiety before competition may be associated with trait anxiety (Donzelli et al., 1990; Huband & McKelvie, 1986), sex (Donzelli et al., 1990), experience (Donzelli et al., 1990) and locus of control (Hall, 1980). More recent findings on the temporal patterns of a unidimensional and multidimensional concept of competitive anxiety have been detailed in the previous chapter, so they will not be discussed.

The first study that examined pre-competitive affects other than anxiety compared changes in pre-competitive affective states with baseline affects in college rodeo athletes (Meyers et al., 1988). The difference between the two approached statistical significance ($p = 0.06$). Twenty minutes before the rodeo competition started, the athletes exhibited higher than baseline tension and vigour, with conjoint decreases in depression, anger and fatigue. Additionally, psychological patterns were analysed by gender, participants' educational institution and type of rodeo event (contact versus non-contact). With regard to the last factor, lower negative affective states were expected in non-contact events. However, no differences in basal or pre-competitive affects were found across gender, institution or type of rodeo competition.

More recently, Prapavessis and Grove (1994) administered the abbreviated version of the POMS (Grove & Prapavessis, 1992) to 75 male and 31 female competitive rifle shooters two days, one day, 12 hours and 15 minutes prior to competition. Significant time-to-competition effects were evidenced for all affective states, with tension and vigour first gradually decreasing and then increasing as the competition approached. Esteem-related affect decreased across the entire period of testing, while fatigue fluctuated in both directions. Anger and confusion remained stable in the first three assessments but, immediately before the competition started, anger increased and confusion decreased. Finally depression increased gradually across the pre-competition period and then decreased 15 minutes prior to the event. Personality variables of trait-sport confidence, neuroticism, hardiness and self-handicapping were found to be associated with the intensity of athletes' affective states but not with their temporal patterns.

Other findings on temporal changes of competitive affects come from studies adopting the individual zones of optimal functioning (IZOF) approach (Hanin 1995, 1997). For instance, Hanin and Syrjä (1996) examined 17 soccer players and observed that Positive-Negative Affect (PNA) scores one day before and 30 minutes after a competition were significantly different from pre-match ratings obtained 40 minutes before the competitive event. However, the direction of the changes was not reported. Results from other investigations adopting the IZOF approach have been already described in the previous chapter (p.37).

### *3.211* Competitive emotions and types of sport

Careful analysis of the results derived from idiographic investigations reveals that, to a certain extent, the type of sport determines whether a specific emotional state is to be considered facilitating or debilitating for performance. Thus, IZOF studies on ice-hockey (Hanin & Syrjä, 1995a), roller-skating hockey, rugby (Bortoli, Robazza, & Nougier, 1997) and soccer (Hanin & Syrjä, 1995b) showed that players in these sports share very similar opinions about the effect of specific emotional states on their performance. Emotional states such as "charged", "motivated", "confident", "alert", "tense", "attacking", "angry" and "dissatisfied" were reported to be facilitative, whereas "comfortable", "unwilling", "easy-going", "sluggish", "lazy", "pleased" and "tired" were identified as debilitating emotions. A qualitative analysis of soccer players' perception of the functional meaning of the selected items revealed that facilitating emotions were mainly related to the production of additional energy (Hanin & Syrjä, 1995b). In fact, being charged, motivated, alert or tense are psychological states that indicate preparedness for the competition and mobilisation of energy. Anger, instead, seems to play another type of facilitative role in these sports. As soccer, rugby and ice-hockey are games involving high physiological arousal and direct contact with the opponent, they require a certain level of aggression or anger for optimal performance (Bortoli et al., 1997).

In contrast to these results, analysis of track and field athletes (Robazza, Bortoli, & Nougier, 1998; Robazza, Bortoli, Zadro et al., 1998), archers (Robazza et al., in press) and figure skaters (Robazza, Bortoli, & Nougier, 1998) showed that, although determination and motivation were still considered facilitative to performance, aggression was perceived to be less important than in team contact sports. Only two of 15 archers identified "anger" as an emotional state that helped their performance. Averages of 0.3 (Robazza, Bortoli, Zadro et al., 1998) and 0.5 "anger" items (Robazza, Bortoli, & Nougier, 1998) per athlete were recorded in track and field athletes and figure skaters. In contrast, ice-hockey players reported 1.7 adjectives denoting aggression or anger in their list of facilitative emotions. Similarly, soccer players reached an average of 1.2 "anger" items.

Further analysis of this series of studies shows that differences in facilitative/debilitative emotional patterns can be also noticed among individual sports. For example, feelings of tranquillity, calmness and relaxation appear to be more desirable for performance in archery than in track and field or figure skating. Robazza, Bortoli and Nougier (1998) showed that track and field athletes and figure skaters considered states of calmness, relaxation and comfort to be more often detrimental than facilitative for their sport. In contrast, eight out of 15 archers chose relaxation and calmness as one of the three most beneficial emotions to performance.

More evidence for the existence of sport-related patterns of optimal pre-competitive emotional states comes from nomothetic studies. Cockerill et al. (1991) were able to predict successfully performance in cross-country runners from their level of tension, anger and depression. They contended that an elevated level of tension may be a prerequisite for success in sports which make considerable aerobic and anaerobic demands on the athlete. Furthermore, they proposed that in such sports better competitors may have the edge on their equally fit opponents in that they may thrive on the increased tension and aggression that the anticipation of the competition brings, which also serves as an additional motivator. Anger and tension were also found to be the best predictors of performance in baseball (Friend & LeUnes, 1990). It is possible that anger and tension reflect the athlete's level of personal engagement and willingness to win. Whether these emotional states will be identified as best predictors of performance or not depends on the characteristics of the task. For instance, sport situations that require explosive strength (e.g., gymnastics, batting in baseball) or involve gross movements (e.g., running) and personal confrontation with the opponent (e.g., boxing) may benefit from higher levels of tension and anger. In contrast, sports that require fine movements (e.g., archery, golf) and/or involve a great deal of cognitive activity (e.g., chess) may favour emotional states characterised by medium or lower arousal (Schmidt, 1990).

In this respect, Krane and Williams (1987) showed that female gymnasts exhibited higher anxiety and lower self-confidence than female golfers in a 24-hour pre-competitive period. Additionally, a significant sport by time effect indicated that participants in the two sports responded differently over time. While for the golfers anxiety tended to decrease as the competition approached, the anxiety level in gymnasts increased. The authors concluded that the results were consistent with Martens et al. (1990) findings that athletes participating in subjectively scored sports (gymnastics) exhibit higher anxiety than athletes competing in objectively scored sports (golf). However, a higher level of anxiety in gymnasts and a lower in golfers could have also resulted from the athletes' attempt to control their emotional states so to meet the requirements of their sport. Gymnastics demands power and involves gross movements performed in a short period of time, so it may actually benefit from higher levels of arousal. In fact, Spink (1990) showed that elite male gymnasts were more anxious than less skilled gymnasts. Also, a study on 105 Portuguese male and female athletes showed that moderate to high levels of anxiety were associated with better athletic performance in gymnastics (Leca-Veiga, Paula-Brito, & Colaco, 1995). In contrast to this, golf requires precise control, arm-hand steadiness, aiming and the ability to focus and refocus repeatedly. These characteristics suggest that, to perform well, golfers must learn to regulate their level of arousal and to maintain their focus. In this regard, Weinberg and Genuchi (1980) demonstrated that lower levels of anxiety facilitated golf performance. Also, Thomas and Over (1994) showed that lower handicap golfers demonstrated greater mental preparation, better concentration and less anxiety and negative thoughts than higher handicap golfers.

That different sports are associated with different patterns and intensities of competitive emotions has been also demonstrated by Martens et al. (1990). In the process of validation of the CSAI-2, different sports were compared in relation to the level of pre-competitive anxiety they evoked. The first comparison was made between individual and team sports. As individual sports maximise personal responsibility for performance errors, they were expected to yield higher levels of anxiety than team sports. Male and female basketball and female volleyball players were compared with gymnasts, swimmers and track and field athletes. As expected, individual sport athletes displayed significantly higher cognitive anxiety and physiological arousal and lower self-confidence than team athletes. The second comparison was made between subjectively and objectively scored sports. Due to the increased uncertainty and lack of control over the outcome of the athlete's performance, subjectively scored sports were hypothesised to yield higher levels of anxiety than objectively scored sports. For this purpose, anxiety in gymnasts was compared to anxiety in track and field athletes and swimmers. Analysis of data revealed that gymnasts displayed higher cognitive anxiety and lower self-confidence than swimmers and track and field athletes. Finally, a comparison between contact and non-contact sports was conducted. It was expected that contact sports would exhibit higher anxiety because of the increased threat arising from personal confrontation and a greater probability of having acquired conditioned somatic responses. Again, expectations were confirmed, and wrestlers exhibited higher anxiety and physiological arousal than gymnasts and swimmers.

The purpose of this section on the moderating effects of the type of sport on competitive emotions is to introduce the rationale for choosing tae kwon do athletes as participants in the current study. As stated earlier, the main objective of this investigation was to examine whether the implementation of the ESM, which involves a substantial number of frequent repeated measurements, may artificially increase intensity of negative emotions and frequency of competition-related thoughts. In this respect, it is sensible to expect that the likelihood of detecting fluctuations in emotions, as the result of thinking about a forthcoming competition, will be greater in sports that are usually associated with negative emotions of greater intensity. Empirical findings suggest that individual, contact and subjectively scored sports such as boxing and martial arts may lead to greater changes in pre-competitive emotions than team, non-contact and objectively scored sports (Martens et al., 1990). For this reason, in this study, it was decided to examine athletes participating in martial art competitions - specifically, Tae Kwon Do practitioners.

### 3.212 Competitive emotions in martial arts

Research of affective phenomena in martial arts has prevalently focused on personality traits (e.g., Konzak & Klavora, 1980; Kroll & Carlson, 1967; Kurian, Caterino, & Kulhavy, 1993; Rothpearl, 1980), general mood states (e.g., McGowan & Jordan, 1988; Nosanchuk, 1981) and on the relationship between pre-competitive emotions and performance (e.g., McGowan & Miller, 1989; McGowan, Miller, & Henschen, 1990; Terry & Slade, 1995). Notably, no information on the temporal patterns of competitive emotions in martial artists is yet available.

In a study conducted by McGowan and Miller (1989), 94 male and 13 female karate practitioners responded to the POMS before a tournament. Differentiation between successful and less successful competitors was based on the tournament result and the accumulated points from regional competitions for that year. Although mood scores could not differentiate between semi-finalists and lower-place finishers in the specific tournament, anger was a good predictor of year-long success. Analysis indicated that successful competitors were significantly more angry than less successful competitors. The authors suggested that it is possible that successful karate competitors use anger as a pre-competition "psyching" strategy. In fact, visualising images of anger has been shown to be associated with improved strength performance (Murphy, Woolfolk, & Budney, 1988).

Since McGowan and Miller (1989) examined a sample of karateka of heterogeneous ability without controlling for skill level (belt rank), the discrimination validity of the POMS in relation to performance might have been restricted. Thus, in order to explore the mediating effect of skill level on pre-competitive affect, McGowan and associates (1990) examined the emotional states of highly experienced (black belts), experienced (brown belts), moderately experienced (coloured belts) and novice (white belts) karate practitioners before a state tournament and regional competitions. Novice participants tended to score higher on tension and lower on depression, anger and fatigue than more experienced participants. It was suggested that more experienced participants might have used anger as a pre-competition "psyching" strategy and a coping mechanism to deal with increasing levels of tension. Novice competitors, instead, might not have possessed this skill. Alternatively, it is possible that these findings were influenced by selection bias. Namely, a tendency for less aggressive individuals to drop out of competitions would lead to an increase in observed average aggression in higher belt ranks. Furthermore, it is noteworthy that experienced competitors showed higher levels of depression, confusion and fatigue. This might have been caused by differences between belt ranks in perceived importance of the competition. More experienced karateka might have exhibited higher levels of negative affect because they attributed more importance to the competition. In this regard, several researchers have suggested that pre-competition restlessness and the resulting fatigue may be a homeostatic response to abnormally high tension or anxiety. As tension rises it triggers increases in fatigue and lethargy (cf. McGowan et al., 1990).

In a later study, differences in pre-competitive affect between first degree black-belts and higher ranking belts were examined (McGowan, Pierce, & Jordan, 1992). The POMS was administered to eight female and 26 male competitors before a tournament. Analysis of data indicated that first degree black-belts exhibited higher levels of pre-competitive anger than more experienced competitors. The authors proposed that more experienced karateka were more self-confident and less anxious and therefore less likely to use coping strategies like anger to compensate for deficits in efficacy or in pre-competitive affect. However, it should be also mentioned that the average training experience of first degree black-belts was 6.28 years, whereas the average experience in second degree black-belts was of 15.90 years. This information supports the contention that martial arts training can lessen both aggressiveness and anxiety (Cox, 1993). In fact, several studies have found a negative correlation between aggressiveness and years of training in martial artists (Daniels & Thornton, 1992; Lamarre & Nosanchuk, 1999; Rothpearl, 1980; Ziegler & Grawe, 1998). So, a synthesis of McGowan and associates' two studies on the relationship between competitive emotions and skill level in karate (McGowan et al. 1990, 1992) suggests that aggression increases from lower to intermediate belt ranks, but decreases with further training and experience. This was also observed by Rothpearl (1980) who reported that intermediate ranks exhibited a greater variety of hostile modes of expression than either beginners or advanced martial artists. To date, the causal factors that mediate aggressiveness in martial artists of different belt rank have still to be identified.

More recently, Terry and Slade (1995) examined the effectiveness of emotional state measures in predicting performance outcome in karate competitions. In contrast to previous research, which analysed the relationship between pre-competitive emotions and overall performance in a tournament or a series or tournaments, this study examined the predictive validity of mood measures in relation to performance in the first round of the competition. It was suggested that, because emotional states change over time, the predictive effectiveness of pre-competitive mood in relation to performance would depend on the duration of performance (Beedie et al., 2000). Consequently, measures of emotions were expected to be a better predictor of a ten-minute first-round fight than of overall performance in a half-day tournament. A sample of 208 male karate competitors was assessed with the POMS and CSAI-2 approximately 40 minutes before the start of the first-round fight. Discriminant function analysis showed that 91.96% of participants could be correctly classified as winners or losers on the basis of pre-competitive scores on the POMS, whereas anxiety scores alone yielded 78.89% discrimination. Winners scored higher on vigour, anger and self-confidence and lower on tension, depression, fatigue, confusion, cognitive anxiety and physiological arousal. Similar results were obtained on a sample of 142 Tae Kwon Do competitors who were assessed with the CSAI-2 one hour before their first fight (Chapman, Lane, Brierley, & Terry, 1997). Again, winners reported lower cognitive anxiety and physiological arousal and higher self-confidence than those who lost. Discriminant function analysis indicated that 62.70% of participants could be correctly classified as winners or losers from their pre-competitive score on the CSAI-2, with self-confidence contributing most to the discrimination. When compared to published norms for male college athletes (Martens et al., 1990), the sample of karateka examined by Terry & Slade (1995) had a mean cognitive anxiety corresponding to the 84th percentile and a mean physiological arousal (somatic anxiety) at the 73rd percentile. Tae kwon do athletes, instead, exhibited average cognitive anxiety levels at the 60th and average physiological arousal at the 61st percentile.

In conclusion, analysis of the literature on pre-competitive emotions in martial arts reveals that researchers have been mainly concerned with the identification of psychological predictors of performance. One of the most consistent findings in this field is that more successful competitors show higher levels of pre-competitive anger. In general, intensity of pre-competitive cognitive anxiety and physiological arousal in martial artists is similar to that exhibited by athletes participating in other individual contact sports, but higher than in college athletes participating in other types of sport (Martens et al., 1990). Finally, no studies have analysed the temporal patterns of pre-competitive emotions and their moderators and antecedents in martial art practitioners.

## 3.22 Assessment of temporal patterns of pre-competitive emotions

Competitive emotions can be assessed through various physiological, cognitive and behavioural methods. To date, researchers have mainly relied on self-report questionnaires. They are thought to be preferable to physiological measures because of constraints such as individual physiological response stereotypy and stimulus-specific stereotypy (Raglin, 1992). Moreover, given the relative ease with which self-reports can be obtained, they allow the study of a large number of subjects, the collection of information concerning individual moderating factors and the use of powerful statistics to determine the relative contribution of such individual characteristics in determining emotional experience (Wallbott & Scherer, 1989). In general, there are three major types of settings in which self-reports can be obtained. These are induction of an emotion by the investigator, the natural occurrence of an emotional incident in the field and the reproduction of past emotional incidents from memory. The first two types of settings produce momentary measures of emotions (how a participant feels at the moment of assessment), whereas the last type of setting yields retrospective measures of emotions (how a participant felt in the past).

### *3.221 Momentary assessments of temporal patterns of pre-competitive emotions*

To date, the majority of the studies examining temporal changes of pre-competitive emotions have employed a time-to-competition paradigm. Momentary pre-competitive emotional states were assessed three to six times throughout the week preceding a competitive event. Thus, for instance, Jones et al. (1991) administered the CSAI-2 to 56 athletes one week, two days, one day, two hours and immediately before a competition. Martens et al. (1990) examined 45 wrestlers two days, one day, two hours, one hour and immediately before a contest. Prapavessis and Grove (1994) administered the abbreviated version of the POMS to 104 competitive rifle shooters two days, one day, 12 hours and 15 minutes prior to competition.

Overall, this paradigm has proved to be an efficient way to investigate patterns of change in pre-competitive emotions and their relationship to some *stable* personal (e.g., sex, perfectionism, skill level) and situational variables (e.g., type of sport). However, this method is not particularly suited for detecting more fine-grained temporal relationships between affects and *changeable* antecedents and moderators (e.g., sources of stress, cognitive interpretation, coping strategies). For this purpose, the experience sampling methodology may be more appropriate. Indeed, the ESM has been successfully employed to study emotional states and their relative correlates in the fields of general, industrial/organisational psychology and behavioural medicine (Alliger & Williams, 1993; Bolger & Schilling, 1991; van Eck et al., 1998).

The ESM involves the in-depth study of everyday experiences and ongoing behaviour in the participant's natural environment (Hormuth, 1986). In general, three types of ESM can be distinguished: signal-, event- and interval-contingent ESM (Wheeler & Reis, 1991). In studies using the event-contingent ESM, participants are asked to record significant experiences as they happen. This type of ESM will be best for examining particular events such as, for example, episodes of interpersonal conflicts within a team or between players and coaches. Interval-contingent ESM asks the participants to record their experiences at equal intervals. This methodology is most appropriate when the research questions requires data on the experiences and events transpiring in the preceding interval. Finally, signal-contingent ESM prompts participants to record immediate emotional states, thoughts and activities. This type of ESM is employed when the object of study is the relationship between phenomena happening within the day, as opposed to across days. It is also used when it is important to minimise bias due to retrospective recall. Typically, participants carry beepers, which signal the time when they need to complete a questionnaire. The signals are randomly scheduled to account for expectancy effects. ESM studies may last for several days or even weeks. During this period, the participants receive several signals a day.

The application of the ESM has a number of advantages over cross-sectional studies. First, it minimises memory effects and, therefore, it provides better estimates of the frequency, distribution and intensity of psychological variables than cross-sectional designs (Larson & Csikszentmihalyi, 1983). Secondly, the ESM provides a more thorough picture of the temporal and dynamic nature of the psychological phenomena examined (Hormuth, 1986). Thirdly, the use of this methodology enables identification of differences that cross-sectional data cannot reveal. In fact, cross-sectional studies tend to confound trait and state factors affecting psychological phenomena (Watson, 1988). Thus, for instance, although cross-sectional data on affect suggest a low negative relationship between negative and positive emotional states (Watson, 1988), findings from ESM studies show that correlations between positive and negative affect vary considerably across individuals (Williams, 1991).

In summary, the advantages that the signal-contingent ESM may offer for the study of competitive affects are numerous. For example, it can provide an ecologically valid method that permits the examination of the ongoing stream of pre-competitive emotions in the athletes' usual habitat. It may facilitate the study of the relationship between personal and situational variables determining athletes' *momentary* affective states (van Eck et al., 1998). It permits the detection of consistent patterns of change in emotional state at individual level, after which meaningful personality differences between individuals can be analysed (Alliger & Williams, 1993). Finally, this procedure makes it possible to examine the *immediate* effects of ever-changing cognitions and events on pre-competitive emotions.

*3.2211 Disadvantages of the ESM*

The main limitations to frequent repeated measurements of emotions using the ESM are related to signal compliance, common method variance problems, self-selection bias and priming effects (Hormuth, 1986). The quality of experience sampling data depends on whether participants comply with the signal on time. Because the main purpose of a random-scheduled ESM is to study the occurrence and distribution of stimulus variables in the customary habitat of the individual, signals should be responded to immediately. Waiting for a convenient situation before responding would threaten the basic purpose of the method. In this regard, it has been suggested that compliance is likely to be based on the participants' trust that the study is important and worthwhile (Larson & Csikszentmihalyi, 1983).

Common method variance problems refer to the fact that a participant's tendency to respond in a similar manner to different items of a questionnaire may artificially inflate the observed correlations between independent and dependent variables (Alliger & Williams, 1993). These problems are more likely to occur in ESM studies because they involve a considerable number of repeated measurements and, therefore, may more easily create attitudes in participants about the hypotheses being tested. This may result in the participants' giving responses that conform to their own hypotheses rather than to their actual experience. This problem can be indirectly assessed by examining correlations among ESM variables. Namely, if some of the correlations are low, this indicates that the participants have been at least differentially responding to the ESM questionnaire.

The problem of self-selection bias arises because some athletes may find it intrusive to complete several questionnaires in the preparation period before a competition and may refuse to participate in the research (Hormuth, 1986). Consequently, some individuals may be overrepresented or underrepresented in ESM studies to a greater extent than in other studies using less intrusive assessments (i.e. retrospective measurements or the conventional time-to-competition paradigm).

Finally, priming effects relate to the fact that the repeated assessment of psychological variables may cause changes in the participants' experience (Alliger & Williams, 1993). It has been suggested that the necessity for self-observations induced by the ESM may increase self-focused attention (Schwarzer & Wicklund, 1991), the consequences of which are described in the theory of self-awareness (Wicklund, 1982). One of the assumptions of the self-awareness theory is that self-focus may lead to self-dissatisfaction and negative affect (Schwarzer & Wicklund, 1991). In this view, the instruction to pay attention to one's own emotions can result in an intensification of affect, particularly negative emotions such as anxiety. Furthermore, the disruption of daily activities caused by a series of frequent momentary assessments may be perceived as stressful and may trigger feelings of irritation and anger. However, on the other hand, self-awareness literature also provides indication that repeated momentary assessments of psychological variables improve the accuracy of self-reports (Brandstätter, 1983).

#### *3.222 Retrospective assessments of temporal pattern of pre-competitive emotions*

Retrospective assessments are particularly useful for cases in which momentary self-reports of competition emotions cannot be obtained for ethical or logistical reasons (Harger & Raglin, 1994). For example, momentary self-reports are often not feasible during performance. They may distract athletes from their pre-competition routines. Also, as noted earlier, they may direct athletes' attention toward emotional states, thereby increasing initial negative affects (Hackfort & Schwenkmezger, 1993). In contrast, because testing is carried out at a more convenient time, i.e. after a competition, retrospective assessments are not affected by these problems. Additionally, they permit the analysis of athletes' performance history and subjective experience across weeks, months or even years. Finally, with regard to temporal patterns of emotions, studies that use retrospective assessments cost less then longitudinal studies with momentary measurements (Hanin & Syrjä, 1996).

In the field of competitive emotions, retrospective measurements have been mainly used to address issues related to the individual's level of optimal anxiety in relation to performance (Hanin, 1980), individual zones of optimal functioning (Hanin, 1997), anxiety intensity during and immediately before competition (Donzelli et al., 1990; Durtschi & Weiss, 1984), and pre-competitive thoughts and feelings (Swain, 1992). Research has shown that retrospective measurements of pre-competitive anxiety as measured with the STAI can be acceptably accurate. Correlations between actual and recalled assessments ranging from 0.50 to 0.97 have been reported (Annesi, 1997). However, investigation on the accuracy of recall has been restricted to the level of anxiety experienced during or immediately before a competitive event. Apparently, accuracy of recall of temporal patterning of pre-competitive emotional states has not yet been explicitly examined. However, analysis of research on the correspondence between momentary and retrospective anxiety (Annesi, 1997) suggests that correlations increase as the interval between the actual and recalled assessments decreases. In other words, athletes tend to be more accurate in recalling emotional states that are less remote in time.

*3.2221 Disadvantages of retrospective assessments*

Like all research methods, retrospective measurements have some disadvantages. It is well acknowledged that humans do forget. The degree of forgetting depends on the period of recall, the type and characteristics of the information and the individual memory abilities and cognitive functions (Stone & Shiffman, 1994). Recall of autobiographical information is influenced by cognitive processes of memory research and reconstruction that are more complex than simple forgetting. These cognitive processes can introduce unintentional bias. Thus, *effort after meaning* pertains to the reconstruction of events in a way that is consistent with the reporter's view of human behaviour in general or his or her self-image. For example, women's recall-based reports of their menstrual symptoms tend to be consistent with their theories of menstrual distress (Boyle & Grant, 1992). Spouses' recall-based reports of their daily assessments of feelings for their partners are biased by their beliefs about how much they trust their partners (Holmberg & Homes, 1994). Individuals who describe themselves as neurotic tend to remember experiencing more negative emotions than they reported on a momentary basis (Barrett, 1997). Additionally, when it comes to the measurement of affect, the emotional state of a person at the time of a retrospective report may substantially influence the recall of emotions. Individuals experiencing positive affect tend to recall being in positive emotional states, whereas individuals in negative affective states tend to remember experiencing more negative emotions than they actually experienced (Baddeley, 1997). Also, according to the theory of state-dependent recall of mood, memories are more likely to be recalled when the person is in the same affective state he or she was in when the memory was encoded (Blaney, 1986).

### 3.23 Concluding remarks and purpose of the study

In conclusion, various methods can be used for the study of the dynamic aspects of competitive emotions. To date, research has in the main relied upon the conventional time-to-competition paradigm with three to six assessments pre-competition. Considering the potential advantages and limitations of the ESM, the suitability of this method for studying competitive emotions needs to be tested. It is necessary to establish whether the use of this methodology distorts athletes' emotional state because of the increased self-focus it may instigate. Also, it is necessary to establish whether its intrusiveness and potential effect on thoughts about a forthcoming competition alter athletes' psychological state.

Consequently, the main purpose of this study was to examine whether the data gathered through the ESM constitute valid measures of the emotional states that athletes may experience before a competition or are artefacts of the method employed. In order to do this, intensity and temporal patterns of pre-competitive emotions obtained via the ESM and less intrusive methodologies were compared. These were the conventional time-to-competition paradigm involving four momentary measurements and retrospective assessments. Because retrospective assessments can be affected by memory distortions, recall accuracy was also analysed. Notably, no empirical data on the recall accuracy of temporal changes of pre-competitive emotional states are available. Consequently, another purpose of this study was to examine how accurately athletes can recall emotional states experienced during the week preceding an important competition. Finally, given that intensity and patterns of competitive emotions seem to depend on the type of sport, an additional aim of this research was to analyse temporal patterns of pre-competitive emotions in Tae Kwon Do martial artists and compare them with findings on other sports.

## 3.3 Method

### 3.31 Design

To examine possible priming effects of the ESM (evoked through several daily subjective analysis of emotions) on measures of pre-competitive emotions, the intensity and temporal patterns obtained through the ESM had to be compared to those gathered via less intrusive methodologies. In the current study these were retrospective measurements and the conventional time-to-competition paradigm. However, it is known that retrospective assessments may be affected by memory distortions (Stone & Shiffman, 1994). Therefore, possible group differences caused by recall inaccuracy needed to be differentiated from priming effects. Consequently, participants who were tested via the ESM and via the time-to-competition paradigm were also assessed retrospectively.

### 3.32 Participants

In the initial phases of participant recruitment, the main instructors of three Tae Kwon Do clubs were contacted to ascertain their interest in the study and request their co-operation (Appendix 1). Next, a major future competition was determined. The target competition in the present study was the National English Tae Kwon Do Championship held at Barnsley in May 1999. All the athletes that were planning to participate in the competition were personally contacted at the end of regularly scheduled training sessions. An offer of three two-hour workshops on the techniques of psychological preparation for sports was used as an incentive for participation in the study. Written informed consent (Appendices 2-3) and background information (Appendix 4) were obtained from 69 male martial artists (31 from the first, 14 from the second and 21 from the third contacted club). Fifty-seven athletes described themselves as competitors at national level, ten participants declared to compete at regional level, while two, even though competing, viewed their sporting activity as recreational.

Before participating in the study, athletes were randomly assigned to one of three experimental groups: "Experience Sampling Method (ESM) group", "Repeated measurements (RM) group" or "Retrospective assessment (RA) group". To obtain equal representation of the three clubs in the experimental groups - i.e. a third of the participants from each club in each of the experimental groups - three participants (one from the first club, two from the second club) were not included in the study. Thus, control of hypothetical club- and instructor-related intervening variables was achieved.

The examined group of martial artists ranged in age from 16 to 41 years (M = 24.76, S.D. = 6.21; median = 23), and had a mean training experience of 5.7 years (S.D. = 4.75). Their mean perceived current performance was 3.14 (S.D. = 0.66) on a 5-point Likert scale ranging from 1 *(extremely poor)* to 5 *(excellent)*.

### 3.33 Instrumentation

As stated earlier, the main scope of this study was to determine whether competitive emotions and their moderators and antecedents can be analysed using the ESM. For this purpose, results from three groups of participants who were exposed to three different methodologies had to be compared. To control and account for the possible moderating effects of personal factors on the differences observed in the three experimental groups, age, training experience, level of participation, competitive trait anxiety and other personality traits were assessed.

Pre-competitive emotions were assessed with a modified version of the CSAI-2 (Swain & Jones, 1992) and a list of adjectives representing negative and positive emotional states. Additionally, to test whether frequent momentary measurements of competition-related emotion increase the time that participants spend thinking about the competition, a single item gauging the percentage of thinking time was included in the set of instruments.

#### *3.331 Demographic Questionnaire (DQ)*

Demographic information was obtained through a short questionnaire assessing age, training experience, level of participation, perceived current performance, expected future performance and the motives for taking part in martial arts.

#### *3.332 Sport Competition Anxiety Test (SCAT)*

The SCAT, Form A (Martens et al., 1990) was used to measure competitive trait anxiety (Appendix 5). The SCAT measures an individual's tendency to perceive competitive situations as threatening and to respond to these situations with elevated state anxiety. It consists of 15 items including ten anxiety-related statements and five filler items. Participants are asked to indicate how they generally feel when they compete in sports and games. They respond to each item using a three-point ordinal scale (hardly ever, sometimes and often). Total scores on the SCAT range from ten (low competitive trait anxiety) to 30 (high competitive trait anxiety). The SCAT is used extensively in sport psychology research, and has satisfactory test-retest reliability ($r = 0.61$ to $0.95$), and internal consistency (alpha = 0.95 to 0.97) (Martens et al., 1990).

### *3.333 <u>The Revised NEO Personality Inventory (NEO PI-R), Form S</u>*

The NEO PI-R, Form S (Appendix 6) is a self-report measure of the five major dimensions, or domains of personality (neuroticism, extraversion, openness, agreeableness and conscientiousness). The five factors represent the most basic dimensions underlying the traits identified in both natural languages and psychological questionnaires. Each of the five factors is represented by six specific traits or facets. The inventory consists of 240 items answered on a 5-point scale from *strongly disagree* to *strongly agree*. Internal consistency for the personality factors ranged from 0.56 to 0.81 in self-reports and from 0.60 to 0.90 in observer ratings (Costa & McCrae, 1992). Data on validity of the facets and factors are summarised in the manual (Costa & McCrae, 1992).

### *3.334 <u>Positive-Negative Affects Questionnaire (PNAQ)</u>*

The PNAQ is a version of the Well-Being Questionnaire (WBQ -Gauvin & Szabo, 1992), which has been modified to suit the purposes of the current study. The WBQ was originally developed by Diener and Emmons (1985) and later modified by Gauvin and Szabo (1992). It consisted of items (adjectives) representative of the dimensions of negative and positive affectivity and items tapping perceptions of physical well-being. In the current study, physical well-being was not analysed. The PNAQ was selected for this study because of its brevity and its successful adoption in the examination of affect in a stressful situation (exercise withdrawal) in habitual exercisers (Gauvin & Szabo, 1992).

The questionnaire requires the participants to rate on a seven-point scale, ranging from one (*not at all)* to 7 (*extremely much)*, the extent to which they are experiencing six positive (happy, pleased, energetic, joyful, relaxed and enjoyment/having fun) and eight negative emotional states (angry/hostile, irritated, frustrated, guilty, stressed, depressed/blue, unhappy and worried/anxious). Earlier research on a shorter version of the questionnaire has reported that these adjectives are representative of the dimensions of positive affectivity and negative affectivity and have high internal consistency (alpha =

0.90) (Diener & Emmons, 1985). However, to gain additional information on the reliability of the instrument, Cronbach alphas were computed for positive affectivity (PA) and negative affectivity (NA) scales using the data collected in the present study. Eight Cronbach alphas, four based on retrospective assessments and four based on actual assessments, were obtained for each scale (Appendix 11). The internal consistency ranged from 0.85 to 0.92 for the PA scale and from 0.75 to 0.90 for the NA scale. Consequently, the two scales were considered to have adequate reliability and were retained for subsequent analysis.

Ratings on individual emotional adjectives and total scores on each subscale were analysed. The total PA score was calculated by adding the six positive affective states (happy, pleased, energetic, joyful, relaxed and enjoyment/having fun). A total NA score was computed by summing the eight negative emotional states (angry/hostile, irritated, frustrated, guilty, stressed, depressed/blue, unhappy and worried/anxious). Possible total scores on the two subscales ranged from 6 to 42 for PA and from 8 to 56 for NA.

#### *3.335* Percentage thinking time item

A single item "To what extent is/was the competition occupying your mind at this/that stage?", with a response scale from 0 to 100% with gradations at every 5% (Swain & Jones, 1990; Swain, 1992), was completed immediately after the implementation of the PNAQ.

#### *3.336* *Modified version of the CSAI-2*

The CSAI-2 (Martens et al., 1990) was used to measure the cognitive and somatic components of competitive anxiety. The scale also includes a self-confidence subscale that was excluded to keep the ESM questionnaire-booklet as short as possible. The response scale asked the participants to rate the intensity with which each symptom was being experienced on a scale from 1 *(not at all)* to 4 *(very much so)*. Thus, possible intensity scores on each subscale ranged from 9 to 36.

In addition, a "direction" scale developed by Swain and Jones (1992) was included. Participants rated the degree to which the experienced intensity of each symptom was facilitative or debilitative to subsequent performance on a scale from –3 *(very debilitative)* to +3 *(very facilitative)*, with the midpoint 0 representing *unimportant*. Thus, possible direction scores on each subscale ranged from –27 to +27. Internal reliability coefficients of this scale were reported as 0.83 for cognitive anxiety and 0.72 for somatic anxiety (Jones, 1995).

*3.337* *Pagers*

To deliver the random signals (Appendix 10) for questionnaire completion to the ESM group, 22 Motorola (model: PageOne Minicall) pagers were used. Calls were performed by means of a personal computer and a modem using the AvantPager 32 (version 4.00) software, so that the possibility of accidental errors in dialling the pager numbers was ruled out.

**3.34 Procedure**

After a regular training session, the participants were briefed about the procedures of the study and informed consent was obtained. They then completed the DQ and the SCAT. Because respondents may require more than 40 minutes to fill out the 240-item NEO PI-R, the participants were given a copy of the inventory to complete in their spare time. This was to be returned to the experimenter in a provided self-addressed envelope before the competition. Confidentiality of information was assured by the experimenter. Subsequently, the participants were randomised into three experimental groups: Experience Sampling Methodology (ESM), Repeated Measurements (RM) or Retrospective Assessments (RA) group. On a subsequent training session, the participants were informed in detail about the experimental procedure related to the experimental group they had been assigned to.

*3.341* *ESM group*

The 22 participants assigned to this group were given a pager. They were told that they would be paged three random times a day over a period of one week before the competitive event. They were well familiarised with the use of the pager. The calls from the researcher were denoted by a numeric message composed of three figures, the message slot number and the time the message was received. The three figures in the message denoted the week (1), the day of the week (from 1 to 7) and the number of the daily call (1, 2 or 3). Thus, message 123 meant: first week, second day, third daily call. The participants were instructed to disregard any message not corresponding to the code of the researcher. The day was divided into three thirds between 9 a.m. and 9 p.m. Within each of these periods one randomised pager signal was sent with a minimum of 30-minute delay between the signals. A booklet containing the PNAQ, the percentage thinking time and the modified version of the CSAI-2 to last for a week plus the day of the competition, was given to each participant (Appendix 9). For all questionnaires a standard "right now" and "at this very moment" instructional set was used. Whenever the pager sounded, participants completed the above set of questionnaires indicating their momentary emotional states and cognitive intrusion. Participants were told that if the pager was accidentally turned off or malfunctioned, or if they were unable to answer within 30 minutes of the signal, they should not complete the questionnaires for that sampling. Other ESM studies adopted similar intervals of 20 (e.g., Shiffman et al., 1994; Stone et al., 1994) or 30 minutes (e.g., Gauvin, Rejeski, & Norris, 1996) within which the participants had to respond. These instructions are given to avoid memory distortions and allow the participants to feel less constraint (Gauvin & Szabo, 1992). A shorter allowed interval of, for instance, five or ten minutes would most likely result in an increased number of missing data, which would significantly decrease the power of the data analysis.

On the day of the competition, the ESM group was assessed only once. They were instructed to complete the set of questionnaires approximately one hour before competing and were asked to return the booklet to the researcher. Two days after the competition, participants were also assessed retrospectively (on the same dependent measures) on the way they *recalled* feeling seven days, four days, one day and one hour before the competition (Appendix 7). The instructional set used for the retrospective assessment was "Please indicate how you felt 1 week / four days / 1 day / 1 hour before competition".

*3.342* *<u>RM group</u>*

The 22 participants in this group were given four sets of the same questionnaires as provided to the ESM group (Appendix 8). They completed a set of questionnaires seven days, four days, one day and one hour before the competition indicating their momentary emotional states. To assure adherence to the experimental procedure, each participant was reminded to complete a set of questionnaires on the agreed days. The participants also recorded the date and time of assessment. Subsequently, they were also assessed retrospectively in the same manner as the ESM group two days after the competition.

### 3.343 RA group

The 22 participants in this group were only assessed retrospectively two days after the competition. They had to complete the same questionnaires with the instructions to respond according to how they recalled feeling seven days, four days, one day and one hour before the competition.

## 3.4 Results

Analysis of data was performed in six stages. The first stage consisted of testing the differences in personality traits and demographic variables such as age and training experience between the three experimental groups. The purpose of this analysis was to determine whether between-group differences in dependent variables were to be ascribed to personal factors or methodologies used. This was followed by the analysis of signal compliance in the ESM group.

Stage three involved the presentation of the means and standard deviations of pre-competitive affect and cognitive intrusion by experimental group, time of assessment and type of assessment. Subsequently, possible prime effects caused by frequent momentary assessments of psychological states were examined via multivariate analysis of variance (MANOVA) with repeated measures on the time-to-competition factor. Memory effects on recall of pre-competitive emotions were analysed in the fifth part of this section. This involved performing several MANOVAs with repeated measures on the time-to - competition and type of assessment factors and analysis of correlations between momentary and retrospective assessments. Temporal patterns of pre-competitive emotions and cognitive intrusion in Tae Kwon Do athletes were examined in the sixth and last stage of the data analysis. This analysis was based on MANOVAs with repeated measures on the time-to-competition factor, where the statistical significance of time-to-competition main effects was examined.

### 3.41 Differences in personality traits and demographic variables between experimental groups

To account for the possibility that personal factors mediated differences in pre-competitive emotional states between experimental groups, personality traits and demographic variables were assessed and statistical significance of observed between-group differences was determined. For this purpose, one-way ANOVAs were carried out (Appendix 12). Levene's test was used to test the hypothesis of equality of variances. No statistically significant differences were observed. Consequently, Table 3.1 reports the means and standard deviations of the examined demographic variables and personality traits for the three experimental groups together.

**Table 3.1 Means and standard deviations of personality traits and demographic variables**

| Variable | Means | SD |
|---|---|---|
| Age (DQ) | 24.76 | 6.21 |
| Training experience (DQ) | 5.71 | 4.75 |
| Current performance (DQ) | 3.41 | 0.66 |
| Expected future performance (DQ) | 3.53 | 0.59 |
| Competitive trait anxiety (SCAT) | 25.24 | 0.48 |
| Neuroticism (NEO-PI) | 94.35 | 23.03 |
| Extraversion (NEO-PI) | 117.73 | 19.02 |
| Openness (NEO-PI) | 118.98 | 15.83 |
| Agreeableness (NEO-PI) | 120.20 | 16.80 |
| Conscientiousness (NEO-PI) | 106.68 | 22.53 |

### 3.42 Signal compliance in the ESM group and missing values

As noted earlier, signal compliance is one possible criterion for evaluating the quality of the experience sampling data. Therefore, the percentage of responses given within the time limit of 30 minutes was computed. Data analysis showed that the participants completed 92.6% of all possible responses within the time limit, for an average of 19.45 out of 21 valid responses per participant. The average time delay between the signal from the pager and the actual completion of the questionnaires was 10.41 minutes (S.D. = 8.93).

### 3.43 Descriptive statistics for pre-competitive emotional states and cognitive intrusion per experimental group by type of assessment

Participants in the ESM group had the task of reporting their pre-competitive psychological states three times a day. In order to be able to compare the results of the

ESM group with those collected through the other two methods, ESM data had to be aggregated. Daily averages for data collected seven days, four days, one day and one hour pre-competition were computed. Tables 3.2 and 3.3 show the means and standard deviations of pre-competitive affect and cognitive intrusion for the three experimental groups and two types of assessment (momentary and retrospective) in the four periods examined (7 days, 4 days, 1 day and 1 hour pre-competition).

**Table 3.2** **Means and standard deviations of negative and positive affects per experimental group by type of assessment**

| | Momentary assessments | | | | Retrospective assessment | | | |
|---|---|---|---|---|---|---|---|---|
| Variable: | 7 days | 4 days | 1 day | 1 hour | 7 days | 4 days | 1 day | 1 hour |
| *PATS* | | | | | | | | |
| ESM | 23.51 (7.20) | 20.27 (6.28) | 21.82 (8.40) | 21.10 (7.97) | 21.77 (8.01) | 21.82 (7.10) | 20.71 (8.71) | 19.95 (8.74) |
| RM | 24.91 (5.77) | 22.82 (7.35) | 19.73 (7.29) | 21.13 (8.62) | 25.00 (5.47) | 23.09 (6.19) | 20.73 (6.97) | 21.64 (8.74) |
| RA | -- | -- | -- | -- | 29.00 (8.39) | 29.32 (6.85) | 23.91 (8.77) | 19.09 (8.67) |
| Total | 24.23 (6.47) | 21.54 (6.88) | 20.75 (7.83) | 21.12 (8.21) | 25.49 (7.70) | 24.94 (7.28) | 21.80 (8.20) | 20.23 (8.53) |
| *NATS* | | | | | | | | |
| ESM | 13.49 (5.73) | 12.92 (6.04) | 14.38 (5.69) | 17.60 (4.69) | 13.22 (6.84) | 12.09 (5.54) | 14.95 (6.77) | 17.90 (5.45) |
| RM | 12.91 (5.83) | 13.64 (5.73) | 17.82 (7.22) | 18.78 (7.78) | 11.18 (3.87) | 12.14 (3.62) | 16.64 (7.16) | 19.18 (7.58) |
| RA | -- | -- | -- | -- | 12.68 (7.18) | 12.64 (6.40) | 19.09 (9.05) | 24.59 (6.87) |
| Total | 13.19 (5.72) | 13.30 (5.06) | 16.18 (6.69) | 18.77 (7.79) | 12.39 (6.12) | 12.29 (5.24) | 16.92 (7.82) | 20.60 (7.22) |
| *Happy (PA)* | | | | | | | | |
| ESM | 4.28 (1.50) | 3.70 (1.11) | 3.61 (1.47) | 3.65 (1.46) | 3.91 (1.31) | 3.95 (1.21) | 3.48 (1.44) | 3.48 (1.54) |
| RM | 4.41 (1.14) | 3.95 (1.36) | 3.54 (1.44) | 3.36 (1.99) | 4.32 (1.21) | 3.91 (1.11) | 3.55 (1.41) | 3.36 (1.99) |
| RA | -- | -- | -- | -- | 5.00 (1.38) | 5.09 (1.19) | 4.14 (1.61) | 3.05 (1.87) |
| Total | 4.35 (1.31) | 3.83 (1.23) | 3.58 (1.44) | 3.50 (1.73) | 4.41 (1.36) | 4.32 (1.28) | 3.72 (1.49) | 3.29 (1.79) |
| *Pleased (PA)* | | | | | | | | |
| ESM | 3.73 (1.34) | 3.19 (1.15) | 3.28 (1.78) | 2.80 (1.58) | 3.32 (1.65) | 3.50 (1.54) | 3.05 (1.69) | 2.62 (1.80) |
| RM | 4.00 (1.41) | 3.41 (1.47) | 2.86 (1.49) | 2.68 (1.52) | 3.95 (1.29) | 3.45 (1.37) | 2.95 (1.40) | 2.73 (1.64) |
| RA | -- | -- | -- | -- | 4.00 (1.83) | 4.00 (1.83) | 3.05 (1.81) | 2.09 (1.41) |
| Total | 4.35 (1.31) | 3.31 (1.32) | 3.06 (1.62) | 2.74 (1.53) | 3.76 (1.60) | 3.65 (1.58) | 3.02 (1.62) | 2.48 (1.62) |
| *Energetic (PA)* | | | | | | | | |
| ESM | 3.55 (1.44) | 3.85 (1.29) | 4.22 (1.72) | 4.85 (1.60) | 3.68 (1.70) | 4.00 (1.41) | 4.24 (2.10) | 4.57 (1.80) |
| RM | 4.27 (1.08) | 4.23 (1.31) | 4.09 (1.27) | 5.09 (1.19) | 4.27 (1.08) | 4.50 (0.96) | 4.36 (1.09) | 5.32 (1.09) |
| RA | -- | -- | -- | -- | 5.41 (1.37) | 5.55 (1.06) | 5.23 (1.27) | 5.50 (1.22) |
| Total | 3.93 (1.30) | 4.05 (1.30) | 4.15 (1.48) | 4.98 (1.39) | 4.45 (1.56) | 4.68 (1.31) | 4.62 (1.58) | 5.14 (1.43) |

*(continued)*

**Table 3.2** - *continued*

| | Momentary assessments | | | | Retrospective assessment | | | |
|---|---|---|---|---|---|---|---|---|
| Variable: | 7 days | 4 days | 1 day | 1 hour | 7 days | 4 days | 1 day | 1 hour |
| *Joyful (PA)* | | | | | | | | |
| ESM | 3.78 (1.39) | 2.99 (1.35) | 3.53 (1.86) | 3.10 (1.92) | 3.36 (1.59) | 2.91 (1.69) | 3.19 (1.75) | 3.00 (1.90) |
| RM | 3.68 (1.36) | 3.59 (1.59) | 2.91 (1.57) | 2.77 (1.90) | 3.68 (1.46) | 3.36 (1.50) | 3.09 (1.54) | 2.82 (1.89) |
| RA | -- | -- | -- | -- | 4.55 (1.68) | 4.41 (1.59) | 3.45 (1.78) | 2.64 (1.89) |
| Total | 3.73 (1.36) | 3.31 (1.50) | 3.21 (1.72) | 2.93 (1.89) | 3.86 (1.63) | 3.56 (1.69) | 3.25 (1.66) | 2.82 (1.87) |
| *Relaxed (PA)* | | | | | | | | |
| ESM | 4.66 (1.34) | 3.98 (1.23) | 3.82 (1.57) | 3.45 (1.88) | 4.05 (1.81) | 4.09 (1.44) | 3.43 (1.66) | 2.57 (1.40) |
| RM | 4.20 (1.77) | 3.46 (1.92) | 2.91 (1.63) | 3.05 (1.99) | 4.36 (1.40) | 3.77 (1.80) | 3.00 (1.66) | 3.14 (2.01) |
| RA | -- | -- | -- | -- | 4.68 (1.94) | 4.77 (1.66) | 3.41 (1.56) | 2.05 (1.62) |
| Total | 4.48 (1.40) | 3.70 (1.63) | 3.34 (1.65) | 3.24 (1.92) | 4.36 (1.72) | 4.21 (1.67) | 3.28 (1.62) | 2.58 (1.73) |
| *Enjoy (PA)* | | | | | | | | |
| ESM | 3.97 (1.64) | 3.21 (1.21) | 3.48 (1.61) | 3.80 (1.85) | 3.45 (1.71) | 3.36 (1.76) | 3.33 (1.62) | 3.71 (1.93) |
| RM | 4.23 (1.82) | 3.50 (1.79) | 3.41 (1.74) | 4.18 (1.97) | 4.41 (1.53) | 4.09 (1.69) | 3.77 (1.48) | 4.27 (1.91) |
| RA | -- | -- | -- | -- | 5.36 (1.79) | 5.50 (1.34) | 4.64 (1.76) | 3.40 (2.22) |
| Total | 4.10 (1.72) | 3.72 (1.53) | 3.44 (1.66) | 4.00 (1.90) | 4.41 (1.83) | 4.32 (1.82) | 3.92 (1.69) | 3.77 (2.09) |
| *Angry (NA)* | | | | | | | | |
| ESM | 1.37 (0.55) | 1.23 (0.36) | 1.44 (0.81) | 1.75 (1.07) | 1.32 (0.72) | 1.18 (0.39) | 1.29 (0.78) | 1.52 (0.81) |
| RM | 1.27 (0.46) | 1.36 (0.49) | 1.50 (0.74) | 1.59 (0.96) | 1.14 (0.35) | 1.23 (0.43) | 1.50 (0.67) | 1.64 (1.05) |
| RA | -- | -- | -- | -- | 1.45 (0.96) | 1.45 (1.01) | 2.00 (1.51) | 2.64 (1.59) |
| Total | 1.32 (0.50) | 1.30 (0.43) | 1.48 (0.77) | 1.67 (1.00) | 1.30 (0.72) | 1.29 (0.67) | 1.60 (1.09) | 1.94 (1.29) |
| *Irritated (NA)* | | | | | | | | |
| ESM | 1.99 (0.93) | 1.66 (0.84) | 1.84 (1.13) | 2.25 (1.02) | 1.59 (0.91) | 1.41 (0.80) | 2.00 (1.64) | 2.05 (1.21) |
| RM | 1.59 (1.01) | 1.91 (1.11) | 2.23 (1.54) | 2.14 (1.61) | 1.27 (0.55) | 1.50 (0.67) | 1.95 (1.56) | 2.27 (1.61) |
| RA | -- | -- | -- | -- | 1.59 (0.96) | 1.45 (0.97) | 2.05 (1.50) | 2.86 (1.49) |
| Total | 1.78 (0.98) | 1.79 (0.99) | 2.04 (1.36) | 2.19 (1.35) | 1.48 (0.83) | 1.45 (0.79) | 2.00 (1.54) | 2.40 (1.42) |

*(continued)*

**Table 3.2** *- continued*

| | Momentary assessments | | | | Retrospective assessment | | | |
|---|---|---|---|---|---|---|---|---|
| Variable: | 7 days | 4 days | 1 day | 1 hour | 7 days | 4 days | 1 day | 1 hour |
| *Frustrated (NA)* | | | | | | | | |
| ESM | 1.80 (1.16) | 1.73 (1.13) | 1.88 (1.10) | 1.75 (1.12) | 1.59 (1.01) | 1.59 (1.14) | 2.05 (1.53) | 1.86 (1.20) |
| RM | 1.59 (0.91) | 1.59 (0.67) | 2.68 (1.55) | 2.86 (1.86) | 1.41 (0.59) | 1.50 (0.60) | 2.32 (1.52) | 2.82 (1.74) |
| RA | -- | -- | -- | -- | 1.64 (1.00) | 1.55 (1.06) | 2.55 (1.71) | 3.68 (1.64) |
| Total | 1.69 (1.03) | 1.66 (0.91) | 2.30 (1.40) | 2.33 (1.63) | 1.55 (0.88) | 1.55 (0.95) | 2.31 (1.58) | 2.80 (1.70) |
| *Guilty (NA)* | | | | | | | | |
| ESM | 1.13 (0.46) | 1.15 (0.60) | 1.35 (0.74) | 1.05 (0.22) | 1.18 (0.66) | 1.09 (0.29) | 1.14 (0.36) | 1.05 (0.22) |
| RM | 1.32 (1.09) | 1.41 (0.73) | 1.18 (0.50) | 1.23 (0.43) | 1.09 (0.29) | 1.14 (0.35) | 1.23 (0.53) | 1.23 (0.43) |
| RA | -- | -- | -- | -- | 1.27 (0.77) | 1.23 (1.07) | 1.64 (1.26) | 1.64 (1.00) |
| Total | 1.23 (1.14) | 1.29 (0.69) | 1.26 (0.63) | 1.14 (0.35) | 1.18 (0.61) | 1.15 (0.66) | 1.34 (0.83) | 1.31 (0.68) |
| *Stressed (NA)* | | | | | | | | |
| ESM | 2.09 (1.04) | 2.23 (1.34) | 2.18 (1.18) | 3.50 (1.67) | 2.09 (1.41) | 2.23 (1.38) | 2.24 (1.64) | 3.33 (1.65) |
| RM | 2.32 (1.49) | 2.41 (1.37) | 3.18 (1.76) | 3.86 (1.93) | 1.91 (1.06) | 1.95 (1.17) | 2.91 (1.44) | 3.86 (1.86) |
| RA | -- | -- | -- | -- | 1.86 (1.39) | 1.91 (1.11) | 3.68 (1.76) | 4.59 (1.18) |
| Total | 2.12 (1.29) | 2.32 (1.34) | 2.71 (1.58) | 3.65 (1.80) | 1.95 (1.28) | 2.03 (1.21) | 2.95 (1.70) | 3.94 (1.65) |
| *Depressed (NA)* | | | | | | | | |
| ESM | 1.68 (1.20) | 1.50 (0.83) | 1.57 (1.36) | 1.40 (0.82) | 1.59 (1.14) | 1.27 (0.70) | 1.52 (1.17) | 1.52 (1.36) |
| RM | 1.50 (0.91) | 1.18 (0.39) | 1.68 (1.52) | 1.23 (0.43) | 1.27 (0.70) | 1.18 (0.66) | 1.50 (1.34) | 1.18 (0.39) |
| RA | -- | -- | -- | -- | 1.50 (1.01) | 1.36 (0.95) | 1.50 (0.86) | 1.45 (0.74) |
| Total | 1.58 (1.05) | 1.33 (0.65) | 1.63 (1.43) | 1.31 (0.64) | 1.45 (0.96) | 1.27 (0.78) | 1.51 (1.12) | 1.38 (0.91) |
| *Unhappy (NA)* | | | | | | | | |
| ESM | 1.57 (1.00) | 1.42 (0.75) | 1.34 (0.76) | 1.60 (1.39) | 1.64 (1.36) | 1.23 (0.69) | 1.52 (1.44) | 1.71 (1.65) |
| RM | 1.27 (0.70) | 1.36 (0.73) | 1.82 (1.33) | 1.31 (0.72) | 1.18 (0.66) | 1.32 (0.72) | 1.68 (1.29) | 1.36 (0.73) |
| RA | -- | -- | -- | -- | 1.59 (1.37) | 1.27 (0.55) | 1.64 (1.00) | 2.41 (1.53) |
| Total | 1.41 (0.86) | 1.39 (0.73) | 1.59 (1.11) | 1.32 (0.72) | 1.47 (1.18) | 1.27 (0.65) | 1.62 (1.23) | 1.83 (1.41) |

*(continued)*

**Table 3.2** *- continued*

| | Momentary assessments | | | | Retrospective assessment | | | |
|---|---|---|---|---|---|---|---|---|
| Variable: | 7 days | 4 days | 1 day | 1 hour | 7 days | 4 days | 1 day | 1 hour |
| *Worried (NA)* | | | | | | | | |
| ESM | 1.86 (0.86) | 2.01 (1.24) | 2.78 (1.58) | 4.30 (1.98) | 2.32 (1.46) | 2.09 (1.60) | 3.19 (1.57) | 4.86 (1.96) |
| RM | 2.05 (1.25) | 2.41 (1.26) | 3.55 (1.71) | 4.55 (2.06) | 1.91 (1.06) | 2.32 (1.13) | 3.55 (1.26) | 4.82 (1.97) |
| RA | -- | -- | -- | -- | 1.77 (1.19) | 2.41 (1.05) | 4.05 (1.43) | 5.32 (1.59) |
| Total | 1.96 (1.07) | 2.22 (1.25) | 3.17 (1.68) | 4.43 (1.96) | 2.00 (1.25) | 2.27 (1.27) | 3.60 (1.44) | 5.00 (1.83) |

Legend:

PATS = positive affectivity total score; NATS = negative affectivity total score; PA = positive affect; NA = negative affect; ESM, RM, R = experimental groups

**Table 3.3** **Means and standard deviations of cognitive intrusion and competitive state anxiety per experimental group by type of assessment**

| | Momentary assessments | | | | Retrospective assessment | | | |
|---|---|---|---|---|---|---|---|---|
| Variable: | 7 days | 4 days | 1 day | 1 hour | 7 days | 4 days | 1 day | 1 hour |
| *%TT* | | | | | | | | |
| ESM | 28.01 (20.51) | 31.92 (18.72) | 61.17 (25.29) | 88.00 (18.24) | 23.64 (18.91) | 36.82 (17.01) | 63.33 (19.58) | 90.00 (15.17) |
| RM | 40.46 (20.34) | 48.41 (21.90) | 76.36 (14.32) | 94.55 (9.63) | 36.36 (12.93) | 49.09 (12.69) | 75.00 (12.63) | 96.36 (5.81) |
| RA | -- | -- | -- | -- | 21.36 (14.57) | 45.00 (13.71) | 70.91 (19.00) | 98.18 (3.95) |
| Total | 34.53 (21.13) | 40.56 (21.85) | 69.13 (21.46) | 91.43 (14.58) | 27.12 (16.80) | 43.64 (15.26) | 69.85 (17.72) | 94.92 (10.02) |
| *CAI* | | | | | | | | |
| ESM | 18.80 (6.19) | 17.84 (5.78) | 19.21 (6.69) | 23.05 (7.21) | 17.09 (6.82) | 17.68 (6.18) | 20.29 (6.79) | 24.14 (6.46) |
| RM | 17.27 (4.44) | 18.55 (3.62) | 20.50 (4.73) | 22.73 (6.30) | 16.73 (4.00) | 18.00 (3.64) | 20.50 (4.67) | 23.09 (5.50) |
| RA | -- | -- | -- | -- | 16.27 (4.94) | 19.09 (5.12) | 23.05 (4.74) | 25.77 (5.53) |
| Total | 18.00 (5.34) | 18.21 (4.73) | 19.89 (5.71) | 22.88 (6.68) | 16.70 (5.31) | 18.26 (5.05) | 21.29 (5.52) | 24.34 (5.85) |
| *SAI* | | | | | | | | |
| ESM | 12.44 (2.21) | 13.57 (2.83) | 14.00 (4.02) | 19.70 (6.12) | 11.36 (2.26) | 11.95 (2.44) | 14.43 (4.77) | 20.10 (5.72) |
| RM | 11.36 (3.30) | 12.32 (2.51) | 15.82 (3.89) | 20.50 (6.43) | 10.77 (2.29) | 11.95 (3.08) | 14.91 (4.32) | 20.27 (5.50) |
| RA | -- | -- | -- | -- | 10.00 (1.63) | 12.09 (3.16) | 17.18 (4.79) | 23.36 (6.00) |
| Total | 11.88 (2.86) | 12.91 (2.71) | 14.95 (4.01) | 20.12 (6.22) | 10.71 (2.13) | 12.00 (2.87) | 15.52 (4.71) | 21.29 (6.19) |
| *CAD* | | | | | | | | |
| ESM | 2.88 (8.24) | 1.49 (10.08) | -0.03 (12.07) | -2.40 (13.94) | 1.05 (9.46) | 1.73 (9.15) | 0.81 (12.31) | -2.94 (13.24) |
| RM | 4.41 (9.96) | 5.36 (10.34) | 4.23 (11.61) | 2.36 (13.85) | 4.09 (10.10) | 5.68 (10.67) | 3.50 (11.29) | 2.73 (14.12) |
| RA | -- | -- | -- | -- | 8.14 (9.56) | 6.95 (9.07) | 2.91 (11.12) | -0.68 (14.67) |
| Total | 3.68 (9.10) | 3.52 (10.28) | 2.20 (11.88) | 0.10 (13.93) | 4.42 (10.00) | 4.79 (9.77) | 2.43 (11.48) | -0.26 (14.01) |
| *SAD* | | | | | | | | |
| ESM | 4.73 (3.98) | 2.96 (6.10) | 4.57 (8.58) | 0.40 (11.73) | 5.45 (6.12) | 4.41 (6.78) | 3.81 (7.70) | -0.38 (10.51) |
| RM | 5.14 (8.58) | 4.91 (7.84) | 2.95 (9.82) | -1.81 (11.67) | 5.27 (8.40) | 6.14 (8.16) | 3.36 (9.34) | -2.55 (11.43) |
| RA | -- | -- | -- | -- | 11.18 (8.14) | 7.73 (9.01) | 0.45 (11.92) | -3.45 (16.89) |
| Total | 4.94 (6.71) | 3.98 (7.05) | 3.72 (9.17) | -0.76 (11.62) | 7.03 (8.00) | 6.09 (8.03) | 2.52 (9.80) | -2.15 (13.14) |

Legend: %TT = percentage of thinking time (cognitive intrusion); CAI = cognitive anxiety intensity; SAI = somatic anxiety intensity; CAD = cognitive anxiety direction; SAD = somatic anxiety direction

### 3.44 Priming effects in the ESM group

To test whether frequent momentary assessments of emotions and cognitive intrusions produce priming effects, 3 (experimental group) x 4 (time-to-competition) MANOVAs with repeated measures on the second factor were performed on ESM and RM groups' momentary measurements and RA group's recalled psychological states (Table 3.4; Appendix 13). Separate MANOVAs were carried out for the following variables: positive affectivity total score, negative affectivity total score, positive affectivity items, negative affectivity items, percentage of thinking time, cognitive and somatic anxiety intensity, cognitive and somatic anxiety direction. To control for experiment-wise error due to multiple testing, a level of significance of 0.01 was adopted (Prapavessis & Grove, 1994). In this study, the multivariate test statistic used was Pillai's trace. It has been shown that, when sample sizes of compared groups are equal, Pillai's trace is the most robust test statistic to violations of assumptions of multivariate normality and homogeneity of covariance matrices (Bray & Maxwell, 1985). Moreover, it has been suggested that Pillai's trace is the most appropriate multivariate statistic for analyses of exploratory nature (Schutz & Gessaroli, 1987). Since in some cases the multivariate assumption of equal group variance-covariance matrices was not met and this was an exploratory study, Pillai's trace was employed in all the multivariate test procedures. When significant MANOVA effects on multiple independent variables were noticed, follow-up univariate analyses of variance with a Bonferroni correction were performed (Harris, 1975).

In order to test priming effects produced by the ESM, main effect for experimental group and interaction effects for experimental group by time-to-competition derived from 3 (group) x 4 (time-to-competition) MANOVAs on ESM and RM groups' momentary measures and RA group's retrospective measures were analysed. Table 3.4 reports significant Group main and interaction effects obtained in the executed MANOVAs.

A significant Group main effect for PA items ($F (12, 114) = 3.618$; $p< 0.01$) was observed. Follow-up univariate tests (Table 3.5) and pairwise comparisons (Appendix 13) revealed that the RA group scored higher on the item "energetic" than both ESM (effect size (ES) = 0.70) and RM groups (ES = 0.61). Additionally, the same group obtained higher scores on the item "enjoyment" than the ESM group (ES = 0.57).

**Table 3.4** **Significant Group main and interaction effects obtained in 3 (Group) X 4 (Time-to-competition) MANOVAs with repeated measures on the 2nd factor on momentary assessments of the ESM and RM group and the RA group**

| Variable | Effect | Pillai's trace | F | Hdf, Edf | p |
|---|---|---|---|---|---|
| PA items | Group | 0.552 | 3.62 | 12, 114 | <0.001 |
| NA total score | Group by Time | 0.259 | 2.96 | 6, 120 | 0.010 |
| PA total score | Group by Time | 0.320 | 3.80 | 6, 120 | 0.002 |
| % thinking time | Group by Time | 0.282 | 3.28 | 6, 120 | 0.005 |
| CAI and SAI | Group by Time | 0.448 | 2.74 | 12, 114 | 0.003 |

Legend: Hdf = Hypothesis degrees of freedom
Edf = Error degrees of freedom
PA = positive affectivity
NA = negative affectivity
CAI = cognitive anxiety intensity
SAI = somatic anxiety intensity

**Table 3.5** **Summary table of significant group main and interaction effects obtained on follow-up univariate tests related to MANOVAs with multiple dependent variables**

| Variable | Effect | F | df | p |
|---|---|---|---|---|
| PA item "energetic" | Group | 5.229 | 2, 61 | 0.008 |
| PA item "enjoyment" | Group | 10.594 | 2, 61 | <0.001 |
| CAI[3.2] | Group by Time | 4.724 | 4.31, 131.33 | 0.001 |
| SAI[3.2] | Group by Time | 4.662 | 3.96, 120.74 | 0.002 |

Significant Group by Time to competition interaction effects were observed for PA items, NA and PA total scores, cognitive intrusion and intensity of competitive anxiety. Follow-up univariate tests (Table 3.5) and pairwise comparisons (Appendix 13)

[3.2] As data of cognitive and somatic anxiety intensity violated the sphericity assumption, Greenhouse-Geisser correction was applied to the degrees of freedom used to assess F-ratios (Field, 2000).

revealed that the interaction effects were mainly attributable to the RA group, which exhibited different patterns of changes than the ESM and RM group. Thus, positive affectivity significantly decreased one day and one hour pre-competition in the RA group, whilst it remained stable in the ESM group and decreased only one day before the event in the RM group (Figure 3.1). Negative affectivity increased one day and one hour pre-competition in the RA group, one hour pre-competition in the ESM group and one day before the event in the RM group (Figure 3.2). Cognitive intrusion increased in the RA group on each assessment, whilst in the other two groups it increased one day and one hour pre-competition (Figure 3.3). Cognitive anxiety intensity remained relatively stable in the ESM and RM groups until the last assessment, whilst in the RA group it increased on each assessment (Figure 3.4). Somatic anxiety increased in the RA group on each assessment, whereas it increased on the last assessment in the ESM group and on the 3rd and 4th assessment in the RM group (Figure 3.5).

**Figure 3.1 Temporal pattern of positive affectivity (total score) in experimental groups**

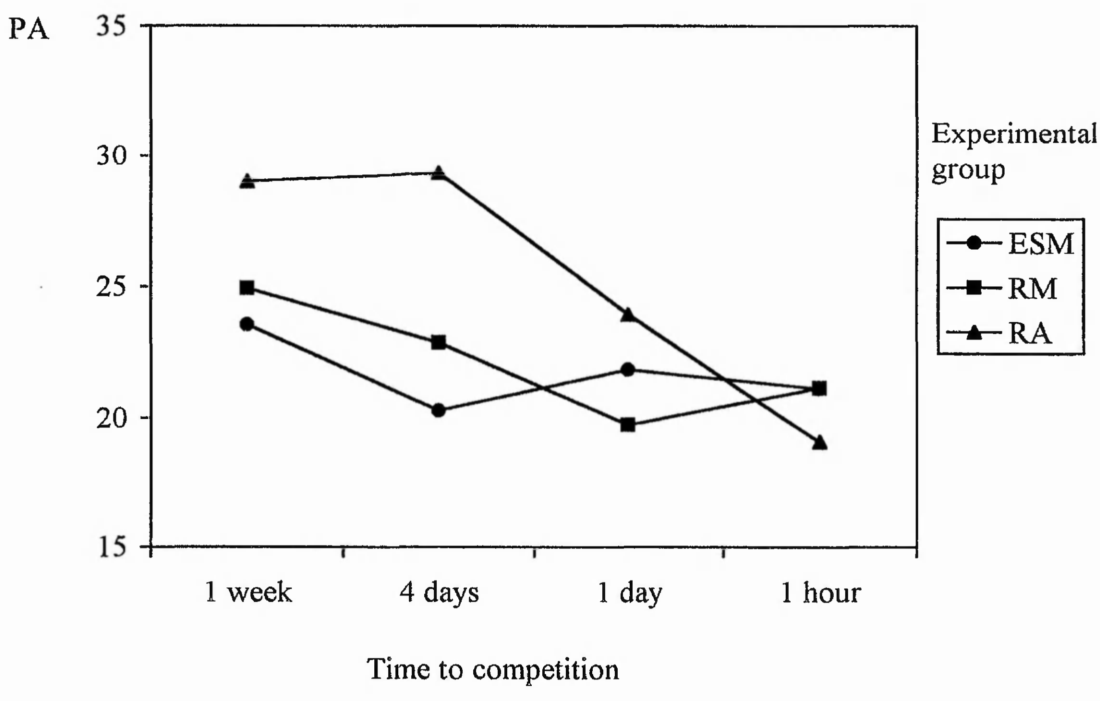


**Figure 3.2** **Temporal pattern of negative affectivity (total score) in experimental groups**

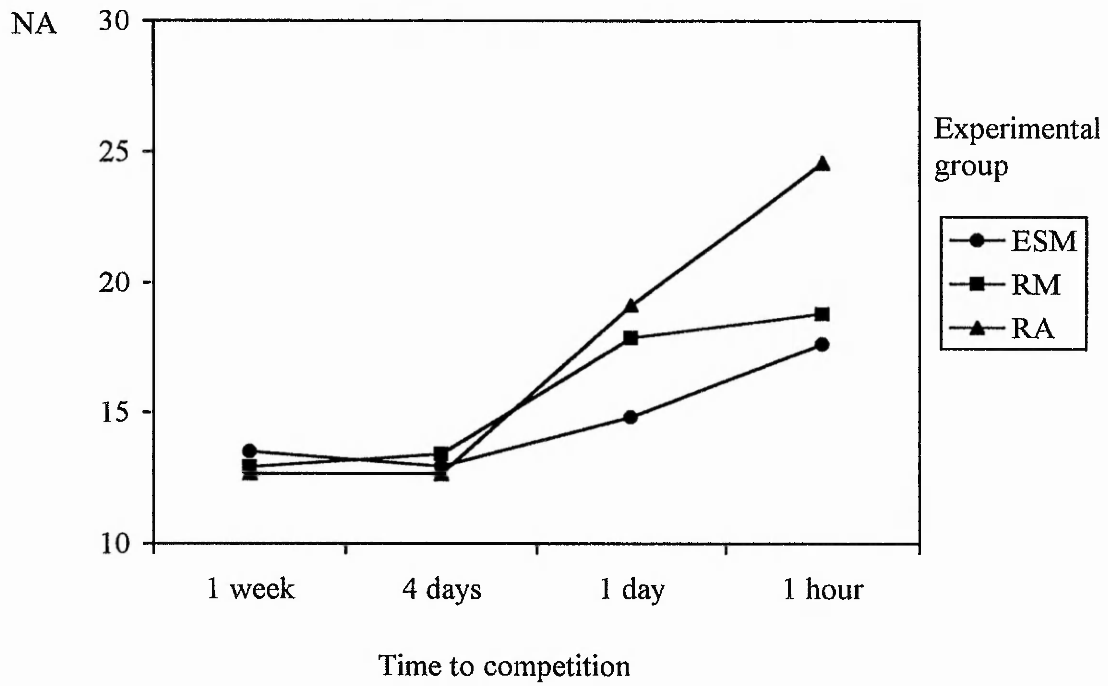



**Figure 3.3** **Temporal pattern of cognitive intrusion (% thinking time) in experimental groups**

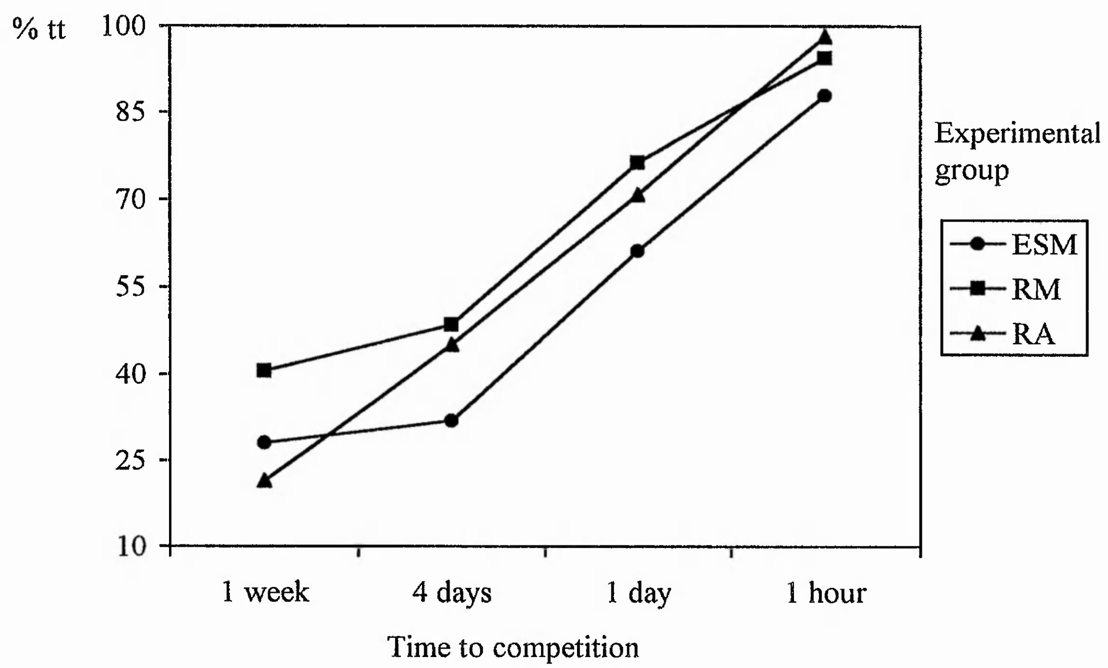


**Figure 3.4 Temporal pattern of cognitive anxiety intensity in experimental groups**

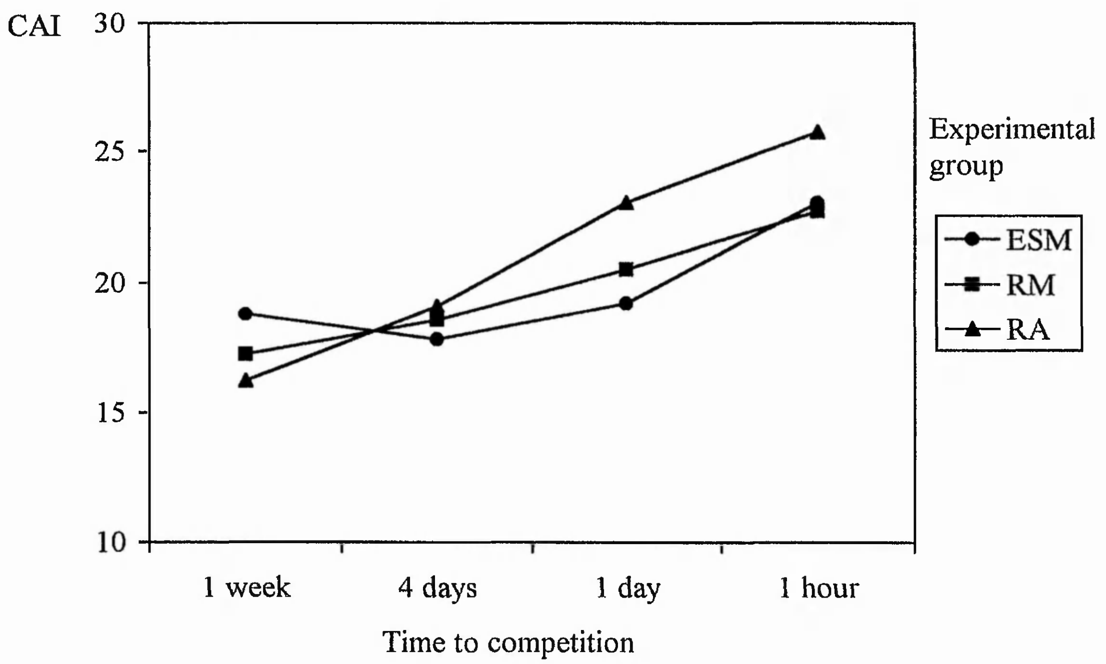
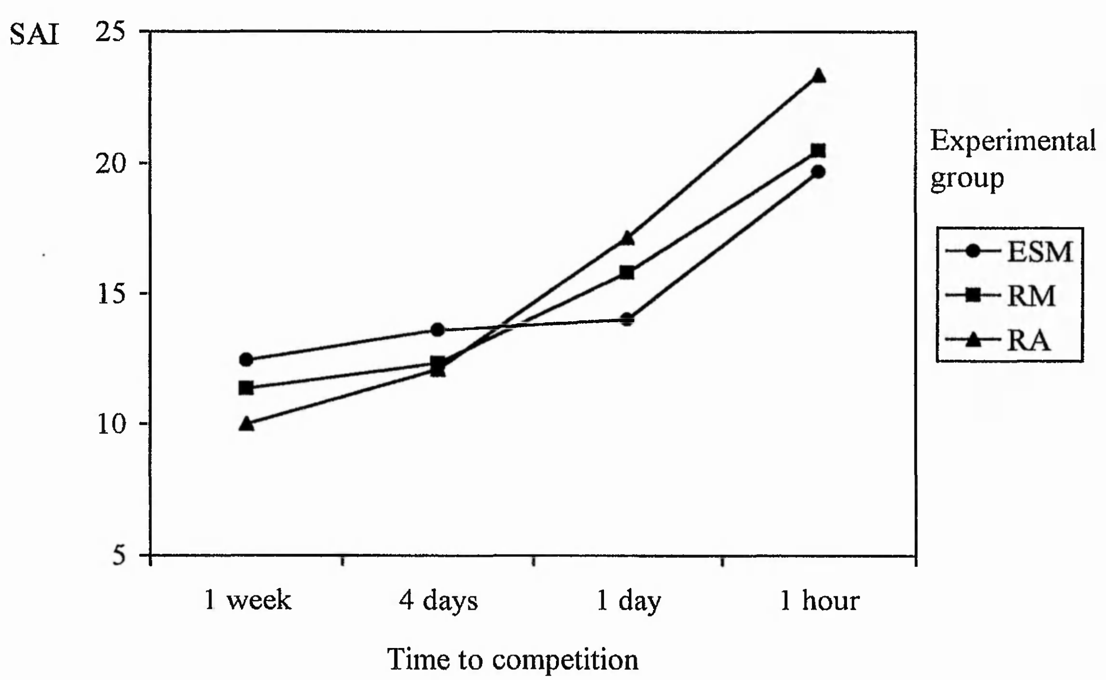



**Figure 3.5 Temporal pattern of somatic anxiety intensity in experimental groups**



### 3.45 Accuracy of recall of temporal patterns of pre-competitive emotions and cognitive intrusion

To evaluate whether the different patterns of change were due to inaccuracy of recall rather than to the effect of self-focus on the emotional experience, the results of the RA group were compared to the retrospective assessments of the other two groups. Consequently, 3 (group) x 4 (time-to-competition) MANOVAs with repeated measures on the 2nd factor were computed for retrospective data (Appendix 14). Table 3.6 shows that a significant Group main effect was observed for PA items ($F(12, 116) = 3.184$; $p<0.01$). Follow-up univariate tests (Table 3.7) and pairwise comparisons (Table 3.8) revealed that the RA group reported significantly ($p<0.01$) higher scores on the items "energetic" and "enjoyment" as compared to the other two groups. However, unlike in the previous set of MANOVAs, no Group by Time to competition interactions were observed.

**Table 3.6 Significant Group main and interaction effects obtained in 3 (Group) X 4 (Time-to-competition) MANOVAs with repeated measures on the 2nd factor on retrospective assessments of the experimental groups**

| Variable | Effect | Pillai's trace | F | Hdf, Edf | p |
|---|---|---|---|---|---|
| PA items | Group | 0.495 | 3.18 | 12, 114 | <0.001 |

**Table 3.7 Summary table of significant group main effects obtained on follow-up univariate tests**

| Variable | F | df | p |
|---|---|---|---|
| PA item "energetic" | 9.455 | 2, 62 | <0.001 |
| PA item "enjoyment" | 6.430 | 2, 62 | 0.003 |

**Table 3.8** **Significant group pairwise comparisons with Bonferroni correction on retrospective assessments of positive affectivity items "energetic" and "enjoyment"**

| Variable | Groups compared | Mean difference | Standard error | p |
|---|---|---|---|---|
| "energetic" | ESM and RA | -1.254 | 0.293 | <0.001 |
| | RM and RA | -0.807 | 0.290 | 0.007 |
| "enjoyment" | ESM and RA | -1.318 | 0.368 | 0.001 |

One explanation for these results could be that they were caused by a memory distortion effect. It is possible that the RA group, not being able to accurately recall their emotions because of a lack of exposure to momentary assessments, reconstructed their past experience so to fit their belief that with the nearing of the competition PA decreases and NA increases. To test this conjecture, correlations between the items "energetic" and "enjoyment" and other positive affects were computed separately for the RA group and the other two groups. Higher correlations in the RA group would indicate that participants attempted to reconstruct their past emotional experience and generalise their answers. As expected, the correlations between the two examined items and other positive affects were consistently higher in the RA group (Table 3.9).

**Table 3.9** **Mean correlations between items "Enjoyment" and "Energetic" and other positive affects in the RA and the other two experimental groups**[3.3]

| | Item "ENJOYMENT" | | Item "ENERGETIC" | |
|---|---|---|---|---|
| Time to competition | ESM & RM group | Retrospective group | ESM & RM group | Retrospective group |
| 1 week | 0.47 | 0.73 | 0.60 | 0.77 |
| 4 days | 0.51 | 0.55 | 0.42 | 0.51 |
| 1 day | 0.66 | 0.79 | 0.50 | 0.70 |
| 1 hour | 0.64 | 0.71 | 0.40 | 0.53 |

The possibility that retrospective assessments of emotions may be based on memory reconstruction, are also substantiated by comparing the Group by Time interactions obtained in two sets of MANOVAs. While MANOVAs of retrospective

[3.3] Mean correlations were computed using Z-score transformations.

assessments yielded no significant Group by Time interaction effects (Table 3.6), significant Group by Time interactions were obtained in four MANOVAs on RM and ESM group momentary measurements and RA group retrospective assessments (Table 3.4).

To further analyse the temporal pattern of pre-competitive emotions and accuracy of recall, 2 (group) x 2 (type of assessment) x 4 (time to competition) MANOVAs with repeated measures on the 2nd and 3rd factor were performed on ESM and RM groups' data (Table 3.10). A significant Type of assessment main effect emerged for the NA items ($F (8, 33) = 3.48$; $p< 0.01$). Follow-up univariate tests showed that participants in retrospective assessments reported lower intensity of anger (ES = 0.39) and irritation (ES = 0.39) than in momentary measurements (Table 3.11). "Worry", however, was higher in retrospective than in momentary measurements (ES = 0.44).

**Table 3.10 Significant Group and Type of assessment main and interaction effects obtained in 2 (Group) X 2 (Type of assessment) X 4 (Time-to-competition) MANOVAs with repeated measures on the 2nd and 3rd factor pertaining to momentary and retrospective data of the ESM and RM group**

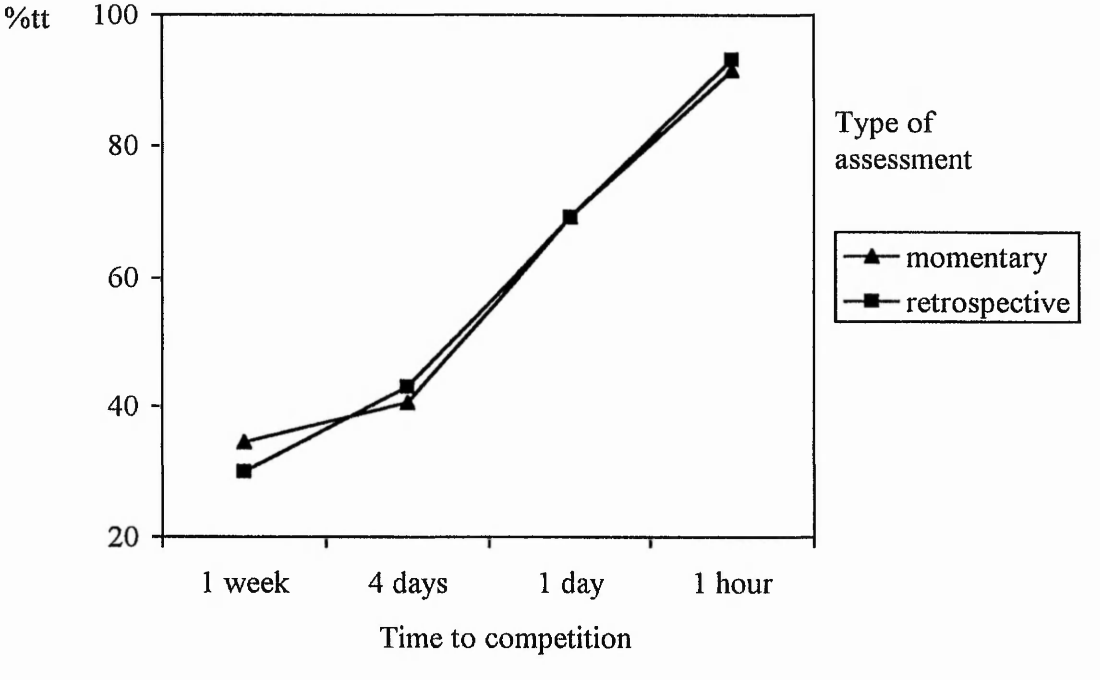
| Variable | Effect | Pillai's trace | F | Hdf, Edf | p |
|---|---|---|---|---|---|
| NA items | Type of assessment | 0.458 | 3.48 | 8, 33 | 0.005 |
| % thinking time | Group | univariate | 8.04 | 1, 40 | 0.007 |
| % thinking time | Type of assessment by Time | 0.103 | 2.99 | 3, 38 | 0.003 |

**Table 3.11 Summary table of significant Type of assessment main effects obtained on follow-up univariate tests on negative affectivity items**

| NA item | F | df | p |
|---|---|---|---|
| "angry" | 7.261 | 1, 41 | 0.010 |
| "irritated" | 7.466 | 1, 41 | 0.009 |
| "worried" | 9.952 | 1, 41 | 0.003 |

MANOVA performed on cognitive intrusion resulted in a significant Time by Type of assessment interaction and Group main effect. Pairwise comparisons of adjacent time-to-competition assessments revealed that there had been a significant increase in cognitive intrusion on each retrospective assessment (Appendix 15). The momentary assessments instead led to a significant increase in cognitive intrusion one day and one hour before the competition (Figure 3.6). Notably, contrary to expectations, the ESM group seemed to spend less time thinking about the competition than the RM group (ES = 0.41).

**Figure 3.6 Temporal pattern of recalled and actual cognitive intrusion (% thinking time)**




In order to examine whether the difference in momentary cognitive intrusion might have been due to diverse interpretations of the given instructions, differences in the accuracy of recall in the two groups were tested (Table 3.12). It was thought that the substantial number of assessments might have prompted the ESM group to report the amount of cognitive intrusion experienced at the very moment they received a signal from their pagers. The RM group might have instead tended to report the daily average of cognitive intrusion. A between-group difference in correspondence between momentary and recalled affect and thoughts, followed by no group differences in retrospective cognitive intrusion (Table 3.6) and a significant difference in momentary cognitive intrusion (Table 3.10), could indirectly indicate that the groups interpreted the given instructions in different ways. Pearson coefficients of correlation between momentary and retrospective measurements were computed. Subsequently, using Z-score transformations, the significance of the difference between the coefficients of correlation, obtained in the two groups, was tested. On eight occasions the RM group was more accurate in recalling their emotions than the ESM group.

**Table 3.12 Differences between the ESM and RM group in correspondence (r) between momentary and recalled pre-competitive affects (only significant differences reported; p=0.01)**

| Variable | ESM | RM | Z | Significance |
|---|---|---|---|---|
| Frustrated – 1 week | 0.85 | 0.33 | 2.80 | 0.005 |
| Stressed – 1 week | 0.46 | 0.89 | -2.77 | 0.006 |
| Joyful – 1 week | 0.61 | 0.96 | -3.60 | <0.001 |
| CAD – 1 week | 0.66 | 0.99 | -5.48 | <0.001 |
| Frustrated – 4 days | 0.90 | 0.54 | 2.73 | 0.006 |
| CAD – 4 days | 0.79 | 0.96 | -2.89 | 0.004 |
| Stressed – 1 day | 0.61 | 0.92 | -2.75 | 0.006 |
| Unhappy – 1 day | 0.46 | 0.94 | -3.71 | <0.001 |
| Joyful – 1 day | 0.66 | 0.97 | -3.85 | <0.001 |

To test accuracy of recall of temporal patterning of pre-competitive affects further, correlation coefficients were computed between actual and retrospective assessments for pre-competitive emotional states experienced 1 week, 4 days, 1 day, and 1 hour before the event. Separate correlation coefficients were calculated for the ESM group and the RM group, allowing comparison of accuracy between the two experimental groups. As expected, accuracy of recall of intensity of pre-competitive affects tended to be greater for assessments that were proximate to the competition. In general, correspondence between recalled and momentary measures of pre-competitive emotions and cognitive intrusion was high in both experimental groups. Table 3.13 summarises the results obtained.

**Table 3.13 Correlations for actual and recalled pre-competitive emotions and cognitive intrusion by experimental group**

| Variable | Time to competition | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 week | | 4 days | | 1 day | | 1 hour | |
| | ESM | RM | ESM | RM | ESM | RM | ESM | RM |
| NA items (mean r) | 0.77 | 0.66 | 0.71 | 0.57 | 0.77 | 0.89 | 0.85 | 0.92 |
| PA items (mean r) | 0.73 | 0.88 | 0.76 | 0.74 | 0.82 | 0.92 | 0.87 | 0.95 |
| NATS | 0.82 | 0.78 | 0.83 | 0.75 | 0.86 | 0.95 | 0.93 | 0.91 |
| PATS | 0.81 | 0.92 | 0.85 | 0.80 | 0.91 | 0.97 | 0.98 | 0.99 |
| %TT | 0.91 | 0.89 | 0.82 | 0.72 | 0.90 | 0.87 | 0.81 | 0.99 |
| CAI | 0.84 | 0.89 | 0.93 | 0.89 | 0.96 | 0.97 | 0.95 | 0.96 |
| SAI | 0.27 | 0.79 | 0.71 | 0.71 | 0.96 | 0.88 | 0.93 | 0.87 |
| CAD | 0.88 | 0.97 | 0.95 | 0.98 | 0.85 | 0.95 | 0.98 | 0.99 |
| SAD | 0.66 | 0.99 | 0.79 | 0.96 | 0.87 | 0.97 | 0.87 | 0.96 |
| Mean correl. | 0.78 | 0.90 | 0.84 | 0.84 | 0.89 | 0.94 | 0.93 | 0.96 |

Legend:

NATS = Negative affectivity total score
PATS = Positive affectivity total score
%TT = Percentage thinking time item
CAI = Cognitive anxiety intensity
SAI = Somatic anxiety intensity
CAD = Cognitive anxiety direction
SAD = Somatic anxiety direction

### 3.46 Temporal pattern of pre-competitive affects and cognitive intrusions in male Tae Kwon Do martial artists

The previous set of MANOVAs on actual and retrospective measurements of the ESM and RM group (Table 3.10) revealed only one significant interaction effect, which was related to cognitive intrusion. Specifically, the temporal pattern of recalled cognitive intrusion differed from the temporal pattern of actual cognitive intrusion. In contrast to this, significant Time main effects were obtained for PA items ($F$ (18, 23) = 4.48; $p<0.01$), NA - total score ($F$ (3, 38) = 12.73; $p<0.01$), NA items ($F$ (24, 17) = 6.22; $p<0.01$), percentage thinking time item ($F$ (3, 38) = 256.11; $p<0.01$), cognitive and somatic anxiety intensity ($F$ (6, 35) = 18.70; $p <0.01$) and cognitive and somatic anxiety direction ($F$ (6,

35) = 4.02; p<0.01). (Appendix 15). To establish the temporal pattern of pre-competitive emotions in Tae Kwon Do athletes Time main effects obtained in one-way MANOVAs with repeated measures were analysed (Table 3.14). Given that retrospective measurements tended to yield different results than momentary measurements (Table 3.5 and 3.10), only momentary assessments were included in the analysis. Where appropriate, pairwise comparisons of adjacent time-to-competition assessments were performed (Appendix 16). The decision to use multivariate instead of univariate tests was based on the fact that the assumption of sphericity was violated in almost all cases (Field, 2000).

**Table 3.14 Significant one-way MANOVAs with repeated measures on Time-to-competition factor pertaining to momentary measurements (p=0.01)**

| Variable | Pillai's trace | F | Hdf, Edf | p |
|---|---|---|---|---|
| NA total score | 0.402 | 8.73 | 3, 39 | <0.001 |
| NA item "stress" | 0.471 | 11.59 | 3, 39 | <0.001 |
| NA item "worried" | 0.663 | 25.61 | 3, 39 | <0.001 |
| PA item "pleasure" | 0.309 | 5.82 | 3, 39 | 0.002 |
| PA item "energetic" | 0.359 | 7.28 | 3, 39 | 0.001 |
| PA item "relaxed" | 0.397 | 8.56 | 3, 39 | <0.001 |
| % thinking time | 0.927 | 163.87 | 3, 39 | <0.001 |
| Cognitive anxiety intensity | 0.500 | 12.98 | 3, 39 | <0.001 |
| Somatic anxiety intensity | 0.672 | 26.64 | 3, 39 | <0.001 |

Overall, positive affectivity (total score) remained stable over time, whereas negative affectivity increased from 4 days to 1 day and from 1 day to 1 hour before the competition (Figure 3.7). Happiness, enjoyment and joy remained relatively stable across the one-week pre-competitive period, whilst a decrease in pleasure and relaxation, but an increase in the item "energetic" was detected (Figure 3.8). Anger, irritation, frustration, guilt, depression and unhappiness were relatively stable across time. There was a significant increase, however, in the intensity of stress from 1 day to 1 hour before the competition. Worry was higher 1 day prior the event than it was 4 days before the competition and it reached its peak on the subsequent assessment (Figure 3.9). Cognitive intrusion increased 1 day and 1 hour before the competition. Since previous analysis

(Table 3.10) had revealed a significant Group main effect on cognitive intrusion between the ESM and RM group, separate graphical representations for the two experimental groups are presented in Figure 3.10. The intensity of the cognitive component of anxiety was significantly greater 1 hour before the competition as compared to 1 day before the event. Somatic anxiety increased 1 day and 1 hour pre-competition (Figure 3.11). Finally, separate analysis of the direction of the two components of anxiety showed that they remained relatively stable over time (Figure 3.12).

**Figure 3.7 Temporal patterns of positive and negative affectivity**

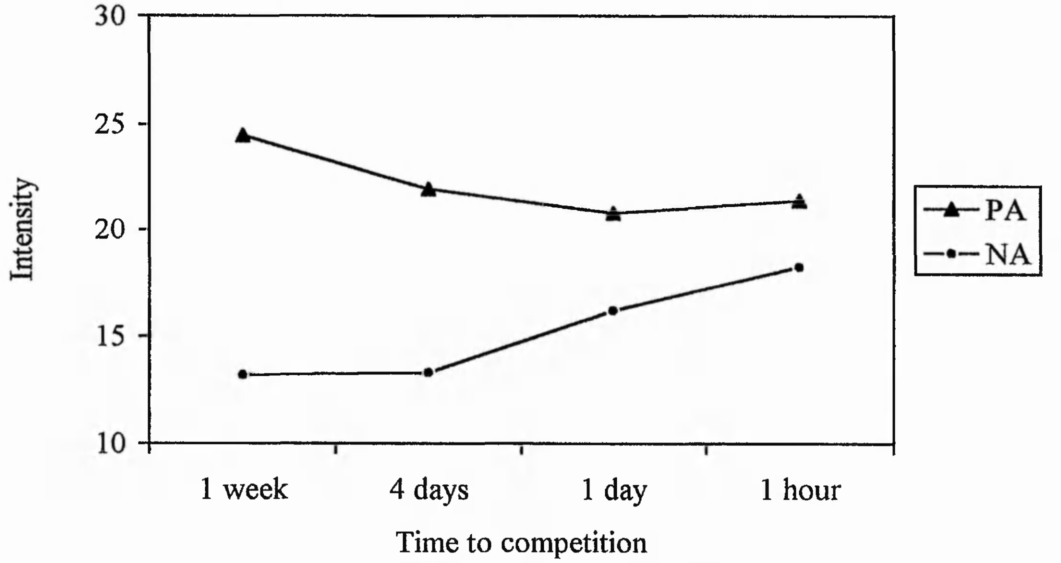



**Figure 3.8 Temporal patterns of positive affectivity items**

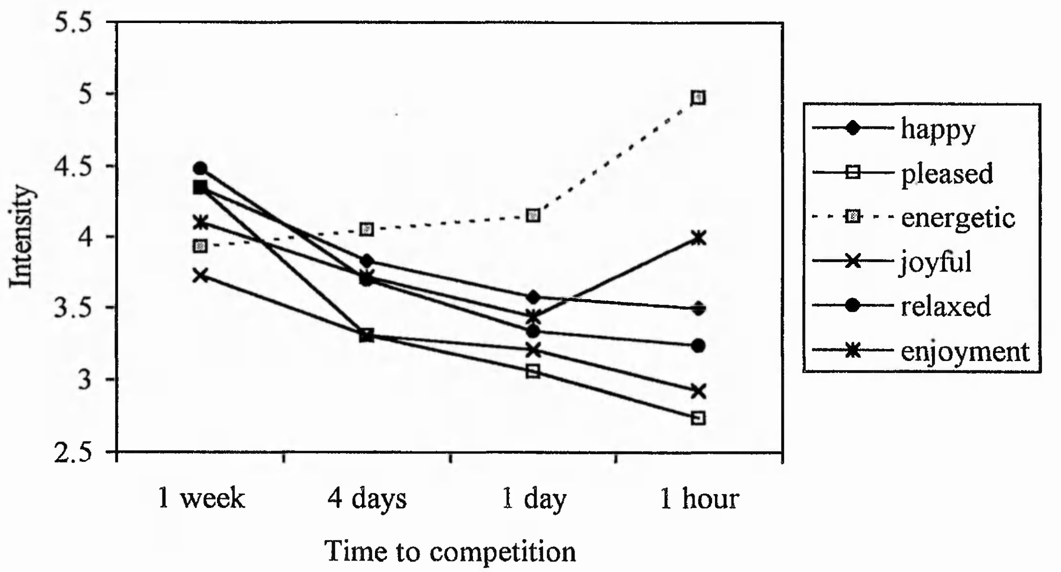


**Figure 3.9 Temporal pattern of negative affectivity items**

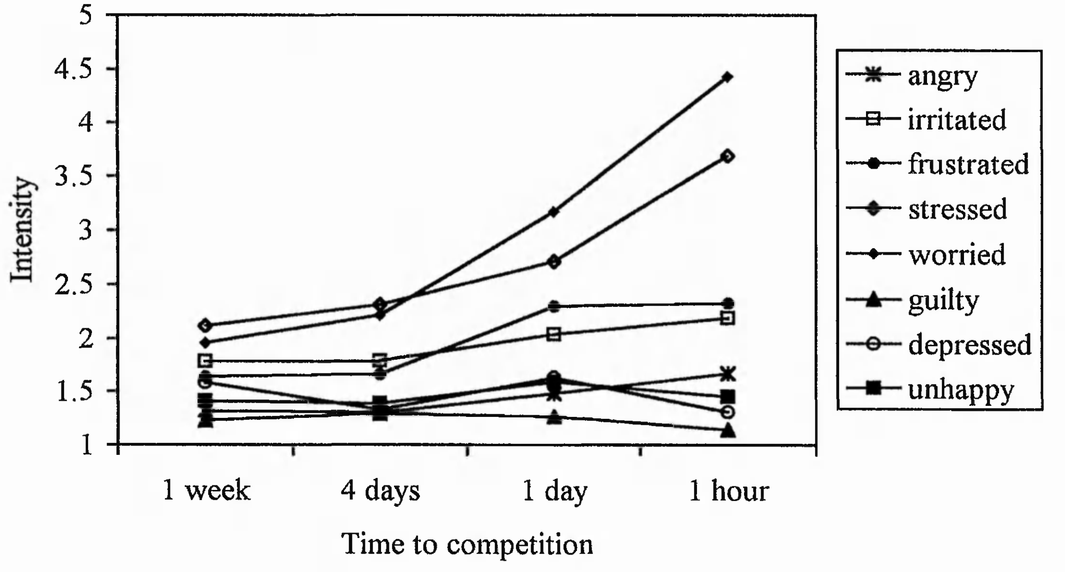



**Figure 3.10 Temporal pattern of cognitive intrusion in ESM and RM group**

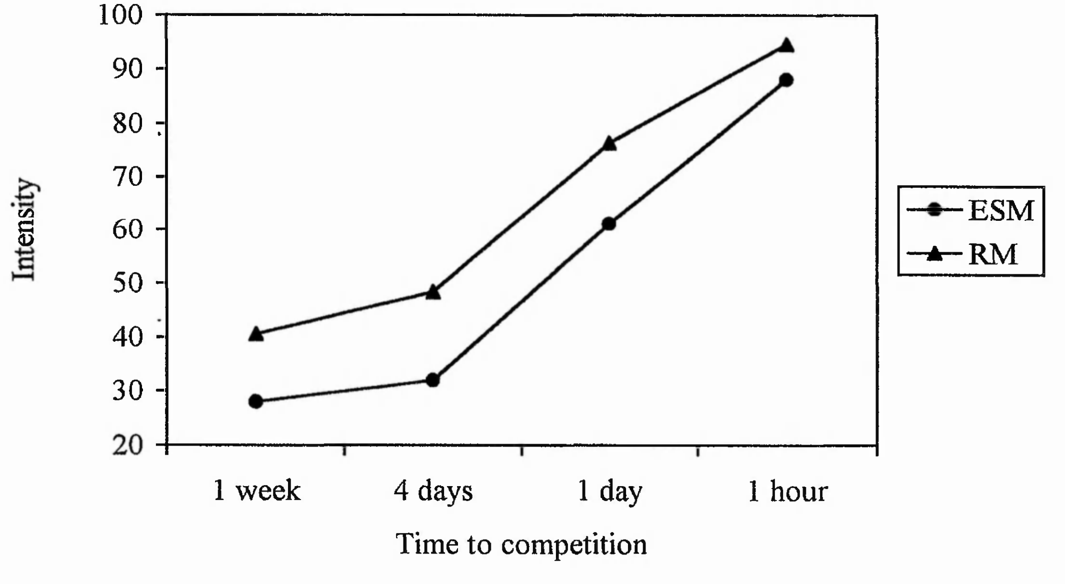


**Figure 3.11 Temporal pattern of cognitive and somatic anxiety intensity**

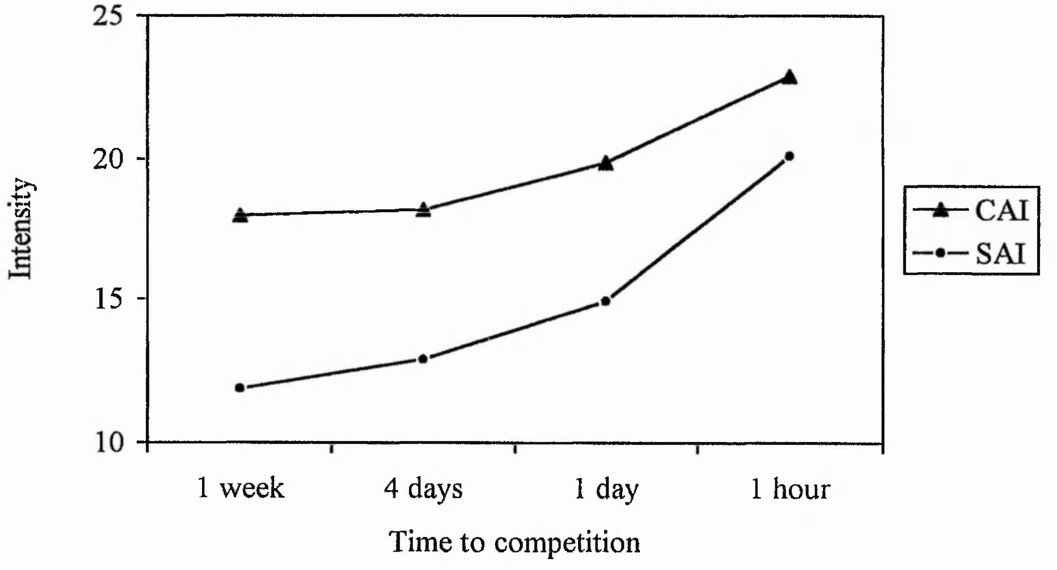
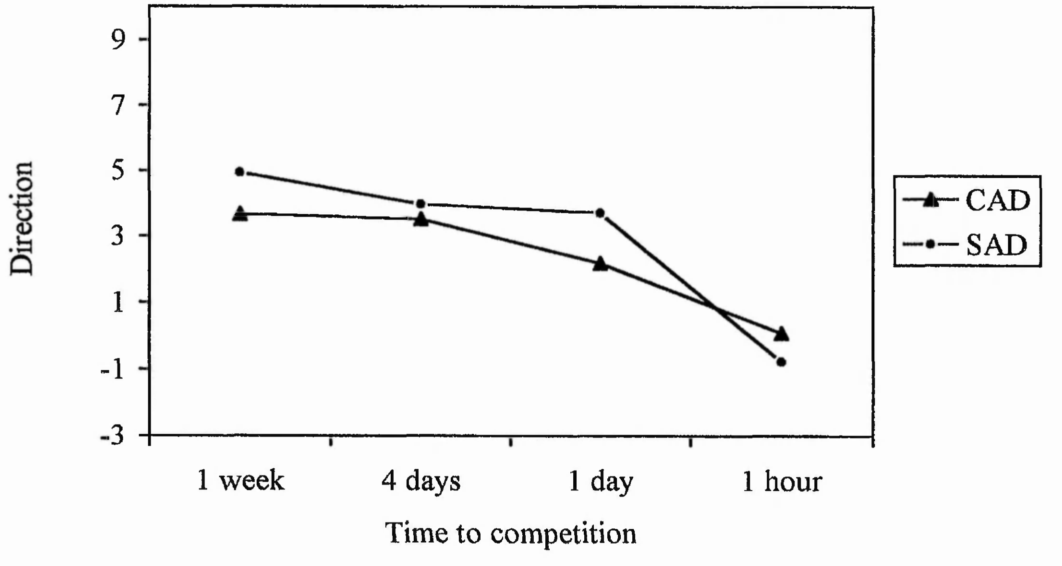



**Figure 3.12 Temporal pattern of cognitive and somatic anxiety direction**



## 3.5 Discussion

### 3.51 Priming effects of frequent momentary assessments of pre-competitive emotions

The current study provides strong evidence that the ESM can be used for the analysis of the dynamic aspects of competitive emotions. The findings do not support the hypothesis that frequent momentary assessments of pre-competitive affects and cognitive intrusions produce priming effects as predicted by the self-awareness theory (Schwarzer & Wicklund, 1991). Neither do the results support the idea that the use of the ESM increases the intensity of momentary negative affects due to its intrusiveness. The group differences in the PA items "energetic" and "enjoyment" represent the only indication that frequent momentary assessments might have had a negative impact on the athletes' emotions (Tables 3.4 and 3.5). The RA group reported feeling more "energetic" than the other two experimental groups and exhibited higher "enjoyment" than the ESM, but not the RM group. Yet, no differences in intensity of positive and negative emotions were observed between the ESM and RM group. This indicates that the participants' intensity of pre-competitive affect did not depend on the frequency and number of momentary assessments. Consequently, we can either conclude that the implementation of the ESM does not alter pre-competitive emotions at all, or that it alters them to the same extent that research designs with less frequent momentary assessments do. The RA group's higher inter-item correlations on the PA scale (Table 3.9), however, suggest that retrospective ratings might have been based on personal beliefs and expectations rather than on recollections. The relative inability of the RA group to give accurate ratings of their pre-competitive emotions may have created a tendency to provide a generalised rating of their emotions. This presumption is reflected in the higher inter-item correlations on the PA subscale and the high degree of similarity between the temporal patterns of various pre-competitive emotions in the RA group (Figures 3.1-3.5). The RA group exhibited symmetrical temporal patterns for negative and positive affect and almost identical temporal patterns for cognitive intrusion and the cognitive and somatic components of anxiety. In contrast to this, the ESM and RM groups showed different patterns of change for positive and negative affectivity and for cognitive intrusion and cognitive anxiety. Additionally, although the temporal patterns for cognitive and somatic anxiety were similar in the ESM group, they differed in the RM group. Consequently, it is suggested that the observed differences between the RA and the other two groups may be ascribed to inaccuracy in recall rather than to priming effects.

This contention is further substantiated by the minor differences observed in the groups' retrospective assessments (Table 3.6) as compared to the greater differences in momentary measurements of the ESM and RM group and the retrospective assessments of the RA group (Table 3.4). No Time by Group interactions were observed in the MANOVAs conducted on recalled pre-competitive emotions and cognitive intrusion, whereas MANOVAs on the ESM and RM groups' momentary assessments and the RA group's retrospective assessment revealed four significant interaction effects. It is possible that the greater group similarities in recalled emotions and cognitive intrusion were related to the participants' tendency to base their retrospective self-reports on similar memory search and reconstruction processes (Stone & Schiffman, 1994).

Another finding suggesting that recall of temporal changes of pre-competitive emotions may not be particularly accurate, comes from the comparison of the means between momentary and retrospective assessments in the ESM and RM group (Table 3.10). As stated earlier, worry was significantly higher in retrospective than in momentary measurements. This is consistent with Hanin's (1989) and Raglin's (1992) research that also revealed a tendency for athletes to report somewhat higher levels of pre-competitive anxiety in retrospective evaluations. With regard to this, Thomas and Diener (1990) conducted two studies in which participants were asked to provide momentary and retrospective ratings of various positive and negative emotions. They showed that retrospective ratings of the intensity of positive and negative affect were significantly higher than the momentary ratings. Thomas and Diener (1990) suggested that because emotional times in people's life are more salient to them than the more neutral occasions, past intense events are more likely to come to mind than less intense ones when participants are asked to provide a retrospective report. This results in a discrepancy between momentary and retrospective reports of emotion intensity. In the current study, worry was on average the negative emotion of highest intensity, which also exhibited greater changes in time than other emotional states as the competition approached (Figures 3.8 and 3.9). This means that, throughout the week preceding the competition, worry dominated the participants' emotional experience. It is possible that, sometimes during the examined days, the participants experienced higher levels of worry than on the particular moments they had to give their concurrent reports, which may then have resulted in their giving higher retrospective than momentary ratings of "worry". Alternatively, it is also possible that the saliency of this emotional state in the pre-competitive period might have prompted the participants to inflate their retrospective reports.

An opposite tendency was observed for the emotional states of anger and irritation. The reason why the participants reported lower levels in their retrospective ratings of these measures could be related to the fact that they were low in intensity throughout the pre-competitive period. Thus, the average concurrent rating for "anger" was 1.44, with a peak of 1.75 on a scale from 1 to 7. "Irritated" reached a maximum average intensity of 2.19. Consequently, it is obvious that pre-competitive emotional states were not characterised by feelings of irritation or anger. This might have induced the participants to underestimate the presence of these two emotions in their own past experiences.

An alternative explanation for these results relates to the fact that anger and irritation are emotional states of short duration (Frijda, 1986). Because they last only for a very short time, they may be detected more easily through momentary measurements. In retrospective assessments, the participants are given the instruction to report their emotional experience on a certain day. This, most likely, prompts them to report an average picture of their emotions over the requested period of time. Indeed, it is rather unlikely that they would experience anger or irritation for most of the day. Consequently, this would further explain why a discrepancy between the retrospective and momentary reports of these two particular emotional states was observed.

As noted earlier, comparison of momentary self-reports between the ESM and RM group led to a significant group main effect in cognitive intrusion. Contrary to expectations, the ESM group reported spending less time thinking about the competition than the RM group. However, most importantly, no group difference was observed in recalled cognitive intrusion. It is suggested that multiple daily assessments may have prompted the ESM group to report their momentary experience at the reception of a signal from their pagers. The observed daily variability in the responses of the ESM group indicates that they most likely did report their momentary emotions and cognitive intrusion. Although they were also asked to give momentary ratings, the RM group might have, instead, tended to give reports that represented a longer period of time. This conjecture may be supported by the fact that significant differences between the ESM and the RM group in accuracy of recall were observed, with the latter group being more accurate (Table 3.12).

Apparently, these results go against the assumption that repeated current assessments of psychological variables enhance self-focused attention and therefore improve the accuracy of self-reports and, possibly, recall (Brandstätter, 1983). However, it should be noted that in order to calculate the coefficients of correlation between the momentary and recalled affects in the ESM group, the data derived from the momentary assessments had to be aggregated (averaged) per day. It is possible that the average of the three daily assessments did not constitute a representative measure of the dominant intensity of emotional states on the examined days. In this case, since retrospective measurements referred to the emotional states experienced on a particular day, the apparent superiority of the RM group in recall accuracy would be explainable, assuming that the concurrent ratings of this group referred to a longer period of time. Moreover, the RM group, having one single momentary assessment per day, may have responded according to what they recalled being their responses. This would make them more accurate than the ESM group in reporting retrospective emotions and thoughts. However, this last possibility on its own would not explain the significant differences between retrospective and momentary assessments of anger and irritation (Table 3.11). As noted earlier, anger and irritation are emotional states of short duration whereas the other examined emotional states (stress, anxiety, sadness, happiness, enjoyment, unhappiness, relaxation, guilt, frustration and depression) may last longer and sometimes characterise the participant's daily mood. The fact that significant differences between recalled and concurrent ratings of emotions occurred only for emotions of short duration indicates that the participants may have reported what they thought was their average emotional state on a certain day and not what they recalled being their responses.

Taken collectively, these findings point at the possibility that, despite the fact that the ESM and RM groups were exposed to identical instructions, they may have interpreted them in different ways. In fact, Winkielman and associates (Winkielman, Knäuper, & Schwarz, 1998) showed that, when asked to report on behaviours and emotional experiences, people interpret the question meaning taking into account the reference period specified in the questionnaire. Thus, participants asked how frequently they get angry assumed that the question referred to less intense and more frequent episodes when presented with a short rather than long reference period, reported more extreme episodes in the latter case and provided differential frequency reports. It is possible that the ESM group with more frequent concurrent measurements interpreted the instructions literally and reported their momentary experience. In contrast to this, the RM group, knowing that it had to be tested only four times during the week preceding the competition, may have tended to give a more general response which was typical for the day of assessment. These findings serve as a warning that the participants' interpretations of the researchers' instructions may not correspond to the researchers' interpretation. Given the relevance of this assumption in relation to the validity of studies on competitive emotions, further investigation of this issue is warranted.

### 3.52 Accuracy of recall of temporal patterns of pre-competitive emotions and cognitive intrusion

In order to test the appropriateness of the ESM for studying competitive emotions it was necessary to differentiate between priming effects and memory distortions, so one of the aims of the present study was to examine recall accuracy of temporal patterns of pre-competitive emotional states and cognitive intrusion. Since the previous section has partially dealt with this issue, this part of the discussion will only examine the degree of correspondence between momentary and retrospective measures and provide a summary of the analyses conducted to test recall accuracy.

As expected, correspondence between actual and retrospective assessments was greater for more recent emotional experiences (Table 3.13). In the ESM group, average degree of correspondence between recalled and concurrent ratings increased gradually from 0.78 to 0.93, as the reference periods became more recent. Recall accuracy of the RM group was greater for emotional states experienced seven days than four days before the competition and it further increased in the last two assessments to a value of 0.96. It is noteworthy that the recall accuracy of cognitive and somatic anxiety direction was high and stable across the assessments. The mean correlation between recalled and momentary ratings was 0.96 for cognitive anxiety direction and 0.93 for somatic anxiety direction. This result is not surprising since the individual interpretation of the facilitative/debilitative effects of anxiety may represent more an attitude towards the emotional experience than a transient emotional or cognitive state. In fact, although cognitive and somatic anxiety tended to increase as the competition neared, no significant temporal changes were observed in actual cognitive and somatic anxiety direction.

As noted earlier, the RM group seemed to be more accurate in recalling their emotional states. The reasons why this may have happened have already been discussed. It is also noteworthy that, in general, the participants showed high recall accuracy for all reference periods. The average correlation coefficients ranged from 0.78 to 0.96. This is in contrast to Annesi's (1997) study in which the correlation coefficients between momentary and retrospective scores on the cognitive and somatic anxiety sub-scales of the CSAI-2 were 0.62 and 0.75 for the reference period of one hour pre-competition. However, in a similar study, Harger and Raglin (1994) obtained a correspondence of 0.97 using the STAI. It is difficult to find a valid explanation for these equivocal findings. Perhaps they could be accounted for by differences in the characteristics of the samples examined. For instance, Annesi tested 34 female gymnasts with a mean age of 13.7 years (from 9 to 17). Harger and Raglin (1994) based their study on a sample of male and female track and field athletes with a mean age of 19.7 (from 18 to 22). Finally, this investigation was carried out on male Tae Kwon Do practitioners, whose average age was 24.8 (from 16 to 41). It follows that the participants in the present study shared more similarities with Harger and Raglin's sample. As the same holds true for the observed correlation coefficients, it is possible that personal factors such as age and competitive experience moderated the recall accuracy of the participants in these three investigations. Consequently, in order to elucidate the relationship between recall accuracy and personal factors, replication of these studies with other samples is needed.

Another issue to be considered when examining recall accuracy of emotions is that the participants in studies on recall are initially exposed to momentary assessments of their emotional experience, which may increase their ability to recollect the same. In the present study, significant differences in recalled positive emotions between the RA group and the other two groups were observed. This suggests that recall of past experiences that were not reported on at the time they occurred may be less accurate than empirical studies on recall accuracy suggest.

In summary, comparison between retrospective and momentary measurements suggests that retrospective self-reports can be used to obtain a general idea about the changes in affect across time. However, unlike momentary measurements, they cannot reveal finer qualitative and temporal aspects of the athlete's pre-competitive emotions.

Consequently, their employment should be limited to situations in which momentary assessment of pre-competitive emotions is not feasible.

### 3.53 Temporal patterns of pre-competitive emotions in male Tae Kwon Do practitioners

An additional aim of the current research was to establish the temporal patterns of pre-competitive affect and cognitive intrusion in male Tae Kwon Do martial artists. For this purpose momentary assessments were analysed. In general, with the nearing of the competition, increases in negative affectivity, competitive anxiety and cognitive intrusion were observed. General positive affectivity remained relatively stable, whereas negative affectivity increased across time (Figure 3.7). Positive emotions such as enjoyment, joy and happiness were of moderate intensity and did not significantly change in the examined period. In contrast to this, pleasure and relaxation decreased from one week to four days before the competition. This was most probably due to the fact that the first measurement was taken during the weekend (on Sunday). Indeed, previous research has shown that positive affectivity is more elevated on weekends compared to weekdays (Stone, Hedges, Neal, & Satin, 1985) because weekends have on average more pleasant and less unpleasant daily events than other days of the week (Stone, 1987). However, it is noteworthy that, in the present study, pleasure and relaxation did not increase on the following weekend. They, instead, reached their lowest levels. This was most likely due to the competition being scheduled for Sunday. The perceived importance of the competitive event and the demands imposed by it caused an increase in tension and, therefore, a decrease in emotional states that are characterised by low activation (i.e. pleasure and relaxation). Ratings on the item "energetic" were stable and moderately high on the first three assessments, but increased one hour before the contest (Figure 3.8). Worry tended to increase gradually as the competition neared and was the most dominant negative emotion in the last two assessments. Stress increased one hour pre-competition, whilst the other negative emotions remained stable and of low intensity throughout the testing period. Notably, the intensity of negative emotions was in general lower than the average intensity of positive emotions, with the exception of worry and stress in the last two assessments.

Similar temporal patterns of pre-competitive emotions were obtained by Prapavessis and Grove (1994), who administered an abbreviated version of the POMS to competitive rifle shooters. In this study, positive emotions were higher than negative. Tension and vigour increased immediately before the competition, indicating readiness to compete. However, they also observed a gradual decrease in the same emotional states from 2 days to 1 day before competition and from 1 day to 12 hours before the event. In the current study, worry tended to increase gradually as the competition neared. These differences in the temporal patterns of "tension/worry" could be attributed to various sources. For instance, they could have been caused by differences in the characteristics of the two sports, circumstances in which the athletes were assessed, levels of competition, timing of assessments and instruments used. As noted earlier, empirical findings suggest that the athlete's affective response to competition depends, among other things, on the sport characteristics and requirements (Hassmén & Blomstrand, 1995; Krane & Williams, 1987; Martens et al., 1990). Close inspection of the temporal pattern of tension in Prapavessis and Grove's (1994) study reveals that tension was lower 15 minutes than two days before the competition. Also, the intensity of vigour on the last assessment was not significantly higher than two days before the contest. The mean score on the tension subscale, ranging from 0 to 24, was approximately 4, that is, very low. Vigour reached an average intensity of 8.0-8.5. This indicates that arousal was lower in rifle shooters than in Tae Kwon Do practitioners. In fact, the latter scored 4.93 on the item "energetic" and 4.43 on the item "worry", but on a seven-point scale. Since rifle shooting requires fine movements, hand steadiness and does not ask for explosive strength and speed (Schmidt, 1990), it demands low levels of arousal. Athletes competing in rifle shooting must learn to keep their level of physiological arousal low. This may explain why the intensity and pattern of "tension" in rifle shooters differed from the sample of martial artists examined in this study.

In general, the profile of pre-competitive emotions observed in the present study indicates that the competitive event was important to the athletes. As the contest approached, they increased their state of readiness and were prepared to invest effort in the task. Intensity of emotional states characterised by high levels of activation increased, regardless of their hedonic tone, except for anger and irritation. Interestingly, although previous studies have shown that anger may be related to performance in contact sports (e.g., McGowan & Miller, 1989; Terry & Slade, 1995), the sample of athletes examined in this study did not exhibit high levels of anger during the period of testing. The situation, of course, might have changed immediately before or during the actual fighting. However, it should be noted that analysis of data from earlier studies suggests that the level of physiological arousal in Tae Kwon Do athletes (Chapman et al., 1997) may be lower than in karate practitioners (Terry & Slade, 1995) and wrestlers (Martens et al., 1990). Perhaps, Tae Kwon Do requires lower levels of arousal than other combat sports and, consequently, practitioners of this specific martial art may not need to use anger as a "psyching up" strategy (McGowan & Miller, 1989). Obviously, these assumptions necessitate empirical testing.

Collectively, the results from the current study stress the importance of examining various emotions instead of relying on global measures of positive and negative affectivity or activation-deactivation. Besides, they support the idea that functionality of emotional states in relation to performance does not depend on the dimension of pleasantness and activation (Hanin, 1999). In fact, not every positive and negative emotion exhibited the same temporal patterns. Nor did emotional states of similar activation level. In conclusion, it appears that analysis of differential patterns of emotions varying in hedonic tone and activation level can give us a better insight into the demands of the situations that athletes encounter in the pre-competition period than do unidimensional approaches.

Pre-competitive anxiety responses of male Tae Kwon Do martial artists using a multidimensional competitive anxiety approach were also examined. The findings did not support Martens' (1990) hypothesis that cognitive anxiety intensity would remain stable over the four pre-competition time periods. A significant increase in cognitive anxiety intensity was observed on the day of competition (Figure 3.11). Indeed, although the multidimensional anxiety theory (MAT; Martens et al., 1990) predicts that state cognitive anxiety intensity should remain stable before competition, current empirical findings are clearly contradictory. While in some studies the cognitive subcomponent remained relatively stable across time (e.g., Gould et al., 1984; Martens et al., 1990), other investigations revealed an increase in the same as the competition neared (e.g., Davis & Gill, 1995; Slaughter et al., 1994; Swain & Jones, 1993). It is hypothesised that the contradictions in the current literature are mainly due to the lack of precision in defining the concept of competitive anxiety and to poor construct validity of the CSAI-2 subscales (Lane et al., 1999).

The present study supports the hypothesis that somatic anxiety increases as the competition approaches (Figure 3.11), thus confirming the findings of previous research (Karteroliotis & Gill, 1987; Slaughter et al., 1994). Finally, the results from the current investigation showed no significant change in directional perceptions of somatic and cognitive anxiety as the competition approached. This supports previous research on other types of sport (Swain & Jones, 1990; Wiggins, 1998). The mean ratings of anxiety direction were positive on all four assessments, except for somatic anxiety direction on the day of the competition. Wiggins (1998) obtained similar results on a sample of 91 high school and college athletes competing in soccer, swimming and track and field. However, it is noteworthy that the participants in the current study considered their experienced intensity of competitive anxiety to be less facilitative than the sample reported by Wiggins (1998). It is possible that the type of sport moderated the participants' responses on the direction scale. The results in the current study suggest that male Tae Kwon Do martial artists normally perceive the items reported in the CSAI-2 as facilitative to their subsequent performance. However, since large between-subject variability was noticed, future research needs to consider the influence of individual variables, such as personality traits, on directional perceptions of cognitive and somatic anxiety. Moreover, because a different interpretation of cognitive and somatic symptoms of anxiety might indicate the presence of qualitatively different emotional states, it is necessary to differentially analyse facilitative and debilitative anxiety as variable patterns of basic emotions, as suggested by differential emotions theorists (Izard, 1977).

### 3.6 Conclusions

In summary, the present study has demonstrated that the ESM is useful for the analysis of the dynamic aspects of competitive emotions. Because of its efficiency in helping the participants focus on their momentary experience and in minimising expectancy effects and memory distortions, the ESM constitutes the most appropriate method for the in-depth examination of complex dynamic aspects of competitive stress. In contrast to the RM which usually relies on three to six assessments pre-competition, the ESM permits the analysis of relationships between transient situational variables and cognitive contents and athletes' emotional experience. For these reasons, it is contended that the implementation of this method may greatly contribute to the better understanding of the complex cognitive and emotional reactions taking place in the period leading to and following a major athletic competition.

As far as retrospective measurements are concerned, the results from this study suggest that they can provide a reliable general idea about athletes' pre-competitive emotional states. However, since they are susceptible to memory distortions, they cannot reveal finer temporal and qualitative aspects of athletes' emotional experience. Therefore, they use should be confined to situations in which, for ethical or logistical reasons, momentary measurements are not feasible.

One of the purposes of this study was also to analyse temporal patterns of pre-competitive emotions in male Tae Kwon Do practitioners. In general, the emotional experience of the examined sample of martial artists was characterised by positive emotions of moderate intensity. As the competition approached, emotional states of different hedonic tone denoting readiness to compete increased in intensity and reached their peak on the last assessment. Although anxiety symptoms were on average considered facilitative to performance, substantial intra-individual differences were observed. This suggests that qualitative differences between facilitative and debilitative anxiety patterns, and factors determining them, need to be examined.

# CHAPTER IV

## Towards a new conceptualisation of competitive anxiety: A changeable set of fundamental emotions

### 4.1 Introduction

This chapter elaborates some fundamental issues pertaining to the definition and measurement of competitive anxiety. As explained in chapter two, athletic competition is viewed as a stressful event that puts athletes' physical and psychological resources to the test. In order to explain athletes' psychological reaction to competition and its effect on performance, sport psychologists have mainly focused on what they considered to be the most obvious psychological consequence of stress: anxiety (Martens et al., 1990). Perusal of the literature on competitive anxiety, as well as that related to other achievement domains (e.g., Alpert & Haber, 1960; Wine, 1980; Zeidner, 1998), reveals that, despite the amount of research, many fundamental questions pertaining to the operationalisation of this particular emotional state are yet to be answered. The equivocal findings pertaining to the temporal pattern of anxiety and its relationship to performance indicate that a more conceptually explicit definition and measurement of anxiety is needed (Burton & Naylor, 1997). Particularly, it is of imperative importance to distinguish anxiety from more positive emotions with similar symptoms (e.g., positive excitement and eagerness).

It has been acknowledged that competitive anxiety, as currently measured via the CSAI-2, can have a facilitative or debilitative effect on performance (Jones, 1995). Self-confidence and the perceived control over a stressful situation are hypothesised to determine whether an individual will consider his/her experience of anxiety as detrimental or beneficial to performance. However, since the instrument used in studies on the directional interpretation of competitive anxiety has been shown to confound positive motivation and worry (Lane et al., 1999), the conclusions derived from these investigations need to be taken with caution. It is possible that in some cases emotional states of excitement and interest have been mislabelled as facilitative anxiety. Consequently, the conclusions drawn from these studies about the extent to which anxiety can help performance may not be valid. In order to understand the mechanism and factors related to the differential effects of anxiety on performance, it is necessary to firstly distinguish anxiety from other emotional states and then analyse the factors that determine the directional effect of anxiety. Furthermore, it is necessary to account for the fact that anxiety is not the only emotional state evoked by stressful evaluative situations such as athletic competition. Vigour, anger, determination, sadness, joy, interest/excitement, shame, guilt and other emotional states have been associated with the occurrence of evaluative events (Hanin, 1999; Lazarus, 1999; Prapavessis & Grove, 1991, 1994). Several sport psychologists have recently agreed that athletes' competition-related emotional states cannot be thoroughly described in terms of presence or lack of anxiety symptoms. They are much more complex and involve a range of different interacting emotions (e.g., Gill, 1994; Hanin, 1999).

In this respect, research has shown that people tend to experience different emotions simultaneously (Frijda, 1986), even if they are of opposite hedonic tone (e.g., Gilboa & Revelle, 1994; Izard, 1977). Mixed emotions tend to emerge primarily at mild or moderate levels of affect (Diener & Iran-Nejad, 1986), but can be detected also at relatively high levels of emotional intensity if tapped at the time of occurrence (Zuckerman, 1987). These findings explain further why a certain level of anxiety is sometimes perceived to facilitate and other times to debilitate performance. Thus, for instance, it can be hypothesised that anxiety mixed with interest and excitement will have a beneficial effect on performance, while anxiety accompanied by sadness or guilt will disrupt the execution of a task.

Closely related to the idea of mixed emotions, another interesting proposal that could explain the differential effects of similar levels of anxiety on performance comes from the DET (Izard, 1991). In contrast to Spielberger (1976) and Lazarus (1999) who view anxiety as a unitary fundamental emotion, differential emotions theorists contend that anxiety is a complex and variable affective phenomenon. As explained earlier, the DET defines anxiety as a changeable pattern of fundamental emotions including fear and two or more of the emotions of sadness, anger, shame, shyness, guilt and interest/excitement. Although fear is considered to be an essential component of the pattern of anxiety, the other fundamental emotions are postulated to be variable elements that depend on the time of assessment, situations, personality and intensity and frequency of subjective perceptions (Buechler & Izard, 1980). Thus, a facilitative pattern of anxiety would include fear and fundamental emotions eliciting approach behaviour such as interest, excitement, enjoyment and anger. Conversely, a debilitative pattern of anxiety would be characterised by fear and fundamental emotions related to self-focused attention and avoidance behaviour (sadness, shame, guilt, shyness and self-hostility).

The principal aim of the studies presented in this chapter was to determine the qualitative and quantitative differences between the subjective experiences of facilitative and debilitative anxiety and distinguish them from other emotional states. In doing so, temporal patterns and some hypothesised personal and situational determinants were also examined. Finally, the construct validity of the cognitive and somatic sub-scales of the CSAI-2 was tested. This analysis aimed at ascertaining whether, as suspected by some researchers (Burton & Naylor, 1997; Jones, 1995), the CSAI-2 confounds fear-like emotional states (anxiety) with more positive states of challenge, positive excitement or motivation to compete.

This chapter is organised into four main sections: a general review of literature, a first study, a second study and a conclusion summarising the findings of the two studies. In the first part of the review of literature various definitions of anxiety are analysed and compared to those of other threat-related emotional states. Subsequently, the concept of anxiety as a unitary emotional state is contrasted to that of anxiety as a complex and variable set of fundamental emotions. In this section, the work of differential emotions theorists on anxiety is detailed and discussed. This introduces the second part of the review, which elaborates the situation-specific concept of competitive anxiety. Here, conceptual, theoretical and empirical evidence of anxiety as an emotional state that can both facilitate and debilitate performance are synthesised. Finally, an interactional model of debilitative and facilitative patterns of anxiety is proposed.

This chapter proceeds with the first study, whose purpose was to examine some of the determinants of state cognitive and somatic anxiety direction from a time-based process perspective. Specifically, the mediating effects of neuroticism, extraversion and competitive trait anxiety on levels, pre-competitive temporal patterns and emotional constituents of competitive anxiety direction were analysed. Additionally, the phenomenological characteristics of debilitative and facilitative patterns of anxiety in male Tae Kwon Do practitioners were examined. The chapter then proceeds with the presentation of a second study, the main purposes of which were to examine the construct and discriminant validity of two subscales of the CSAI-2 and analyse the structure of facilitative and debilitative patterns of fundamental emotions and anxiety in individual sports. Finally, the chapter concludes with a synthesis of the findings from the two studies.

## 4.2 Review of literature

### 4.21 The concept of anxiety

Perusal of the literature in various psychological areas, such as psychology of learning and physiological, educational, clinical and organisational psychology reveals that there has been a tendency to make anxiety the central mediating construct in virtually every form of behaviour, pathological or normal, human or animal. In line with this tendency, sport psychologists have considered anxiety the most important psychological factor influencing performance (Raglin & Hanin, 1999). Despite the staggering amount of research, when reading the literature on anxiety, one is struck by the almost endless variety of experiences and behaviours encompassed under this rubric. The only point the literature seems to be manifestly clear on is that anxiety is not a unitary concept. Since its introduction researchers have been trying to define and differentiate it from other threat-related emotional states. This has yielded significant disagreements on the basic semantics and resulted in reports of interesting observations of different emotional phenomena (Beck, 1972). As the situation-specific construct of competitive anxiety is intimately related to the general concept of anxiety, it has been affected by the same conceptual problems.

Due to its vagueness and complexity, anxiety has been defined in many different ways. However, behavioural inhibition is the explicit or implicit common denominator of all definitions of anxiety. It is inherent in the concepts of uncertainty of action, anticipation of threat and absence of concrete identifiable danger (objectless), all of which are elements of anxiety definitions. Behavioural inhibition occurs upon exposure to novel stimuli (Gray, 1994), in situations of cognitive incongruity (Lidell, 1964; McReynolds, 1960), when a potential source of danger is unknown (Lazarus, 1966; May, 1950) or when a waiting period is required before a response can be made (Epstein, 1972). It also occurs in presence of a conflict between opposing response tendencies (Epstein, 1972; Gray & McNaughton, 1996) or because the response that is recognised as necessary is not in the individual's repertory (Cattell, 1972; Lazarus, 1999; Mandler, 1972; Zeidner, 1998). All the above-mentioned stimuli are considered antecedents of the supposedly unitary emotional state of anxiety. However, close analysis of these situations shows that, although they produce similar behaviours (inhibition of action, increased arousal), they may be associated with different cognitive appraisals and, therefore, may evoke qualitatively different emotional states. For instance, novel stimuli may elicit surprise, interest or/and fear. The unavailability of task- or situation-relevant behaviour may be associated with shame, embarrassment, fear, guilt or discouragement. Also, opposing response tendencies are by definition accompanied by ambivalent feelings and may result in mixed emotional states of despair, frustration, guilt, fear, interest and excitement. Overall, these observations indicate that if we define anxiety as a state of behavioural inhibition (undirected arousal) following the perception of threat, it may not correspond to an introspectively unitary concept. The phenomenological quality of the emotional state labelled as anxiety will depend on the type of threat (e.g., physical, social punishment or omission of reward) and the situation (e.g., lack of coping skills, novel stimuli, necessity to delay action, conflict of motives) that caused behavioural inhibition and risk assessment. For example, anxiety triggered by potential social rejection (social punishment) resulting from display of incompetence (unavailability of task-relevant behaviour), will be characterised by fear accompanied by emotional distress, embarrassment and shame. In contrast, anxiety associated with uncertainty of reward in a situation requiring a delayed response (e.g., anticipatory competitive anxiety) will be most likely characterised by apprehension (fear-like emotional state following the perception of threat), eagerness, excitement and interest. Although these two examples fall under the same category of anxiety states (behavioural inhibition, perceived threat and increased arousal), they are undoubtedly phenomenologically different.

Another factor contributing to the complexity of anxiety is time. Anxiety states usually last more than a few seconds. Actually, they may last for days (Cattell, 1972). Although behavioural inhibition resulting from perception of threat may be present for a long period of time, cognitive appraisal of the situation (risk assessment) does not stop. As appraisal of the situation changes, emotional experience changes. For example, anticipation of a potential danger which characteristics are unknown can be accompanied by alternating positive and negative expectations. As thoughts about the future outcome change, negative emotional states of fear and helplessness are replaced by more positive states of hope, and vice-versa. Although both states are associated with uncertainty of outcome, perception of threat, heightened arousal and behavioural inhibition and could be, therefore, classified under the common label of anxiety, they are introspectively different. Consequently, albeit anxiety may be related to a specific and clearly identifiable motivational system (BIS) of defence behaviour, it is not a unitary, subjectively identifiable emotional state. It is a variable set of emotions built on the perception of potential danger and, therefore, always associated with fear-like affective states. Anxiety is not only fear or apprehension; it is a complex and variable affective phenomenon.

Examples of descriptions of anxiety as a complex emotional state can be found in the work of many contemporary psychologists. For example, Basowitz, Persky, Korchin and Grinker (1955) acknowledged that anxiety is not a simple unitary phenomenon and distinguished harm-anxiety from shame-anxiety. Sarason, Davidson, Lighthall, White and Ruebush (1960) put forth a psychodynamic theory of test anxiety development in children which describes anxiety as a complex emotional state that involves the fundamental emotions of fear, distress, anger, shame and guilt. Mosher (1966), Maher (1966), Katz and Zigler (1967) viewed guilt and anxiety as related concepts. Gottschalk and Gleser (1969) proposed six subtypes of anxiety which were based on observations from clinical experience. These were mutilation, separation, death, guilt, shame and diffuse anxiety. Cattell (1972) defines anxiety as a second order factor or, in other words, a compound of first order factors such as lack of self-confidence, inability to cope, agreeableness, shame. Janis (1969) states that anxiety is a generic term that includes fear, shame and guilt. Plutchik (1994) defines anxiety as a combination of the fundamental emotions of fear and anticipation. For Izard (1972; 1977; 1991) anxiety is a complex, variable emotional reaction that can be approximated to a set of fundamental emotions.

Izard is one of the few researchers that systematically tested the concept of anxiety as a complex emotional state. So his work will be reviewed in greater detail. The DET (Izard, 1991) conceptualises anxiety as an unstable and variable combination of fear and two or more of the fundamental emotions of anger, shame, guilt, shyness, self-hostility and interest-excitement. The combination and interaction of emotions constituting anxiety is thought to vary with relation to time, personality and situations. In order to test this definition of anxiety, a series of studies was conducted using the Differential Emotions Scale (DES), an instrument that measures 11 to 12 fundamental emotions, as conceived by Izard (1972, 1991).

A first factor-analytic study was carried out on 297 college students who were instructed to recall or visualise situations in which they felt anxious. Their emotional states were assessed with an instrument (DES+A) that combined items of the DES and the STAI (Spielberger et al., 1970). The idea was to test the DET's definition of anxiety through the analysis of the factor loadings of the STAI items on various emotion factors (fundamental emotions). The factor analysis of the data showed that anxiety, as operationalised by the STAI, was indeed a complex of affective states. As expected, most of the negative items of the STAI loaded on the DES fear factor. A few of the STAI items loaded on a factor that combined sadness and guilt items of the DES. Finally, with the exception of the item "calm", all the positive items of the STAI (e.g., confident, content, joyful) loaded on the enjoyment factor of the DES.

Subsequently, Izard (1972) used the DES+A as a tool to study each of the fundamental emotions that he hypothesised as potential components of anxiety. For this purpose, a group of 193 students was randomised into five experimental groups. The first group was asked to visualise a fear situation, the second a guilt situation, the third a distress situation, the fourth a shyness situation and the fifth an interest/excitement situation. The first four groups had been previously tested on an anxiety setting. This made it possible to compare a given group of participants' DES+A scores derived from the anxiety situation with their scores derived from a fundamental emotion situation. On all occasions, participants were also asked to give a brief description of the scene they were visualising. This was done to determine the degree of correspondence between free-response descriptors of anxiety situations and the five fundamental emotion situations. Analyses of variance showed that anxiety as measured by the STAI items on the DES+A did not differ in the fear situation and the anxiety situation. Similarly, the mean anxiety scores in the distress and guilt situations were statistically equal to those in the anxiety situation. In contrast, the average anxiety scores from the shyness (68.89) and interest (52.31) situations were significantly lower than the anxiety scores from the anxiety situation (75.29 and 75.35). However, it is noteworthy that the shyness and interest situations were not free of anxiety. In fact, the minimum obtainable mean anxiety score was 19.00 or 1.00 on a five-point scale, while the average anxiety score in the interest situation reached 52.31 or 2.70 on a five-point scale. Additionally, Spielberger et al. (1970) reported a mean anxiety score of 1.75 on a four-point scale under instructions to assume a calm state.

Whilst the STAI could not differentiate anxiety situations from fear, distress and guilt situations, the DES subscales could distinguish one situation from another. For example, the highest mean score (expressed in terms of T-scores) under instructions to visualise a guilt-evoking episode was, as expected, on the guilt factor. Moreover, the mean guilt score for the guilt situation was significantly higher than for the other experimental situations. In contrast, equally high mean anxiety scores were recorded in the fear, anxiety, distress and guilt situations. Also, while the mean anxiety scores in the anxiety, guilt and fear situations were not significantly different, the average scores on a combination of fear/anxiety scale were significantly higher in the fear situation than in the guilt and distress situations.

Analysis of correspondence between the free-descriptors from the anxiety situation and the other five situations showed that there was a substantial overlap between them. Seventy-nine percent of the free-responses given in the distress situation were identical to the responses given in the anxiety situation. More than half of the situations that were associated with fear were also identified as causes of anxiety. Even the interest-excitement situation produced 41% of free-responses that were identical to those associated with anxiety. These findings indicate that the events that people identify as antecedents of anxiety overlap considerably with what they see as causes of distress, guilt, fear, shyness and interest-excitement.

In another investigation, Izard (1972) analysed the patterns of emotions in a highly threatening real-life situation. Following a tragic confrontation between students and the police, the DES was administered to a large sample of African American college students at two different campuses. The students were instructed to recall the event and its aftermath and describe their emotional states. As expected, they showed elevated mean scores on the subscales of fear, sadness, shame, anger and interest, most of the hypothesised affective components of anxiety.

More recently, Blumerang and Izard (1985) examined the phenomenology of anxiety in children. They found that fear, guilt, sadness and shame were significantly related to anxiety. Fear accounted for 42.1% of the variance of anxiety, while sadness, guilt and shame explained more than 20% of the remaining variance. Overall, these findings support DET's conceptualisation of anxiety as a complex affective phenomenon that is best defined as a set of fundamental emotions. These studies also suggest that anxiety as a concept and anxiety scales as measurement techniques do not constitute adequate means for the study of emotional experience.

In conclusion, anxiety can be relatively clearly defined in terms of neuropsychological motivational system as being associated with the activation of the BIS, in terms of primary cognitive appraisal as involving perception of potential threat and in terms of action readiness change as suspension of action and risk assessment. However, it does not have a fixed phenomenological form. Since anxiety is related to the perception of a potential danger, it is akin to fear. In fact, as seen earlier, a multitude of studies has shown that fear is a constant and dominant component of the construct of anxiety. In contrast to anxiety, fear has a clearly definable phenomenological form (feeling), but is not associated with a specific motivational neural structure (FFS and BIS) or manifest behaviour. It is invariably the emotion associated with the perception of threat, which can be concrete, abstract, proximal, potential, rational, irrational, and so forth. It ranges from states of panic to mild apprehension and, as such, may involve uncontrollable defence behaviour (freezing or flight), controllable defence behaviour (escape, avoidance or active coping) or risk assessment (behavioural inhibition). Anxiety is a threat-related and, therefore, a fear-like emotional state accompanied by behavioural inhibition or risk assessment. While fear is easily defined by its object (danger) anxiety is differentially defined by its action tendency (behavioural inhibition and risk assessment). The variability of the phenomenological experience of anxiety is due to temporal, situational and personality factors. As explained earlier, behavioural inhibition and risk assessment can continue for an extended period of time, ideally until the nature of the source of danger is assessed and a way of avoiding or tackling it is found. As risk assessment activity proceeds, the source of danger is constantly appraised and re-appraised leading to changes in the perception of threat and, consequently, to changes in the emotional state. Behavioural inhibition occurs for different reasons and in different situations, most of which, besides being linked to fear, are usually associated with other specific emotions. Thus, unavailability of task-relevant behaviour (helplessness) usually evokes sadness, shame and guilt (Wickless & Kirsch, 1988). Delayed action may evoke eagerness (anticipation), while exploration of novel stimuli is regularly associated with interest (Izard & Youngstrom, 1996). It follows that anxiety may be perceived as a state of fear or a complex emotional state comprising fear and one or more of the other fundamental emotions. These other emotions are hypothesised to have an interactive rather than an additive effect with fear, which has consequences for the regulation, expression, idiosyncratic experience and treatment of anxiety (Izard & Youngstrom, 1996).

Before concluding this part of the literature review pertaining to the general concept of anxiety, it is necessary to further explain one of the pivotal concepts of the DET: the concept of patterning of emotions. Basic or fundamental emotions seem to be experienced in patterned relations to one another (Diener, 1999; Frijda, 1986; Izard, 1991; Watson, Wiese, Vaidya & Tellegen, 1999). Studies of self-rated emotional states consistently indicate that various negative emotions such as fear, anger, contempt, disgust and sadness co-occur in individuals (Watson & Clark, 1992). Similarly, positive (pleasant) emotions tend to be interrelated. These observations have led to the general consensus that two broad factors, which are generally labelled Negative Affect and Positive Affect, constitute the major dimension of affective structure (e.g., Meyer & Schack, 1989; Russell, 1980; Watson & Tellegen, 1985). It is important to emphasise that the existence of two broad affective factors is not opposed to the existence of discrete emotions. In fact, Watson and Clark (1992) examined the relations amongst measures of fear, sadness, hostility and guilt and found that all four negative affects represented meaningful and differentiable psychological constructs. However, the measures were also consistently interrelated, thereby demonstrating the existence of a higher order Negative Affect dimension in self-reported data.

DET defines a pattern of emotions as an interactive set of basic emotions in which the key emotion is experienced more frequently and with more intensity than other affective elements. Emotions can become associated with each other through socialisation or personal experience and, as such, can form situation-specific and idiosyncratic patterns. The emotions forming a pattern are causally linked. This means that the activation of one of them, and especially the key emotion, increases the probability of activation of the other constituents of the emotional set (Izard & Youngstrom, 1996). With experience, especially in situations of uncertainty of outcome and action associated with a potential danger, fear tends to become linked to certain other emotions. This leads to characteristic patterns of emotions in various anxiety disorders and situation-specific anxiety states.

There is overwhelming evidence that the subjective experience of a pure emotion is rare and very short in duration (e.g., Frijda, 1986; Gilboa & Revelle, 1994). Consequently, for the sake of a better understanding of an individual's emotional experience, the analysis of discrete emotional states should be replaced by the analysis of patterns or profiles of emotions. This would mean viewing any significant person-environment interaction as one that is characterised by a pattern of emotions rather than by a single discrete emotion. In support to this approach are the findings of a study that examined the difference between emotional profiles in fear, anxiety, guilt, distress, shyness and interest (Izard, 1972). Three-way analyses of variance (subjects by DES+A by situations) were performed to compare the patterns of emotions evoked by fear, guilt, distress, shyness and interest situations with those evoked by anxiety situations. As seen earlier, although the mean anxiety scores in the anxiety, fear, distress and guilt situations were statistically equal, the interaction of emotion factors (DES+A) by situation was highly significant in every comparison between the anxiety situation and a discrete emotion situation. Also, simultaneous comparison of the patterns obtained in all experimental situations led to a highly significant emotion by situation interaction. These finding indicate that in order to analyse and understand an individual's emotional experience it is necessary to assess a broad range of emotions. By relying on measurements of one single discrete emotion we obtain a partial and distorted vision of an individual's affective state. These remarks are particularly relevant to the study of phenomenologically non-unitary complex emotional states such as depression and anxiety.

### 4.22 Competitive state anxiety: from a unitary to a complex affective phenomenon via the concept of directional interpretation of anxiety

Over the last 30 years, the definition of competitive state anxiety has been mainly based on Spielberger's (1976) general definition of state anxiety. Thus, competitive state anxiety has been conceptualised as an unpleasant emotional state triggered by the perception of threat in competitive situations and characterised by feelings of apprehension and tension, with associated activation of the autonomic nervous system. This implies that, in the main, sport psychologists consider anxiety a phenomenologically unitary and fundamental rather than complex and variable affective state.

Two approaches to anxiety have dominated the sport psychology literature. The first approach marked the research scene of the 1970s and 1980s and was characterised by a unidimensional conceptualisation of anxiety that acknowledged the need to distinguish between anxiety as a disposition and anxiety as a transient state (e.g., Hall, 1980; Huddleston & Gill, 1981; Scanlan, 1977; Tenenbaum & Milgram, 1978). In these formative years of competitive anxiety research, sport psychologists measured competitive anxiety with the STAI and the Competitive State Anxiety Inventory (CSAI; Martens et al., 1980), a version of the STAI adapted to sport.

In the 1990s, inspired by some findings in the clinical and educational psychology areas (Davidson & Schwartz, 1976; Liebert & Morris, 1967), Martens and associates (1990) introduced a multidimensional theory of competitive anxiety (MTCA). The MTCA hypothesises the existence of two relatively independent components of anxiety labelled cognitive and somatic anxiety. They are thought to be triggered by different antecedents and affect performance via different mechanisms. Cognitive anxiety is defined as a psychological state characterised by fear of failure and negative expectations about athletic performance. Somatic anxiety refers to the physiological elements of the anxiety experience that are directly associated with autonomic arousal. The MTCA predicts a negative linear relationship between cognitive anxiety and performance. This negative relationship is attributed to the detrimental effect of negative thoughts and self-talk on attentional processes. In this view, athletes who are worried become preoccupied with their own self-evaluation and ruminate about possible failure rather than directing attention to the task at hand. Consequently, because concentration on task-relevant cues is impaired, performance suffers.

Furthermore, the multidimensional theory of competitive anxiety predicts the existence of a curvilinear inverted-U relationship between somatic anxiety and performance. Whether an increase in somatic anxiety will facilitate or debilitate performance depends on whether an individual has reached his/her optimal level of arousal. In conclusion, the MTCA states that an increase in somatic anxiety can be either debilitative or facilitative to performance, whereas an increase in cognitive anxiety will always impede performance.

#### *4.221 Can anxiety be facilitative?*

In the last decade, several researchers have acknowledged that not all athletes consider the experiences listed in the cognitive subscale of the CSAI-2 and other anxiety inventories to be detrimental to performance (Jones, 1991; Jones & Hardy, 1990; Kerr, 1989). In this regard, Jones (1991) recognised the need for the introduction of a new dimension of multidimensional anxiety pertaining to the subjective interpretation of the perceived symptoms in relation to performance. Consequently, he and his associates (Jones & Swain, 1992) constructed a modified version of the CSAI-2 gauging both intensity and interpretation of anxiety and self-confidence. Jones (1995) explained how sport psychologists have traditionally labelled the entire range of emotions associated with evaluation as anxiety and consequently have failed to distinguish between facilitative and debilitative states, assuming anxiety is negative. The idea of the existence of facilitative and debilitative anxiety was not new. Educational psychologists studying test anxiety had much earlier elaborated a bidirectional concept of anxiety that explained how anxiety symptoms of similar intensity could in some individuals facilitate performance and in others impede performance (e.g., Alpert & Haber, 1960; Wine, 1980). Moreover, earlier studies on elite athletes (e.g., Mahoney & Avener, 1977; Gould et al., 1983) indicated that successful performers tended to interpret the anxiety symptoms they experienced as a stimulant for their performance.

That anxiety can be facilitative is also supported by Gray (1994) and Izard (Izard & Youngstrom, 1996). As explained earlier, activity in the BIS is thought to be associated with anxiety (Gray, 1994). The major outputs of this system are inhibition of motor behaviour, increased level of arousal and increased attention to the environment, especially to novel events in the environment (Gray & McNaughton, 1996). The fact that these elements are essential for successful coping with potential threats indicates that anxiety states can be indeed facilitative. Notably, increased attention to the environment is one of the elements associated with successful performance in open-skill sports (Moran, 1996).

From an evolutionary perspective, the first function of anxiety and fear, as the phenomenal common denominator of anxiety states, is related to defence behaviour (Izard & Youngstrom, 1996). Behavioural inhibition with the purpose of risk assessment is the biological function of anxiety. The behavioural pattern of risk assessment is supposed to provide information confirming, identifying and localising danger, thus enabling the transition from a risk assessment pattern to an active behaviour pattern in form of avoidance, escape or instrumental behaviour (Blanchard & Blanchard, 1990). Also, fear and anxiety have been shown to activate appraisal processes that can help guide action (Mineka & Zinbarg, 1996). These observations provide further support for the contention that anxiety and fear have a very important adaptive function and can be facilitative to performance.

Several factors will determine whether an anxiety state will perform its inherently adaptive or "facilitative" function. These comprise trait anxiety, the strength of adaptive connections between the emotion, cognitive and action systems and the individual's coping abilities (Izard & Youngstrom, 1996). Adaptive connections between emotion, action and cognitive systems refer to the creation of links between the motivational power of anxiety and fear and appropriate thoughts and actions in a variety of anxiety- and fear-eliciting situations. This means that for anxiety and fear to be functional they have to produce functional coping or motivate the learning of new coping skills within the threatening situation (Izard & Youngstrom, 1996). Additionally, in order for fear and anxiety to be adaptive, the cognitive appraisal must operate in conjunction with a fear/anxiety system (state) that is at least moderately controlled. When trait anxiety is low, cognitive appraisal can usually accurately assess potential danger and activate fear when the danger is real and imminent. In this sense anxiety and fear are adaptive because they act as motivators for the reduction of threat. In highly anxious persons (anxiety disorders), fear is activated in a broad range of innocuous situations and, therefore, is often dysfunctional.

Eysenck and Calvo (1992) have also generated another plausible theory regarding the processes that might underlie the effects of anxiety upon performance. Processing Efficiency Theory (Eysenck & Calvo, 1992) predicts that state anxiety produces worry that has two main effects. Worry may produce an increase in on-task effort and strategies designed to maintain performance effectiveness at the experience of processing efficiency. On the other hand, worry reduces the capacity of working memory, depleting resources that would normally be available to deal with concurrent tasks, resulting in performance decrements. In other words, according to Processing Efficiency Theory, cognitive anxiety reduces the effective working capacity available to performers by wasting resources on worry, self-concern and other task-irrelevant activities. However, because anxious performers have a greater discrepancy between their current aspirations and their perceived ability, they invest more effort in the task, provided that they perceive themselves to have at least a moderate chance of success. Consequently, performance effectiveness may be maintained or even enhanced, but at a reduced efficiency and an increased energetical cost to processing efficiency. Furthermore, this increased energetical cost may be reflected in increased physiological arousal and somatic anxiety. If the cost becomes too great, the performer will give up and performance will break down.

In general, these theories suggest that competitive anxiety can be facilitative if it motivates task-relevant behaviour and learning of new skills aimed at reducing threat (e.g., failure). Conversely, it becomes debilitating if it is associated with task-irrelevant behaviour and cognitive interfering thoughts of failure. An example of facilitative anxiety would be that of a tennis player who, during a rally, translates his/her worry into task-relevant concerns such as "where is the next ball going to land" instead of task-irrelevant concerns like "what is my coach going to say if I lose". The first type of cognitions is associated with task-relevant behaviour (environment scanning) and narrow external attentional focus, which is what an open skill like tennis requires. The second type of thought is task-irrelevant and is associated with a tennis-wise dysfunctional narrow internal attentional focus.

In a recent article, Burton and Naylor (1997) have criticised the concept of facilitative anxiety questioning its existence. Their opinion is intimately linked to their definition of anxiety. They adopt Lazarus' (1991) conceptualisation of anxiety as a unitary fundamental negative emotional state, clearly distinguishable from challenge-related emotions and excitement, and associated with negative expectations of goal attainment and coping. Lazarus (1991) sees the difference between challenge and anxiety in the primary appraisal of goal congruence, defined as the degree to which a situation is appraised as beneficial or harmful. While anxiety is triggered by goal incongruity (expected threat), challenge is evoked by goal congruence (expected benefit). The similarities between challenge-related emotions and anxiety stem from the fact that they both entail goal relevance and ego-involvement (Lazarus, 1991). Adopting these theoretical propositions and acknowledging the poor discriminative validity of the CSAI-2, the instrument used in research on directional interpretation of competitive anxiety, Burton and Naylor (1997) believe that defining anxiety as both facilitative and debilitative to performance confounds positive (excitement, challenge) with negative (anxiety) emotional states. This rationale would be impeccable if anxiety and fear were invariably associated with maladaptive behaviour, anxiety was a phenomenologically unitary emotion and an individual's affective state could be characterised by "pure" emotions. As explained earlier, these premises do not hold. It is true that the CSAI-2 may confound challenge-related emotions (e.g., interest, excitement, eagerness) with anxiety (Lane et al., 1999). However, this does not mean that anxiety is invariantly debilitative to performance. On the contrary, it is associated with one of the universally most important behavioural tendencies that permit individual survival and survival of the species: risk assessment. Despite these shortcomings, Burton and Naylor's (1997) observations are most valuable as they indirectly acknowledge the phenomenal diversity of facilitative and debilitative anxiety and recognise the inability of the CSAI-2 to discriminate between facilitative, debilitative, negative and positive affective states.

So, can anxiety be facilitative? The answer to this question depends on how we define anxiety. Anxiety can be facilitative if we defined it as a complex and phenomenologically variable emotional state triggered by the perception of potential threat, accompanied by the arousal of the autonomic nervous system and characterised by behavioural inhibition. It obviously cannot be facilitative if we define it as a unitary emotional state triggered by the perception of potential threat, accompanied by the arousal of the autonomic nervous system and characterised by task-irrelevant ruminative thoughts of failure or absence of coping resources. Neuropsychological and general emotion research indicate that a broader definition of anxiety, that does not circumscribe it to the presence of negative ruminative thoughts and perception of absence of coping resources, needs to be adopted. The virtual ubiquity of fear and anxiety amongst animals and humans confirms its potential functionality. In summary, anxiety can be facilitative and debilitative, it can be an adaptive and "normal" reaction to an event or it can be a dysfunctional and "pathological" state (anxiety disorders). What constellation of factors determines its functionality is yet to be explored.

#### *4.222* ***Facilitative and debilitative competitive anxiety: Current findings***

In the last ten years, Jones and associates have conducted a series of studies aimed at elucidating several issues pertaining to the directional interpretation of competitive anxiety. For this purpose, they used a modified version of the CSAI-2 (Jones & Swain, 1992) which was meant to gauge both intensity and direction of self-confidence and anxiety. Since the validity of a study depends on the instruments used, before analysing the findings that emerged from these investigations it is important to note that the diagnostic and discriminative validity of the CSAI-2 has been recently questioned (Burton & Naylor, 1997; Jones, 1995; Lane et al., 1999). Specifically, there are some doubts about whether emotional states that the CSAI-2 identifies as facilitative anxiety are invariably and truly anxiety states. It is contended that some of the items included in the CSAI-2 describe physiological or psychological states that lend themselves to different interpretations. They can be understood as symptoms of negative debilitating states characterised by avoidance tendencies (fear of failure, negative outcome expectancies) or as symptoms of positive facilitating states indicating preparedness for competition and characterised by a prevalence of approach tendencies (excitement, challenge). In this regard, Lane et al. (1999), using confirmatory factor analysis, observed that at least two items from the cognitive subscale and one item from the somatic subscale of the CSAI-2 showed low factor loadings on the factors they were hypothesised to represent. Most importantly, Martens' (Martens et al., 1990) hypothesised three-dimension model showed poor fit indices in two large samples of over 600 athletes. These results may be interpreted in two ways. Firstly, they suggest that the CSAI-2 may confound anxiety with more positive emotions. Secondly, they suggest that anxiety should be regarded and measured as a complex emotional state encompassing affective states associated with both avoidance and approach behaviour. In order for an emotional state to be categorised as "anxiety", it has to involve the element of perceived threat. If there is no perceived (potential) threat, there is no anxiety. In other words, if there is no fear, there is no anxiety (Figure 2.2). Consequently, the CSAI-2 can be considered to have poor discriminative validity only if it is possible, in total absence of an actual or potential threat, to obtain scores higher than the lowest possible score. To test whether the CSAI-2 discriminates anxiety states from non-anxiety states, it is necessary to analyse the factor loadings of its items on emotion scales such as the DES. Yet, irrespective of whether the CSAI-2 confounds positive emotions with threat-related emotions, it is contended that for the sake of a better understanding of the athletes' reaction to competition and performance prediction, anxiety should be measured as a set of fundamental emotions including both approach and avoidance tendencies.

Returning to the current findings on anxiety direction as measured by the modified version of the CSAI-2, a first study examined temporal patterns of direction of anxiety in a sample of 49 track and field athletes who were tested on four occasions during the pre-competition period (Swain & Jones, 1990). Whilst cognitive and somatic anxiety intensity increased as the competition approached, direction of these two aspects of anxiety did not change. In contrast, self-confidence direction became more positive with the nearing of the contest. The tendency for anxiety direction but not anxiety intensity to remain stable over the week preceding a competition has been also observed among wheelchair sport participants (Campbell & Jones 1995; 1997), soccer players (Wiggins, 1998), swimmers (Nordell & Sime, 1993; Wiggins, 1998) and Tae Kwon Do practitioners (Study 1). This suggests that anxiety direction may be more based on performance expectations and self-confidence (Hardy, 1990; Jones, 1995) than anxiety intensity symptoms. It also indicates that intensity and direction of competitive anxiety as measured by the CSAI-2 may be two separate dimensions of anxiety (Jones, 1995). Most importantly, it supports the contention that anxiety is a phenomenologically complex changeable rather than unitary affective state. Finally, it may be regarded as an indication of the poor psychometric characteristics of the CSAI-2.

State directional interpretation of anxiety has been shown to be positively correlated with self-confidence (Jones, Swain, & Hardy, 1993; Wiggins, 1998), skill level (Jones, Hanton, & Swain, 1994), performance expectations (Jones & Hanton, 1996; Wiggins, 1998), coping skills (Eubank & Collins, 2000), competitiveness (Jones & Swain, 1992) and negatively correlated with anxiety intensity (Jones et al., 1993; Wiggins, 1998). Trait directional interpretation of anxiety appears to be associated with positive and negative affectivity (Jones et el., 1996), skill level (Jones & Swain, 1995; Perry & Williams, 1998), gender (Perry & Williams, 1998), goal orientation (Ntoumanis & Biddle, 1998) and competitive anxiety intensity (Jones et al., 1996; Ntoumanis & Biddle, 1998). The variables of skill level, self-confidence, performance expectations, coping skills and locus of control beliefs are interrelated. They all entail perception of control over the final outcome of the competition and appraisal of the ability to cope with the demands of the competitive situation. Notably, perceived control over behaviour and performance or, in Lazarus' (1999) words, positive secondary appraisal, is the crucial factor that Jones (1995) has posited to determine whether an athlete will experience anxiety as facilitating or impeding performance. Jones' (1995) model of facilitative and debilitative competitive anxiety represents an adaptation of Carver and Scheier's (1988) self-regulation model of test anxiety which hypothesises that favourable goal expectancies are associated with facilitative anxiety, whereas unfavourable goal expectancies are associated with debilitative anxiety. The observed correlations between anxiety direction and self-confidence, skill level, performance expectations, locus of control and performance expectations support Jones' (1995) model and the contention that perceived control over the competitive situation mediates the phenomenal quality of athletes' pre-competitive affective state.

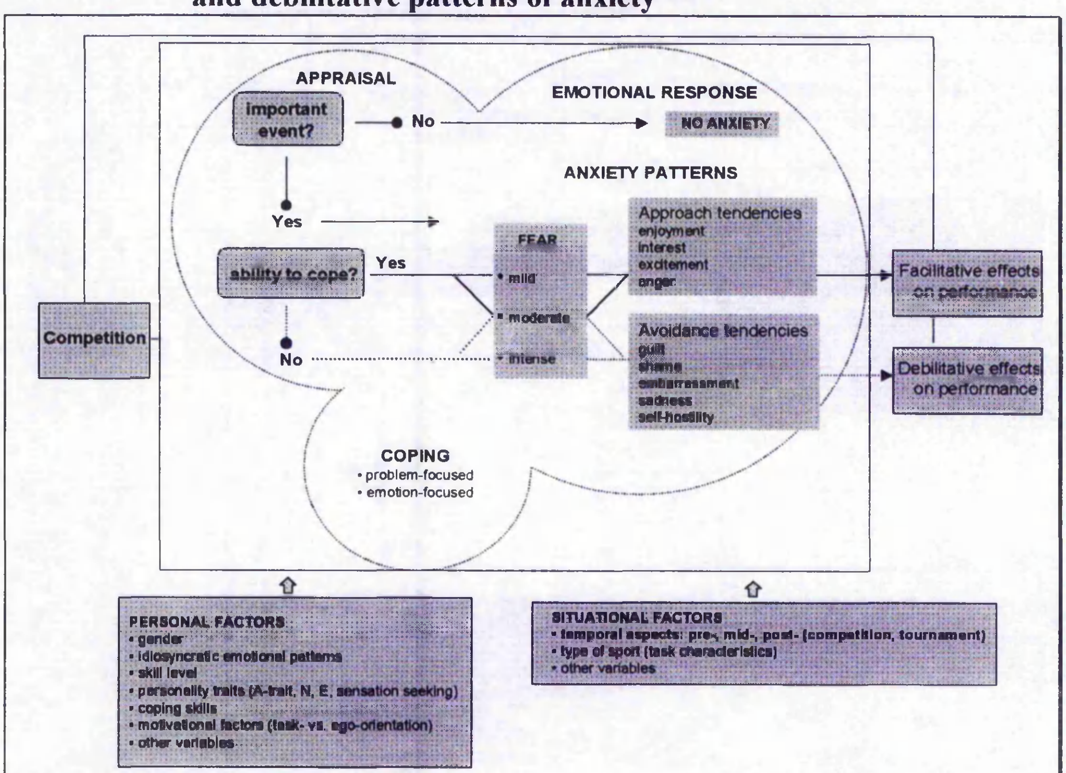
4.2221 *A synthesis and a model*

This final section of the literature review constitutes an attempt to integrate current findings on directional interpretation of competitive anxiety into an interactional model of competitive stress that explains the features and determinants of facilitative and debilitative patterns of anxiety from a DET's perspective (Figure 4.1). Irrespective of the instrument used, research indicates that the level of anxiety experienced by athletes before a competition is on average perceived as facilitative to performance (e.g., Jones & Swain, 1992; Hanin & Syrjä, 1995b; Lee & Hewitt, 1987; Nordell & Sime, 1993; Raglin & Hanin, 1999). This confirms that anxiety can be a functional emotional state that is associated with increased attention and readiness to react to the environmental demands (Gray & McNaughton, 1996; Izard & Youngstrom, 1996). Moreover, if we consider that anxiety is related to perceived importance of an event and indicates an individual's level of motivation (Lazarus, 1999), it is not surprising that a certain level of it is regarded as facilitative to performance. If a situation has no subjective intrinsic value, it cannot trigger anxiety. The presence of anxiety symptoms implies that the individual is ready to invest extra effort in a subjectively meaningful situation involving a potential threat (e.g. social rejection or omission of a financial reward).

As sport and athletic competition are nearly always freely chosen activities (Jackson, 1999), it is legitimate to expect that they will evoke positive emotional states associated with intrinsic interest and/or with expectancies of extrinsic reward attainment (enhanced financial benefit, social status and self-esteem). Sport participation has been associated with the experience of the emotions of joy/enjoyment, fun (Jackson, 1999), interest, excitement, love and pride (Lazarus, 1999). In competitive situations characterised by uncertainty of outcome, especially amongst athletes with an ego orientation (Ntoumanis & Biddle, 1998; Roberts, 1992), fear will be a component of the emotional experience (Figure 4.1). If positive goal attainment expectancies are reasonably high (self-confidence), fear will be accompanied by positive emotions associated with approach behaviour (interest, excitement, enjoyment) and the general emotional state will be facilitative to performance. It is important to note that in these circumstances fear will be of low or moderate intensity, allowing the co-occurrence of positive emotions associated with approach behaviour (Diener, 1999; Gray, 1994; Izard, 1991). Intense fear in a competitive situation is debilitating. It does not permit the presence of other positive affects (Izard & Youngstrom, 1996), it reduces working memory (Hope, Heimberg, & Klein, 1990) and motor co-ordination (Schmidt, 1990) and generates cognitive and perceptual bias (Easterbrook, 1959). In this regard, research has consistently shown a negative correlation between the intensity and direction of the physiological symptoms of anxiety ranging from -0.57 to -0.21 (Edwards & Hardy, 1996; Jones et al., 1993; Maynard, Hemmings, & Warwick-Evans, 1995; Wiggins, 1998). Results pertaining to the relationship between cognitive anxiety intensity and direction are less consistent, with some studies reporting significant negative correlations ranging from -0.75 to -0.10 (Edwards & Hardy, 1996; Maynard et al., 1995; Ntoumanis & Biddle, 1998) and others failing to find a significant relationship (e.g., Jones et al., 1993). However, it is noteworthy that the latter studies examined athletes' reactions to competitions of minor importance. The fact that the correlation between intensity and direction of anxiety is only moderate is due to the potentially adaptive function and complex and variable nature of this emotional state (Figure 2.2), the intricacy of the competitive process (Figure 2.1) and the existence of individual differences in the optimal intensity of arousal (Hanin, 1980).

In summary, a facilitative pattern of anxiety will be phenomenologically characterised by low or moderate levels of fear (Izard & Youngstrom, 1996), the presence of emotions associated with approach behaviour (Hanin, 1999; Izard & Youngstrom, 1996; Jones et al., 1996) and a subjectively optimal intensity of arousal (Figure 4.1). Cognitively, a facilitative pattern of anxiety will involve acceptance of the competitive situation and perception of being able to cope with its demands (Jones, 1995). The optimal self-referenced or relative level of fear and arousal will be determined by the characteristics of the task (Oxendine, 1984; Schmidt, 1990) and by personal factors such as gender (Perry & Williams, 1998), skill level and personality traits (e.g., CTA, sensation-seeking; Larsen & Diener, 1987). The term of self-referenced or relative level of arousal refers to the possibility that individuals use subjective criteria in making intensity judgements (Frijda et al., 1992; Larsen & Diener, 1987). As individuals differ in their base arousal and arousal bandwidths, they may report nominally different levels of optimal arousal that actually refer to the same objective intensity.

**Figure 4.1 Interactional model of stress representing facilitative and debilitative patterns of anxiety**[4.1]




[4.1] This figure represents a simplified model of facilitative and debilitative competitive anxiety. The effects of autonomic arousal on the interpretation of anxiety are not included.

An anxiety state can be debilitative when accompanied by excessively high autonomic arousal (e.g., Raglin & Hanin, 1999; Weinberg & Hunt, 1976) and task-irrelevant interfering thoughts (e.g., Martens et al., 1990, Jones, 1995; Smith, 1993) and when arising from and accompanied by negative goal attainment expectancies (e.g., Carver & Scheier, 1990; Jones, 1995; Marchant et al., 1997). Notably, lack of anxiety can also be considered debilitative if reflecting disinterest in the activity (Eysenck, 1992). From a phenomenological perspective, the most deleterious patterns of anxiety will encompass intense fear or moderate to intense fear coupled with negative emotions associated with avoidance behaviour and negative self-focus (guilt, shame, embarrassment, shyness and sadness). These affective states will be triggered or/accompanied by thoughts of inability to cope with the competition and negative outcome expectations (Jones, 1995; Smith, 1996). They will negatively affect performance by impairing motor co-ordination (Schmidt, 1990), increasing distractibility (Yee & Vaughan, 1996) and self-focus, decreasing attentional focus on the task and by leading to behavioural withdrawal and mental disengagement (Carver & Scheier, 1990; Jones, 1995).

Finally, anxiety patterns encompassing low to moderate fear and emotions associated with approach behaviour that interact so as to produce excessively high levels of autonomic arousal may be also perceived, to a certain extent, as debilitative. It is important to note that autonomic arousal in this pattern of debilitative anxiety will not result exclusively from fear. It may be associated with the presence of other emotional states such as positive excitement or anger. This pattern of debilitative anxiety will be detected on the modified version of the CSAI-2 as debilitative somatic anxiety and will be cognitively characterised by acceptance of the competitive situation, perception of the availability of effective task-relevant behaviour and by extreme approach tendencies (intense anger, strong desire to compete).

It is hypothesised that, besides being determined by primary and secondary appraisal of the competitive situation, the affective elements of anxiety patterns will depend on situational variables such as temporal factors and sport characteristics. Patterns of anxiety before competition can be expected to differ from those during and after competition. The former are exclusively based on the athlete's negative or positive expectations about performance, the latter are mainly triggered by dissatisfaction with the actual performance and, as such, may be more debilitative and unpleasant than those associated with the pre-competition stage (Carver & Scheier, 1990; Jones, 1995).

As the characteristics of a sport determine whether an emotional state will be facilitative or debilitative to performance (Terry, 1995), the frequency and functionality of various anxiety patterns will most certainly vary from sport to sport. For example, facilitative anxiety patterns in open-skilled sports will be characterised by emotional states that do not impede external attentional focus (interest, excitement, low to moderate fear, moderate arousal). Sports like golf, requiring fine motor skills, will be associated with facilitative anxiety patterns characterised by positive emotions accompanied by low arousal. By contrast, the typical facilitative anxiety pattern of contact sports, such as karate and rugby, will encompass the emotions of anger and positive excitement accompanied by high arousal (McGowan & Miller, 1989).

The structural components of anxiety patterns will also depend on personality traits (Cattell, 1972; Humphreys & Revelle, 1986; Izard & Youngstrom, 1996; Sarason, 1984), gender (Perry & Williams, 1998), coping skills (Eubank & Collins, 2000), motivation for participation in sport (Izard, 1972; Gray, 1994; Lazarus, 1993; Roberts, 1992) and idiosyncratic emotional systems associated with the individual's history (Izard, 1991). For example, trait-anxious individuals have been shown to be more distractible (Alting & Markham, 1993) and guilt prone and irritable (Cattell, 1972), less self-confident (Carver & Scheier, 1990), prone to perceiving social interactions and social-evaluative situations as threatening and, therefore, to experiencing shame and embarrassment (Spielberger, 1972). Consequently, high-anxious athletes may exhibit the tendency to experience debilitative patterns of anxiety encompassing the emotions of fear, guilt, embarrassment, inward hostility and shame. Other personality traits that may determine competitive anxiety patterns are neuroticism, extraversion and sensation seeking. Thus, it is hypothesised that individuals high in neuroticism will tend to experience a variety of negative emotions (e.g., fear, shame, guilt, sadness, hostility) with greater frequency and intensity than less neurotic individuals (Watson & Clark, 1992). In contrast, individuals high in extraversion will tend to experience positive affects, will be enthusiastic and self-confident (Costa & McCrae, 1992) and, consequently, prone to experiencing facilitative patterns of anxiety.

Gender differences in anxiety patterns may be also expected. In fact, Perry and Williams (1998) observed that, irrespective of anxiety intensity and self-confidence, male tennis players tend to report a more facilitative interpretation of their anxiety symptoms than do female players. Also, test anxiety research has shown that men exhibit more facilitating anxiety than women, whereas women exhibit more debilitating anxiety than men (Couch, Garber, & Turner, 1983). Men in test situations show increased arousal, vigilance and enthusiasm, while women experience increases in worry, fear, anger and lowering of self-esteem (Lewis & College, 1987).

As explained earlier, control over the situation is one of the most important determinants of the direction of competitive anxiety. Individuals who possess situation-relevant coping skills and are aware of them will almost certainly experience facilitative patterns of anxiety. By contrast, individuals who perceive unavailability of task-relevant behaviours will be affected by debilitative emotional states. In this regard, Eubank and Collins (2000) assessed 22 youth sport participants in two training and two competitive environments on intensity and direction of competitive anxiety and dispositional coping strategies. They showed that facilitators appeared to be able to use problem- and emotion-focused coping in response to stress maintaining positive focus and self-statement, whereas debilitators appeared limited in their use of coping strategies. Debilitators seemed highly concerned with what was going on around them rather than the actual competition, with significant others being a major concern.

The reasons why an individual participates in sport competitions will greatly influence the patterns of anxiety that he or she will experience during the various stages of the competition. Highly ego-oriented athletes, who see athletic competition as a means to enhance their self-esteem or social status (Duda, 1989), will in a situation characterised by uncertainty of outcome or certainty of failure experience debilitative anxiety patterns associated with the emotions of guilt, shame, self-hostility and sadness. Task-oriented individuals, who value mastery and co-operation in sport and are more interested in the activity itself, will be less likely to develop debilitative anxiety patterns.

Finally, the differential emotions theory postulates that personal history or experience will regulate the development of certain patterns of emotions (Izard & Youngstrom, 1996). For instance, if attempts to express anger are consistently followed by punishment or rejection by significant others, anger may become associated with fear and sadness to form a pattern of emotions. The emotion systems in the pattern are causally linked so that the activation of one of them increases the probability that the others in the set will also activate. Consequently, an athlete with an anger-fear-sadness pattern of emotions will avoid being aggressive and so not make constructive use of the emotion of anger because of the existing link between anger and the debilitative emotions of sadness and fear. Additionally, in anger-provoking situations (e.g., provocations, unfavourable judging) the athlete will tend to experience fear and sadness, which may negatively affect his/her performance.

## 4.3 Study 1a: Emotions and personality traits as predictors of facilitative and debilitative patterns of competitive anxiety

### 4.31 Introduction and purpose of the study

The scope of this study was to test some of the propositions presented in the interactional model of stress regarding the directional interpretation of competitive anxiety (Figure 4.1). It is suggested that anxiety is a complex changeable emotional state encompassing the emotion of fear and one or more other fundamental emotions. This implies that anxiety states may differ in intensity and phenomenal quality. Whether a pattern of anxiety will be facilitative or debilitative depends on various situational and personality variables defining the optimality of certain emotional states for the performance on a certain task. In general, it is hypothesised that fear of low or moderate intensity accompanied by positive emotions and emotions associated with approach tendencies will facilitate performance. By contrast, moderate to high fear accompanied by emotions associated with avoidance tendencies will debilitate performance. Jones et al. (1996) have shown that individuals with a predisposition to experience negative affects are prone to experiencing more debilitative patterns and higher levels of anxiety, whereas individuals with a high positive affectivity trait tend to experience facilitative patterns of anxiety. However, to date, the relationship between competitive state anxiety direction and other pre-competitive emotions has not been examined.

Additionally, the temporal patterning of anxiety direction has been somewhat neglected. This is probably due to the fact that most studies did not detect a significant temporal change on cognitive and somatic anxiety direction (Jones et al., 1993; Wiggins, 1998). In contrast to earlier findings, Eubank and Collins (2000) have recently observed significant temporal changes in anxiety direction amongst athletes prone to debilitative anxiety, with anxiety direction becoming more negative before a competitive event as compared to training sessions. Yet, no temporal changes were found amongst athletes with a facilitative interpretation of anxiety. This indicates that research should attempt to identify the situational and personal determinants of anxiety direction from a time-based process perspective. In other words, competitive stress is a complex process that changes over time and, as such, needs to be studied longitudinally.

One of the theoretical tenets of the interactional model of competitive stress is that personality traits moderate cognitive appraisal and emotional response to competition. Several studies have found strong and systematic associations between personality and emotional experience. For example, the tendency to experience negative affects is substantially correlated with neuroticism, whereas the tendency to experience positive affects is associated with extraversion (Costa & McCrae, 1980; Tellegen, 1985; Watson & Clark, 1992). Consequently, it is possible that individuals high in neuroticism and low in extraversion will tend to exhibit a debilitative pattern of anxiety. Conversely, individuals high in extraversion and low in neuroticism might show a tendency to experience facilitative patterns of anxiety or very little anxiety. While there are no explicit empirical findings on the relationship between anxiety direction and the personality traits of neuroticism and extraversion, there is substantial empirical support for the relationship between neuroticism, anxiety intensity and other negative emotions (e.g., Allik & Realo, 1997; Costa & McCrae, 1992). In the realm of sport, competitive anxiety intensity has been related to trait anxiety (e.g., Martens et al., 1990; Scanlan, 1978), self-handicapping, neuroticism, sport-trait confidence and the control and commitment components of hardiness (Prapavessis & Grove, 1994).

One of the most significant personality traits associated with state anxiety is, obviously, trait anxiety. Competitive trait anxiety (CTA) is a personality disposition that reflects an individual's tendency to perceive threat in situations involving sport competition. It is positively correlated with fear of failure, fear of evaluation (Passer, 1983), preferences for avoiding competitions, negative emotional reactions to poor performances and negatively correlated with self-esteem (Lewthwaite & Scanlan, 1989). High-anxious individuals are prone to feelings of fear, anger, guilt, shame, sadness, fatigue and shyness, most of the hypothesised affective components of state anxiety as conceptualised by the DET (Allik & Realo, 1997; Cattell, 1972; Izard, 1972). These findings indicate that CTA is likely to be a good predictor of anxiety direction, with high-anxious individuals experiencing more debilitative patterns of anxiety than low-anxious individuals.

In summary, the general purpose of the present study was to examine some of the determinants of state cognitive and somatic anxiety direction from a process-oriented perspective. Specifically, the mediating effects of the personality traits of neuroticism, extraversion and CTA on levels, temporal patterns and emotional constituents of state competitive anxiety direction were analysed. Another main purpose of this study was to examine the phenomenological characteristics of debilitative and facilitative patterns of anxiety in male Tae Kwon Do practitioners. It was hypothesised that anxiety direction would show a positive correlation with emotions associated with approach action tendencies, including anger-like emotional states, and a negative correlation with emotions related to avoidance action tendencies. Moreover, it was hypothesised that there would be a moderate negative relationship between both cognitive and somatic anxiety intensity and direction. In order to test these hypotheses, a mixed idiographic/nomothetic design (Epstein, 1982) in which many subjects are assessed on multiple occasions was employed. This type of design permits the analysis of mediators at both intra- and interindividual levels (Snijders & Bosker, 1999). Specifically, in the present study it permitted within- and between-subjects regressions between competitive anxiety direction, competitive anxiety intensity and other competitive emotions.

## 4.32 Method

### *4.321 Design*

This analysis of patterns of competitive anxiety is based on data collected in the previous study (Chapter 3). Since it has been shown that retrospective assessments of pre-competitive emotional states were affected by memory distortions, only momentary assessments were analysed in the present study. As there was no significant difference between the ESM and RM group, their data were combined into a single data pool, which was then submitted to various statistical analyses. The methodology employed has been already detailed in the previous chapter (pp. 65-71), so the remainder of this method section will only briefly describe the participants' characteristics, instruments and procedures that are relevant to the purposes of the present investigation.

### *4.322 Participants*

Forty-four male Tae Kwon Do practitioners, who had been randomised into a ESM and a RM group, were assessed on momentary pre-competitive emotions on several occasions during the week preceding a major competition. The mean age of the participants was 25.34 years (S.D. = 6.08). They had a mean training experience of 6.03 years (S.D.=2.72) and their mean perceived current performance was 3.5 (S.D. = 0.62) on a 5-point Likert scale ranging from 1 *(extremely poor)* to 5 *(excellent)*.

#### 4.323 ***Instrumentation***

*4.3231 Demographic Questionnaire (DQ)*

Demographic information was obtained through a short questionnaire assessing age, training experience, level of participation, perceived current performance, expected future performance and the motives for taking part in martial arts (Appendix 4).

*4.3232 The SCAT*

The SCAT, Form A (Martens et al., 1990) was used to measure CTA (Appendix 5). The SCAT measures an individual's tendency to perceive competitive situations as threatening and to respond to these situations with elevated state anxiety. It consists of 15 items including ten anxiety-related statements and five filler items. Participants are asked to indicate how they generally feel when they compete in sports and games. They respond to each item using a three-point ordinal scale (hardly ever, sometimes and often). Total scores on the SCAT range from ten (low CTA) to 30 (high CTA). The SCAT is used extensively in sport psychology research, and has satisfactory test-retest reliability ($r = 0.61$ to $0.95$), and internal consistency ($alpha = 0.95$ to $0.97$) (Martens et al., 1990).

*4.3233 The NEO PI-R, Form S.*

The NEO PI-R, Form S (Appendix 6) is a self-report measure of the five major dimensions, or domains of personality (neuroticism, extraversion, openness, agreeableness and conscientiousness). The five factors represent the most basic dimensions underlying the traits identified in both natural languages and psychological questionnaires. Each of the five factors is represented by six specific traits or facets. The inventory consists of 240 items answered on a 5-point scale from *strongly disagree* to *strongly agree*. Internal consistency for the personality factors ranged from 0.56 to 0.81 in self-reports and from 0.60 to 0.90 in observer ratings (Costa & McCrae, 1992). Data on validity of the facets and factors are summarised in the manual (Costa & McCrae, 1992). Only data on the dimensions of neuroticism and extraversion were examined in the present study.

*4.3234 The PNAQ*

The PNAQ is a version of the Well-Being Questionnaire (WBQ -Gauvin & Szabo, 1992), which has been modified to suit the purposes of the current study. The questionnaire requires the participants to rate on a seven-point scale, ranging from one (*not at all)* to 7 (*extremely much)*, the extent to which they are experiencing six positive and eight negative emotional states. Earlier research on a shorter version of the questionnaire has reported that these adjectives are representative of the dimensions of positive affectivity and negative affectivity and have high internal consistency (alpha = 0.90) (Diener & Emmons, 1985).

*4.3235 Modified version of the CSAI-2*

The CSAI-2 (Martens et al., 1990) was used to measure the cognitive and somatic components of competitive anxiety. The response scale asked the participants to rate the intensity with which each symptom was being experienced on a scale from 1 *(not at all)* to 4 *(very much so)*. Thus, possible intensity scores on each subscale ranged from 9 to 36.

In addition, a "direction" scale developed by Swain and Jones (1992) was included. Participants rated the degree to which the experienced intensity of each symptom was facilitative or debilitative to subsequent performance on a scale from –3 *(very debilitative)* to +3 *(very facilitative)*, with the midpoint 0 representing *unimportant*. Thus, possible direction scores on each subscale ranged from –27 to +27. Internal reliability coefficients of this scale were reported as 0.83 for cognitive anxiety and 0.72 for somatic anxiety (Jones, 1995).

*4.3236 Pagers*

To deliver the random signals (Appendix 10) for questionnaire completion to the ESM group, 22 Motorola (model: PageOne Minicall) pagers were used. Calls were performed by means of a personal computer and a modem using the AvantPager 32 (version 4.00) software, so that the possibility of accidental errors in dialling the pager numbers was ruled out.

***4.324 <u>Procedure</u>***

After a regular training session, the participants were briefed about the procedures of the study and informed consent was obtained. They then completed the DQ and the SCAT. The participants were given a copy of the NEO PI-R to complete in their spare time, which was to be returned to the experimenter in a provided self-addressed envelope before the competition. Subsequently, 44 participants were randomised into an ESM and a RM group.

*4.3241 ESM group*

The 22 participants assigned to this group were given a pager and were famaliarised with its use. They were told that they would be paged three random times a day over a period of one week before the competitive event. The day was divided into three thirds between 9 a.m. and 9 p.m. Within each of these periods one randomised pager signal was sent with a minimum of 30-minute delay between the signals. A booklet containing the PNAQ and the CSAI-2 to last for one week plus the day of the competition, was given to each participant (Appendix 9). For all questionnaires a standard "right now" and "at this very moment" instructional set was used. Whenever the pager sounded, participants completed the above set of questionnaires indicating their momentary emotional states. Participants were told that if the pager was accidentally turned off or malfunctioned, or if they were unable to answer within 30 minutes of the signal, they should not complete the questionnaires for that sampling. Compliance with the procedure was very good. The participants completed an average of 92.6% of all possible responses within the time limit, for an average of 19.45 out of 21 valid responses per participant. The average time delay between the signal from the pager and the actual completion of the questionnaires was 10.41 minutes (S.D.= 8.93). On the day of the competition, the ESM group was assessed only once. They were instructed to complete the set of questionnaires approximately one hour before competing and were asked to return the booklet to the researcher.

*4.3242 RM group*

The 22 participants in this group were given four sets of the same questionnaires as provided to the ESM group (Appendix 8). They completed a set of questionnaires seven days, four days, one day and one hour before the competition indicating their momentary emotional states. To assure adherence to the experimental procedure, each participant was reminded to complete a set of questionnaires on the agreed days. The participants also recorded the date and time of assessment.

### 4.33 Results

As there was no significant difference between the two experimental groups in personality, demographic or affective variables, their data were analysed conjointly. Analysis of data was performed in four stages. The first stage consisted in the reduction of the 14 affective variables measured by the PNAQ to a smaller number of affective factors. Principal component analyses with oblique (oblim) rotation on both mean scores aggregated per subject and within-subject $z$ scores were performed. The obtained latent affective factors were subsequently included as predictors in multilevel linear models of cognitive anxiety and somatic anxiety direction.

In the second stage of the data analysis correlations within the predictors and between the predictors and criteria to be entered in the multilevel linear model of anxiety direction were computed. Next, construction and testing of multilevel linear models of cognitive and somatic anxiety direction were performed. The fourth and last stage of the data analysis tested patterns of debilitative and facilitative anxiety on the day of the competition. For this purpose, differences in intensity of affective states and personality traits between individuals with facilitating and debilitating patterns of anxiety were examined. Finally, correlational analysis and multiple regression analyses were used to examine the components and predictors of anxiety direction one hour before the competition.

#### *4.331 <u>Principal component analyses of the PNAQ</u>*

In order to define a multilevel linear model of anxiety direction, it was necessary to reduce the 14 emotional states measured by the PNAQ to a subset of factors. This procedure was meant to tackle multicollinearity and shrinkage problems usually found in regression models with a high number of correlated predictors (Field, 2000). It has been shown that factor structures of state measures of emotions are influenced by the peculiarity of the sample and the characteristics of the situation in which the assessment is carried out (Cattell, 1972; Field, 2000; Izard, 1972). For this reason, instead of simply calculating the total score for the predefined scales of positive (PA) and negative affectivity (NA), the intra- and interindividual factorial structures of the PNAQ were examined.

Principal component analyses were performed on both mean affective scores averaged per subject and within-subject $z$ scores. To reiterate, the main scope of these analyses was to reduce the set of 14 intercorrelated emotional states measured by the PNAQ to a subset of factors, the ultimate purpose being to avoid multicollinearity and shrinkage problems. Another scope of this analysis was to identify the differences, if any, between factor structures of affect reflecting individual dispositions and those reflecting intraindividual state response changes. For example, Cattell (1972) using R- (factor analysis of between-subject variations), dR- (factor analysis of within-subject variations) and P-techniques (factor analysis of single-subject variation) found that the factor pattern of anxiety as a trait differed from the factor pattern of anxiety as a state. Since multilevel linear modelling permits the simultaneous analysis of intra- and inter-individual sources of variation, differences between factor structures of dispositional affect and state affect needed to be identified. These were subsequently modelled in the multilevel regression equation. Finally, given that affective factors are usually interrelated (Watson & Clark, 1992), principal component analyses with oblimin oblique factor rotations were performed. It should be noted that because the principal component analysis of average scores was performed on data from only 44 participants, the obtained factorial structure of pre-competitive affects may not be representative of a general population of male martial artists and, consequently, must in this regard be interpreted with caution.

*4.3311 Principal component analysis of mean scores aggregated per subject*

Principal component analysis with oblimin oblique rotation was performed on the means scores of the 14 items of the PNAQ aggregated per subject (Appendix 17). Averages were computed on sets of four to 21 data points (assessments) per subject. Only factors with eigenvalues greater than 1 were retained (Kaiser, 1960). Table 4.1 reports the rotated pattern matrix. Three oblique factors accounting for 71.0% of the total variance emerged from the analysis. These were Positive Affect accounting for 31.00% of the variance, an Anger-Depression factor accounting for 19.82% of the variance and a Tension-Guilt factor explaining 20.18% of the total variance. Low negative correlations were observed between Positive Affect and the other two factors. A positive correlation of 0.36 emerged between the factors of Tension-Guilt and Anger-Depression. Notably, Tension-Guilt encompassed emotional states that are deemed to be components of anxiety patterns (e.g., guilt, irritation, worry and energetic).

**Table 4.1 Rotated factor pattern matrix for average scores on the PNAQ**[4.2]

| | Oblique factors | | |
|---|---|---|---|
| Items | Positive affect | Anger-Depression | Tension-Guilt |
| Pleased | **0.91** | -0.00 | -0.02 |
| Happy | **0.90** | 0.14 | -0.13 |
| Joyful | **0.86** | -0.11 | -0.09 |
| Enjoyment/fun | **0.82** | -0.14 | -0.12 |
| Energetic | **0.77** | -0.10 | ***0.40*** |
| Relaxed | **0.67** | 0.23 | ***-0.54*** |
| Depressed | -0.09 | **0.95** | -0.13 |
| Unhappy | -0.01 | **0.83** | -0.03 |
| Irritated | 0.04 | **0.64** | ***0.41*** |
| Frustrated | -0.16 | **0.52** | ***0.48*** |
| Angry | 0.03 | **0.40** | 0.24 |
| Worried | -0.18 | 0.03 | **0.80** |
| Stressed | -0.17 | 0.13 | **0.79** |
| Guilty | 0.15 | 0.14 | **0.55** |

*4.3312 Principal component analysis of within-subject z scores*

Principal component analysis with oblimin oblique rotation was performed on within-subject *z* scores on the 14 items of the PNAQ (Appendix 18). Only factors with eigenvalues greater than 1 were retained (Kaiser, 1960). Table 4.2 reports the rotated pattern matrix. Three affective factors accounting for 53.28% of the total variance were retained. These were Positive Affect accounting for 23.83% of the variance, an Anger-Depression-Guilt factor accounting for 18.55% of the variance and a Tension-Vigour factor explaining 10.71% of the total variance. A low negative correlation was obtained between Positive Affect and the Tension-Vigour, whereas a low positive correlation of 0.12 was observed between Tension-Vigour and Anger-Depression-Guilt. Finally, a negative correlation of -0.36 emerged between Positive Affect and Anger-Depression-Guilt. Unlike the previous analysis, tension had a more positive connotation and instead

[4.2] Items' highest loadings are in bold. Items' second highest loadings of .40 and larger are in bold italics.

of being associated with the negative emotions of guilt and irritation, it formed an oblique factor with the item "energetic".

**Table 4.2 Rotated factor pattern matrix for within-subject z scores on the PNAQ[4.3]**

| | Oblique factors | | |
|---|---|---|---|
| Items | Positive affect | Anger-Depression-Guilt | Tension-Vigour |
| Pleased | **0.76** | -0.03 | -0.03 |
| Happy | **0.79** | -0.10 | -0.03 |
| Joyful | **0.74** | -0.13 | 0.08 |
| Enjoyment/fun | **0.78** | 0.02 | 0.06 |
| Energetic | ***0.52*** | -0.08 | **0.58** |
| Relaxed | **0.66** | 0.10 | -0.37 |
| Depressed | -0.08 | **0.68** | -0.08 |
| Unhappy | -0.15 | **0.65** | -0.02 |
| Irritated | 0.15 | **0.66** | 0.30 |
| Frustrated | -0.08 | **0.59** | 0.23 |
| Angry | -0.08 | **0.52** | 0.06 |
| Worried | -0.17 | 0.06 | **0.71** |
| Stressed | -0.14 | ***0.42*** | **0.53** |
| Guilty | 0.12 | **0.49** | 0.15 |

A Positive Affect factor encompassing the items "pleased", "happy", "joyful", "enjoyment/fun" and "relaxed", an Anger-Depression factor composed by the items "depressed", "unhappy", "irritated", "frustrated" and "angry" and a Tension factor defined by the items "worried" and "stressed" emerged from both principal component analyses. In contrast, the items "energetic" and "guilty" behaved differently in the two analyses. At interindividual level, the item "energetic" had the highest loading on the Positive Affect factor, whereas at intraindividual level it had the highest factor loading on a Tension-Vigour factor. "Guilty" loaded on the Tension-Guilt factor in the first analysis, but loaded

[4.3] Items' highest loadings are in bold. Items' second highest loadings of .40 and larger are in bold italics.

on the Anger-Depression factor in the second analysis. Considering these results, a Positive Affect scale (PAS), an Anger-Depression scale (ADS) and a Tension scale (TS) represented by the mean ratings of their constituent items were formed. The items "energetic" and "guilt" were treated as separate scales. The internal consistency was 0.89 for PAS, 0.80 for ADS and 0.74 for TS.

#### *4.332* ***Correlations between predictors of anxiety direction and between anxiety direction and its predictors***

Correlational analysis was performed to determine the nature of the associations between personality traits, anxiety direction and affective factors. Correlations were computed on mean scores aggregated per subject (Table 4.3) and on within-subject $z$ scores (Table 4.4). A significant positive correlation between cognitive and somatic anxiety direction was obtained in both analyses. Notably, a higher effect size was observed on aggregated scores. CTA was significantly correlated to all affective variables, with the exception of "guilt" and "energetic". Neuroticism was negatively related to somatic anxiety direction and positively related to tension. No significant correlation emerged between extraversion and the other variables. Significant negative correlations were observed in aggregated scores between cognitive anxiety direction and cognitive and somatic anxiety intensity, tension and CTA. In contrast, cognitive anxiety direction was positively correlated with positive affects. Somatic anxiety direction was negatively related to somatic anxiety intensity, cognitive anxiety intensity and tension and positively correlated to positive affect. Similar correlational patterns emerged from the analysis performed on within-subject $z$ scores (Table 4.4).

**Table 4.3 Correlations between personality traits and mean scores of anxiety direction and intensity and affective factors aggregated per subject (N=44)**

| Variable | SCAT | NEURO | EXTRA | CAD | SAD | CAI | SAI | TS | PAS | ADS | GUILT | E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SCAT | 1.00 | | | | | | | | | | | |
| NEURO | *0.35 | 1.00 | | | | | | | | | | |
| EXTRA | -0.02 | -0.20 | 1.00 | | | | | | | | | |
| CAD | **-0.52 | -0.26 | 0.22 | 1.00 | | | | | | | | |
| SAD | **-0.51 | **-0.45 | 0.03 | **0.78 | 1.00 | | | | | | | |
| CAI | **0.53 | 0.26 | -0.20 | **-0.61 | **-0.49 | 1.00 | | | | | | |
| SAI | **0.62 | 0.22 | -0.05 | **-0.41 | **-0.43 | **0.62 | 1.00 | | | | | |
| TS | **0.53 | **0.43 | -0.20 | **-0.52 | **-0.50 | **0.47 | **0.50 | 1.00 | | | | |
| PAS | *0.38 | -0.28 | 0.28 | **0.49 | **0.44 | -0.24 | *-0.33 | **-0.49 | 1.00 | | | |
| ADS | *0.32 | 0.21 | 0.04 | -0.27 | -0.24 | 0.10 | 0.24 | **0.62 | *-0.31 | 1.00 | | |
| GUILT | 0.22 | 0.19 | 0.29 | -0.14 | -0.27 | 0.13 | 0.16 | *0.36 | -0.14 | **0.39 | 1.00 | |
| E | 0.22 | -0.21 | 0.21 | 0.03 | 0.01 | 0.22 | 0.12 | -0.05 | **0.53 | -0.02 | 0.11 | 1.00 |

Legend:

SCAT = Sport Competition Anxiety Test; NEURO = Neuroticism; EXTRA = Extraversion; CAD = cognitive anxiety direction; SAD = somatic anxiety direction; CAI = cognitive anxiety intensity; SAI = somatic anxiety intensity; TS = tension scale; PAS = positive affect scale; ADS = anger-depression scale; E = energetic; * = <0.05; **= <0.01

**Table 4.4** **Correlations between within-subject z scores of anxiety direction and intensity and affective factors (536 observations; minimum effective N=44)**

| Variable | CAD | SAD | CAI | SAI | TS | PAS | ADS | GUILT | E |
|---|---|---|---|---|---|---|---|---|---|
| CAD | 1.00 | | | | | | | | |
| SAD | *_**0.35**_ | 1.00 | | | | | | | |
| CAI | *_**-0.33**_ | _**-0.16**_ | 1.00 | | | | | | |
| SAI | _**-0.25**_ | **_**-0.53**_ | *_**0.35**_ | 1.00 | | | | | |
| TS | _**-0.25**_ | _**-0.24**_ | *_**0.35**_ | **_**0.42**_ | 1.00 | | | | |
| PAS | _**0.22**_ | *_**0.30**_ | _**-0.16**_ | _**-0.25**_ | **_**-0.40**_ | 1.00 | | | |
| ADS | _**-0.19**_ | _**-0.25**_ | _**0.19**_ | *_**0.29**_ | **_**0.52**_ | **_**-0.43**_ | 1.00 | | |
| GUILT | -0.05 | 0.04 | 0.06 | 0.04 | _**0.12**_ | -0.08 | _**0.17**_ | 1.00 | |
| E | _**0.09**_ | 0.08 | 0.08 | 0.07 | _**0.09**_ | *_**0.29**_ | -0.02 | -0.04 | 1.00 |

Legend:

CAD = cognitive anxiety direction; SAD = somatic anxiety direction; CAI = cognitive anxiety intensity; SAI = somatic anxiety intensity; TS = tension scale; PAS = positive affect scale; ADS = anger-depression scale; E = energetic; * = <0.05; **= <0.01. The level of significance refers to a minimum effective N of 44. Coefficients of correlations that are significant at a 0.05 level with a maximum effective N of 536 are denoted in bold italics.

### *4.333 Multilevel linear models of pre-competitive anxiety direction*

A multilevel or hierarchical linear model (Goldstein, 1987; Snijders & Bosker, 1999) of cognitive anxiety direction was defined, using the program MLWin 1.1 (Rashbash, Browne, Healy, Cameron & Charlton, 2000). The multilevel liner model is a variant of multiple regression for data sets with a hierarchical structure. The main difference between the two statistical models is in the number of error terms included in the equation, with the single-level multiple regression containing one error term and the multilevel model containing one error term per level of variability (hierarchy). Ignoring the hierarchical structure of data by application of aggregation techniques (e.g., mean scores per subject) may create serious problems, some of which are "shift of meaning" and ecological fallacy (Robinson, 1950). Disagreggation of hierarchically structured data is associated with increased risk of committing type I errors if examining between-group or between-subject differences. Also, disagreggation of data may lead to unnecessary conservative statistical tests if studying within-group or within subject differences. These problems are discussed in detail by Snijders and Bosker (1999).

Multilevel linear models are particularly useful for the analysis of longitudinal data. They allow for missing observations and, unlike time series analysis, do not require the observations to be equally spaced in time. Estimates for the parameters are based on the available observations, with the missing observations assumed to be missing at random. Finally, multilevel models allow for a flexible specification of the dependency among the measurements within the same subject (Snijders & Bosker, 1999).

In the present study, the data set comprised one or more daily observations nested within days within subjects. These three levels are referred to as beep level, day level and person level. Multilevel linear models of cognitive and somatic direction, in which participant and day of measurement were the two main sources of dependency among measurements, were defined. These sources of dependency were modelled in the multilevel equation by estimating a beep-level, a day-level and a person-level variance.

A multilevel linear model of cognitive anxiety direction (CAD) encompassing six predictors at beep-level, one predictor at day-level and three predictors at person-level was constructed. The predictors at beep-level were cognitive anxiety intensity (CAI), somatic anxiety intensity (SAI), positive affects (PAS), anger-depression (ADS), the items "guilt" (G) and "energetic" (E). Tension was excluded from the model due to its substantial correlations with CAI and SAI on both within-subject *z* scores and aggregated scores (Tables 4.3 and 4.4). Day of study or proximity to competition (DAY) represented the only predictor at day level. Finally, CTA (SCAT), neuroticism (NEURO) and extraversion (EXTRA) were included in the equation as person-level predictors. The relationship between cognitive anxiety direction and the beep- and day-level predictors was modelled for the *i*-th person as follows:

$$(\text{CAD})_{ijt} = \beta_{0i} + \beta_1(\text{CAI})_{ijt} + \beta_2(\text{SAI})_{ijt} + \beta_3(\text{PAS})_{ijt} + \beta_4(\text{ADS})_{ijt} + \beta_5(\text{G})_{ijt} + \beta_6(\text{E})_{ijt} + \\ + \beta_{7i}(\text{DAY})_{jt} + v_{jt} + \varepsilon_{ijt},$$

where $(\text{CAD})_{ijt}$ is the cognitive anxiety direction of person $i$ at the $t$-th beep of day $j$. The intercept of person $i$ is denoted by $\beta_{0i}$. The regression coefficients of the affective predictors on CAD are denoted by $\beta_{1...6}$. The symbol $\varepsilon_{ij}$ represents the random effect or error term at beep level. It is normally distributed and has mean zero and beep-level variance $\sigma_1^2$. $\beta_{7i}$ is the regression coefficient of proximity of competition on CAD, which was allowed to vary at person-level in order to account for potential moderating effects of personality traits on changes in competitive anxiety direction associated with proximity to competition. As significant Time by CTA interaction effects on state anxiety intensity had been observed in earlier studies (e.g., Donzelli et al., 1990; Huband & McKelvie, 1986), it was hypothesised that a similar effect could also emerge for anxiety direction. Finally, $v_{jt}$ represents the normally distributed residual variation among the daily averages of CAD. This term has mean zero and day-level variance $\sigma_2^2$.

The person-level intercept $\beta_{0i}$ denotes the effect of personal characteristics on the average CAD of the person $i$-th. It can be interpreted as the average CAD value of a person $i$ when beep- and day-level predictors are held constant. The variation of the individual intercepts was defined as a linear function of CTA (SCAT), neuroticism (NEURO) and extraversion (EXTRA) by the following equation

$$\beta_{0i} = \beta_{00} + \beta_{01}(\text{SCAT})_i + \beta_{02}(\text{NEURO})_i + \beta_{03}(\text{EXTRA})_i + v_i,$$

where $\beta_{00}$ is the overall intercept (estimated marginal grand mean) and $v_i$ is the normally distributed error term at person-level with mean zero and person-level variance $\sigma_3^2$.

To test the moderating effects of personality factors on changes in cognitive anxiety direction attributed to the time variable of proximity to competition, variables representing the interaction between proximity to competition and personality traits were included in the beep- and day-level model. The effect of proximity to competition was allowed to vary as a function of CTA, neuroticism and extraversion. For this purpose, the three cross-level interaction terms of $\beta_8(\text{SCAT})_i(\text{DAY})_{ij}$, $\beta_9(\text{NEURO})_i(\text{DAY})_{ij}$ and $\beta_{10}(\text{EXTRA})_i(\text{DAY})_{ij}$ were added to the model.

The model of somatic anxiety direction included all the predictors entered in the model of cognitive anxiety direction plus a beep-level quadratic term of somatic anxiety intensity denoted by $\beta_2(\text{QSAI})_{ijt}$, accounting for a possible curvilinear relationship between intensity and direction of somatic anxiety. The full model of somatic anxiety direction was defined as follows:

$$(\text{SAD})_{ijt} = \beta_{0i} + \beta_1(\text{SAI})_{ijt} + \beta_2(\text{QSAI})_{ijt} + \beta_3(\text{CAI})_{ijt} + \beta_4(\text{PAS})_{ijt} + \beta_5(\text{ADS})_{ijt} + \beta_6(\text{G})_{ijt} +$$
$$+ \beta_7(\text{E})_{ijt} + \beta_{8i}(\text{DAY})_{jt} + \beta_9(\text{SCAT})_i(\text{DAY})_{ij} + \beta_{10}(\text{NEURO})_i(\text{DAY})_i +$$
$$+ \beta_{11}(\text{EXTRA})_i(\text{DAY})_{ij} + v_{jt} + \varepsilon_{ijt},$$

where

$$\beta_{0i} = \beta_{00} + \beta_{01}(\text{SCAT})_i + \beta_{02}(\text{NEURO})_i + \beta_{03}(\text{EXTRA})_i + v_i,$$

All the predictors at beep- and person-level were standardised. The time variable "DAY" denoting the "day of the study" was centred and assumed values from -3.5 to 3.5. Day 3.5 corresponded to the day of the competition. This was done to reduce the chances of numerical errors in the IGLS (Iterative Generalised Least Square) estimation method of model parameters (Rashbash et al., 2000), which was employed in the present analysis. Thirty-six observations with missing data on any of the predictors were deleted. Additionally, four outlying observations were identified using the procedures described by Rashbash et al. (2000) and were excluded from the models. This resulted in the reduction of a total of 572 observations to 531 observations. Significance of the regression coefficients was established by dividing the estimated effect by its standard error. This ratio is approximately normally distributed (Snijders & Bosker, 1999). Two-tailed tests were used. The likelihood ratio test (Bryk & Raudenbush, 1992) was employed to test the significance of the variances at each level. For this purpose, one-tailed tests were used and an alpha level of 0.05 was adopted (van Eck et al, 1998). The amount of variance in anxiety direction explained by the models was established by calculating the proportional reduction of error ($R^2$) for predicting an individual score on anxiety direction scales at beep level using the method described by Snijders & Bosker (1999) (Appendix 19).

**Table 4.5 Multilevel model estimates for cognitive anxiety direction**

| | Variable | β | SE β | Z | |
|---|---|---|---|---|---|
| Intercept | | 2.89 | 1.11 | 2.60 | ** |
| BEEP LEVEL | Cognitive anxiety intensity (CAI) | -3.62 | 0.39 | -9.28 | ** |
| | Somatic anxiety intensity (SAI) | -0.32 | 0.29 | -1.08 | |
| | Positive affect (PAS) | 1.00 | 0.34 | 2.93 | ** |
| | Anger-depression (ADS) | -0.03 | 0.28 | -0.11 | |
| | Guilt (G) | -0.10 | 0.23 | -0.42 | |
| | Energetic (E) | 0.19 | 0.27 | 0.70 | |
| DAY LEVEL | Day of study (DAY) | -0.04 | 0.16 | -0.27 | |
| PERSON LEVEL | Competitive trait anxiety (SCAT) | -2.94 | 1.10 | -2.67 | ** |
| | Neuroticism (NEURO) | 0.29 | 1.30 | 0.22 | |
| | Extraversion (EXTRA) | 1.70 | 1.19 | 1.43 | |
| DAY by PERSON | Day of study by CTA | -0.24 | 0.15 | -1.67 | |
| | Day of study by neuroticism | -0.37 | 0.17 | -2.17 | ** |
| | Day of study by extraversion | 0.02 | 0.15 | 0.16 | |
| VARIANCE TERMS | Person level | 56.19 | | | ** |
| | Day level | 4.46 | | | ** |
| | Beep level | 12.82 | | | ** |
| | $R^2$ (beep level) | | | 0.40 | ** |

Legend:

** $p < 0.01$

Table 4.5 represents the results of the multilevel regression analysis for cognitive anxiety direction. Significant main effects for competitive anxiety intensity, positive affect and CTA were obtained. Increases in cognitive anxiety intensity were accompanied by a decrease in the perception of the facilitative effects of cognitive anxiety or an increase in the perception of the debilitative effects of cognitive anxiety. The negative impact of cognitive anxiety intensity was mitigated by the presence of positive emotions. High-anxious individuals tended to perceive the same intensity of cognitive anxiety and other emotions as less facilitative or more debilitative to performance. Finally, a significant Day by Neuroticism interaction effect was observed. Controlling for other predictors, more neurotic individuals exhibited a slight decrease on the cognitive anxiety direction subscale as the competition approached.

As CTA emerged to be a significant predictor of anxiety direction, emotion patterns in low- and high-anxious individuals were examined. For this purpose, the sample was split into a high-anxious group with a SCAT score one standard deviation at or above the mean (N=9) and a low-anxious group with a SCAT score one standard deviation at or below the sample mean (N=7). Between-group differences between mean scores aggregated per subject on cognitive anxiety direction, cognitive and somatic anxiety intensity, positive affect, tension, guilt, "feeling energetic" and anger-depression were tested via t-test (Table 4.6). Bonferroni correction for multiple testing was applied. T-tests based on separate variance were employed when a significant difference between group variances was detected. Subsequently, a multilevel regression model of cognitive anxiety direction was tested on the two groups (Table 4.7 and 4.8).

**Table 4.6 Group means, standard deviations and t-values for high- and low-anxious athletes on CAD, CAI, SAI, PAS, TS, C, E and ADS**

| Variable | Mean (SD) | | t-value | Bonferroni adjusted probability |
|---|---|---|---|---|
| | Low anxiety | High anxiety | | |
| CAD | 8.07 (8.90) | -7.07 (6.10) | 4.04 | 0.010 |
| CAI | 15.84 (1.51) | 23.66 (1.86) | -9.03 | <0.001 |
| SAI | 11.75 (1.62) | 17.93 (2.57) | -5.09 | 0.001 |
| PAS | 4.34 (1.40) | 2.85 (0.57) | 2.67 | 0.244 |
| ADS | 1.42 (0.39) | 1.79 (0.46) | -1.76 | 0.802 |

*(continued)*

**Table 4.6 - continued**

| Variable | Mean (SD) | | t-value | Bonferroni adjusted probability |
|---|---|---|---|---|
| | Low anxiety | High anxiety | | |
| TS | 2.01 (0.70) | 3.41 (1.02) | -3.27 | 0.006 |
| G | 1.06 (0.16) | 1.39 (0.47) | -1.97 | 0.617 |
| E | 4.11 (1.59) | 4.60 (0.77) | -0.76 | 1.000 |

Legend: CAD = cognitive anxiety direction; CAI = cognitive anxiety intensity; SAI = somatic anxiety intensity; TS = tension scale; PAS = positive affect scale; ADS = anger-depression scale; G = guilt; E = energetic

Table 4.6 shows that high-anxious individuals had higher mean scores on tension and cognitive and somatic anxiety intensity. Although the difference in means between the two groups on positive affect, anger-depression and guilt were in the expected direction, they were not statistically significant. Particularly important is the fact that on average highly anxious individuals tended to perceive their anxiety pattern as debilitative to performance, whereas low-anxious individuals exhibited facilitative patterns of anxiety. The difference in anxiety direction between the two groups was most likely determined by the differences in anxiety intensity. In fact, anxiety intensity and tension was significantly higher in the high-anxious group. To explore possible between-group differences in the structure of anxiety patterns, a multilevel regression model of cognitive anxiety direction was tested on the two groups. It was hypothesised that the direction of anxiety in the two groups might have been determined not only by differences in cognitive anxiety intensity, but also by the effect of other affective components. Low-anxious athletes were expected to exhibit patterns of anxiety in which positive affects played a greater role than guilt and anger-depression. In contrast, high-anxious athletes were hypothesised to be affected by anger-depression and guilt to a greater extent than low anxious individuals. The relationship between cognitive anxiety direction and the beep- and day-level predictors was modelled for the *i*-th person as follows:

$$(\mathrm{CAD})_{ijt} = \beta_{00} + \beta_1(\mathrm{CAI})_{ijt} + \beta_2(\mathrm{SAI})_{ijt} + \beta_3(\mathrm{PAS})_{ijt} + \beta_4(\mathrm{ADS})_{ijt} + \beta_5(\mathrm{G})_{ijt} + \beta_6(\mathrm{E})_{ijt} + $$
$$+ \beta_7(\mathrm{DAY})_{jt} + v_i + v_{jt} + \varepsilon_{ijt},$$

Table 4.7 represents the results of the multilevel regression analysis for cognitive anxiety direction in the low-anxious group. Calculations were based on 113 observations nested within 9 persons. The best predictor of cognitive anxiety direction in this group of Tae Kwon Do practitioners was somatic anxiety intensity, followed by "feeling energetic", positive affect and competitive anxiety intensity. While increases in somatic and cognitive anxiety had a negative effect on cognitive anxiety direction, "feeling energetic" and presence of positive affects were associated with a more positive interpretation of cognitive anxiety. As expected, anger-depression and guilt did not significantly contribute to anxiety direction variance over and above that accounted for by the other significant predictors. This model explained 30% of the total variance of cognitive anxiety direction in low-anxious athletes (Appendix 20).

**Table 4.7 Multilevel model estimates for cognitive anxiety direction for low-anxious athletes**

| | Variable | β | SE β | Z | |
|---|---|---|---|---|---|
| Intercept | | 5.03 | 1.87 | 2.69 | ** |
| BEEP LEVEL | Cognitive anxiety intensity (CAI) | -1.75 | 0.88 | -1.99 | * |
| | Somatic anxiety intensity (SAI) | -2.45 | 0.75 | -3.27 | ** |
| | Positive affect (PAS) | 2.07 | 0.90 | 2.30 | ** |
| | Anger-depression (ADS) | 0.53 | 0.68 | 0.78 | |
| | Guilt (G) | -0.16 | 0.43 | -0.37 | |
| | Energetic (E) | 1.38 | 0.59 | 2.38 | ** |
| DAY LEVEL | Day of study (DAY) | 0.41 | 0.22 | 1.82 | |
| VARIANCE TERMS | Person level | 29.26 | | | |
| | Day level | 7.50 | | | ** |
| | Beep level | 6.57 | | | ** |
| | $R^2$ (beep level) | | | 0.30 | ** |

Legend:

* = p<0.05; ** = p<0.01

Table 4.8 represents the results of the multilevel regression analysis for cognitive anxiety direction in the high-anxious group. Calculations were based on 84 observations nested within seven persons. Multilevel regression analyses on standardised and raw scores produced virtually identical results. Unlike the low-anxious group, the best predictor of cognitive anxiety direction in this group of Tae Kwon Do practitioners was cognitive anxiety intensity, followed by positive affect, anger-depression and proximity to competition. Interestingly, in high-anxious athletes an increase in anger-depression was accompanied by a more facilitative perception of cognitive anxiety. Proximity to competition had an additional negative effect on cognitive anxiety direction. Comparison of the multilevel models of high- and low-anxious athletes shows that pre-competitive emotional experience in the two groups differed quantitatively and qualitatively. Although they benefited from the presence of positive affects in equal manner, high anxious athletes were more reactive to changes in cognitive anxiety intensity than low anxious athletes. High-anxious athletes also benefited from the presence of anger-depression, while low anxious athletes did not seem to. This model explained 30% of the total variance of cognitive anxiety direction in high-anxious athletes (Appendix 21).

**Table 4.8 Multilevel model estimates for cognitive anxiety direction for high-anxious athletes**

| | Variable | β | SE β | Z | |
|---|---|---|---|---|---|
| Intercept | | -4.43 | 1.88 | -2.36 | ** |
| BEEP LEVEL | Cognitive anxiety intensity (CAI) | -3.44 | 0.93 | -3.71 | ** |
| | Somatic anxiety intensity (SAI) | 0.51 | 0.78 | 0.65 | |
| | Positive affect (PAS) | 2.50 | 0.80 | 3.14 | ** |
| | Anger-depression (ADS) | 2.06 | 0.84 | 2.45 | ** |
| | Guilt (G) | 0.81 | 0.63 | 1.29 | |
| | Energetic (E) | -0.13 | 0.66 | 0.20 | |
| DAY LEVEL | Day of study (DAY) | -0.80 | 0.31 | 2.59 | ** |
| VARIANCE TERMS | Person level | 24.08 | | | |
| | Day level | 6.03 | | | ** |
| | Beep level | 14.42 | | | ** |
| | $R^2$ (beep level) | | | 0.30 | ** |

Legend: ** = p<0.01

The results of the multilevel regression analysis for somatic anxiety direction are reported in Table 4.9. Significant main effects for somatic anxiety intensity, positive affect and proximity to competition were observed. An increase in somatic anxiety was accompanied by a decrease in the perception of the functionality of somatic anxiety. Both linear and quadratic terms of somatic anxiety intensity were significant predictors of somatic anxiety direction. The fact that the linear term was negative and the quadratic positive indicates a predominantly negative, concave downward curvilinear relationship. The negative effect of increased somatic anxiety intensity on somatic anxiety direction was mitigated by the presence of positive emotions and the nearing of the competitive event. Finally, a significant negative Day by CTA interaction effect was observed. When controlling for other predictors, high-anxious athletes exhibited more negative perceptions of somatic anxiety as a function of proximity to competition than less anxious athletes. The model predicted 35% of the total variance of somatic anxiety direction (Appendix 22).

**Table 4.9 Multilevel model estimates for somatic anxiety direction**

| | Variable | β | SE β | Z | |
|---|---|---|---|---|---|
| Intercept | | 3.38 | 0.90 | 3.76 | |
| BEEP LEVEL | Somatic anxiety intensity (SAI) | -4.87 | 0.34 | -14.32 | ** |
| | Quadratic term of somatic anxiety intensity (QSAI) | 0.49 | 0.15 | 3.27 | ** |
| | Cognitive anxiety intensity (CAI) | 0.44 | 0.35 | 1.26 | |
| | Positive affect (PAS) | 1.30 | 0.30 | 4.32 | ** |
| | Anger-depression (ADS) | 0.33 | 0.25 | 0.32 | |
| | Guilt (G) | 0.19 | 0.20 | 0.94 | |
| | Energetic (E) | 0.41 | 0.23 | 1.78 | |
| DAY LEVEL | Day of study (DAY) | 3.22 | 1.24 | 2.60 | ** |
| PERSON LEVEL | CTA (SCAT) | -0.83 | 0.88 | -0.93 | |
| | Neuroticism (NEURO) | -1.64 | 1.04 | -1.58 | |
| | Extraversion (EXTRA) | -0.76 | 0.96 | -0.79 | |

*(continued)*

**Table 4.9 - continued**

| | Variable | β | SE β | Z | |
|---|---|---|---|---|---|
| DAY by PERSON | Day of study by CTA | -0.07 | 0.03 | 2.06 | * |
| | Day of study by neuroticism | -0.11 | 0.01 | 1.83 | |
| | Day of study by extraversion | -0.00 | 0.01 | -0.14 | |
| VARIANCE TERMS | Person level | 35.97 | | | ** |
| | Day level | 3.97 | | | ** |
| | Beep level | 9.69 | | | ** |
| | $R^2$ (beep level) | | | 0.35 | ** |

Legend: * = p<0.05; ** = p<0.01

***4.334*** ***<u>Debilitative and facilitative patterns of anxiety on the competition day</u>***

As the greatest changes in pre-competitive emotional states were experienced on the day of the competition (Figures 3.8-3.10), patterns of direction of anxiety experienced one hour before the competition were examined. Eighteen out of 43 athletes exhibited a facilitative pattern of anxiety (facilitators), with positive values on both cognitive and somatic anxiety directions. Eighteen athletes exhibited a debilitative pattern of anxiety (debilitators), with negative values on both anxiety direction subscales. In order to examine the differences between facilitators and debilitators in emotional experience and personality traits, t-tests were used (Table 4.10). Bonferroni correction for multiple testing was applied. T-tests based on separate variance were employed when a significant difference between group variances was detected. Significant differences between the means of the two groups were observed on CTA, cognitive and somatic anxiety intensity, positive affects, anger-depression and tension. As expected, debilitators exhibited higher state and trait anxiety, tension and anger-depression and lower positive affects than did facilitators.

### 4.10 Group means, standard deviations and t-values for debilitators and facilitators on CAD, CAI, SAI, PAS, TS, G, E, ADS and personality traits

| Variable | Mean (SD) | | t-value | Bonferroni adjusted probability |
|---|---|---|---|---|
| | Facilitators | Debilitators | | |
| SCAT | 22.00 (4.42) | 27.00 (2.56) | 4.15 | 0.003 |
| NEURO | 86.29 (22.16) | 101.94 (23.20) | -2.07 | 0.551 |
| EXTRA | 127.50 (21.49) | 115.39 (24.06) | 1.59 | 1.000 |
| CAD | 12.72 (7.67) | -12.33 (8.18) | 9.48 | <0.001 |
| SAD | 8.50 (7.92) | -11.11 (6.63) | 8.05 | <0.001 |
| CAI | 20.11 (5.94) | 27.17 (5.87) | -3.58 | 0.013 |
| SAI | 16.22 (5.04) | 24.83 (4.89) | -8.61 | <0.001 |
| PAS | 4.36 (1.48) | 2.18 (0.78) | 5.52 | <0.001 |
| ADS | 1.38 (0.52) | 2.16 (0.78) | -3.53 | 0.016 |
| TS | 2.69 (1.14) | 5.31 (1.43) | -6.07 | <0.001 |
| G | 1.06 (0.24) | 1.28 (0.46) | -1.82 | 0.965 |
| E | 5.33 (1.46) | 4.67 (1.61) | 1.34 | 0.932 |

Legend: CAD = cognitive anxiety direction; CAI = cognitive anxiety intensity; SAI = somatic anxiety intensity; TS = tension scale; PAS = positive affect scale; ADS = anger-depression scale; G = guilt; E = feeling energetic; SCAT = competitive trait anxiety; NEURO = neuroticism; EXTRA = extraversion

In order to analyse the structure of anxiety patterns, correlations between anxiety direction and intensity, personality traits and affective factors were computed (Table 4.11). Results showed that cognitive and somatic anxiety intensity were positively correlated with tension and anger-depression and negatively correlated with positive affects. Additionally, cognitive anxiety intensity was positively correlated with guilt. Cognitive anxiety direction was negatively correlated with cognitive and somatic anxiety intensity, tension and anger-depression and positively correlated with positive affectivity. A similar correlational pattern was obtained for somatic anxiety direction.

**Table 4.11** **Correlations between anxiety direction and intensity, personality traits and affective factors based on data collected on the day of the competition (N=43)**

| Variable | CAD | SAD | CAI | SAI | SCAT | NEURO | EXTRA | PAS | ADS | TS | G |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CAD | 1.00 | | | | | | | | | | |
| SAD | ** 0.84 | 1.00 | | | | | | | | | |
| CAI | **-0.61 | **-0.54 | 1.00 | | | | | | | | |
| SAI | **-0.60 | **-0.64 | ** 0.70 | 1.00 | | | | | | | |
| SCAT | **-0.49 | **-0.53 | **0.48 | ** 0.57 | 1.00 | | | | | | |
| NEURO | -0.25 | *-0.34 | 0.12 | 0.03 | * 0.35 | 1.00 | | | | | |
| EXTRA | 0.22 | 0.21 | -0.16 | -0.21 | -0.02 | -0.20 | 1.00 | | | | |
| PAS | ** 0.65 | ** 0.66 | **-0.52 | **-0.56 | **-0.49 | *-0.30 | ** 0.40 | 1.00 | | | |
| ADS | **-0.55 | **-0.46 | ** 0.39 | ** 0.42 | * 0.37 | 0.17 | -0.14 | *-0.36 | 1.00 | | |
| TS | **-0.59 | **-0.64 | ** 0.59 | ** 0.60 | ** 0.50 | ** 0.42 | *-0.32 | **-0.58 | ** 0.56 | 1.00 | |
| G | -0.28 | -0.22 | * 0.35 | 0.22 | ** 0.41 | 0.21 | 0.16 | **-0.40 | * 0.34 | * 0.38 | 1.00 |
| E | 0.11 | 0.15 | -0.01 | 0.03 | 0.03 | *-0.33 | * 0.37 | **0.41 | 0.06 | -0.24 | 0.01 |

Legend: CAD = cognitive anxiety direction; CAI = cognitive anxiety intensity; SAI = somatic anxiety intensity; TS = tension scale; PAS = positive affect scale; ADS = anger-depression scale; G = guilt; E = feeling energetic; SCAT = competitive trait anxiety; NEURO = neuroticism; EXTRA = extraversion; * = <0.05; ** = <0.01

As far as personality traits are concerned, significant relationships between CTA and all affective factors with exception of "feeling energetic" were observed. Neuroticism was negatively related to somatic anxiety direction and positive emotions, but positively correlated with tension and CTA. Extraversion was negatively correlated with tension and positively correlated with positive emotions.

Stepwise regression analyses were performed to examine the relative influence of personality traits and affective factors on anxiety direction (Tables 4.12 and 4.13). Besides personality traits, other predictors entered in the regression equation were cognitive anxiety intensity in the regression model of cognitive anxiety direction and somatic anxiety intensity in the regression model of somatic anxiety direction. To avoid multicollinearity problems, tension was excluded from both equations, somatic anxiety intensity was excluded from the model of cognitive anxiety direction and cognitive anxiety intensity was excluded from the model of somatic anxiety direction. Positive affect, anger-depression, guilt and "feeling energetic" were entered in both equations (Appendix 23).

**Table 4.12 Summary of stepwise regression analysis of personality traits and affective components predicting cognitive anxiety direction on the day of the competition (N=43)**

| Predictor | R | $R^2$ | $R^2$change | F-to-enter (df) |
|---|---|---|---|---|
| PAS | 0.65 | 0.42 | 0.421** | 29.83 (1, 41) |
| ADS | 0.73 | 0.54 | 0.117** | 10.11 (1, 41) |
| CAI | 0.77 | 0.59 | 0.055* | 5.27 (1, 41) |

Model summary

| R | $R^2$ | Adjusted $R^2$ | SE of estimate | F-ratio | p |
|---|---|---|---|---|---|
| 0.770 | 0.593 | 0.562 | 9.195 | 18.931 | <0.001 |

Legend: CAI = cognitive anxiety intensity; PAS = positive affect scale; ADS = anger-depression scale; SE = standard error; R = multiple correlation coefficient; $R^2$ = multiple coefficient of determination; * = p<0.05; ** = p<0.01

Stepwise regression analysis produced the following regression equation of cognitive anxiety direction (predictors standardised):

Cognitive anxiety direction = -0.23 + 5.55(PAS) - 4.11(ADS) - 3.94(CAI)

Unlike throughout the week preceding the competition, on the day of the competitive event positive affectivity was the best predictor of cognitive anxiety direction, followed by anger-depression and cognitive anxiety intensity. This might have been partly due to the fact that one hour before the start of the competition cognitive anxiety intensity was considerably elevated in the whole sample, reaching a mean value of 22.95 (Appendix 24). In contrast, the mean value for the one-week period leading to the competition was 18.73 (Appendix 24). Presence of positive affects indicated a more facilitative pattern of anxiety, whereas presence of higher levels of cognitive anxiety and anger-depression was associated with a more debilitative pattern of anxiety. These results support the formulated hypotheses regarding the structure of facilitative and debilitative patterns of anxiety.

**Table 4.13 Summary of stepwise regression analysis of personality traits and affective components predicting somatic anxiety direction on the day of the competition (N=43)**

| Predictor | R | $R^2$ | $R^2$change | F-to-enter (df) |
|---|---|---|---|---|
| SAI | 0.73 | 0.54 | 0.538** | 33.28 (1, 38) |
| NEURO | 0.88 | 0.78 | 0.237** | 38.80 (1, 38) |

Model summary

| R | $R^2$ | Adjusted $R^2$ | SE of estimate | F-ratio | p |
|---|---|---|---|---|---|
| 0.880 | 0.775 | 0.762 | 5.302 | 63.56 | <0.001 |

Legend: SAI = somatic anxiety intensity; NEURO = Neuroticism; SE = standard error; R = multiple correlation coefficient; $R^2$ = multiple coefficient of determination

Stepwise regression analysis produced the following regression equation of somatic anxiety direction (predictors standardised):

Somatic anxiety direction = -2.57 - 7.90(SAI) - 5.43(NEURO)

On the day of the competitive event, somatic anxiety intensity was the best predictor of somatic anxiety direction followed by neuroticism (Appendix 25). Similarly, in the one-week period before the competition, somatic anxiety intensity contributed the most to the criterion variance. Controlling for somatic anxiety intensity, more neurotic individuals had a significantly more negative perception of somatic anxiety then less neurotic individuals.

## 4.34 Discussion

### *4.341 Affective components of patterns of anxiety*

Results from the current study confirm the hypotheses that anxiety is a changeable complex emotional state whose components are determined by personal characteristics and time of assessment relative to the occurrence of an anxiety-evoking event. An oblique factor encompassing the items "worried", "stressed" and "guilty", which could be interpreted as anxiety, emerged from the principal component analysis of pre-competitive emotional states averaged per subject (Table 4.1). Notably, irritation and frustration also showed substantial loadings on this anxiety factor. However, these two emotional states were more related to an anger-depression factor. These results indicated that athletes that manifested high levels of worry and stress during the week preceding the competition tended to feel guilty, frustrated and irritated.

As this factor was based on the analysis of interindividual differences defined as mean levels of affect for the entire one-week pre-competition period, it may be more indicative of a trait than a state pattern of anxiety. This is consonant with previous research. In fact, although guilt and irritation have been identified as components of state anxiety (Blumerang & Izard, 1985; Izard, 1972), they appear to be more consistently associated with trait anxiety (Cattell, 1972). The perception of a prolonged inability to cope with a situation, which is typical of highly anxious people, is thought to evoke guilt, lack of self-confidence and irritability. Contrasted with the trait pattern, a state anxiety pattern is seen to emphasise the momentary subjective appraisal of one's ability or inability to cope with a situation, while showing less guilt and the temperamental tendency of threat susceptibility (Cattell, 1972).

A similar difference between trait and state anxiety patterns was observed in the present study. Worry and stress did not correlate with guilt when intraindividual temporal changes were examined (within-subject $z$ scores). By contrast, a state anxiety factor comprising the items "stressed", "worried" and "feeling energetic" emerged (Table 4.2). Consequently, the observed pattern of state anxiety seemed to be related to the athletes' subjective perception of their coping abilities. Specifically, it reflected their efforts to cope with anxiety-evoking events encountered in the week prior to competition. The fact that increases in worry were associated with increases in "feeling energetic" can be interpreted as an indication of the athletes' positive perception of their coping abilities in relation to the competition and their willingness to face the competitive event. Additional support for this contention comes from earlier analysis of pre-competitive temporal patterns of worry, stress and "feeling energetic" (p. 100). These three affective states exhibited similar changes over time, increasing significantly on the day of the contest. This may partly explain why on average pre-competitive anxiety was perceived as facilitative to performance (Tables 4.5 and 4.6; Appendix 24).

Carver and Scheier (1990) and Jones and associates (Jones & Hanton, 1996) noted that positive appraisal of goal attainment and coping abilities is associated with facilitative anxiety, whereas negative appraisal of coping abilities and goal attainment may lead to disengagement from attempts to achieve a specific goal. The fact that "feeling energetic" formed a factor with worry and stress indicates that the athletes thought that they would be able to cope with the anxiogenic situation. Yet, it must be noted that these results need to be interpreted with caution with respect to the anxiety-evoking stimulus. Given that the PNAQ does not specifically instruct the participants to report competition-related emotional states (Appendix 8), no conclusion can be drawn regarding whether the obtained oblique factors represent patterns of general anxiety, competitive anxiety or a combination of both.

In contrast to the PNAQ, the CSAI-2 asks the participants to respond accordingly to how they feel in relation to the competitive event and is deemed to gauge the cognitive and somatic components of competitive anxiety. The present study confirms that the CSAI-2 measures stress and worry. In fact, both cognitive and somatic anxiety were positively correlated with tension (worry and stress) over individuals ($r = 0.47$; $r = 0.50$) and time ($r = 0.35$; $r = 0.40$). However, it is noteworthy that the observed correlations between tension and cognitive anxiety were only low ($r = 0.35$) or moderate ($r = 0.47$; 0.60). Additionally, as opposed to tension, cognitive anxiety intensity did not exhibit significant correlations (Tables 4.3 and 4.4) or exhibited weaker correlations with guilt and anger-depression (Table 4.11). These results suggest that the cognitive anxiety subscale of the CSAI-2 may confound motivation and positive emotions with worry about the forthcoming competition and/or that competitive anxiety in the examined sample of athletes encompassed a more positive pattern of emotions than that arising from other anxiety-evoking stimuli. One hour before the contest, when scores on the PNAQ were most likely related to the competition, tension was again more strongly correlated with anger-depression ($r = 0.56$) than were cognitive ($r = 0.39$) or somatic anxiety ($r = 0.42$). Additionally correlations of 0.60 were observed between tension and the CSAI-2 intensity subscales. Since it has been shown that higher levels of worry and fear tend to become associated with negative emotions such as sadness or anger (Cattell, 1972; Izard, 1991; Sarason et al., 1960), these findings might indicate that the CSAI-2, to a certain extent, confounds positive motivation and threat-related emotions. As noted earlier, the CSAI-2 has been criticised for its poor metric characteristics (Lane et al., 1999). Specifically, it has been argued that some items of the CSAI-2 are worded neutrally so that they are not only characteristic of threat-related states but may represent challenge, excitement or self-confidence (Burton & Naylor, 1998). Factorial analyses of the CSAI-2 combined with a psychometrically sound anxiety scale such as the STAI and an instrument gauging positive and negative emotions would provide a definite answer to whether the CSAI-2 differentiates threat-related from non-threat-related emotional states. At the same time, this type of analysis could be used to explore patterns of competitive anxiety with respect to various moderators such as gender, sport, level of competition and trait anxiety. Currently, no studies have examined the factorial structure of the CSAI-2 in combination with any other instrument measuring anxiety or various positive and negative emotions.

It is interesting that relationships between tension and the affective factors of anger-depression, guilt and positive affects based on interindividual differences one hour before the competition (Table 4.11) were similar to those obtained on interindividual differences in mean affect throughout the week preceding the competition (Table 4.3). In contrast, the relationships between cognitive anxiety intensity and the factors of anger-depression, guilt and positive affect strengthened in proximity to the competition. This is congruent with what was initially hypothesised about the structure of anxiety patterns. Namely, previous analysis (p. 91) had shown that there was a significant increase in cognitive anxiety intensity immediately before the contest as compared to the day before the competition, with a week average of 18.73 (S.D. = 6.34) and a pre-competition average of 22.95 (S.D. = 6.60). With respect to fear intensity, it was suggested that higher levels of fear or worry could become associated with other negative emotions such as sadness, guilt and anger. It was also suggested that high levels of fear would not be accompanied by positive emotions, whereas low to moderate levels of worry and fear could. The differences between the correlational pattern of competitive anxiety and other emotions one hour before the competition and the correlational pattern pertaining to the week preceding the competition support these hypotheses. The fact that no differences were found between the correlational patterns of tension and other emotions in the two examined periods was most likely due to the PNAQ being a general measure of affect, not specifically related to the competitive event. In the week preceding the competition, athletes might have had to face various anxiety-evoking events that elicited emotional reactions similar to those experienced on the day of the competition.

In summary, these results support the contention that anxiety is a complex changeable emotional state whose components are determined by the time of assessment in relation to the occurrence of an anxiety-evoking stimulus. It has been shown that worry, as the main component of anxiety states, can form an oblique factor with both negative (guilt) and positive emotional states (energetic) and that anxiety patterns may differ with regard to whether they are examined as personal tendencies (traits) or changes in time (states). Finally, the results from this study revealed that anxiety patterns change as a function of proximity to the anxiety-evoking event in both intensity (elevated worry or fear) and structure (presence of other emotions).

#### *4.342 Debilitative and facilitative patterns of anxiety*

One of the main scopes of this study was to examine the structure of debilitative and facilitative patterns of anxiety in male Tae Kwon Do practitioners. Analysis of the mean scores of anxiety direction revealed that the examined sample exhibited facilitative patterns of competitive anxiety over the week preceding the competition. They had an average score of 2.17 (S.D. = 10.99) for cognitive anxiety direction and an average score of 4.02 (S.D. = 7.83) for somatic anxiety direction on a scale ranging from -27.00 to +27.00. This is congruent with previous research (e.g., Jones & Hanton, 1996; Jones & Swain, 1992; Wiggins, 1998). On the day of the competition, interpretation of the anxiety symptoms was slightly negative. The mean cognitive anxiety direction was -0.23 (S.D. = 13.89) and the mean somatic anxiety direction was -1.05 (S.D. = 11.58).

On the day of the competition 18 athletes exhibited a facilitative pattern of anxiety with positive scores on both cognitive and somatic anxiety direction scales and 18 athletes exhibited a debilitative pattern of anxiety with negative scores on the two scales. Significant differences between the means of the two groups were observed on CTA, cognitive and somatic anxiety intensity, positive affects, anger-depression and tension. As expected, debilitators exhibited higher state and trait anxiety, tension and anger-depression and lower positive affects than did facilitators (Table 4.10).

In order to examine further the structure and predictors of facilitative and debilitative patterns of anxiety, correlational analyses of anxiety direction and pre-competitive emotions and multilevel regression analysis of anxiety direction were performed. It was hypothesised that interpretation of anxiety would show a moderate negative correlation with cognitive anxiety intensity, guilt and anger-depression and a positive relationship with the item "energetic" and the positive affect scale. A moderate negative correlation between cognitive anxiety direction and intensity and a moderate positive correlation between cognitive anxiety direction and positive affects were observed in the week preceding the competition (Tables 4.3 and 4.4). On the day of the competition, a negative moderate correlation between cognitive anxiety direction and anger-depression emerged (Table 4.11). Previous research on trait positive and negative affectivity and CTA revealed similar relationships (Jones et al., 1996), yet with lower effect sizes. Also, earlier studies found correlations ranging from -0.10 to -0.83 between state measures of cognitive anxiety intensity and direction (Edwards & Hardy, 1996; Maynard, Smith, & Warwick-Evans, 1995; Maynard et al., 1995; Ntoumanis & Biddle, 1998).

Results from multilevel regression analysis showed that the best predictor of directional interpretation of cognitive anxiety was cognitive anxiety intensity followed by positive affect. It is noteworthy that the effects of specific emotional states were assessed after adjusting for individual- and day-level differences in directional interpretation of cognitive anxiety. In fact, day-level and person-level sources of dependency had been accounted for by including day-level and person-level error terms in the multilevel regression equation. The results of this regression analysis indicated that, controlling for other significant predictors, an increase of one standard deviation in cognitive anxiety intensity would be associated with an average decrease of 3.62 points on the cognitive anxiety direction subscale. This negative effect of cognitive anxiety intensity was mitigated by the presence of positive emotions such as enjoyment, happiness, joy and pleasure. The predicted mean score for the examined sample four days before the competition was 2.89, indicating a facilitative anxiety pattern. No other significant independent contributions to cognitive anxiety direction by other pre-competitive emotional states were observed. Overall, proximity to the competition did not play a significant role as a predictor of anxiety direction. However, a significant but small Day by Neuroticism interaction effect was observed. This will be discussed later within the analysis of the moderating effects of personality traits on anxiety patterns.

The best predictor of cognitive anxiety direction one hour before the event was positive affect followed by anger-depression and cognitive anxiety intensity (Table 4.12). The reduced impact of cognitive anxiety intensity on cognitive anxiety direction might have been due to the significant increase in average cognitive anxiety intensity on the day of the competition and the fact that the symptoms listed in the CSAI-2 are liable to different interpretation. Higher levels of positive affect were associated with more positive interpretations of cognitive anxiety. By contrast, higher levels of anger-depression and cognitive anxiety intensity were associated with more negative perceptions of anxiety directions. At the same levels of anxiety intensity, individuals experiencing more positive affects and less anger-depression exhibited a much more facilitative pattern of anxiety than individuals experiencing low positive affect and higher anger-depression.

The fact that the presence of emotions such as enjoyment/fun and happiness had a substantial beneficial effect on anxiety direction is particularly significant. It may be interpreted as an indication of athletes' positive goal attainment expectancies (Jones, 1995) and predicted actualisation of a sense of competence (Deci, 1975). It may be also interpreted as a sign of adaptive achievement behaviour characterised by valorisation of the task and enjoyment in effort exertion (Roberts, 1992). Finally, it may indicate the presence of intrinsic motivation (Csikszentmihalyi, 1975).

The positive emotion of enjoyment has been recently recognised as one of the cornerstones of motivation in sport. In this respect, Scanlan and associates Scanlan and Simons (1992) view sport enjoyment as one of the most important determinants of sport commitment. Research in this field has shown that sport enjoyment is positively correlated with athletes' desire for future participation, desire to exert effort and perception of their actual effort output (Scanlan & Lewthwaite, 1986; Scanlan, Stein, & Ravizza, 1989). Additionally, perception of competence, challenge (Csikszentmihalyi, 1975; Wankel & Sefton, 1989), social interactions, extrinsic rewards and measuring self against others have been identified as sources of sport enjoyment and commitment in several studies (Csikszentmihalyi, 1975).

It is not possible to say whether the negative effect of anger-depression on cognitive anxiety direction is to be attributed to the presence of depression and unhappiness, or self-hostility, anger and irritation. It was hypothesised that self-hostility, unhappiness and depression would be associated with a debilitative pattern of anxiety, whereas low to moderate anger would have a potentially positive effect on anxiety direction. In order to analyse the effects of these emotional states on the directional interpretation of anxiety an instrument gauging these emotions and differentiating self-hostility from anger should be administered in conjunction with the modified version of the CSAI-2.

Multilevel regression analysis showed that the best predictor of somatic anxiety direction was somatic anxiety intensity followed by positive affect, a quadratic term of somatic anxiety intensity and proximity to competition. Overall, controlling for other predictors, there was a significant concave downward curvilinear relationship between somatic anxiety intensity and direction. The mean somatic anxiety for the week preceding the competition was 13.71 (S.D. = 4.37) on a scale from 9 to 36. This indicates that in general male Tae Kwon Do practitioners prefer lower levels of arousal. A similar but stronger and linear relationship between somatic anxiety intensity and direction was observed on the day of the competition. Interestingly, as the competition approached the same levels of somatic anxiety tended to be perceived as more facilitative to performance, with an increase of 3.22 points on a 55-point scale per day. Finally, as observed for cognitive anxiety direction, positive affect significantly contributed to a more positive interpretation of somatic anxiety throughout the week preceding the competition, but not on the day of the competition. Apparently, the significant increase in somatic anxiety on the day of the competition diminished the effect of the quality of the emotional state on somatic anxiety direction. These findings support the hypothesis that an anxiety pattern accompanied by too high a physiological arousal may be perceived as debilitative to performance even in the presence of positive emotions associated with approach tendencies.

In summary, the present study and previous research revealed that positive emotions associated with approach behaviour and negative emotions associated with increased self-focus and avoidance behaviour will determine whether an emotional state characterised by the presence of fear (anxiety) will be perceived as facilitative or debilitative to performance. This is because positive emotions (enjoyment) indicate the willingness to invest a considerable amount of effort in the sport activity and are associated with favourable predictions of goal attainment. By contrast, negative emotions associated with avoidance behaviour and increased self-focus impair concentration on the task and are indicative of disengagement behaviour. Considering these findings, it is suggested that in order to explain athletes' reactions to competition and understand the motivational aspects of sport participation, the analysis of athletes emotional responses should be extended to a broader range of emotions other than anxiety. Anxiety is a complex emotional state encompassing both approach and avoidance tendencies and as such provides ambiguous information about athletes' psychological states and the athlete-competition relationship. The ambiguity of the information obtained through anxiety scales can be resolved by using psychological instruments that gauge basic emotions. Contrasted with anxiety, basic emotions convey fundamental information about the person-environment relationship (Lazarus, 1999) and are clear in meaning. Consequently, the study of these emotions in sport settings should contribute to a better understanding of the competitive process.

#### *4.343 Personality traits as predictors of facilitative and debilitative patterns of anxiety*

One of the hypotheses tested in the present study was that personality traits would moderate patterns of anxiety. It was suggested that individuals high in CTA and neuroticism would exhibit debilitative patterns of anxiety, whereas individuals high in extraversion would tend to exhibit facilitative patterns of anxiety. No significant relationship between extraversion and average pre-competitive emotions and anxiety direction was observed (Table 4.3), but a positive correlation with positive emotions and a negative correlation with tension emerged on the day of the competition (Table 4.11). It is noteworthy that the examined sample of athletes had an average score on the extraversion scale of 121.43 (S.D. = 21.38), which corresponds to the 75th percentile of the published norms for American adult males (Costa & McCrae, 1992). These findings are congruent with previous research which showed that athletes, regardless of skill level and gender, tend to be characterised by an extraverted temperament (Eysenck, Nias, & Cox, 1982). The fact that the examined group of athletes experienced mainly positive emotions throughout the whole week preceding the competition (Appendix 24) and was on average highly extraverted explains why no significant correlation between extraversion and positive affect was observed on mean scores aggregated per subject (Table 4.3). Differences between individuals emerged only upon exposure to a significant social, emotion-evoking event, as the championship was. In fact, extraverts are known for their sociability, preference for large groups and gatherings, higher levels of optimum stimulation, activity and assertiveness (Costa & McCrae, 1992; Eysenck et al. 1982). Consequently, it is sensible to expect that their reaction to competitive events will be positive and accompanied by emotions such as enjoyment and excitement. The present study supported this contention. However, the hypothesis that extraversion would moderate cognitive and somatic anxiety direction was not substantiated. This could be partly attributed to the fact that the examined sample exhibited mainly facilitative patterns of anxiety and was high in extraversion.

Neuroticism is characterised by the general tendency to experience negative emotions such as fear, sadness, guilt, embarrassment, anger and disgust. Neurotics are less able to control their impulses, cope with stress and are prone to have irrational thoughts (Costa & McCrae, 1992). So, it was suggested that individuals higher in neuroticism would exhibit debilitative patterns of anxiety. In fact, the present study revealed that neuroticism was negatively related to somatic anxiety direction and positively related to tension in the week prior to and on the day of the competition. Neuroticism did not show a significant relationship with cognitive and somatic anxiety intensity. This could be an additional indication that the CSAI-2 confounds apprehension with positive emotions and motivation. Also, on the day of the competition, individuals higher in neuroticism felt less energetic and exhibited lower levels of positive affects than those lower in neuroticism (Table 4.11). Finally, a small but statistically significant Day by Neuroticism cross-level interaction was observed in the multilevel regression analysis of cognitive anxiety direction (Table 4.5). Controlling for intensity of anxiety and other pre-competitive emotional states, neurotics experienced a slight worsening in interpretation of cognitive anxiety as the competition approached.

One of the hallmarks of neuroticism is that those high on this trait tend to experience more emotional distress (Watson & Clark, 1984) and engage in modes of coping that create and maintain stress (O'Brien & DeLongis, 1996). Additionally, neurotics are inclined to be hypervigilant to threat cues from the environment. For example, Gallagher (1990) showed extraversion to be associated with emotions consistent with challenge appraisal and neuroticism to be associated with emotions consistent with threat appraisal, for a recalled academic stressor. Results from the present study suggest that athletes higher on neuroticism tended to perceive the forthcoming competition as more threatening than less neurotic athletes (Table 4.11). Their perception of the potential danger associated with the competition increased with the proximity to the event (Table 4.5), which might have then negatively affected their directional interpretation of cognitive anxiety. A similar trend was observed among athletes high on CTA (Table 4.8). The fact that trait anxiety is considered to be a facet of neuroticism

(Costa & McCrae, 1992) and is characterised by proneness to worry, apprehension, nervousness and tension explains these findings.

Contrary to expectations, on the day of the competition, neuroticism appeared to a better predictor of somatic anxiety direction than did CTA. Analysis of correlation coefficients showed that this was a result of multicollinearity (Table 4.11). In fact, somatic anxiety intensity, the best predictor of somatic anxiety direction, was moderately correlated with CTA but was not significantly correlated with neuroticism. Comparison of the coefficients of correlation between anxiety direction and the two personality traits showed that, as expected, CTA was significantly inversely related with both direction scales, whereas neuroticism exhibited only a low correlation with somatic anxiety direction. It is difficult to explain why neuroticism was positively correlated with tension (worry and stress) but did not correlate with cognitive and somatic anxiety intensity, whereas CTA positively correlated with all these variables. A possible reason could be that both CSAI-2 and SCAT measure not only perceived competition-related threat and worry, but also positive motivational aspects related to sport competition (e.g., desire to compete, positive excitement). If this were true then neuroticism, being a general trait not specifically related to sport participation and competition, would show a weaker correlation with competitive anxiety as measured by these instruments than with simple emotion adjectives checklists or scales, such as the PNAQ. Obviously, these speculations need to be empirically tested.

It is also important to notice that although research has shown that athletes tend to be low in neuroticism, the present sample exhibited a mean score on the neuroticism scale of the NEO PI-R that was above the average of the norms for adult males. It corresponded to the 79th percentile of the norms for adults and the 59th percentile of the norms for college-age males (Costa & McCrae, 1992). So, the examined sample of Tae Kwon Do practitioners was characterised by high extraversion and neuroticism. This combination of personality traits defines the dimension of impulsivity or impulsiveness (Gray, 1994). According to Gray (1994), impulsive individuals tend to experience positive emotions, show higher reactivity of the behavioural approach system and tend to act rashly and without due consideration. This could explain why in the present study a negative, concave downward curvilinear relationship was observed between somatic anxiety intensity and direction (Table 4.9). Namely, the examined athletes, being relatively impulsive, might have reacted negatively to any slight increase in arousal because it had an additional detrimental effect on their motor control ability and decision making. Therefore, despite being extraverted, they preferred lower levels of arousal in relation to performance in Tae Kwon Do.

CTA emerged as one of the most salient predictors of intensity and patterns of competitive anxiety. Athletes high in this trait exhibited debilitative anxiety patterns characterised by high intensities of worry and tension and the presence of the negative emotional factor of anger-depression (Tables 4.3 and 4.6). On the day of the competition, CTA was positively correlated with all the emotional factors hypothesised to be constituents of debilitative patterns of anxiety and negatively correlated with positive affectivity (Table 4.11). Multilevel regression analyses also revealed CTA to be a significant predictor of cognitive anxiety direction (Table 4.5). Controlling for anxiety intensity, other emotional states and personality traits, high-anxious individuals tended to experience more debilitative patterns of anxiety than individuals lower on CTA. Analysis of week averages of pre-competitive emotions and anxiety direction showed that low-anxious individuals experienced facilitative patterns of anxiety, with significantly lower levels of tension and anxiety. In contrast, high-anxious individuals tended to experience debilitating patterns of anxiety (Table 4.6). To explore possible between-group differences in the structure and dynamics of anxiety patterns, a multilevel regression model of cognitive anxiety direction was tested on a group of high-anxious athletes and a group of low-anxious athletes (Tables 4.7 and 4.8). Results showed that although an increase in cognitive anxiety intensity was perceived as detrimental to performance by both groups, low-anxious athletes were much less reactive to changes in anxiety intensity than high-anxious athletes. It is possible that the two groups tended to interpret the symptoms described in the CSAI-2 in different ways. High-anxious individuals might have mainly reported their intensity of fear and sense of threat, while low-anxious individuals might have referred to level of experienced threat as well as levels of challenge and motivation. Alternatively, it is also possible that equal scores on the anxiety intensity scale represented different objective values for high- and low-anxious individuals. In fact, high-anxious and high-neurotic individuals have a much broader bandwidth of anxiety intensity than low-anxious and low-neurotic individuals (Gilboa & Revelle, 1994). So, assuming that emotion intensity ratings are to a certain extent based on an individual's typical intensity bandwidth, a one-unit increase in anxiety intensity in high-anxious athletes would correspond to a much greater objective change in intensity than a one-unit increase reported by low-anxious athletes.

Both groups of athletes experienced more facilitative patterns of anxiety in the presence of positive emotions. A between-group difference emerged in the effect of "feeling energetic", somatic anxiety, anger-depression and proximity to competition on directional interpretation of cognitive anxiety. Namely, low-anxious athletes benefited from feeling energetic, while high-anxious individuals did not seem to. This was most likely caused by the fact that the latter were already too highly aroused due to higher levels of fear (Table 4.6). So, an increase in "feeling energetic" would not have contributed to a more positive perception of cognitive anxiety. In contrast, in the low-anxious group "feeling energetic" was an indication of their level of motivation and readiness for the competition. Paradoxically, somatic anxiety appeared to be associated with a less facilitative or more debilitative pattern of anxiety in low-anxious athletes but not in high-anxious athletes. Inspection of the coefficients of correlation between other predictors of anxiety direction and arousal intensity showed that this result was due to multicollinearity. In fact, in both groups somatic anxiety intensity showed a low negative correlation with cognitive anxiety direction (high-anxious group $r = -0.33$; low-anxious group $r = -0.26$). However, a substantial positive correlation was observed between cognitive and somatic anxiety intensity in the high-anxious group ($r = 0.66$) but not in the low-anxious group ($r = 0.39$).

Interestingly, high-anxious individuals were positively affected by the presence of anger-depression (Table 4.8), while low-anxious athletes were not. Given that the anger-depression scale encompassed the emotional states of frustration, anger, irritation, unhappiness and depression, it is not possible to ascertain what emotions high-anxious athletes benefited from. Nevertheless, it could be tentatively suggested that anger might have been used as a coping strategy to counteract the negative effects of fear and compensate for deficits in efficacy. With respect to this contention, previous studies on martial artists have found a positive relationship between anger and performance (McGowan & Miller, 1989; McGowan et al., 1990, 1992).

Finally, it is important to mention that 76.40% of the variance in cognitive anxiety direction was attributed to interindividual differences, whereas only 10.04% was related to day-level factors and 13.57% to beep-level factors (Appendix 19). The personality traits of CTA, neuroticism and extraversion explained 47.33% of the variance at individual level, with CTA being a significant predictor of state anxiety direction. This indicates that other important individual factors that were not included in the model might have contributed to the prediction of patterns of anxiety. Previous research suggests that these might be coping skills (Eubank & Collins, 2000), self-confidence (Prapavessis & Grove, 1994), skill level (Jones & Swain, 1995; Perry & Williams, 1998), performance expectations (Jones & Hanton, 1996; Wiggins, 1998), goal orientation (Ntoumanis & Biddle, 1998), optimism (Carver & Scheier, 1989), helplessness (Pekrun, 1995), self-handicapping and hardiness (Prapavessis & Grove, 1994).

In conclusion, the present study supports the hypothesis that competitive anxiety is a complex changeable emotional state, which is determined by situational and personal factors. In order to understand the effect of anxiety on performance and athletes' reaction to competition, the structure and the dynamics of the emotional components of anxiety need to be analysed. Consequently, both intra- and interindividual differences in emotional states need to be accounted for. Although most of the anxiety direction variance is due to personal factors, only analysis of intraindividual changes in emotional states in various categories of individuals can give us a realistic picture of the subjective experience labelled "anxiety" and its relationship with performance.

## 4.4 Study 2: Interpretation of the cognitive and somatic subscales of the CSAI-2 and facilitative and debilitative patterns of pre-competitive emotions in individual sports

### 4.41 Introduction and purpose of the study

The previous study has shown that directional interpretation of pre-competitive anxiety as measured by the CSAI-2 (Martens et al., 1990) depends on the intensity of the anxiety symptoms, the set of emotions accompanying them and personal factors such as neuroticism and CTA. In the week preceding the competition, facilitative patterns of pre-competitive anxiety were characterised by lower levels of anxiety and higher levels of positive emotions such as enjoyment, joy and happiness. As the competition approached the impact of anxiety intensity on directional interpretation of anxiety decreased. One hour before the contest, positive emotions were the best predictors of cognitive anxiety direction followed by negative emotions and cognitive anxiety intensity. Albeit the average cognitive anxiety intensity for the examined group of athletes was relatively high (22.88), mean cognitive anxiety direction was not significantly different from zero (-0.23), denoting no detrimental effect on performance.

Overall, these findings can be interpreted in two different ways. On one hand, they support the contention that anxiety is a complex changeable non-unitary emotional state that, depending on its affective constituents and on personal and situational factors, can be both debilitative and facilitative to performance. They also suggest that the assessment of competitive anxiety on its own cannot provide a thorough and realistic picture of athletes' emotional states. On the other hand, these findings indicate that the items of the CSAI-2 lend themselves to different interpretations and, as such, may not be able to satisfactorily differentiate positive excitement and motivation from fear-like and threat-related emotional states. In this regard, several researchers have noted that the symptoms described in the CSAI-2 can be understood as negative debilitating states characterised by fear of failure and a sense of threat or as positive facilitating states indicating preparedness for competition, positive excitement and challenge (Burton & Naylor, 1997; Jones, 1995). However, to date, except for Lane et al.'s (1999) confirmatory factor analysis, no other empirical research has been undertaken to test the validity of this instrument. Consequently, one of the aims of this study was to examine the discriminant validity of the CSAI-2 cognitive and somatic anxiety subscales and try to ascertain whether and to what extent the anxiety patterns obtained in the previous investigation were an artefact of the instrument used. Specifically, the ability of the CSAI-2 to distinguish between anxiety and positive excitement and threat and challenge was examined and contrasted to the STAI (Spielberger et al., 1970). The idea was to compare the CSAI-2 with a psychometrically sound questionnaire gauging anxiety such as the STAI. Also, following Izard's (1972) procedure, factor loadings of the items of the CSAI-2 and STAI on fundamental emotions as operationalised by the Differential Emotions Scale - IV (DES-IV; Izard, 1991) were examined. This permitted the analysis of the subjective interpretation of individual items of the CSAI-2 in relation to the functionality of the emotional state for performance. Anxiety items were expected to load on an anxiety-fear factor and an interest-excitement factor in facilitative patterns of pre-competitive emotions and load on a fear-anxiety factor and the negative emotions of guilt, shame, shyness, sadness and self-hostility in debilitative emotional states.

In contrast to the previous study, which analysed patterns of anxiety defined as sets of primary (e.g., anger) and secondary emotions (e.g., depression), the present study examined facilitative and debilitative patterns of primary or fundamental emotions, as defined by Izard (1991), and the role of anxiety in these patterns. The advantages of studying primary, fundamental or basic emotions are attributed to their clarity of meaning (Plutchik, 1994) and the information about the person-environment relationship that they convey (Lazarus, 1999). It was suggested that anxiety is a complex changeable non-unitary emotional state triggered by the perception of threat and characterised by the presence of fear and one or more other basic emotions (Izard, 1991). It was also hypothesised that the functionality of anxiety with respect to performance would depend on the emotions accompanying fear. Fear of low or moderate intensity associated with emotions characterised by approach tendencies (e.g., happiness, enjoyment, interest and, to a certain extent, anger) would be facilitative to performance. On the other hand, fear of moderate or high intensity associated with emotions characterised by avoidance tendencies or increased self-focus (e.g., sadness, shame, shyness, self-hostility and guilt) would be detrimental to performance. It follows that emotions associated with a clear approach or avoidance action tendency (e.g., interest-excitement, enjoyment and shame) were expected to be better predictors of the functionality/dysfunctionality of athletes' emotional state than anxiety. This is because anxiety is a complex, variable and ambiguous emotional state characterised by clusters of emotions that may motivate both approach and avoidance behaviours.

## 4.42 Method

### *4.421 Design*

One of the main scopes of this study was to examine facilitative and debilitative patterns of pre-competitive fundamental emotions and anxiety. For this purpose, intra- and interindividual differences in emotional components of debilitative and facilitative pre-competitive emotional states were analysed. To examine intraindividual differences between functional and dysfunctional pre-competitive emotional states, athletes were assessed on recalled emotions before their best and worst competition ever. It was thought that assessment of recalled pre-competitive emotions before the athletes' worst and best competition would maximise the chances of getting individuals who would report functional or facilitative patterns of emotions on one assessment and dysfunctional or debilitative emotional patterns on the other assessment, which could then be compared. So, in order to establish intraindividual differences between functional and dysfunctional pre-competitive emotional patterns, retrospective self-reports from athletes who exhibited a neutral or facilitative emotional pattern on their best competition and a debilitative pattern on their worst competition were analysed.

As it has been shown that recalled pre-competitive emotions are liable to memory distortions, athletes were also tested on actual fundamental emotions and anxiety one hour before a competition. Since a more balanced distribution of facilitative and debilitative emotional states was expected before the actual competition than prior to the best and worst competition, only momentary self-reports were used for the analysis of interindividual differences between facilitative and debilitative patterns of emotions.

Additionally, in order to examine the role and structure of fundamental emotions and anxiety patterns further and test the construct validity of the CSAI-2, the relationship between patterns of emotions and athletes' perception of the competition as a source of threat or challenge was analysed. Finally, the ability of the CSAI-2 to differentiate positive excitement from anxiety was tested and loadings of the items of the CSAI-2 on fundamental emotion factors were analysed.

### *4.422 Participants*

One hundred and thirteen male and 89 female athletes competing in individual non-contact and contact sports at regional or national level agreed to participate in the study. Table 4.14 shows the composition of the examined sample in relation to sport and gender. At least five days prior to a competition, the participants were assessed on recalled pre-competitive emotions experienced before their best and worst competition ever. They were also assessed on their momentary pre-competitive states one hour before an actual competition. Momentary data from Karate, Tae Kwon Do, cycling, gymnastics and triathlon were based on one major national competition, whereas data from swimming and table tennis were based on two regional competitions during the 2000 season. The mean age of the participants was 24.44 years (S.D. = 7.25). They had a mean training experience of 8.87 years (S.D. = 6.31) and their mean perceived current performance was 3.4 (S.D. = 0.81) on a 5-point Likert scale ranging from 1 *(extremely poor)* to 5 *(excellent)*.

**Table 4.14 Composition of the examined sample in relation to sport and gender (frequencies)**

| Sport | Males | Females |
|---|---|---|
| Tae Kwon Do | 39 | 49 |
| Table tennis | 30 | 8 |
| Karate | 29 | 8 |
| Swimming | 7 | 9 |
| Triathlon | 7 | 5 |
| Gymnastics | 0 | 9 |
| Cycling | 1 | 1 |
| Total | 113 | 89 |

### *4.423 Instrumentation*

#### *4.4231 Demographic Questionnaire (DQ)*

Demographic information was obtained through a short questionnaire assessing age, training experience, level of participation, perceived current performance, expected future performance and the motives for taking part in sport (Appendix 26).

*4.4232 Pre-competitive emotions self-evaluation questionnaire (PESQ)*

A battery comprising the somatic and cognitive subscale of the CSAI-2, the STAI (form X-1), the DES-IV and two items gauging perceived "threat" and "challenge" was constructed. To account for potential effects of the sequence of presentation of the items on the participants' responses, the items of the battery were randomised so that each participant was given the same set of questionnaires but with the items presented in different order. For consistency, although the CSAI-2 and STAI are originally rated on a 4-point Likert scale, all responses were recorded on a 5-point Likert-type scale ranging from 1 *(not at all)* to 5 *(very strongly),* which is the original rating scale of the state version of the DES - IV (Izard, 1972). As two items from the STAI and the somatic subscale of the CSAI-2 ("I feel jittery" and "I feel nervous") are identical, they appeared only once in the PESQ.

The CSAI-2 (Martens et al., 1990) was used to measure the cognitive and somatic components of competitive anxiety. Possible intensity scores on each subscale ranged from 9 to 45. While the psychometric validity of the CSAI-2 has been demonstrated by Martens et al. (1990), other researchers have argued or shown that this instrument may confound motivation and positive excitement with anxiety (Burton & Naylor, 1997; Jones, 1995; Lane et al., 1999).

The STAI (Spielberger et al., 1970) consists of 20 self-statements that ask the respondents to describe how they feel or felt at a particular moment. High scores on this measure indicate a high level of state anxiety, whereas low scores reflect states of calmness and serenity. The inventory has been extensively used in clinical and research settings and has good reliability and validity (Spielberger et al., 1970). Possible intensity scores on this inventory ranged from 20 to 100.

The DES-IV (Izard, 1991) is a self-report instrument designed for the use and assessment of an individual's experience of fundamental emotions or patterns of emotions as conceptualised by the DET. To keep the DES scales as emotion-specific as possible, their item content was derived from cross-cultural research on emotion expression labelling (Izard et al., 1993). The DES-IV represents a modified version of the DES-III, an inventory adapted for a maximum range of ages and educational levels. It comprises 12 three-item subscales gauging the emotions of interest, enjoyment, surprise, sadness, anger, disgust, contempt, fear, guilt, shame, shyness and self-hostility. Several studies have contributed evidence for the construct validity of the DES scales, including the scales of the last version of the inventory (e.g., Blumerg & Izard, 1985, 1986; Izard et al., 1993). The possible intensity scores on each subscale of the DES-IV ranged from 3 to 15.

In order to assess athletes' appraisal of the competition as a source of threat or a source of challenge two additional items, also rated on a 5-point Likert scale, were added to the above questionnaires. These were "I feel/felt like the competition is/was a threat" and "I feel/felt like the competition is/was a challenge".

*4.4232 Functionality of pre-competitive emotional states*

Perceived functionality of athletes' pre-competitive emotional state was measured with a single 7-point item scale ranging from -3 (very harmful to performance) to +3 (very helpful to performance) with the midpoint "0" denoting *"unimportant to performance"* (Appendices 28-29).

*4.4233 Dominant pre-competitive emotion*

An open-ended question asked the participants to identify the dominant emotion they experienced pre-competition. A list of 12 emotions measured by the DES-IV and "anxiety" were presented as possible answers. The respondents were also allowed to report emotions that were not included in the provided list.

#### *4.424 Procedure*

After a regular training session that took place at least five days before a competition, the participants were briefed about the procedures of the study and informed consent was obtained (Appendix 27). They then completed the DQ and the pre-competitive emotions questionnaire referring to how they felt before their best and worst competitions (Appendix 28). Subsequently, the participants were instructed to complete the same questionnaire one hour before an actual competition (Appendix 29) and were asked to return to the questionnaire to the experimenter in a provided self-addressed envelope.

### 4.43 Results

Analysis of data was divided into two main stages. The main scope of the first stage was to analyse patterns of facilitative and debilitative fundamental emotions and anxiety. In the second stage, the construct validity of the somatic and cognitive subscale of the CSAI-2 was tested. Analysis of facilitative and debilitative patterns of pre-competitive emotions included:

a) testing of internal consistency of the individual scales used in the study,

b) testing of intra- and interindividual differences between facilitative and debilitative patterns of emotions,

c) analysis of factorial structure of facilitative and debilitative patterns of emotions,

d) analysis of the impact of specific emotional factors on the perception of the functionality of emotional states and

e) analysis of the relationship between emotional factors and the perception of the competition as a source of threat or challenge.

In order to examine the construct validity of the cognitive and somatic subscales of the CSAI-2, separate factor analyses of the PESQ were carried out on recalled and actual facilitative patterns of emotions and recalled debilitative patterns of emotions. Factor loadings of the items of the CSAI-2 in facilitative and debilitative emotional states were analysed in order to determine whether they confound positive excitement with fear-like and threat-related emotions. Subsequently, a canonical correlation with the "threat" and "challenge" items as criteria and the individual scales of the PESQ as predictors was performed. The purpose of this analysis was to test the ability of the CSAI-2 to differentiate between threat and challenge.

A series of t-tests for independent samples was carried out in order to examine the ability of the CSAI-2 to discriminate between positive excitement and anxiety and compare it to that of other emotion scales. These t-tests verified the significance of the difference between the mean scores on the various emotion scales of athletes reporting "anxiety" and athletes reporting "excitement" as the dominant emotion they experienced before an actual competition. Also, a stepwise discriminant analysis of scores on emotion scales was performed in order to identify the instruments that best discriminate between "anxiety" and "excitement".

#### *4.431 Debilitative and facilitative patterns of pre-competitive emotions*

Internal consistency indices of the STAI, DES-IV subscales and somatic and cognitive subscales of the CSAI-2 were calculated for each retrospective and momentary assessment (Appendix 30). Results showed that internal consistency for the DES-Contempt subscale was below 0.70. Exclusion of the item "I felt/feel like I was/am better than somebody" improved the internal consistency of the scale to Alpha values of 0.82 and 0.85. So, this item was excluded from subsequent data analysis and re-included in the data pool when factor analysis of the items of the questionnaires was carried out. The other scales exhibited an acceptable degree of internal consistency.

In order to examine intraindividual differences between debilitative and facilitative patterns of pre-competitive emotions, results from athletes who exhibited a neutral or facilitative pattern of emotions on their best competition and a debilitative pattern of emotions on their worst competition were examined. For this purpose, t-tests for dependent samples testing the significance of the difference between intensity of emotions in the two recalled situations were computed. One hundred and twenty out of 202 athletes exhibited a neutral or facilitative pattern of emotions before their best competition and a debilitative pattern of emotions before their worst competition. Table 4.15 reports the means, standard deviations, t-values and Bonferroni adjusted probabilities for this group of participants. Fifty-eight athletes exhibited a neutral or facilitative emotional state and 19 athletes reported a debilitative emotional state in both occasions. Only five athletes reported a debilitative pattern of emotions on their best competition and a neutral or facilitative pattern of emotions on their worst competition.

Results showed that recalled facilitative emotional states experienced before the best competition differed in all measured emotions from recalled debilitative emotional states experienced before the worst competition, except for contempt and anger. When contrasted with facilitative patterns, debilitative patterns of emotions were characterised by higher levels of competitive cognitive and somatic anxiety, anxiety, fear, guilt, self-anger, sadness, shame, shyness, disgust and sense of threat. They were also characterised by lower levels of interest, enjoyment, surprise and challenge. In both competitions negative emotions were relatively low in intensity reaching a mean value of 4 to 6 on a scale ranging from 3 to 15 before the worst competition. Anxiety and fear were the most elevated negative emotions prior to both competitions. Recalled facilitative patterns of emotions were characterised by moderate to high levels of interest and enjoyment, whereas debilitative emotional states were characterised by low levels of enjoyment and low to moderate levels of interest.

**Table 4.15** **T-values, means and standard deviations of recalled pre-competitive emotions and functionality of emotional state in the group of athletes who exhibited a facilitative emotional pattern before their best competition and a debilitative emotional pattern before their worst competition**

| Scale (theoretical range) | Best competition | | Worst competition | | t-values (df = 119) | p |
|---|---|---|---|---|---|---|
| | M | SD | M | SD | | |
| CSAI-2 - cognitive (9-45) | 22.48 | 6.43 | 26.78 | 9.68 | -4.63 | <0.001 |
| CSAI-2 - somatic (9-45) | 23.63 | 6.58 | 27.78 | 8.33 | -4.99 | <0.001 |
| STAI (20-100) | 56.06 | 9.36 | 66.99 | 13.74 | -7.74 | <0.001 |
| DES - Fear (3-15) | 5.20 | 2.41 | 7.42 | 3.95 | -6.53 | <0.001 |
| DES - Enjoyment (3-15) | 7.63 | 2.36 | 4.75 | 2.13 | 11.80 | <0.001 |
| DES - Interest (3-15) | 10.79 | 2.43 | 6.54 | 2.59 | 15.45 | <0.001 |
| DES - Surprise (3-15) | 5.03 | 2.93 | 3.78 | 1.61 | 5.01 | <0.001 |
| DES - Guilt (3-15) | 3.40 | 1.14 | 5.53 | 2.81 | -7.94 | <0.001 |
| DES - Self-hostility (3-15) | 3.28 | 0.86 | 5.27 | 2.57 | -8.65 | <0.001 |
| DES - Sadness (3-15) | 3.26 | 0.82 | 6.58 | 3.03 | -12.27 | <0.001 |
| DES - Shame (3-15) | 4.48 | 2.40 | 6.30 | 3.46 | -6.52 | <0.001 |
| DES - Shyness (3-15) | 3.72 | 1.76 | 4.96 | 2.60 | -4.94 | <0.001 |
| DES - Disgust (3-15) | 3.40 | 1.20 | 4.12 | 2.03 | -3.57 | 0.018 |
| DES - Anger (3-15) | 3.88 | 1.68 | 4.20 | 2.29 | -1.34 | 1.000 |
| DES - Contempt (2-10) | 2.79 | 1.75 | 2.54 | 1.32 | 1.30 | 1.000 |
| Emotion functionality (-3 to +3) | 1.67 | 0.97 | -1.09 | 1.46 | 33.25 | <0.001 |
| Threat (1-5) | 1.87 | 0.91 | 2.94 | 1.49 | -7.41 | <0.001 |
| Challenge (1-5) | 3.97 | 1.00 | 2.68 | 1.32 | 10.08 | <0.001 |

The above analyses tested within-subject differences between patterns of debilitative and facilitative emotions. In order to test interindividual differences, t-tests were computed on data collected one hour before an actual competition. Table 4.16 shows the means and standard deviations of pre-competitive emotions in athletes who experienced a debilitative pattern of emotions (N=44) and athletes who experienced a neutral or facilitative pattern of emotions (N=158) before an actual competition. Additionally, it shows the results of the t-tests for independent samples with the associated Bonferroni adjusted probabilities. T-tests based on separate variances were employed when a significant difference between group variances was detected. Results showed that debilitative patterns of emotions were characterised by higher levels of competitive cognitive and somatic anxiety, anxiety (STAI), fear, guilt, self-anger, sadness and shyness and lower levels of enjoyment, interest and challenge. By contrast, individuals that reported a debilitative pattern of emotions did not significantly differ from their counterparts in the level of threat, disgust and shame experienced pre-competition. Additionally, athletes exhibiting a debilitative pattern of pre-competitive emotions reported higher levels of anger than athletes exhibiting a facilitative pattern of emotions.

**Table 4.16 T-values, means and standard deviations of actual pre-competitive emotional states and functionality of emotional state in athletes with a facilitative emotional pattern and athletes with a debilitative emotional pattern**

| Scale (theoretical range) | Facilitative pattern (N=158) | | Debilitative pattern (N=44) | | t-values (df = 200) | p |
|---|---|---|---|---|---|---|
| | M | SD | M | SD | | |
| CSAI-2 - cognitive (9-45) | 21.48 | 5.64 | 25.82 | 8.60 | -3.16 | 0.047 |
| CSAI-2 - somatic (9-45) | 22.51 | 6.49 | 27.41 | 6.99 | -4.17 | 0.002 |
| STAI (20-100) | 55.01 | 10.87 | 67.84 | 9.08 | -7.16 | <0.001 |
| DES - Fear (3-15) | 4.95 | 1.95 | 7.84 | 2.96 | -6.13 | <0.001 |
| DES - Enjoyment (3-15) | 7.11 | 2.57 | 5.16 | 2.52 | 4.51 | <0.001 |
| DES - Interest (3-15) | 9.69 | 3.14 | 7.71 | 2.79 | 3.80 | 0.003 |
| DES - Surprise (3-15) | 3.88 | 1.55 | 4.73 | 2.51 | -2.13 | 0.681 |
| DES - Guilt (3-15) | 3.51 | 1.61 | 5.18 | 2.37 | -4.41 | 0.001 |
| DES - Self-hostility (3-15) | 3.21 | 1.08 | 5.09 | 2.60 | -4.68 | <0.001 |
| DES - Sadness (3-15) | 3.37 | 1.52 | 5.18 | 2.27 | -4.96 | <0.001 |
| DES - Shame (3-15) | 4.29 | 2.27 | 5.61 | 2.97 | -2.74 | 0.146 |
| DES - Shyness (3-15) | 3.42 | 1.30 | 4.52 | 1.96 | -3.51 | 0.016 |
| DES - Disgust (3-15) | 3.20 | 0.98 | 4.47 | 3.02 | -2.76 | 0.148 |
| DES - Anger (3-15) | 3.37 | 1.16 | 5.16 | 3.22 | -3.63 | 0.013 |

*(continued)*

**Table 4.16 - continued**

| Scale (theoretical range) | Facilitative pattern (N=158) | | Debilitative pattern (N=44) | | t-values (df = 200) | p |
|---|---|---|---|---|---|---|
| | M | SD | M | SD | | |
| DES - Contempt (2-10) | 2.50 | 1.25 | 2.80 | 2.04 | -0.91 | 1.000 |
| Emotion functionality (-3 to +3) | 1.29 | 0.89 | -1.41 | 0.54 | 19.11 | <0.001 |
| Threat (1-5) | 1.90 | 0.99 | 2.23 | 1.54 | -1.34 | 1.000 |
| Challenge (1-5) | 3.65 | 1.08 | 2.91 | 1.20 | 3.72 | 0.008 |

As part of testing the structure of facilitative and debilitative patterns of emotions and especially anxiety, principal axis factor analyses with oblimin rotation were carried out using data of facilitative emotional patterns related to the best and actual competition and debilitative emotional patterns related to the athletes' worst competition. Only factors with eigenvalues greater than 1 were retained (Kaiser, 1960). Factor analysis of recalled facilitative patterns of emotions (Table 4.17; Appendix 31) revealed four oblique factors. A first factor was composed of negative emotions associated with increased self-focus and avoidance behaviour (self-hostility, shyness, guilt, shame, sadness and disgust). Anxiety scales and fear formed a second factor. Enjoyment, interest and surprise grouped together on one factor. Finally, anger and contempt formed a fourth factor. These factors explained 68.27% of the total variance. The anxiety-fear factor showed a positive low correlation with the anger-contempt factor ($r = 0.32$) and the negative emotions factor ($r = 0.22$). Other inter-factor correlations were lower than 0.15 (Appendix 31).

**Table 4.17 Rotated factor pattern matrix for recalled facilitative sets of pre-competitive emotions related to athletes' best competition (N=178)[4.4]**

| Scale | Factor 1 | Factor 2 | Factor 3 | Factor 4 |
|---|---|---|---|---|
| DES - Self-hostility | **0.90** | 0.01 | -0.03 | 0.07 |
| DES - Shyness | **0.90** | -0.04 | 0.08 | 0.04 |
| DES - Shame | **0.87** | 0.08 | -0.04 | -0.12 |
| DES - Guilt | **0.76** | -0.03 | 0.04 | -0.06 |

*(continued)*

[4.4] Items' highest loadings are in bold.

**Table 4.17 - continued**

| Scale | Factor 1 | Factor 2 | Factor 3 | Factor 4 |
|---|---|---|---|---|
| DES - Disgust | **0.73** | 0.10 | 0.04 | 0.26 |
| DES - Sadness | **0.43** | 0.18 | -0.10 | 0.13 |
| CSAI-2 - Somatic | -0.01 | **0.96** | 0.00 | 0.00 |
| STAI | -0.08 | **0.80** | -0.46 | 0.03 |
| DES - Fear | 0.09 | **0.75** | 0.17 | 0.04 |
| CSAI-2 - Cognitive | 0.27 | **0.67** | 0.18 | -0.01 |
| DES - Enjoyment | 0.10 | -0.17 | **0.88** | -0.03 |
| DES - Interest | -0.33 | 0.25 | **0.64** | 0.14 |
| DES - Surprise | 0.36 | 0.05 | **0.47** | -0.03 |
| DES - Anger | 0.22 | -0.05 | -0.04 | **0.92** |
| DES - Contempt | -0.09 | -0.07 | 0.03 | **0.70** |

Factor analysis of actual facilitative patterns of emotions (Table 4.18; Appendix 32) revealed four oblique factors of very similar structure to that obtained for recalled facilitative patterns. A first factor was composed of negative emotions associated with increased self-focus (self-hostility, guilt, shame, sadness, shyness) and the emotion of surprise. Surprise also loaded on a factor of enjoyment and interest. This negative emotions factor explained 26.30% of the total variance. Anxiety scales and fear formed a second factor which explained 18.79% of the total variance. Interest had a substantial loading (0.31) on this factor. Enjoyment and interest grouped together on one factor, accounting for 10.04% of the total variance. Anger, contempt and disgust formed a fourth factor and explained 17.91% of the total variance. The anxiety-fear factor showed a positive low correlation with the negative emotions factor ($r = 0.28$). The latter also correlated with the anger-contempt-disgust factor ($r = 0.36$). Other inter-factor correlations were lower than 0.20 (Appendix 32).

**Table 4.18 Rotated factor pattern matrix for actual facilitative sets of pre-competitive emotions (N=158)[4.5]**

| Scale | Factor 1 | Factor 2 | Factor 3 | Factor 4 |
|---|---|---|---|---|
| DES - Guilt | **0.88** | -0.01 | 0.06 | 0.01 |
| DES - Shyness | **0.87** | 0.01 | 0.08 | -0.08 |
| DES - Self-hostility | **0.82** | 0.09 | 0.12 | -0.02 |
| DES - Shame | **0.67** | 0.15 | -0.06 | -0.18 |
| DES - Sadness | **0.57** | 0.22 | 0.27 | -0.02 |
| DES - Surprise | **0.51** | -0.06 | 0.10 | 0.31 |
| CSAI-2 - Somatic | -0.07 | **0.99** | 0.06 | 0.09 |
| STAI | 0.03 | **0.76** | 0.14 | -0.42 |
| DES - Fear | 0.24 | **0.65** | 0.15 | 0.08 |
| CSAI-2 - Cognitive | 0.41 | **0.64** | -0.26 | 0.06 |
| DES - Disgust | 0.11 | -0.05 | **0.94** | -0.08 |
| DES - Anger | 0.13 | 0.01 | **0.89** | -0.03 |
| DES - Contempt | -0.05 | 0.04 | **0.76** | 0.07 |
| DES - Enjoyment | 0.20 | -0.26 | -0.06 | **0.77** |
| DES - Interest | -0.29 | 0.31 | 0.03 | **0.75** |

Factor analysis of debilitative patterns of emotions (Table 4.19; Appendix 33) revealed three oblique factors. A first factor comprised anxiety, fear, sadness and lack of enjoyment. They explained 28.57% of the total variance. Interest formed one factor and explained 8.5% of the total variance. The negative emotions of guilt, shame, shyness, anger, contempt, self-hostility and disgust and the emotion of surprise grouped together in a factor explaining 25.54% of the total variance. The anxiety-fear-sadness factor was mildly correlated with the negative emotions (r = 0.36) and interest factor (r = -0.21). The negative emotions and interest factors were not correlated (r = 0.00) (Appendix 33).

[4.5] Items' highest loadings are in bold.

**Table 4.19** **Rotated factor pattern matrix for recalled debilitative sets of pre-competitive emotions related to athletes' worst competition (N=139)**[4.6]

| Scale | Factor 1 | Factor 2 | Factor 3 |
|---|---|---|---|
| STAI | **0.96** | -0.08 | -0.06 |
| CSAI-2 - Somatic | **0.96** | 0.03 | 0.22 |
| CSAI-2 - Cognitive | **0.78** | 0.11 | 0.20 |
| DES - Fear | **0.75** | 0.14 | 0.09 |
| DES - Enjoyment | **-0.53** | 0.27 | 0.35 |
| DES - Sadness | **0.43** | 0.18 | 0.10 |
| DES - Anger | -0.08 | **0.86** | -0.04 |
| DES - Contempt | -0.12 | **0.84** | 0.08 |
| DES - Surprise | -0.08 | **0.77** | 0.38 |
| DES - Disgust | 0.18 | **0.69** | -0.08 |
| DES - Shyness | 0.35 | **0.53** | -0.26 |
| DES - Self-hostility | 0.34 | **0.48** | -0.33 |
| DES - Guilt | 0.34 | **0.41** | -0.30 |
| DES - Shame | 0.32 | **0.39** | -0.02 |
| DES - Interest | -0.27 | -0.03 | **0.68** |

Stepwise regression analysis was performed to examine the relative influence of the factors emerged from the factor analysis of actual pre-competitive emotions on perceived functionality of pre-competitive emotional states (Table 4.20; Appendix 34). Besides the four extracted factors, interaction terms defined as products of the anxiety-fear factor and the negative emotions and interest-enjoyment factors were also entered in the regression equation. It was hypothesised that the negative emotions and interest-enjoyment factors would be better predictors of the functionality of the pre-competitive emotional state than the anxiety/fear factor. This would be due to the fact that anxiety/fear is a complex, variable and ambiguous emotional state that may motivate both approach and avoidance behaviour. By contrast, interest-enjoyment always entails approach behaviour and negative emotions such as shyness, shame and sadness are clearly associated with avoidance behaviour. It was also expected that the interaction terms of anxiety/fear by interest-enjoyment and anxiety/fear by negative emotions would

[4.6] Items' highest loadings are in bold.

significantly contribute to the prediction of functionality of the emotional state. On one hand, anxiety/fear accompanied by higher levels of interest and enjoyment would be associated with a facilitative pattern of emotions. On the other hand, anxiety/fear accompanied by low levels of interest and enjoyment would be less facilitative or more debilitative to performance. Finally, anxiety/fear accompanied by high levels of negative emotions such as guilt, sadness, shyness, self-hostility and shame would be more debilitative to performance than anxiety/fear accompanied by lower levels of these negative emotions. Results showed that the factors of enjoyment-interest and negative emotions were the best predictors of the functionality of pre-competitive emotions. Anger-disgust-contempt and anxiety-fear did not additionally contribute to the prediction of emotion functionality. The interaction between negative emotions and anxiety-fear was not significant, whereas the interaction between anxiety-fear and interest-enjoyment approached significance ($p = 0.07$). Overall, these results support the hypothesis that anxiety can be associated with both facilitative and debilitative emotional states and that the perceived effect of anxiety on performance will depend on the emotions accompanying it.

Correlational analysis revealed a low negative relationship between perceived functionality of emotional state and the factors of anger-contempt-disgust ($r = -0.23$) and anxiety-fear ($r = -0.27$). Analysis of the relationship between functionality of emotional state and the components of the anxiety-fear factor showed that cognitive and somatic anxiety as measured by the CSAI-2 were not significantly correlated with functionality of emotional state. By contrast, scores on the STAI ($r = -0.32$) and the DES-Fear subscale ($r = -0.34$) showed a low negative but significant correlation with functionality of emotional state (Appendix 35).

**Table 4.20 Summary of stepwise regression analysis of emotional factors predicting functionality of emotional state for the actual competition (N=201)**

| Predictor | R | $R^2$ | $R^2$change | F-to-enter (df) |
|---|---|---|---|---|
| IEF | 0.44 | 0.19 | 0.189** | 46.36 (1, 200) |
| NEF | 0.54 | 0.13 | 0.107** | 30.03 (1, 200) |

Model summary

| R | $R^2$ | Adjusted $R^2$ | SE of estimate | F-ratio | p |
|---|---|---|---|---|---|
| 0.544 | 0.296 | 0.289 | 1.172 | 41.58 | <0.001 |

Legend: IEF = interest-enjoyment factor; NEF = negative emotions factor; SE = standard error; R = multiple correlation coefficient; $R^2$ = multiple coefficient of determination

Stepwise regression analysis produced the following regression equation of pre-competitive emotional state functionality (predictors standardised):

Emotional state functionality = 0.70 + 0.41(IEF) - 0.33(NEF)

Finally, in order to examine the patterns of emotions that are associated with the perception of the competitive event as a source of challenge or threat, canonical correlation between the extracted emotional factors as predictors and threat and challenge as criteria was carried out (Appendix 36). It was hypothesised that threat would be mainly associated with anxiety/fear and negative emotions, whereas challenge would be related to interest/enjoyment. Two canonical variates were found to be significant ($Rc1$ = 0.65, $p < 0.001$; $Rc2$ = 0.48; $p<0.001$), accounting for 42.38% and 23.14% of the variance, respectively. As redundancy index has been shown to provide a more accurate measure of the proportion of variance in the variables in one set that is reproducible from the variables in the other set (Thompson, 1984), a redundancy index was calculated for each canonical variate. Redundancy indices showed that the first canonical variate accounted for 24.10% of the variance and the second variate accounted for 10.00% of the variance in the criteria.

Table 4.21 shows the canonical loadings for the set of criteria and predictors. For the first canonical variate, the predictor variable of anxiety-fear and interest-enjoyment together with the criterion variables of challenge and threat contributed most to the canonical correlation. The first variate represented a mixed state of threat and challenge most strongly associated with anxiety-fear. The second variate represented appraisal of the competition as either a challenge or a threat. In other words, it represented a state of high challenge and low threat that was negatively correlated with negative emotions and anxiety-fear and positively correlated with interest-enjoyment or a state of high threat and low challenge that was positively correlated with negative emotions and anxiety-fear and negatively correlated with interest-enjoyment. These results indicate that athletic competition is mainly appraised as a source of both threat and challenge which is associated with feelings of anxiety/fear and interest-enjoyment. The emotional experience of individuals who perceived a forthcoming competition as a source of challenge was characterised by higher levels of interest-enjoyment and lower levels of negative emotions and anxiety/fear. In contrast, individuals who perceived athletic competition exclusively as a threat exhibited an emotional pattern characterised by low interest-enjoyment and high anxiety/fear and negative emotions. Overall, these findings support the hypothesis that anxiety is a threat-related emotional state that can be associated with both approach and avoidance action tendencies.

**Table 4.21 Canonical loadings: threat-challenge and pre-competitive emotions**

| Variables | | Canonical correlation 1 loadings | Canonical correlation 2 loadings |
|---|---|---|---|
| Criteria | Threat | 0.77 | -0.64 |
| | Challenge | 0.74 | 0.67 |
| Anxiety-Fear | | 0.77 | -0.61 |
| Interest-Enjoyment | | 0.40 | 0.76 |
| Negative emotions | | 0.21 | -0.66 |
| Anger-Disgust-Contempt | | -0.14 | -0.44 |

### *4.432 <u>Interpretation of items of the cognitive and somatic subscales of the CSAI-2</u>*

In order to examine the meaning that athletes ascribe to the symptoms reported in the cognitive and somatic subscales of the CSAI-2, principal axis factor analyses of the items of the CSAI-2, STAI and DES were performed. Data referring to facilitative patterns of emotions experienced before the athletes' best competition, debilitative patterns of emotions experienced before the worst competition and pre-competitive emotions reported before an actual competition, regardless of their functionality, were analysed (Appendices 37-39). As some of the resulting communalities (after extraction) were below 0.70 and the factor analyses were based on more than 30 variables, the number of factors to be retained was determined using scree plots (Stevens, 1992). When analysis of scree plots could not provide a clear indication of the number of factors to be retained, interpretability of extracted factors and percent of total variance explained by various factor solutions were also considered. The results of the three factor analyses are summarised in Table 4.22.

**Table 4.22 Highest factor loadings of the items of the cognitive and somatic subscale of the CSAI-2 on emotion factors**

| Item of the CSAI-2 (subscale) | Highest loadings from factor analysis of facilitative patterns of emotions before best competition | | Highest loadings from factor analysis of debilitative patterns of emotions before worst competition | | Highest loadings from factor analysis of patterns of emotions before an actual competition | |
|---|---|---|---|---|---|---|
| | Factor (n.f.) | Loading | Factor (n.f.) | Loading | Factor (n.f.) | Loading |
| I am concerned about this competition (Cognitive) | Calmness - enjoyment (2) | -0.40 | Anxiety - tension (8) | 0.37 | Concern (7) | 0.64 |
| | | | Fear - tension (1) | 0.32 | Shame (6) | -0.30 |
| I have self-doubts (Cognitive) | Fear - tension (1) | 0.42 | Sadness - guilt (7) | 0.33 | Shame (6) | 0.37 |
| | Worry (6) | 0.35 | Fear - tension (1) | 0.32 | | |
| I am concerned I may not do as well in this competition as I could (Cognitive) | Worry (6) | 0.75 | Shame - worry (5) | 0.60 | Concern (7) | 0.57 |
| | | | | | Shame (6) | 0.39 |
| I'm concerned about losing (Cognitive) | Worry (6) | 0.58 | Interest (3) | 0.37 | Concern (7) | 0.50 |
| | | | Shame - worry (5) | 0.33 | Sadness (1) | 0.32 |
| | | | Sadness - guilt (7) | 0.31 | | |
| I am concerned about choking under pressure (Cognitive) | Sadness (5) | 0.35 | Shame - worry (5) | 0.46 | Sadness (1) | 0.52 |
| | | | Sadness - guilt (5) | 0.34 | | |

*(continued)*

**Table 4.22 - continued**

| Item of the CSAI-2 (subscale) | Highest loadings from factor analysis of facilitative patterns of emotions before best competition | | Highest loadings from factor analysis of debilitative patterns of emotions before worst competition | | Highest loadings from factor analysis of patterns of emotions before an actual competition | |
|---|---|---|---|---|---|---|
| | Factor (n.f.) | Loading | Factor (n.f.) | Loading | Factor (n.f.) | Loading |
| I'm concerned about performing poorly (Cognitive) | Worry (6) | 0.59 | Shame - worry (5) | 0.58 | Concern (7) | 0.52 |
| | | | Interest (3) | 0.32 | | |
| I am concerned about reaching my goal (Cognitive) | Worry (6) | 0.33 | Shame - worry (5) | 0.52 | Interest (3) | 0.43 |
| | Fear - tension (1) | 0.31 | Interest (3) | 0.37 | Concern (7) | 0.36 |
| | Shame - shyness - self-anger - disgust (8) | -0.30 | | | | |
| I am concerned that others will be disappointed with my performance (Cognitive) | Worry (6) | 0.51 | Shame - worry (5) | 0.64 | Concern (7) | 0.49 |
| | Shame - shyness - self-anger - disgust (8) | 0.30 | | | Shame (6) | 0.40 |
| I'm concerned I won't be able to concentrate (Cognitive) | Guilt - confusion (9) | 0.48 | Sadness - guilt (7) | 0.52 | Fear - tension (5) | 0.36 |
| | Fear - tension (1) | 0.37 | Shame - worry (5) | 0.31 | | |

*(continued)*

**Table 4.22 - continued**

| Item of the CSAI-2 (subscale) | Highest loadings from factor analysis of facilitative patterns of emotions before best competition | | Highest loadings from factor analysis of debilitative patterns of emotions before worst competition | | Highest loadings from factor analysis of patterns of emotions before an actual competition | |
|---|---|---|---|---|---|---|
| | Factor (n.f.) | Loading | Factor (n.f.) | Loading | Factor (n.f.) | Loading |
| I feel nervous (Somatic) | Calmness - enjoyment (2) | -0.49 | Anxiety - tension (8) | 0.54 | Concern (7) | 0.60 |
| | Worry (6) | 0.43 | | | Fear - tension (5) | 0.36 |
| I feel jittery (Somatic) | Fear - tension (1) | 0.75 | Fear - tension (1) | 0.76 | Fear - tension (5) | 0.78 |
| My body feels tense (Somatic) | Fear - tension (1) | 0.51 | Anxiety - tension (8) | 0.47 | Fear - tension (5) | 0.61 |
| | Calmness - enjoyment (2) | -0.48 | Calmness - enjoyment (2) | -0.32 | Concern (7) | 0.41 |
| | Excitement - self-confidence (3) | 0.30 | | | | |
| I feel tense in my stomach (Somatic) | Fear - tension (1) | 0.37 | Anxiety - tension (8) | 0.49 | Fear - tension (5) | 0.53 |
| | Worry (6) | 0.36 | Fear - tension (1) | 0.31 | Concern (7) | 0.43 |
| My body feels relaxed (Somatic) | Calmness - enjoyment (2) | 0.71 | Calmness - enjoyment (2) | 0.85 | Calmness - enjoyment (2) | 0.70 |

*(continued)*

**Table 4.22 - continued**

| Item of the CSAI-2 (subscale) | Highest loadings from factor analysis of facilitative patterns of emotions before best competition | | Highest loadings from factor analysis of debilitative patterns of emotions before worst competition | | Highest loadings from factor analysis of patterns of emotions before an actual competition | |
|---|---|---|---|---|---|---|
| | Factor (n.f.) | Loading | Factor (n.f.) | Loading | Factor (n.f.) | Loading |
| My heart is racing (Somatic) | Calmness - enjoyment (2) | -0.39 | Anxiety - tension (8) | 0.54 | Fear - tension (5) | 0.71 |
| | | | Fear - tension (1) | 0.40 | | |
| | Fear - tension (1) | 0.33 | | | | |
| I feel my stomach sinking (Somatic) | Fear - tension (1) | 0.61 | Fear - tension (1) | 0.40 | Fear - tension (5) | 0.49 |
| | | | Anxiety - tension (8) | 0.31 | | |
| My hands are clammy (Somatic) | Shame - shyness - self-anger - disgust (8) | 0.40 | Fear - tension (1) | 0.48 | Sadness (1) | 0.34 |
| | | | Anxiety - tension (8) | 0.34 | Interest (3) | 0.33 |
| | Fear - tension (1) | 0.30 | | | | |
| My body feels tight (Somatic) | Excitement - self-confidence (3) | 0.50 | Fear - tension (1) | 0.33 | Fear - tension (5) | 0.45 |
| | | | | | Interest (3) | 0.38 |
| | Calmness - enjoyment (2) | -0.45 | | | | |

Legend: n.f. = number of extracted factor in a particular factor analysis. The complete outputs of the factor analyses are reported in Appendices 37 to 39.

Factor analysis of recalled facilitative emotional states before athletes' best competition produced nine factors and explained 60.55% of the variance (Table 4.23; Appendix 37). The PESQ items from the factor analysis of recalled debilitative emotional states experienced before the worst competition resulted in nine factor groupings and explained 69.82% of the variance (Table 4.24; Appendix 38). Finally, factor analysis of the momentary emotional states before an actual competition yielded nine factors that explained 66.80% of the total variance (Table 4.25; Appendix 39).

Results showed that most items of the somatic subscale of the CSAI-2 were related to Fear-Tension (Table 4.22). The item "My body feels/felt relaxed" consistently loaded on a Calmness-Enjoyment factor. The items "My body feels/felt tight" and "My body feels/felt tense" were understood in two different ways. "My body feels/felt tight" was associated with Excitement-Self-confidence in recalled facilitative emotional states, Fear-Tension in recalled debilitative emotional states and had positive loadings on both Interest and Fear-Tension before an actual competition. Similarly, "My body feels/felt tense" loaded on a Fear-Tension and an Excitement-Self-confidence factor in facilitative emotional states and an Anxiety-Tension factor in debilitative emotional states. Analysis of momentary pre-competitive emotions revealed that this item was related to Fear-Tension and Concern. "I feel/felt nervous" was associated with "anxiety" factors. It was related to Worry in recalled facilitative patterns of emotions, Anxiety-Tension in recalled debilitative patterns of emotions and Concern in momentary pre-competitive emotional states. It is noteworthy that these "anxiety" factors were associated with both threat and challenge appraisals (Tables 4.22-4.24). In other words, they were related to ambivalent action tendencies with respect to the competitive event. In contrast, Fear-Tension factors that emerged in the three factor analyses were associated with threat but not with challenge appraisals, providing clearer information of athletes' perception of the competition. "Anxiety" factors were positively correlated with fear. Additionally, they showed a stronger relationship with negative emotions associated with avoidance tendencies in recalled debilitative pre-competitive emotional states (Table 4.23) than in recalled facilitative and momentary pre-competitive emotional states. Factor analysis of the PESQ based on recalled debilitative emotional states produced an emotional dimension that encompassed shame, anxiety, self-hostility and shyness. This dimension showed a positive relationship with a Sadness-Guilt factor.

Analysis of the cognitive subscale of the CSAI-2 revealed that its items were less clear in meaning than those of the somatic subscale. They conveyed equivocal information about athletes' action tendencies and perception of the competitive event. Only one of the items of the cognitive subscale showed a loading greater than 0.40 on a Fear-Tension factor (Table 4.22). "I'm concerned about losing", "I'm concerned about reaching my goal" and "I'm concerned about performing poorly" were related to both Interest and "anxiety" factors. The item "I am concerned about this competition" was not associated with any threat-related emotional factors in recalled facilitative emotional states. The same item showed a positive loading on Concern and a negative loading on Shame in momentary pre-competitive emotional states. Two items of the cognitive subscale showed a relatively consistent relationship with shame and one item exhibited substantial positive loadings on a Sadness factor. Most importantly, the average maximal loadings of the items of the cognitive subscale of the CSAI-2 were 0.49 against 0.58 of the somatic subscale, 0.61 of the STAI and 0.63 of the DES items (Appendices 37-39). Only three out of nine items of the cognitive subscale of the CSAI-2 exhibited maximal loadings greater than 0.40 in all factor analyses. These were ""I am concerned I may not do as well in this competition as I could", "I am concerned about performing poorly" and "I am concerned that others will be disappointed with my performance". These items were associated with the anxiety-related factors of Worry, Concern and Shame-Worry.

In contrast to the cognitive subscale of the CSAI-2, most of the DES items exhibited maximal loadings greater than 0.40 and grouped into a single emotional factor. For instance, the three items of the "Fear" subscale were consistently associated with a Fear-Tension factor. The same held true for the DES subscales of "Disgust", "Enjoyment", "Sadness", "Anger", "Shame", "Shyness" and "Guilt" (Appendices 37-39). The items of the STAI denoting lack of anxiety also showed a stable tendency to load on a single factor labelled Calmness-Enjoyment. Additionally, three items of the STAI denoting presence of anxiety were consistently associated with Fear-Tension and four other items exhibited a stable relationship with "anxiety" factors". By contrast, "I feel upset" loaded on a Sadness factor, "I am regretful" was associated with guilt and anger but not with threat-related emotions and "I feel high strung" was interpreted as a sign of fear-tension as well as positive excitement.

**Table 4.23 Structure of anxiety-related factors (only items with loadings equal to or greater than 0.40 are reported) obtained in factor analysis of recalled facilitative emotional states before athletes' best competition and correlation with other extracted factors and the items "threat" and "challenge"**

| Factor: Fear - Tension | | Factor: Worry | |
|---|---|---|---|
| ***Item (Scale) (loading on factor)*** | | ***Item (Scale) (loading on factor)*** | |
| I felt afraid, shaky and jittery (DES - Fear) (0.84) | | I was concerned I might not do as well in that competition as I could (CSAI-2, C) (0.75) | |
| I felt jittery (CSAI-2, S; STAI) (0.75) | | I felt anxious (STAI) (0.66) | |
| I felt my stomach sinking (CSAI-2, S) (0.61) | | I was worried (STAI) (0.63) | |
| I felt scared, uneasy, like something might have harmed me (DES - Fear) (0.60) | | I was concerned about performing poorly (CSAI-2, C) (0.59) | |
| I felt fearful, like I was in danger, very tense (DES - Fear) (0.53) | | I was concerned about losing (CSAI-2, C) (0.58) | |
| My body felt tense (CSAI-2, S) (0.51) | | I was concerned that others would be disappointed with my performance (CSAI-2, C) (0.51) | |
| I had self-doubts (CSAI-2, C) (0.42) | | I was worried about possible misfortunes (STAI) (0.48) | |
| I was tense (STAI) (0.40) | | I felt nervous (CSAI-2, S; STAI) (0.43) | |
| Correlations with other extracted factors and "threat" and "challenge": | | | |
| Calmness- Enjoyment | -0.13 | **Fear - Tension** | **0.38** |
| Excitement - Self-confidence | 0.22 | Calmness - Enjoyment | -0.23 |
| Anger - Contempt | 0.21 | Excitement - Self-confidence | 0.09 |

*(continued)*

**Table 4.23 - Continued**

| Correlations with other extracted factors and "threat" and "challenge": | | | |
|---|---|---|---|
| Factor: Fear - Tension | | Factor: Worry | |
| Sadness | 0.15 | Anger - Contempt | 0.18 |
| **Worry** | **0.38** | Sadness | 0.19 |
| Surprise | 0.16 | Surprise | 0.09 |
| Shame - Shyness - Self-hostility - Disgust | 0.11 | Shame - Shyness - Self-hostility - Disgust | 0.13 |
| Guilt - Confusion | 0.03 | Guilt - Confusion | 0.09 |
| **Threat** | **0.38** | Threat | 0.27 |
| Challenge | 0.17 | Challenge | 0.25 |

Legend: C = cognitive subscale; S = somatic subscale

**Table 4.24 Structure of anxiety-related factors (only items with loadings equal to or greater than 0.40 are reported) obtained in factor analysis of recalled debilitative emotional states before athletes' worst competition and correlation with other extracted factors and the items "threat" and "challenge"**

| Factor: Fear - Tension | Factor: Anxiety - Tension | Factor: Shame -Worry |
|---|---|---|
| ***Item (Scale) (loading on factor)*** | ***Item (Scale) (loading on factor)*** | ***Item (Scale) (loading on factor)*** |
| I felt fearful, like I was in danger, very tense (DES - Fear) (0.85) | I was tense (STAI) (0.58) | I felt like people would have looked at me when something went wrong (DES - Shame) (0.84) |
| I felt afraid, shaky and jittery (DES - Fear) (0.82) | I felt disgusted, like something was sickening (DES - Disgust) (0.57) | I felt embarrassed at the thought that someone might have seen me make a mistake (DES - Shame) (0.74) |
| I felt scared, uneasy, like something might have harmed me (DES - Fear) (0.77) | I felt nervous (CSAI-2, S; STAI) (0.54) | I felt like people would laugh at me (DES - Shame) (0.73) |
| I felt jittery (CSAI-2, S; STAI) (0.76) | My heart was racing (CSAI-2, S) (0.54) | I was concerned that others would be disappointed with my performance (CSAI-2, C) (0.64) |
| I felt over-excited and "rattled" (STAI) (0.59) | I felt anxious (STAI) (0.52) | I was concerned I might not do as well in that competition as I could (CSAI-2, C) (0.60) |
| My hands were clammy (CSAI-2, S) (0.48) | I felt tense in my stomach (CSAI-2, S) (0.49) | I was concerned about performing poorly (CSAI-2, C) (0.58) |
| I felt my stomach sinking (CSAI-2, S) (0.40) | My body felt tense (CSAI-2, S) (0.47) | I was concerned about reaching my goal (CSAI-2, C) (0.52) |
| My heart was racing (CSAI-2, S) (0.40) | | |

*(continued)*

**Table 4.24 - Continued**

| Factor: Fear - Tension<br>*Item (Scale) (loading on factor)* | | Factor: Anxiety - Tension<br>*Item (Scale) (loading on factor)* | | Factor: Shame -Worry<br>*Item (Scale) (loading on factor)* | |
|---|---|---|---|---|---|
| | | | | I felt bashful, embarrassed (DES - Shyness) (0.46) | |
| | | | | I was concerned about choking under pressure (CSAI-2, C) (0.46) | |
| | | | | I was worried about possible misfortunes (STAI) (0.42) | |
| | | | | I felt mad at myself (DES-Self-hostility) (0.41) | |
| Correlations with other extracted factors and "threat" and "challenge" | | | | | |
| **Calmness - Enjoyment** | **-0.31** | Fear - Tension | 0.27 | **Fear - Tension** | **0.32** |
| Interest | 0.24 | Calmness - Enjoyment | -0.24 | Calmness - Enjoyment | -0.14 |
| Anger - Disgust - Contempt - Surprise | 0.14 | Interest | 0.28 | Interest | 0.19 |
| **Shame - Worry** | **0.32** | Anger - Disgust - Contempt - Surprise | 0.11 | Anger - Disgust - Contempt - Surprise | 0.21 |
| Enjoyment | 0.13 | Shame - Worry | 0.20 | Enjoyment | 0.08 |
| Sadness - Guilt | 0.29 | Enjoyment | - 0.07 | Sadness - Guilt | 0.25 |

*(continued)*

**Table 4.24 - Continued**

| Correlations with other extracted factors and "threat" and "challenge" | | | | | |
|---|---|---|---|---|---|
| Factor: Fear - Tension | | Factor: Anxiety - Tension | | Factor: Shame -Worry | |
| Anxiety - Tension | 0.26 | Sadness - Guilt | 0.24 | Anxiety - Tension | 0.20 |
| Self-hostility - Shyness - Guilt | 0.27 | Self-hostility - Shyness - Guilt | 0.14 | Self-hostility - Shyness - Guilt | 0.20 |
| **Threat** | **0.76** | **Threat** | **0.60** | **Threat** | **0.52** |
| Challenge | 0.10 | **Challenge** | **0.31** | **Challenge** | **0.46** |

Legend: C = cognitive subscale; S = somatic subscale

**Table 4.25** **Structure of anxiety-related factors (only items with loadings equal to or greater than 0.40 are reported) obtained in factor analysis of momentary emotional states experienced before a competition and correlation with other extracted factors and the items "threat" and "challenge"**

| Factor: Fear - Tension | Factor: Concern |
|---|---|
| ***Item (Scale) (loading on factor)*** | ***Item (Scale) (loading on factor)*** |
| I feel afraid, shaky and jittery (DES - Fear) (0.84) | I am concerned about this competition (CSAI-2, C) (0.64) |
| I feel jittery (CSAI-2, S; STAI) (0.78) | I feel anxious (STAI) (0.60) |
| My heart was racing (CSAI-2, S) (0.71) | I feel nervous (CSAI-2, S; STAI) (0.60) |
| I feel fearful, like I'm in danger, very tense (DES - Fear) (0.66) | I'm concerned I may not do as well in this competition as I could (CSAI-2, C) (0.57) |
| My body feels tense (CSAI-2, S) (0.61) | I am concerned about performing poorly (CSAI-2, C) (0.52) |
| I feel tense in my stomach (CSAI-2, S) (0.53) | I am concerned about losing (CSAI-2, C) (0.50) |
| I felt my stomach sinking (CSAI-2, S) (0.49) | I am concerned that others will be disappointed with my performance (CSAI-2, C) (0.49) |
| I feel scared, uneasy, like something may harm me (DES - Fear) (0.48) | I am worried about possible misfortunes (STAI) (0.46) |
| My body feels tight (CSAI-2, S) (0.45) | I feel like I am better than somebody (DES - Contempt) (0.44) |
| I am tense (STAI) (0.43) | I feel tense in my stomach (CSAI-2, S) (0.43) |
| I feel over-excited and rattled" (STAI) (0.40) | My body feels tense (CSAI-2, S) (0.41) |

*(continued)*

**Table 4.25 - Continued**

| Correlations with other extracted factors and "threat" and "challenge": | | | |
|---|---|---|---|
| Factor: Fear - Tension | | Factor: Concern | |
| Sadness | 0.24 | Sadness | 0.24 |
| Calmness-Enjoyment | -0.24 | Calmness-Enjoyment | -0.14 |
| Interest | 0.18 | Interest | 0.22 |
| Anger - Contempt - Disgust | 0.10 | Anger - Contempt - Disgust | 0.02 |
| Shame | 0.13 | **Fear - tension** | **0.30** |
| **Concern** | **0.30** | Shame | 0.18 |
| Surprise | 0.18 | Surprise | 0.03 |
| Self-hostility - Guilt - Shyness | 0.15 | Self-hostility - Guilt - Shyness | 0.06 |
| **Threat** | **0.47** | **Threat** | **0.52** |
| Challenge | 0.15 | **Challenge** | **0.33** |

Legend: C = cognitive subscale; S = somatic subscale

In order to analyse the relationship between the CSAI-2 and anxiety measured with the STAI as predictors and "threat" and "challenge" as criterion, canonical correlation analysis was used (Appendix 40). Two canonical variates were found to be significant ($Rc1 = 0.75$, $p < 0.001$; $Rc2 = 0.60$; $p<0.001$), accounting for 56.25% and 35.49% of the variance, respectively. As redundancy index has been shown to provide a more accurate measure of the proportion of variance in the variables in one set that is reproducible from the variables in the other set (Thompson, 1984), a redundancy index was calculated for each canonical variate. Redundancy indices showed that the first canonical variate accounted for 31.9% of the variance and the second variate accounted for 15.3% of the variance.

Table 4.26 shows the canonical loadings for the set of criteria and predictors. The first variate represented a dimension of combined challenge and threat, which was positively correlated with interest and cognitive and somatic anxiety. The second variate represented a state of increased threat with relatively low challenge or increased challenge with relatively low threat that was associated with anxiety as measured by the STAI, fear, self-hostility, sadness and interest.

**Table 4.26 Canonical loadings: threat-challenge and pre-competitive emotions**

| Variables | | Canonical correlation 1 loadings | Canonical correlation 2 loadings |
|---|---|---|---|
| Criteria | Threat | 0.66 | 0.75 |
| | Challenge | 0.83 | -0.55 |
| CSAI-2 - Cognitive | | 0.76 | 0.40 |
| CSAI-2 - Somatic | | 0.59 | 0.41 |
| STAI | | 0.40 | 0.66 |
| DES - Fear | | 0.30 | 0.61 |
| DES - Enjoyment | | 0.09 | -0.33 |
| DES - Interest | | 0.58 | -0.58 |
| DES - Surprise | | 0.14 | 0.16 |
| DES - Guilt | | 0.06 | 0.50 |
| DES - Self-hostility | | 0.07 | 0.65 |

*(continued)*

**Table 4.26- Continued**

| Variables | Canonical correlation 1 loadings | Canonical correlation 2 loadings |
|---|---|---|
| DES - Sadness | 0.12 | 0.58 |
| DES - Shame | 0.17 | 0.37 |
| DES - Shyness | -0.03 | 0.52 |
| DES - Disgust | -0.21 | 0.37 |
| DES - Anger | -0.18 | 0.30 |
| DES - Contempt | -0.03 | 0.23 |

Finally, the ability of the various scales to discriminate between emotional states that athletes label as "anxiety" and emotional states labelled as "excitement" was examined. Fifty-one athletes identified "excitement" and 50 athletes identified "anxiety" as the dominant emotion experienced before an actual competition. T-tests showed that athletes who reported "anxiety" as being the dominant pre-competitive emotion had higher levels of anxiety (STAI), fear, guilt, self-hostility, shame, shyness and disgust and lower levels of interest and enjoyment than athletes who reported "excitement" as the dominant pre-competitive emotion (Table 4.27). No significant differences between the two groups were observed on surprise, sadness, anger, contempt and competitive somatic and cognitive anxiety.

**Table 4.27 T-values, means and standard deviations of momentary pre-competitive emotions and functionality of emotional states in athletes with "anxiety" and "excitement" as dominant pre-competitive emotions**

| Scale (theoretical range) | Excitement (N=51) | | Anxiety (N=50) | | t-values (df = 99) | p |
|---|---|---|---|---|---|---|
| | M | SD | M | SD | | |
| CSAI-2 - cognitive (9-45) | 20.92 | 5.73 | 24.32 | 6.29 | -2.84 | 0.099 |
| CSAI-2 - somatic (9-45) | 22.86 | 6.53 | 26.62 | 6.91 | -2.81 | 0.108 |
| STAI (20-100) | 55.26 | 11.69 | 64.00 | 7.31 | -4.52 | <0.001 |
| DES - Fear (3-15) | 4.47 | 1.47 | 6.84 | 2.56 | -5.69 | <0.001 |
| DES - Enjoyment (3-15) | 7.35 | 3.14 | 5.50 | 1.93 | 3.58 | 0.010 |

*(continued)*

**Table 4.27 - Continued**

| Scale (theoretical range) | Excitement (N=51) | | Anxiety (N=50) | | t-values (df = 99) | p |
|---|---|---|---|---|---|---|
| | M | SD | M | SD | | |
| DES - Interest (3-15) | 10.04 | 3.17 | 8.00 | 2.89 | 3.38 | 0.019 |
| DES - Surprise (3-15) | 3.92 | 1.37 | 4.18 | 1.99 | -0.76 | 1.000 |
| DES - Guilt (3-15) | 3.26 | 0.66 | 4.24 | 1.93 | -3.43 | 0.020 |
| DES - Self-hostility (3-15) | 3.04 | 0.28 | 3.80 | 1.68 | -3.16 | 0.047 |
| DES - Sadness (3-15) | 3.14 | 0.40 | 3.82 | 1.82 | -2.60 | 0.217 |
| DES - Shame (3-15) | 3.90 | 1.20 | 5.24 | 2.43 | -3.50 | 0.015 |
| DES - Shyness (3-15) | 3.10 | 0.46 | 3.84 | 1.35 | -3.69 | 0.009 |
| DES - Disgust (3-15) | 3.02 | 0.14 | 3.58 | 1.05 | -3.74 | 0.009 |
| DES - Anger (3-15) | 3.22 | 0.54 | 3.80 | 1.55 | -2.52 | 0.261 |
| DES - Contempt (2-10) | 2.33 | 0.86 | 2.40 | 1.09 | -0.34 | 1.000 |
| Emotion direction (-3 to +3) | 1.47 | 1.01 | -0.04 | 1.38 | 6.26 | <0.001 |
| Threat (1-5) | 2.18 | 1.14 | 2.24 | 1.21 | -0.27 | 1.000 |
| Challenge (1-5) | 3.86 | 0.09 | 3.46 | 1.25 | 1.72 | 1.000 |

Stepwise discriminant analysis was performed using the emotional scales as predictors of pre-competitive emotional states that the respondents labelled as "anxiety" or "excitement". Analysis showed the DES subscales of fear, interest and guilt could correctly classify 87.13% of the athletes into an "anxiety" and "excitement" group (Table 4.28; Appendix 41). Other predictors did not additionally contribute to group discrimination. The CSAI-2 subscales alone successfully discriminated 63% of the participants, whereas the STAI successfully discriminated 68% of the athletes (Appendix 42).

Table 4.28 **Stepwise discriminant function analysis of scores on pre-competitive emotion scales as predictors of "anxiety" and "excitement" states**

| Variable | | | Standardised discriminant coefficients | | |
|---|---|---|---|---|---|
| DES - Fear | | | 0.96 | | |
| DES - Interest | | | -0.81 | | |
| DES - Guilt | | | 0.31 | | |
| **Eigenvalue** | | | **0.87** | | |
| **Canonical correlation** | | | **0.68** | | |
| **Wilks' lambda = 0.535 F = 28.91 df = 3, 97 p<0.001** | | | | | |
| Actual group | No. of cases | Predicted "Excitement" | | Predicted "Anxiety" | |
| | | n | % | n | % |
| Excitement | 51 | 45 | 88.24 | 6 | 11.76 |
| Anxiety | 50 | 7 | 14.00 | 43 | 86.00 |
| % of correctly classified: n = 88 (87.13%) | | | | | |

## 4.44 Discussion

### *4.441 Debilitative and facilitative patterns of pre-competitive emotions*

The main purpose of this study was to examine the structure of facilitative and debilitative patterns of fundamental emotions experienced prior to athletic competitions and the role of anxiety in these patterns. In general, support was found for the proposed model of facilitative and debilitative patterns of pre-competitive anxiety (Figures 2.2 and 4.1). First, it was suggested that facilitative patterns of anxiety would be characterised by fear of low or moderate intensity, whereas debilitative patterns of anxiety would be associated with moderate to high levels of fear. In other words, a low to moderate negative relationship between fear and emotion functionality was expected. Comparison of the average intensity of fear and anxiety in debilitative and facilitative emotional states and correlational analysis of emotion functionality and intensity of fear-like emotions gave support to this hypothesis (Tables 4.15 and 4.16; Appendix 35). In fact, average anxiety and fear were significantly higher in debilitative than in facilitative patterns of emotions. Moreover, a low negative correlation between fear-like emotions as measured by the STAI ($r = -0.32$) and DES ($r = -0.34$) and emotion functionality was observed in momentary pre-competitive emotional states (Appendix 35). Interestingly, no significant correlation was found between the two subscales of the CSAI-2 and emotion functionality. As previous research proved that the STAI and the fear subscale of the DES are psychometrically valid measures of fear-like emotions (Izard, 1972; Izard et al. 1993; Spielberger et al., 1970), these findings suggest that the CSAI-2 may confound fear and anxiety with other more positive states. It should be noted that, although anxiety has been defined as a complex emotional state that can be described as a set of fundamental emotions, the anxiety scales employed in this study are based on the supposition that anxiety is a unitary emotion. Since by definition fear is the main component of anxiety states (Spielberger, 1972), unidimensional anxiety scales are supposed to measure emotional states related to fear. Consequently, the fact that the CSAI-2 might not be able to differentiate fear-like from other types of emotions disputes its validity as a measure of anxiety.

A second hypothesis related to the model of anxiety patterns stated that debilitative emotional states would be characterised by the presence of emotions associated with avoidance tendencies and increased self-focus, whereas facilitative emotional patterns would be characterised by emotions motivating approach behaviour. Additionally, as anxiety has been here defined as a complex, variable and ambiguous affective phenomenon motivating both approach and avoidance behaviour, it was hypothesised that emotions characterised by a clear action tendency would be better predictors of the functionality of pre-competitive emotions than would anxiety or fear. These suppositions were based on earlier research which showed that similar levels of anxiety symptoms could be rated completely differently on a facilitative-debilitative continuum (e.g., Jones, 1995; Jones & Swain, 1995; Jones et al., 1996). These hypotheses were also supported by the findings that emerged from the previous study. In fact, regression analysis of personality traits and affective components on cognitive anxiety direction showed that negative and positive emotions were the best predictors of perceived functionality of cognitive anxiety. Notably, positive emotions played a significant role as determinants of anxiety direction even at intraindividual level.

Results from a stepwise regression analysis gave support to the above suppositions. The emotional factors of Interest-Enjoyment and Negative Emotions were the best predictors of functionality of pre-competitive emotional states (Table 4.20). Notably, Anger-Fear did not additionally contribute to the prediction of the criterion. Only a low negative correlation was observed between the factor of Anxiety-Fear and emotion functionality ($r = -0.27$; $p < 0.01$). Analysis of emotions' intensity in debilitative and facilitative emotional patterns revealed that facilitative patterns were characterised by higher levels of emotions motivating approach behaviour (interest and enjoyment) and lower levels of emotions motivating avoidance behaviour and self-focus (guilt, self-hostility, sadness and shyness) (Tables 4.15 and 4.16). It is noteworthy that, although negative fundamental emotions other than fear and anger were significantly higher in debilitative than in facilitative emotional states, they were still very low in intensity. In fact, they reached mean values ranging from 1.37 to 2.19 on a 5-point scale with "1" denoting absence of emotion and "2" denoting a "slight" presence (Appendices 27-29). These results are consonant with previous research findings which showed that athletes' emotional experience is characterised by very low levels or total absence of negative emotions (Lane & Terry, 2000; Prapavessis & Grove 1994; Terry & Lane, 2000; Study 1 in chapter 3). In addition, it is important to note that the structure of debilitative patterns of emotions presented here is in agreement with some recent empirical findings on the impact of depressive states on athletic performance. In this regard, Lane and Terry (2000) have shown that even a small degree of depression as measured by the POMS can have a detrimental effect on performance. Using structural equation modelling techniques, they demonstrated that tension-performance relationships differed significantly between slightly depressed and non-depressed athletes (Lane & Terry, 1998). Also, a recent study revealed that tension accompanied by minimal levels of depression can debilitate performance (Lane, Terry, Karageorghis, & Lawson, 1999).

In order to examine the structure of debilitative and facilitative patterns of emotion further and analyse the relationships amongst their emotional components, factor analyses of emotional scales were carried out (Tables 4.17-4.19). Analysis of recalled and momentary facilitative emotional states showed that the STAI, the cognitive and somatic subscale of the CSAI-2 and the fear subscale of the DES grouped together to form an Anxiety-Fear factor (Tables 4.17 and 4.18). A low positive correlation was found between Anxiety-Fear and other negative emotions (Appendices 31 and 32). This is consonant with the observed tendency for negative emotions to be intercorrelated and group into a Negative Affect dimension (Watson & Clark, 1992; Watson et al., 1988).

No significant correlation was observed between the factors of Anxiety-Fear and Interest-Enjoyment in recalled facilitative emotional patterns. However, analysis of data related to an actual competition showed that the emotion of interest exhibited a substantial positive loading on an Anxiety-Fear factor (Table 4.18). This finding tentatively suggests that, in facilitative patterns of pre-competitive emotions, interest may show a tendency to associate with low to moderate levels of anxiety-fear. Failure to find a stronger relationship between interest and anxiety-fear might have been due to two main reasons. First, interest does not imply perception of threat but perception of threat entails a certain level of interest (Izard, 1991; Lazarus, 1999). Second, over 80% of the examined athletes reported facilitative patterns of emotions typified by moderate to very high levels of interest and very low fear and threat.

Factor analysis of recalled debilitative emotional states produced an emotional dimension encompassing anxiety, fear, sadness and lack of enjoyment (Table 4.19) which was positively correlated with Negative Emotions and negatively correlated with Interest (Appendix 33). It is noteworthy that while analysis of facilitative emotional states yielded no significant correlation between enjoyment and fear, in debilitative patterns of emotions enjoyment (negative loadings) grouped together with fear and anxiety to form an oblique emotional factor. This means that in debilitative patterns of emotions an increase in fear or anxiety was associated with unpleasant and negative feelings, while in facilitative patterns of emotions higher levels of fear or anxiety were sometimes accompanied by enjoyment. These findings support the proposed model of anxiety patterns (Figure 4.1).

At this point, a question that needs to be asked is how and why fear and anxiety become associated with other negative emotions. The interactional model of competitive stress (Figures 2.1 and 4.1) posits that the quality and intensity of athletes' emotional experience will be determined by appraisal of the importance of a stressful event and the perceived ability to cope with it. A forthcoming competition can be appraised as a source of challenge, entailing the perception of potential benefit, and/or a source of threat, entailing the perception of potential harm (Lazarus, 1999). If a competitive situation is perceived as a source of threat it will trigger fear or anxiety. The degree of perceived threat will correspond to the discrepancy between the demands of the situation and the perceived ability to cope with it, which in turn will determine the intensity of fear or anxiety. Favourable goal attainment expectancies (e.g., winning a competition) will yield increased on-task effort and thus performance facilitation. This state will be phenomenologically experienced as a state of high interest and low to moderate fear. Unfavourable goal attainment expectancies will produce mental disengagement, non-task-related rumination and lowered performance (Slapion & Carver, 1981), which will translate into feelings of fear, sadness, guilt, shame, shyness, helplessness or self-hostility and avoidance behaviour. Specifically, individuals with unfavourable expectancies will focus their attention on perceived deficits of the self, self-doubts and the larger ramifications of being unable to proceed toward his or her goal. High self-focus will lead to mental withdrawal from full engagement in the task and thus adversely affect task performance (Carver & Scheier, 1984).

In summary this study showed that, as hypothesised, debilitative patterns of pre-competitive emotions were characterised by moderate levels of anxiety-fear, low levels of positive emotions associated with approach tendencies (enjoyment and interest) and the presence of negative emotions associated with avoidance tendencies (e.g., sadness, shame, shyness). Additionally, these patterns were characterised by the presence of a positive relationship between fear and other negative emotions and a negative relationship between fear and the positive emotions of interest and enjoyment. Facilitative emotional states consisted of moderate levels of anxiety, low levels of fear and other negative fundamental emotions and moderate to high levels of enjoyment and interest. Fear and anxiety exhibited a mild positive relationship with negative emotions and interest.

In order to understand an individual's emotional reaction to a stressful encounter, it is necessary to study the relationship between types of cognitive appraisals and specific emotions (Lazarus, 1999). Anxiety has been defined as a complex threat-related emotional state which motivates both approach and avoidance behaviour (Buechler & Izard, 1980). Consequently, competitive anxiety is thought to be associated with two different types of cognitive appraisal: threat and challenge. The former entails appraisal of potential harms, whereas the latter entails appraisal of potential benefits arising from the competitive event (Lazarus, 1999). By definition, a threat appraisal occurs when the situation is goal relevant and environmental demands are perceived as taxing or exceeding resources or ability to cope (Lazarus & Folkman, 1984). In contrast, a challenge appraisal occurs when the situation is goal relevant and environmental demands are appraised as within the individual's resources or ability to cope. It was expected that athletes' scores on the STAI, CSAI-2 and the fear subscale of the DES would be invariably associated with threat appraisals. This is because fear and anxiety are, by definition, threat-related emotional states. It was also hypothesised that anxiety scales would show a positive correlation with challenge in facilitative but not in debilitative emotional states. Additionally, it was proposed that challenge would in all circumstances correlate with positive emotions, especially with interest. Finally, negative emotions associated with avoidance behaviour were expected to show a positive correlation with threat in debilitative patterns of emotions.

Results showed that facilitative patterns of pre-competitive emotions were characterised by low threat and moderate levels of anxiety (Tables 4.15 and 4.16). Correlations between these scales and threat ranged from 0.21 to 0.44 in recalled facilitative emotional states and from 0.37 to 0.51 in momentary facilitative emotional states. Fear and other negative fundamental emotions were consistently low in intensity, exhibiting mean values ranging from 1.10 to 1.73 on a 5-point scale, which corresponded to the average level of perceived threat. Fear was the only fundamental emotion related to threat appraisals. Facilitative pre-competitive emotional states were also characterised by high challenge appraisals. Challenge was positively related to interest ($r = 0.46$; $p<0.01$) as well as cognitive anxiety ($r = 0.30$; $p<0.01$) but was not significantly correlated with the other anxiety scales in recalled facilitative emotional patterns. Similarly, analysis of momentary emotions revealed a positive correlation between challenge and interest ($r = 0.47$; $p<0.01$) and cognitive ($r = 0.44$; $p<0.01$) and somatic anxiety ($r = 0.39$; $p<0.01$).

Debilitative patterns of emotions were typified by moderate levels of challenge and threat. However, perceived threat was higher and perceived challenge lower than in facilitative emotional patterns (Tables 4.15 and 4.16). Correlational analysis revealed strong positive correlations between threat and fear-like emotions ranging from 0.68 to 0.72. Moderate positive correlations were also observed between threat and the negative emotions of guilt, sadness, shyness and self-hostility. Moreover, a moderate negative relationship emerged between threat and enjoyment ($r = -0.41$; $p<0.01$). Finally, challenge showed a significant positive relationship with interest ($r = 0.58$; $p<0.01$) and cognitive anxiety ($r = 0.52$; $p<0.01$).

Canonical correlation between challenge and threat appraisals as criteria and emotional factors related to momentary measurements as predictors yielded two significant canonical variates (Table 4.21). The first variate represented a mixed state of threat and challenge accounting for 42.38% of the total variance. Analysis of the canonical loadings showed that parallel increases in threat and challenge were most strongly associated with increases in the Anxiety-Fear factor. A similar canonical variate explaining 56.25% of the variance resulted from the canonical correlation analysis of individual emotional scales and cognitive appraisal (Table 4.26). Appraisal of the competition as a source of both threat and challenge was positively associated with interest and cognitive and somatic anxiety. The STAI contributed to this canonical correlation only to a minor extent. A second variate was obtained in both canonical correlation analyses. This variate represented a state characterised by unitary appraisals of the competition as either a source of challenge or a source of threat. The factors of Interest-Enjoyment, Negative Emotions and Anxiety-Fear contributed the most to this canonical correlation (Table 4.21). Canonical correlation analysis using emotional scales as predictors of cognitive appraisal showed that amongst the scales composing the Anxiety-Fear factor, the STAI and the fear subscale of the DES had the highest loadings on this variate. Other emotions that contributed to the differentiation between threat and challenge appraisals were self-hostility, interest, sadness, shyness and guilt.

In summary, the results from this study support the contention that anxiety and fear are invariably associated with the perception of threat. In fact, except for the cognitive subscale of the CSAI-2, fear and anxiety scales showed positive correlations with threat in both debilitative and facilitative patterns of emotions. Support was also found for the hypothesis that negative emotions motivating avoidance behaviour would show a positive relationship with threat in debilitative patterns of emotions. Additionally, as expected, interest showed a consistent positive correlation with challenge. The hypothesis that anxiety scales would show a positive correlation with challenge in facilitative emotional states was not unequivocally confirmed. In fact, the cognitive anxiety subscale of the CSAI-2 showed a consistent positive relationship with challenge in both facilitative and debilitative patterns of emotions. The somatic subscale of the CSAI-2 correlated with challenge in momentary facilitative patterns of emotions. Finally, the STAI showed no association with challenge appraisal at all. It is possible that the last finding was due to the fact that the STAI includes items that infer anxiety from absence of positive affect such as self-confidence, joy, relaxation and calmness. As challenge entails perception of ability to cope with a stressful event and is characterised by presence of positive emotions, it is understandable why no correlation between the two variables was found.

Results from canonical correlation analyses have shown that athletic competition is most often associated with both threat and challenge. A mixed pattern of appraisal was exhibited by 51% of the athletes that participated in this study. These ambivalent states are generally characterised by higher challenge than threat and are accompanied by feelings of interest and anxiety as operationalised by the CSAI-2. It has been also shown that a considerable percentage of athletes associate competition with challenge only (42.08%). For very few athletes a competitive event is exclusively a source of threat

(3.47%). These "pure" appraisals are best predicted by fear, interest, self-hostility, guilt, sadness, shyness and anxiety as measured by the STAI. Unmixed challenge appraisals are associated with low levels of fear, self-hostility, shyness, guilt and anxiety as measured by the STAI and high levels of interest. Conversely, unmixed threat appraisals are associated with low levels of interest and high levels of fear, self-hostility, guilt, sadness, shyness and anxiety (STAI). Of crucial importance is the fact that the CSAI-2 did not significantly contribute to the differentiation of challenge and threat appraisals. The two subscales of the CSAI-2 were instead linked to ambiguous states characterised by both approach and avoidance tendencies, which is congruous with the DES' definition of anxiety. On the other hand, the STAI was able to differentiate between threat and challenge appraisals but did not show a substantial association with mixed appraisals of threat and challenge.

The interpretation of these results will depend on how we define anxiety. If anxiety is conceptualised as a variable emotional state that motivates both avoidance and approach behaviour, then the present findings evidence the validity of the CSAI-2, and especially the somatic subscale, as a measure of anxiety. However, at the same time, these results question the validity of the STAI. From this perspective, the STAI would constitute a measure of the most negative (debilitative) patterns of anxiety typified by unmixed threat appraisals, which ultimately correspond to fear. If the above suppositions are true, then the next question to be asked is what can be gained from measuring complex ambiguous emotional states with instruments, such as the CSAI-2, that reflect this ambiguity in its totality without giving any information about the different components that define these emotional states. It is obvious that this approach to the measurement of anxiety is neither theoretically nor practically acceptable.

Finally, it should be noted that the present study did not analyse the self-confidence subscale of the CSAI-2, the reason being that most emotion theorists agree that self-confidence is a positive non-emotional state (Lazarus, 1999; Plutchik, 1994). It is possible that this subscale might have significantly contributed to the differentiation of unmixed threat and challenge appraisals.

### *4.442 Construct validity of the cognitive and somatic subscales of the CSAI-2*

One of the purposes of this study was to examine the construct validity of the cognitive and somatic subscales of the CSAI-2. In this respect, it is noteworthy that in recalled facilitative emotional states cognitive anxiety was significantly correlated with challenge but not with threat. This finding indicates that the symptoms described in the cognitive subscale of the CSAI-2 are not necessarily associated with perceptions of a potential danger. As Burton and Naylor (1997) suspected, they may be interpreted as signs of positive engagement, excitement and motivation to compete. It should be noted that a significant relationship between cognitive anxiety and challenge in facilitative emotional states would not on its own question the validity of the cognitive subscale of the CSAI-2. Actually, a positive relationship between challenge and anxiety was expected in facilitative patterns of pre-competitive emotions. However, the fact that in recalled facilitative emotional states the cognitive subscale of the CSAI-2 showed no association with threat raises some doubts as to whether it invariably gauges anxiety.

Principal axis factor analyses showed that four items of the somatic subscale of the CSAI-2 were consistently associated with a Fear-Tension factor, which was positively correlated with threat but not with challenge appraisals (Table 4.22). These were "I feel/felt jittery", "I feel/felt my stomach sinking", "I feel/felt tense in my stomach" and "My heart is/was racing". The last two items also loaded on anxiety factors. It is noteworthy that these factors exhibited positive significant correlations with both challenge and threat appraisals, evidencing once again the ambiguous nature of anxiety. The item "My body feels/felt relaxed" exhibited consistent loadings on a Calmness-Enjoyment factor, which showed a tendency to negatively correlate with anxiety and Fear-Tension. Another item that showed a consistent pattern of loadings was "I feel/felt nervous". This item was associated with anxiety factors. In contrast, "My body feels/felt tense", "My hands are/were clammy" and "My body feels tight" loaded onto factors which were not related to fear-like emotional states. Besides being related to anxiety and fear, "My body feel/felt tense" showed also a tendency to load on Excitement-Self-confidence in recalled facilitative patterns of emotions. In momentary pre-competitive emotions, "My hands are/were clammy" was not related to fear or anxiety but was weakly related to Interest and Sadness. Finally, "My body feels/felt tight" was associated with Excitement-Self-confidence in recalled facilitative emotional states and both Interest and Fear-Tension in momentary pre-competitive emotions. These results indicate that most items of the somatic subscale of the CSAI-2 gauge threat-related emotional states and, therefore, anxiety or fear. Some items are associated with both challenge and threat, others are related only to threat. In contrast, the items "My hands are/were clammy" and "My body feels/felt tight" appear to be problematic. In fact, in one of the factorial analyses they showed no relationship with any of the fear- and anxiety-related factors. It should be noted that the fact that some items of the CSAI-2 would load on factors other than anxiety and fear was expected and is actually congruous with the proposed model of facilitative and debilitative patterns of anxiety. However, items can be classified as markers of anxiety only if they show substantial loadings on an anxiety or fear factor. Failure to do so leads to the conclusion that they confound threat-related emotional states with other emotions. In the case of the item "My body feels/felt tight" the conclusion is that this item may confound anxiety with positive excitement.

Although the items of the CSAI-2 tended to group into anxiety-related factors, only three of them had loadings that were consistently higher than 0.40. Moreover, only one item showed a significant relationship with Fear-Tension (Table 4.22). Three items failed to load on any of the anxiety and fear factors in at least one of the analyses. Thus, "I have/had self-doubts" reached a maximal loading of 0.37 on a Shame factor. "I am/was concerned about this/that competition" was most strongly related to a Calmness-Enjoyment factor in recalled facilitative patterns of emotions. "I am concerned about choking under pressure" consistently loaded on a Sadness factor and, in one occasion, also on Shame-Worry. As expected, some of the items significantly loaded on factors defined by the emotions of shame, guilt and/or sadness and on Interest. Finally, six out of nine items of the cognitive subscale of the CSAI-2 showed maximal loadings lower than 0.40 in at least one of the factor analyses. In contrast, most of the DES items exhibited maximal loadings greater than 0.40 and consistently grouped into a single factor that corresponded to the emotion they were supposed to gauge. Similarly, 85% of the items of the STAI were associated with anxiety, fear or calmness. In conclusion, the fact that the cognitive subscale of the CSAI-2 failed to show a consistent relationship with threat appraisals and that most of its items were liable to inconsistent interpretations throws doubts upon its construct validity and reliability as a measure of anxiety. So it is suggested that the use of this instrument should be avoided.

Finally, since it has been argued that the CSAI-2 may not be able to differentiate anxiety from positive excitement (Burton & Naylor, 1997; Lane et al. 1999), the ability of the CSAI-2 to discriminate between these two types of emotional states was examined and compared to that of other scales. Results showed that a linear combination of fear, interest and guilt as measured by the DES could with greatest accuracy predict whether an athlete would label his or her emotional experience as positive excitement or as anxiety. When compared to anxiety, excitement was associated with higher interest, lower fear and lower guilt. Although anxiety intensity as measured by the STAI and the

CSAI-2 tended to be higher in "anxiety" than "excitement" states (Table 4.27), they alone successfully discriminated approximately 65% of the athletes, which is 22% less than the linear combination of fear, guilt and interest (Table 4.28). Collectively, these findings evidenced that fundamental emotions are a valuable and reliable source of information about athletes' perception of and reaction to competition. Consequently, it is suggested that future research should focus on the study of fundamental emotions instead of dwelling upon the ambiguous and uninformative emotional state of anxiety.

## 4.5 Conclusions

The purpose of this chapter was to propose a different way of looking at the affective phenomenon of competitive anxiety and resolve some of the controversies related to its definition, measurement and practical and theoretical importance. In the past 40 years, there has been a tendency to make anxiety the central mediating construct in virtually every form of behaviour. Despite the popularity of this affective phenomenon and the incredible amount of research related to it, no clear consensus about what anxiety actually is has been reached. The only point the literature seems to be manifestly clear on is that anxiety is not a unitary concept.

Analysis of the history of controversies associated with the definition and measurement of anxiety resulted in the adoption of a DET's (Izard, 1991) conceptualisation of this ambiguous emotional state. So anxiety has been conceptualised as a complex and variable emotional state that can be best defined as a set of fundamental emotions in which fear plays a central role. It was suggested that the combination and interaction of emotions constituting anxiety would vary in relation to time and personal and situational factors. In the light of previous research, it was also proposed that the functionality of anxiety in relation to athletic performance would depend on the structural characteristic of the anxiety pattern. Facilitative anxiety patterns would consist of a combination of low to moderate levels of fear and emotions associated with approach behaviour. Cognitively, they would be characterised by challenge and threat appraisals, acceptance of the competitive situation and perception of being able to cope with it. In contrast, it was thought that debilitative patterns of anxiety would encompass moderate to high levels of fear accompanied by negative emotions associated with avoidance behaviour and increased negative self-focus. It was also suggested that debilitative patterns of anxiety would be characterised by high levels of threat appraisals and the perceived inability to cope with the demands of the competition.

Two studies were conducted in order to test some of the tenets of the model of debilitative and facilitative patterns of anxiety. The results of these studies gave support to the contention that competitive anxiety, as currently measured, is not a unitary and clearly definable emotion. It is an ambiguous emotional state that provides little information about athletes' appraisal of and emotional reaction to competition. In fact, it can be both debilitative and facilitative to performance. It is associated with both challenge and threat appraisals. It entails both avoidance and approach behaviours. Whether a certain level of anxiety as measured by anxiety scales will be perceived as debilitative or facilitative to performance will depend on personality factors, temporal proximity of the competition and on the emotions accompanying the anxiety symptoms described in the inventory. In contrast, fundamental emotions with a clear approach or avoidance action tendency offer a much more reliable indication of the quality, functionality and hedonic tone of an athlete's competition-related emotional experience and cognitive appraisal.

Before concluding that future research should stop dwelling on competitive anxiety and should instead focus on clearly definable emotions, some measurement issues need to be considered. Namely, it is obvious that the problems associated with competitive anxiety are partly due to poor construct validity of the cognitive subscale of the CSAI-2. In contrast, the STAI seems to provide a much clearer picture of athletes' cognitive appraisal of the competition and functionality of emotional states. This is mainly due to the fact that the STAI does not measure a unitary emotional factor of "anxiety". It gauges fear-like emotional states as well as positive affect. In fact, almost half of the items of the STAI are markers of states of calmness, enjoyment and self-confidence. Also, the present study has shown that most of the items of the STAI consistently grouped into two only mildly correlated factors, one of which was Calmness-Enjoyment. Consequently, given that the STAI measures two nearly orthogonal emotional factors, it provides more information about action tendencies and cognitive appraisals related to a stressful situation than do the cognitive and somatic subscale of the CSAI-2. Yet, the STAI is less informative than the DES. In fact, the interest, guilt, fear, sadness, shyness and self-hostility subscales of the DES were able to differentiate threat from challenge appraisals, debilitative from facilitative emotional patterns and the emotional states of excitement and anxiety with great accuracy.

Therefore, the conclusion is that, from a practical and theoretical viewpoint, there is not much sense in focusing on the complex and controversial affective phenomenon of anxiety without considering other important aspects of an individual's emotional experience. Future research should concentrate on universally present and easily definable affective phenomena commonly called primary, basic or fundamental emotions.

# CHAPTER V

## Study 3: Cognitive and personal factors influencing pre- and post-competition emotional states in male martial artists[5.1]

### 5.1 Introduction

The interactional model of competitive stress presented in this thesis adopts a time-based approach to the explanation of athletes' responses to competition (Figure 2.1). Competitive stress is described as a process that unfolds over time. Emotions, appraisal of the situation, coping strategies and situational variables change continuously as the process of stress develops (Lazarus, 1999). The changes in emotional states that athletes experience before, during and after a competition reflect the meaning of what is happening as the situation develops and the effectiveness of the coping strategies adopted. So, it is contended that, for the sake of a better understanding and prediction of the athletes-competition relationship, the dynamics of the components of competitive stress need to be examined.

The analysis of competitive stress as a time-based process requires a longitudinal research design in which the components of the stress process are frequently assessed on the same individuals over a period of time. The first study presented in this thesis (Chapter 3) showed that the ESM, involving the in-depth study of everyday experiences and ongoing behaviour in the participant's natural environment, provides a valid research tool by which the dynamic aspects of stress can be analysed.

With regard to the temporal patterns of pre-competition emotions in male Tae Kwon Do practitioners, the study also showed that general positive affectivity remained relatively stable, whereas negative affectivity increased across time. As the competition approached, emotional states of different hedonic tone denoting readiness to compete increased in intensity and reached their peak one hour before the competition. Collectively, these results emphasised the need to examine discrete emotions instead of relying on global measures of positive and negative affectivity or activation-deactivation. Study 1a indicated the importance of personality traits as moderators of emotional states

[5.1] Here, pre- and post-competition emotional states refer to an individual's emotional experience in a given period before and after a competitive event, regardless of the event evoking that experience.

and perceived functionality of competitive anxiety. Additionally, Study 2 demonstrated the ambiguity of the affective phenomenon of anxiety and the need to extend the study of competitive stress to a broader range of more easily definable emotions.

The purpose of the present investigation was to integrate and elaborate further the findings from the previous three studies with regard to the interactional model of competitive stress. The ESM was employed to examine some of the hypothesised situational and personal determinants of pre- and post-competition discrete emotions. Specifically, the effect of extraversion, neuroticism and CTA on intensity and temporal patterns of pre- and post-competition emotions and the relationship between some aspects of primary and secondary cognitive appraisal and athletes' emotional responses were examined.

## 5.2 Review of literature

Competitive stress is conceptualised as a process of transaction between an athlete and the competition-related environment. In order to explain this process, an interactional model of competitive stress has been proposed (Figure 2.1). According to this model, one of the most important determinants of the impact of a competitive event on an athlete is how it is appraised. Appraisal is a complex, mainly cognitive process through which a current or impending transaction between the athlete and the competition is evaluated (Lazarus, 1999). This evaluation is seen as having two fundamental facets. Primary appraisal refers to the issue of whether the competitive situation has relevance for personal well-being. Secondary appraisal focuses on the possible ways of coping with the situation and evaluates the extent of available personal and environmental resources for dealing with the encounter (Lazarus & Folkman, 1984). Together, primary and secondary appraisals are thought to determine the quality and intensity of emotions evoked by a competitive event, which in turn affects athletes' behaviour and performance (Jones, 1995; Lazarus, 1999; Lazarus & Folkman, 1984).

Several theorists have given different explanations of how particular appraisal patterns are associated with different emotions (e.g., Ellsworth, 1994; Frijda, 1986; Lazarus, 1999; Roseman, 1979; Weiner, 1985). One of the most comprehensive models has been proposed by Smith and Lazarus (1993), who suggested that the full range of human fundamental emotional experience (basic emotions) is determined by three primary and three secondary basic appraisal dimensions. These are the primary appraisal dimensions of goal relevance, goal congruence and type of ego-involvement and the secondary appraisals of blame or credit, coping potential and future expectations. Goal relevance refers to the importance of the situation. Goal congruence or incongruity refers to the perceived benefit, harm or threat related to a particular situation. This dimension determines whether the hedonic tone of one's emotional state will be positive or negative. Type of ego-involvement defines the kind of concern that is associated with a certain situation and is needed to distinguish among the emotions of anger (preservation of one's ego identity), guilt (preservation of a moral value) and shame (living up to an ego ideal). Blame or credit depends on whether an attribution of responsibility for the harm or benefit can be made. Coping potentials relates to whether and how an individual can control and improve the person-environment relationship. Future expectations refer to whether an individual thinks that, in the future, things will improve or worsen for any reason (Lazarus, 1999).

Smith and Lazarus (1993) proposed that the distinctive pattern of primary and secondary appraisal associated with each particular emotion can be summarised in terms of core relational theme referring to an individual's sense of the harms and benefits in a particular person-environment relationship. For example, the core relational theme for guilt is having transgressed a moral imperative, violated an internal standard or betrayed one's trust. In terms of primary cognitive appraisal, it is characterised by goal relevance and goal incongruity and is aimed at the preservation or enhancement of a moral value. In terms of secondary appraisal, it entails self-blame and is mainly related to the perception of having had the potential ability to cope with the situation but having failed to do so. The core relational theme for sadness is having experienced an irrevocable loss (Lazarus, 1993). Again, this emotion is characterised by goal relevance and goal incongruity but is not defined by a specific type of ego-involvement. Also, in contrast to guilt, it is not necessarily associated with blame or credit. The most important secondary appraisal dimensions related to the occurrence of sadness are negative future expectations and perceived lack of control over the situation (helplessness). Happiness is characterised by the realisation of a goal or the perception of a reasonable progress towards the realisation of a goal and, therefore, entails the appraisals of goal relevance and goal congruence.

From these examples, it is obvious that the analysis of the quality of an individual's emotional experience provides a great amount of information about the relationship between a person and the environment. This observation applies also to the process of competitive stress. The study of the full range of fundamental emotions in a competitive setting offers essential information about the athlete-competition relationship. Specifically, it indicates the subjective importance of a competitive event. It reveals whether it is perceived as a source of threat, challenge or loss. It provides information on athletes' future expectations and perceived ability to cope with the situation. Finally, it may uncover the underlying motives for sport participation and attributional appraisal of performance outcome.

Despite the apparent importance of studying discrete emotions for a better understanding of competitive stress, close inspection of the sport psychology literature reveals that there has been little research on pre-competition emotions other than anxiety, especially from a time-based perspective. It follows that not much information is available about the true nature of the athlete-competition relationship. In fact, Study 2 showed that anxiety, and especially the cognitive component of anxiety as measured by the CSAI-2, is an emotional state that cannot be clearly defined on the primary appraisal dimension of goal congruence. Since it is associated with both challenge and threat, it cannot on its own provide a clear picture of athletes' response to and attitude towards the competitive process. In contrast to pre-competition emotions, post-competition emotional responses have been studied from a much broader perspective. A wide range of discrete emotions has been analysed in relation to performance outcome and attributional appraisal (Vallerand & Blanchard, 1999). As the current findings on temporal patterns, antecedents and moderators of pre-competition emotions have already been discussed, they will only be briefly summarised. In contrast, research on post-competition emotions will be examined in greater detail.

## 5.21 Temporal patterns of competitive emotions: relationship with personality traits, cognitive appraisal of the competitive situation and temporal proximity to competition

### *5.211 Temporal proximity to competition*

In general, analysis of the temporal patterns of pre-competition emotional states showed that some emotions do significantly change in the week preceding the competition. Consistent findings have been reported for unidimensional anxiety (e.g., Durtschi & Weiss, 1984; Huddleston & Gill, 1981), the somatic component of multidimensional anxiety (e.g., Slaughter et al., 1994; Swain & Jones, 1993), tension

(Robazza et al., in press), vigour and depression (e.g., Meyers et al, 1988; Prapavessis & Grove, 1994). Anxiety, tension and vigour increased with temporal proximity to competition, whilst depression decreased. Contradictory results have been obtained for the cognitive component of anxiety (e.g., Caruso et al., 1990; Martens et al., 1990; Slaughter et al., 1994; Swain & Jones, 1993), anger, fatigue and confusion (e.g., Meyers et al, 1988; Prapavessis & Grove, 1994).

In the present thesis, a study on the temporal patterns of pre-competition emotions in male Tae Kwon Do practitioners revealed significant increases in both somatic and cognitive aspects of competitive anxiety one day and one hour before the contest. These changes in competitive anxiety were accompanied by elevations in vigour, worry and stress and decrements in relaxation and pleasure. In contrast, enjoyment-fun, joy, happiness, anger, irritation, frustration, guilt, depression and unhappiness remained stable across the whole week preceding the competition. Robazza et al. (2000) observed a similar stability in intensity of positive emotions in a group of elite archers.

Collectively, analysis of the course of pre-competition emotions reveals that competitions play an important role in athletes' lives. The significant emotional reactions they usually evoke are evidence of their strong motivational properties. However, although it is clear that competitions are salient episodes in the eyes of an athlete, it is not clear what their relative importance is in comparison to other concomitant forms of activity and other types of daily stressors. In this regard, in-depth qualitative studies have shown that elite athletes experience stress from both competition and non-competition sources (Gould, Jackson, & Finch, 1993; Scanlan, Stein, & Ravizza, 1991). Lack of finances, worry about school, life-career concerns, substance abuse and family problems are only few of the non-competition stressors that were observed in a group of elite figure skaters (Gould et al., 1993). The fact that studies on temporal patterns of emotions regularly show significant changes in emotional state in immediate proximity to the competition does not give any information about the relative importance of the competition in relation to other events. It tells us that a significant portion of the examined sample experienced a reduction or an increase in a certain emotion at the same point in time, which corresponds to the competitive event. In order to achieve a more realistic representation of the significance and impact of a competitive event on athletes' psychological state and behaviour, other aspects of athletes' life need to be taken into consideration.

With regard to post-competition emotions, a reduction in unidimensional and multidimensional anxiety has been reported immediately (Huband & McKelvie, 1986; Karteroliotis & Gill, 1987; Sanderson & Reilly, 1983; Slaughter et al., 1994) and one day after a competitive event (Huband & McKelvie, 1986). Post-game decreases in stress, arousal, anxiety, excitement and provocativeness and increases in spontaneity, relaxation, boredom, pride, humiliation, shame and guilty were observed in rugby players (Kerr & van Schaik, 1995; Wilson & Kerr, 1999). Post-competition increases in fatigue and decreases in vigour and tension were found in triathletes (Johnson, Wainwright, Wong, & Yee, 1995). Also, in a recent field study, soccer players exhibited significant post-match increases in fatigue and decreases in revitalisation and positive engagement (Szabo & Bak, 1999). Overall, these data indicate that athletes tend to disengage from the competition once it is over (lower anxiety, arousal, stress and positive engagement) but, at the same time, manifest a range of positive and negative emotional reactions in relation to its outcome (pride, shame, guilt or humiliation). To date, no studies have monitored the temporal pattern of post-competition emotions more than one day after the competitive event. So it is not known how long they take to dissipate and how the course of post-competition emotion is related to various personal and situational variables.

### *5.212 Cognitive factors and performance*

Cognitive appraisal is postulated to determine athletes' emotional responses to competition (Figure 2.1). Recent research has focused on uncovering the cognitive and evaluative processes that moderate the onset and course of competitive anxiety. In this regard, Martens et al. (1990) proposed a model of multidimensional pre-competitive anxiety that describes anxiety as a function of perceived threat, which, in turn, is determined by uncertainty and importance of outcome. Perceived importance of outcome relates to the perceived value of attaining a favourable result at a competition and, in terms of cognitive appraisal, corresponds to the dimension of goal relevance. Uncertainty of outcome is indirectly related to the secondary appraisals of future expectations and coping potential. Empirical validation of this model revealed that perceived importance of the competitive event was a significant predictor of pre-competitive anxiety intensity (Marchant et al., 1998) but uncertainty of outcome was not (Marchant et al., 1997). Contrary to what was postulated by the model, threat of defeat was a better predictor of pre-competitive anxiety than uncertainty of outcome.

More recently, Jones (1995) proposed a model of the relationship between competitive stress and performance, which is based on Carver and Scheier's (1990) self-regulation model of test anxiety. This model views the secondary appraisal dimensions of coping potential and future expectations as the key determinants of competitive anxiety direction. It was hypothesised that athletes with negative goal attainment expectancies and a low confidence in their ability to control both themselves and the environment will experience a debilitative pattern of anxiety. Direct and indirect empirical support for these propositions can be traced back to the Seventies, long before the formulation of the model. For example, Scanlan and Passer (1978) conducted a study on a sample of 191 boys aged 11-12 years and showed that expectancies of self and team performance outcomes were significantly related to level of pre-game anxiety as measured by the State Anxiety Inventory for Children (SAIC; Spielberger, 1973). In a follow-up investigation, these findings were replicated using a sample of female soccer participants of the same age (Scanlan & Passer, 1979). Later, Scanlan and Lewthwaite (1984) investigated the influence of individual differences and situational factors on the competitive stress experienced by 9 to 14 year old wrestlers before two consecutive tournament matches. They showed that personal performance expectancies were one of the best predictors of pre-match stress (as measured by the CSAI-C, i.e. CSAI version for children; Martens, 1977). Similar results have been obtained for adult tennis players (Cooley, 1987), volleyball players (Alexander & Krane, 1996) and female collegiate golfers (Krane, Williams, & Feltz, 1992).

These studies operationalised performance expectancies in terms of absolute outcome (e.g., winning the match or finishing the race in first place), which is associated with only one of the three types of goal that an athlete can set for a competition. The other two types of performance-related goals are process goals and performance goals (Burton, 1988; 1989). Performance goals specify an end product of performance that is easily measurable and can be achieved by the performer relatively independently of other performers (e.g., running the race at a certain time). Process goals specify the process in which the performer will engage during the performance (i.e., watch the ball, keep relaxed and focused). Whilst outcome goals are intimately related to absolute performance expectancies, process and performance goals form the foundations of self-referenced performance expectancies, i.e. performance expectations in relation to one's standards and abilities. As the attainment of outcome goals is less controllable than the attainment of performance and process goals, it may be accompanied by greater psychological distress. In this respect, Burton (1988) showed that outcome goals are associated with higher anxiety than performance and process goals. Consequently, when evaluating the findings of the above studies it is necessary to account for the fact that they examined absolute performance and that the relationship between anxiety and self-referenced performance might have been different.

Recently, a series of studies investigated the relationship between multidimensional competitive anxiety and a combination of self-referenced and absolute performance expectancies. Jones et al. (1990) developed a five-factor Pre-Race Questionnaire (PRQ) measuring several hypothetical antecedents of multidimensional anxiety, some of which can be interpreted as direct and/or indirect measures of self-referenced performance expectancies. These are "Perceived Readiness", pertaining to mental and physical readiness for competition, "Position Goal", referring to goal difficulty and goal attainment expectations and "Attitude Toward Previous Performance", denoting athletes' reactions to previous competition in terms of absolute and self-referenced performance. In general, studies using the PRQ showed that Perceived Readiness was consistently the most influential predictor of cognitive anxiety and self-confidence. In contrast Position Goal was a significant but inconsistent predictor of somatic anxiety (Hanton & Jones, 1995, 1997; Jones et al., 1990; Lane, Terry, & Karageorghis, 1995a; 1995b).

Other studies investigated the relationship between directional interpretation of multidimensional anxiety and performance expectancies. Jones and Hanton (1996) assessed 91 swimmers on intensity and direction of cognitive and somatic anxiety one hour before an important race. They showed that positive goal attainment expectancies were associated with facilitative patterns of cognitive and somatic anxiety, while negative and uncertain goal attainment expectancies were associated with more debilitative patterns of competitive anxiety. Similar results were obtained in a group of athletes competing in soccer and track and field (Wiggins & Brustad, 1996).

To date, only two investigations have examined the temporal changes of cognitive variables associated with competitive anxiety. In a first study, multidimensional anxiety, importance of the competition and performance expectancies were monitored in 28 male and 28 female university athletes throughout a one-week period leading to a major competition (Jones et al., 1991). Cognitive anxiety and performance expectancies remained stable in male athletes throughout the whole period of testing but importance of the competition gradually increased over time. In contrast, female athletes experienced a significant increase in cognitive anxiety and a decrease in performance expectancies as the competition approached. In another study, 91 high school and college male and female athletes were assessed one day, two hours and one hour prior to a competition on anxiety intensity, anxiety direction and performance expectations (Wiggins, 1998). Results indicated that while somatic anxiety increased as the competition neared, cognitive anxiety, anxiety direction and performance expectations did not significantly change over time.

Taken collectively, analysis of the literature on the dynamics of pre-competition emotions is quite disconcerting. Researchers have been so focused on the psychological construct of anxiety that they have overlooked the importance of other emotions as key determinants of human behaviour. As a result, no research on the cognitive determinants of pre-competition emotions other than anxiety has, to date, been undertaken. Also, despite the emphasis on anxiety, researchers have failed to tackle many important issues pertaining to the dynamic aspects of this emotional state. Only two studies have attempted to carry out a process analysis of competitive anxiety and cognitive appraisal. As previously emphasised, it is unreasonable to expect to achieve a satisfactory level of understanding of an ever-changing phenomenon such as competitive stress by relying on data based on a single measurement. It is also unreasonable to expect to achieve a good understanding of human behaviour by examining in detail only one aspect of human emotional experience. In conclusion, future research on pre-competitive stress should proceed with the study of the whole range of emotional experiences at both intra- and interindividual level.

The study of post-competitive stress has focused mainly on the effects of absolute or self-referenced performance and attributional appraisal on athletes' emotional reaction. As one might expect, research has shown that, when compared to successful performances, poor performances were associated with higher levels of anxiety (e.g., Caruso et al., 1990; Gould, Eklund, Petchlikoff, Peterson, & Bump, 1991; Gould & Petlichkoff, 1988; Halvari & Gjesme, 1995; Scanlan & Passer, 1978, 1979), anger (Hassmén & Blomstrand, 1995; Wilson & Kerr, 1999), depression, confusion (Hassmén, & Blomstrand, 1995), sullenness, humiliation, resentment, shame and stress (Wilson & Kerr, 1999). Vura et al. (1985) also reported an increase in state anxiety in elite weight-lifters after a poor performance. However, the effect of failure was mediated by the quality of judging. Thus, failure accompanied by unfavourable judging led to a decrease in post-competition anxiety, whereas failure coupled with favourable judging produced an increase in post-competition anxiety. These findings indicate that athletes' post-competition emotional response is not only a function of goal congruence in terms of success or failure, but it is also determined by the secondary appraisals of blame/credit and coping potential, which define the degree of latent controllability of a situation. It appears that a poor performance associated with perceived uncontrollability of the situation may evoke less psychological distress than a poor performance in potentially controllable circumstances. Indeed, a study that explicitly examined causal attribution of outcome and post-competition emotions showed that controllability was the cognitive appraisal dimension that best predicted athletes emotional reaction to performance outcome (McAuley et al., 1983).

Belciug (1992) conducted a field study to examine some aspects of attributional appraisal of athletic performance in relation to post-competition emotional reactions. He showed that the best predictor of post-competition emotions in both success and failure conditions was locus of causality followed by controllability of the situation. Specifically, the perception of personal control over the outcome predicted a significant portion of the total variance of post-competition happiness, satisfaction, pride, gratefulness and depression.

Another study examined the relationship between cognitive appraisal and affective reactions following performance in an individual floor exercise routine at the end of an 11-week course in gymnastics (McAuley & Duncan, 1990). Results showed that, in general, subjective evaluation of performance was a better predictor of a composite measure of post-competition general (happiness, pleasure, satisfaction and depression) and self-related (pride, competence, shame, guilt and disappointment) affect than attributions of causality of outcome (performance). Similarly, Biddle and Hill (1992) observed that post-competition emotions in winners were generally related to performance satisfaction rather than attributions. Subjective appraisal of performance predicted positive self-esteem and relaxation. In contrast, in losers emotional state was best predicted by perceived importance of outcome and unstable attributions (e.g. invested effort, mood and luck), but only for one of the three examined emotional factors (relaxation).

Unlike the investigations of Belciug (1992) and Vura et al. (1985), these last two studies failed to find a significant relationship between the dimensions underlying causal attributions and post-competition emotions. The most likely explanation for the discrepancies in findings concerns the degree of ego-involvement associated with the task and the particulars of the measurement instruments used. For example, in the study of McAuley and Duncan (1991), the participants experienced their performances in the context of gymnastic activity classes. Biddle and Hill (1992) examined players participating in regional league matches. Such situations are likely to be significantly less ego-involving than international elite athletics or weight-lifting.

Lastly, Willimczik and Rethorst (1995) showed that post-competition emotions can be affected by both primary (i.e. importance of outcome and perceived performance) and secondary cognitive appraisals (attributional appraisal). Using path analysis they found that joy and sadness were strongly outcome-dependent emotions, pride was associated with internal attribution of outcome and shame depended equally on outcome and internal attribution of outcome. Additionally, they found that the outcome-dependent emotions of guilt and pride were also directly influenced by the outcome evaluation.

In summary, existent research has revealed that objective outcome, self-referenced performance, importance of outcome and the secondary cognitive appraisal dimension of individual controllability are important antecedents to the generation of post-competition emotions. As such, future research on the dynamics of post-competitive stress should take into account their moderating effects.

### *5.213 Personality traits*

The interactional model of competitive stress postulates that cognitive appraisal of a competitive event is influenced by the interaction of personal and situational factors. As detailed earlier, two personality traits have been identified as moderators of both magnitude and temporal patterns of pre-competitive anxiety. These are CTA (Donzelli et al., 1990; Huband & McKelvie, 1986) and perfectionism (Hall et al., 1998). It has been shown that individuals with high levels of CTA and/or perfectionism exhibit greater increases in anxiety intensity and are more anxious before a competition than individuals who are low on these two personality traits.

One single study analysed the moderating effect of various personality traits on magnitude and course of pre-competition emotional states as measured by the abbreviated version of the POMS. Prapavessis and Grove (1994) assessed trait-sport confidence, optimism, hardiness, neuroticism and self-handicapping in 106 competitive rifle shooters and monitored their affective state over a two-day pre-competition period. Results revealed that the selected personality traits were not related to temporal patterns of pre-competitive affects, but the magnitude of some affective states were influenced by neuroticism, trait-sport confidence, self-handicapping and the control and commitment components of hardiness. Specifically, trait-sport confidence was positively correlated with vigour and esteem and negatively correlated with confusion and tension. Neuroticism was associated with tension. Self-handicapping was negatively correlated with vigour and esteem and positively correlated with confusion and tension. Individuals high in control demonstrated more tension and less esteem-related affect than individuals with low control. Finally, high commitment was associated with more tension and confusion. After comparing these results with some earlier findings, the authors suggested that the combination of sport-specific and more general measures of personality dispositions might explain a greater proportion of the variance in pre-competitive emotions than sport-specific measures alone.

Although no other investigations examined the moderating effects of personality traits on temporal patterns of pre-competition emotions, a recent study examined the relationship between the magnitude of pre-competition emotional states as measured by the POMS and some personality traits (Hassmén, Koivula, & Hansson, 1998). Eight male golf players were assessed on neuroticism, extraversion, self-consciousness, locus of control and CTA between two and four weeks before the first competition of the season. Subsequently, they completed the POMS between 30 and 60 minutes before every game played throughout the competitive season. The study showed that athletes who were high in CTA, external locus of control and neuroticism scored higher on pre-competition tension, anger, depression and confusion. Most interestingly, some personality traits moderated the functionality of specific emotions in relation to performance. For instance, athletes scoring high on neuroticism, CTA, public self-consciousness and external locus of control performed better in conditions of increased anger. This is consonant with what was observed in Study 1a, which showed that anger-depression contributed to a more positive interpretation of cognitive anxiety in high-anxious Tae Kwon Do practitioners.

Three personality traits have been examined as moderators of post-competition state anxiety. These are competitive trait anxiety (e.g., Huband & McKelvie, 1986; Scanlan & Lewthwaite, 1984; Scanlan & Passer, 1979), self-esteem (Gould et al., 1991; Scanlan & Lewthwaite, 1984; Scanlan & Passer, 1979) and locus of control (Hall, 1980). No significant effects of self-esteem on post-competition anxiety were observed and only one out of four studies found a significant relationship between competitive trait anxiety and post-competition state anxiety (Huband & McKelvie, 1986). Two groups of basketball and hockey players, identified as high and low on CTA, were tested on competitive state anxiety one day before, just before, just after and one day after a league game. While there was no significant difference between the two groups 24 hours before the competition, on the three subsequent administrations, they displayed different patterns of anxiety. In high-anxious athletes state anxiety increased immediately before the competition and returned to its initial levels one day later. In contrast, in low-anxious athletes state anxiety remained stable till the last assessment, when it dropped significantly below the values recorded one day before the competition.

The only study that has investigated the effect of locus of control on post-competitive anxiety found that locus of control mediated the emotional response to failure and success on a motor task (Hall, 1980). Individuals with an internal locus of control tended to experience higher post-competition anxiety after failure than individuals with an external locus of control. In contrast, externals showed no significant differences in post-competition anxiety whether succeeding or failing.

Overall, these findings indicate that the study of personality traits can offer a more comprehensive understanding of athletes' emotional response to the competitive process and, at the same time, provide an explanation for the differential effects of pre-competition emotions on performance. Unfortunately, as is clear from this review of literature, very little research effort has been invested in this direction. Most surprisingly, no research has yet been undertaken to investigate the moderating effects of personality traits on post-competition emotions other than anxiety. The paucity of findings on the role of personality traits in the competitive process indicates a need for further investigations.

## 5.22 Purpose of the study

Given the dearth of research in the field of competitive emotions, the aim of the present investigation was to examine some aspects of the competitive process as defined by the interactional model of competitive stress (Figure 2.1). For this purpose, an 11-day ESM study was conducted on 44 male martial artists. Pre- and post-competition emotional states and type, importance and controllability of sources of concerns were monitored throughout the week leading to an important competition, on the day of the competition and across three days following the competition.

Previous research has shown that athletes are affected by both competition and non-competition sources of stress (Gould et al., 1993; Scanlan et al., 1991). So the first scope of this study was to determine the perceived importance of the competitive event in relation to other sources of concern that athletes might experience in temporal proximity to the competition. It should be noted that here "concern" has been defined as a disposition to desire occurrence or non-occurrence of a given type of situation (Frijda, 1986). Therefore, in this study, sources of concern refer to negative and positive events, thoughts and situations. Closely linked to the previous purpose, this study also attempted to differentiate between emotions evoked by the competitive event, emotions evoked by other events and general pre- and post- competition mood.

In the light of previous research, the second major purpose of this study was to examine the relationship between pre- and post-competition discrete emotions and the cognitive appraisals of goal relevance, goal congruence, future expectations and controllability of sources of concern. Goal relevance referred to the subjective importance of an event or thought. Goal congruence was defined through the perceived pleasantness or unpleasantness of a source of concern. It was assumed that goal congruent sources of concern would be perceived as pleasant and goal incongruent sources of concern would be perceived as unpleasant (Smith & Lazarus, 1993). Controllability was defined as the perceived degree of personal control that an individual has over a source of concern. Future expectations were measured only in relation to the forthcoming competition and were defined as self-referenced performance expectations.

To account for individual differences in emotional responses to competition-related and competition-extraneous sources of concern, the effects of extraversion, neuroticism and CTA on intensity and temporal patterns of pre- and post-competition emotions were examined. As suggested by Prapavessis and Grove (1994), it was decided to assess both sport-specific (CTA) and general personality traits (neuroticism and extraversion), hoping that such an approach would explain a greater portion of the variance of pre- and post-competition emotions. It was decided to test CTA because it has been associated both with magnitude and temporal pattern of pre- and post-competition emotional responses (Study 1a - Chapter 4). The decision to assess neuroticism and extraversion was based on the fact that they have been consistently associated with emotionality (Watson & Clark, 1992). More precisely, it has been shown that the tendency to experience negative emotions is substantially correlated with neuroticism, whereas the tendency to experience positive emotions is associated with extraversion (Costa & McCrae, 1992; Tellegen, 1985; Watson & Clark, 1992).

## 5.3 Method

### 5.31 Participants

Male athletes who were planning to participate in the National English Tae Kwon Do Championship and the National Shotokan Karate Championship in the season 2000 were personally contacted. Twenty-two Tae Kwon Do and 22 Karate practitioners agreed to take part in this study. Thirty-nine participants completed the 11 days of experience sampling. Two of the remaining participants discontinued participation within 72 hours of experience sampling because they believed that the procedures were too disruptive to their daily activities. Three participants discontinued participation due to injuries or other health problems. Table 5.1 provides descriptive data on characteristics of the athletes who completed the full two weeks of experience sampling and those who did not. No significant differences in personality and other demographic variables were detected between athletes who completed the study and those who did not (Appendix 43). Also no differences were found between Tae Kwon Do and Karate practitioners (Appendix 44).

**Table 5.1 Characteristics of participants who completed the study and participants who discontinued participation**

| Variable | Completed study (N=39) | | Discontinued participation (N=5) | |
|---|---|---|---|---|
| | M | SD | M | SD |
| Age | 26.77 | 7.75 | 24.60 | 4.22 |
| Experience (years) | 10.40 | 6.47 | 6.40 | 3.44 |
| Current performance (5-point scale) | 3.72 | 0.65 | 3.60 | 0.55 |
| Expected performance at the competition (11-point scale) | 6.08 | 1.65 | 5.85 | 0.84 |
| Neuroticism (NEO PI-R) | 75.39 | 20.15 | 81.80 | 10.55 |
| Extraversion (NEO PI-R) | 120.10 | 16.22 | 113.20 | 6.06 |
| Competitive trait anxiety (SCAT) | 22.51 | 3.91 | 25.60 | 2.07 |

Legend: SCAT = Sport Competition Anxiety Test; M = mean; SD = standard deviation

The group of martial artists who completed the study ranged in age from 16 to 53 years (M = 26.77, S.D. = 7.75; median = 23) and had a mean training experience of 10.40 years (S.D. = 6.47). Their mean perceived current performance was 3.72 (S.D.=0.65) on a 5-point Likert scale ranging from 1 *(extremely poor)* to 5 *(excellent)*. On average, they expected to perform slightly above their usual standard at the forthcoming competition. When compared to the norms for male American adults (Costa & McCrae, 1992), this group of athletes exhibited average neuroticism (52nd percentile) and above average extraversion (75th percentile). Finally, the sample had a mean level of CTA that corresponded to the 60th percentile of the norms for male wrestlers (Martens et al., 1990).

## 5.32 Instrumentation

The main purpose of this study was to determine the effects of some personality traits, situational variables and primary and secondary appraisal on fundamental emotions experienced pre- and post-competition. The personality traits of neuroticism and extraversion were assessed with the NEO PI-R, Form S (Costa & McCrae, 1992), while CTA was measured with the SCAT (Martens et al., 1990).

Emotions were assessed with the DES-IV (Izard et al., 1993). A series of items constructed for the purpose of this study assessed occurrence, pleasantness, importance, controllability and type of sources of concern experienced during the period of testing (van Eck, 1996).

### *5.321 Demographic Questionnaire (DQ)*

Demographic information was obtained through a short questionnaire assessing age, training experience, level of participation, perceived current performance, expected performance at the forthcoming competition and the motives for taking part in martial arts (Appendix 46).

### *5.322 The SCAT*

The SCAT, Form A (Martens et al., 1990) was used to measure CTA. The SCAT measures an individual's tendency to perceive competitive situations as threatening and to respond to these situations with elevated state anxiety. It consists of 15 items including ten anxiety-related statements and five filler items. Participants are asked to indicate how they generally feel when they compete in sports and games and respond to each item using a three-point ordinal scale (hardly ever, sometimes and often). Total scores on the SCAT range from ten (low CTA) to 30 (high CTA). The SCAT is used extensively in sport psychology research, and has satisfactory test-retest reliability ($r = 0.61$ to $0.95$), and internal consistency (alpha = 0.95 to 0.97) (Martens et al., 1990).

#### *5.323 <u>NEO PI-R. Form S: Neuroticism and Extraversion Scales</u>*

The NEO PI-R, Form S is a self-report measure of the five major dimensions, or domains of personality (Neuroticism, Extraversion, Openness, Agreeableness and Conscientiousness). The five factors represent the most basic dimensions underlying the traits identified in both natural languages and psychological questionnaires. Each personality factor is measured with a scale consisting of 48 items answered on a 5-point scale from *strongly disagree* to *strongly agree*. For the purpose of this study, the participants were assessed on the personality domains of neuroticism and extraversion (Appendix 47). Neuroticism refers to the tendency to experience irrational ideas and negative emotions such as fear, shame, anger, guilt, sadness and disgust. It also entails poor ability to control impulses and cope with stress. Individuals who score low on Neuroticism are emotionally stable, calm and relaxed and are able to face stressful events without becoming upset. Extraversion is typified by sociability, preference for large groups and gatherings, assertiveness, optimism, excitement seeking and high activity levels. Internal consistency for neuroticism and extraversion ranged from 0.89 to 0.92 in self-reports and from 0.90 to 0.93 in observer ratings (Costa & McCrae, 1992). Data on the validity of these factors are reported in the manual (Costa & McCrae, 1992).

#### *5.324 <u>The DES-IV</u>*

The DES-IV (Izard, 1991) is a self-report instrument designed for the use and assessment of an individual's experience of fundamental emotions or patterns of emotions as conceptualised by the DET. The item content of the DES was derived from cross-cultural research on emotion expression labelling (Izard et al., 1993). The DES-IV represents a modified version of the DES-III, an inventory adapted for a maximum range of ages and educational levels. It comprises 12 three-item subscales gauging the emotions of interest, enjoyment, surprise, sadness, anger, disgust, contempt, fear, guilt, shame, shyness and self-hostility. Several studies have contributed evidence for the construct validity of the DES scales, including the scales of the last version of the inventory (e.g., Blumerg & Izard, 1985, 1986; Izard et al., 1993). The possible intensity scores on each subscale of the DES-IV range from 3 to 15. Internal consistencies of the individual scales ranged from 0.60 (Shame scale) to 0.85 (Sadness and Anger scales). These values are acceptable for scales with only three items (Costa & McCrae, 1992).

*5.325* *Assessment of sources of concern*

Participants were asked to describe a positive or negative event, situation or thought (if any) that occurred in the interval since their last ESM report that affected their emotional state (Appendix 48). Participants' description of events, situations or thoughts were coded according to the activity context with the categories competition-extraneous and competition-related. These categories were mutually exclusive. Only sources of concern for which it was explicitely stated that they were associated with the forthcoming competition were classified as competition-related. Events such as "late for Tae Kwon Do training", although pertaining to the sport the participants were going to compete in, were classified as competition-extraneous because they were part of the participants' daily routine that was not exclusively associated with competition (Appendix 50). Interrater agreement between two independent coders was assessed for 761 events using Cohen's kappa (Laundis & Koch, 1977). Cohen' kappas were 0.98 for competition-related sources of concern and 0.99 for competition-extraneous sources of concern. Only three events were initially differently classified by the two independent coders. Consensus was subsequently achieved.

Participants also rated pleasantness/unpleasantness, controllability and importance of the reported source of concern. Controllability and importance were rated on a 7-point Likert scale ranging from 1 *(not at all)* to 7 *(very much)*. Unpleasanteness/pleasantness of the source of concern was defined as a dichotomous variable (Appendix 48).

*5.326* *Self-referenced expected and actual performance at the competition*

Self-referenced expected and actual performance were measured on a 11-point Likert scale ranging from 0 *(very much below my usual standard)* to 10 *(very much above my usual standard)* (Appendices 46 and 48). Expected performance was measured at the beginning of the study, whereas actual performance was assessed immediately after the competition.

*5.327 Pagers*

To deliver the random signals (Appendix 49) for questionnaire completion to the athletes, 22 Motorola (model: PageOne Minicall) pagers were used. Calls were performed by means of a personal computer and a modem using the AvantPager 32 (version 4.00) software, so that the possibility of accidental errors in dialling the pager numbers was ruled out.

## 5.33 Procedure

During an initial interview, participants were briefed about the aims and procedures of the study and informed consent was obtained (Appendix 45). They then completed the DQ, the SCAT and the neuroticism and extraversion scales of the NEO PI-R. Participants were given a pager and were well familiarised with its use. They were also given a booklet containing the DES-IV, items assessing type, controllability, importance and pleasantness of sources of concern and an item measuring self-referenced performance at the competition (Appendix 48). Each booklet included enough experience sampling questionnaires to last for 11 days of sampling. Participants were paged five random times a day over a period of seven consecutive days before and three consecutive days after the competition. The calls from the researcher were denoted by a numeric message composed of three figures, the message slot number and the time the message was received. The three figures in the message denoted the week (1 or 2), the day of the week (from 1 to 7) and the number of the daily call (1 to 5). For example, message 242 meant: second week, fourth day, second daily call. Participants were instructed to disregard any message not corresponding to the code of the researcher.

The day was divided into five blocks between the hours of 9.00 a.m. and 9.30 p.m. Within each of these periods one randomised pager signal was sent with a minimum of 30-minute delay between the signals. Upon reception of the signal, participants completed the experience sampling questionnaires. They first indicated the date and time of the day of completion. Second, they rated their momentary emotional states on the DES-IV. Finally, they reported the type, pleasantness, controllability and importance of eventual positive or negative sources of concern experienced in the interval since their last report. Participants were instructed that if the pager was accidentally turned off or malfunctioned, or if they were unable to answer within 30 minutes of the signal, they should not complete the questionnaires for that sampling (Gauvin et al., 1996; Gauvin & Szabo, 1992).

On the day of the competition, participants were assessed twice. They completed the usual set of questionnaires approximately 1 hour before and immediately after the competition and rated their actual performance on a self-referenced scale (Appendix 48). Finally, they were instructed to return the booklet and the pager four days after the competition. An inconvenience allowance of £35 was given to the participants that completed the study.

Compliance with the procedures was very good. Participants completed an average of 93.54% of all possible responses within the time limit, for an average of 48.64 out of 52 valid responses per participant. The average time delay between the signal from the pager and the actual completion of the questionnaires was 8.00 minutes (SD = 8.68). Compliance rate was unrelated to age, sport experience, competitive trait anxiety, extraversion and day of the study. A low negative correlation between compliance rate and neuroticism was observed ($r = -0.32$; $p<0.05$). However, this correlation was not significant when Bonferroni correction for multiple significance testing was used (Appendix 51).

## 5.4 Results

Analysis of data was performed in five stages. First, differences in personality traits and demographic variables between Tae Kwon Do and Shotokan Karate practitioners were tested for significance (Appendix 44). This was done in order to determine whether statistical analyses could be performed conjointly on data from both groups of athletes. Subsequently, signal compliance and internal consistency of the DES subscales were examined. The results of the analyses of signal compliance and group differences in personality variables are reported in the methodology section.

Stage three involved the analysis of differences in intensity and temporal patterns of pre- and post-competition emotional states between the Tae Kwon Do and Shotokan Karate practitioners. Besides testing for group differences, this analysis provided information on the temporal changes of discrete emotions pre- and post-competition. Subsequently, analysis of occurrence, type, pleasantness and temporal patterns of sources of concern was performed. This included descriptive analysis of controllability, importance and frequency of occurrence of four categories of concerns (pleasant competition-related, pleasant competition-extraneous, unpleasant competition-related, unpleasant competition-extraneous) on each day of the ESM study and one hour before and immediately after the competition. Additionally, differences in occurrence of sources of concerns between adjacent days and adjacent assessments on the competition day were tested for significance.

In the fourth stage of the data analysis, descriptive statistics of perceived importance and controllability of different categories of concern were computed. Correlational analysis of personality traits and occurrence, controllability and importance of the various categories of sources of concerns was also performed. The final stage of the data analysis involved the construction and testing of multivariate multilevel linear models of pre- and post-competition discrete emotions. Personality traits, temporal proximity to competition, occurrence, pleasantness, controllability and importance of competition-related and competition-extraneous sources of concern were examined as predictors of discrete pre- and post-competition emotions.

### *5.41 Temporal patterns of discrete emotions and pleasant and unpleasant sources of concern in Tae Kwon Do and Shotokan Karate practitioners*

Internal consistency indices of the DES-IV subscales were calculated for the two assessments on the day of the competition, these being the periods at which stronger emotional reactions and greater interindividual differences were expected. Results showed that Cronbach alphas for the DES-Contempt subscale were below 0.50. Exclusion of the item "I felt/feel like I was/am better than somebody" improved the internal consistency of the scale to Alpha values 0.55 and 0.52. As this was not considered an acceptable degree of internal consistency, this scale was excluded from subsequent data analysis. The other scales exhibited an acceptable degree of internal consistency ranging from 0.73 to 0.96 (Appendix 52).

In order to examine temporal patterns of emotions and test eventual differences between Tae Kwon Do and Karate practitioners, two-way ANOVAs with repeated measures on the time factor were carried out for each discrete emotion. They were computed on aggregated measures of emotions defined as daily averages for the days preceding and following the competition. Data pertaining to the assessments on the day of the competition were not aggregated and were analysed in their original raw form. To control for experiment-wise error due to multiple testing, Bonferroni correction was adopted. Levene's test was used to test the hypothesis of equality of variances. When the assumption of sphericity was violated, Greenhouse-Geisser correction was applied.

Significant ANOVA effects were followed by comparisons of adjacent assessments. Significance levels of contrasts were evaluated with Bonferroni adjusted probabilities (Appendix 53).

No significant Group main effects or significant Group by Time interaction effects were observed. These results indicated that the data derived from the two groups could be merged into a single data pool. Significant Time main effects were observed for guilt, shyness, self-hostility, shame, sadness, fear, anger, surprise and interest, which indicated that certain emotions did change over time. Table 5.2 reports the means and standard deviations of pre- and post-competition emotions and F-ratios and probabilities related to Time main effects. Results showed that guilt, self-hostility and anger remained stable in the pre-competition period but significantly increased immediately after the competition (Table 5.2; Figure 5.1). The average intensity of these emotions decreased on the day following the competition and remained stationary for the rest of the time. Over the period of testing, average intensity of anger, self-hostility and guilt ranged from 1.02 (no presence at all) to 1.87 (low intensity) on a three-point scale. Shyness and shame were also on average virtually non-existent and reached low levels on the day of the competition. Sadness reached its peak immediately after the contest and gradually decreased on the following days. Fear increased from very low levels in the week preceding the competition to low- moderate levels one hour before the competitive event and dropped back to very low levels when the contest finished. Surprise and interest increased before the competition and decreased on the following day. Notably, interest was significantly lower on the second day of the study than it was on the first day. Interest, enjoyment and surprise were higher than negative emotions across the whole 11-day period, with interest and enjoyment approaching moderate levels.

In order to examine the occurrence, type, pleasantness and temporal patterns of events or thoughts reported during the experience sampling, they were categorised into pleasant competition-related, unpleasant competition-related, pleasant competition-extraneous and unpleasant competition-extraneous concerns. Table 5.3 shows frequency and percentages of occurrence of the four categories of concerns by day, including also the two assessments on the day of the competition. Calculation of percentages was based on the total number of valid experience samplings obtained for a particular period of time. Specifically, it represented the percentage of experience samplings on a certain day or assessment in which a specific category of concern was observed. For example, on the second day of the study, 184 valid reports were collected. Eleven of these reports contained the description of pleasant sources of concern that were related to the competition, which corresponds to 5.98% of the total number of reports for that day. One hour before the competition, 33 descriptions of pleasant competition-related events or thoughts were observed. This corresponded to 84.62% of the total number (N=39) of reports on that particular assessment. During the 11 days of experience sampling, athletes reported a total of 761 subjectively significant events or thoughts. This corresponded to 40.12% of the total number of valid ESM reports collected in this study. Specifically, 10.91% of the reports included descriptions of competition-related concerns that were pleasant, 3.43% encompassed unpleasant concerns associated with competition and 25.78% described concerns that were extraneous to competition. Half of the events in the last category were considered to be pleasant and half were perceived as unpleasant. Overall, athletes reported significantly more pleasant than unpleasant concerns ($F$ (899, 625)=1.44; $p<0.01$). No significant difference was observed between the number of pleasant and unpleasant competition-extraneous concerns ($F$ (495, 485)=1.016; $p<0.05$). In contrast, a significant difference was found between the number of pleasant and unpleasant events or thoughts related to competition ($F$ (415, 131)=3.168; $p<0.01$), with the former being more frequent. Finally, competition-extraneous concerns were more frequent than competition-related concerns ($F$ (979, 545)=1.79; $p<0.01$).

In order to examine pre- and post-competition temporal changes in occurrence of sources of concerns, significance of the difference in frequency of reported concerns between adjacent days and adjacent assessments on the competition day was tested. For this purpose, F-tests for counted results (frequencies) were used (Kanji, 1999). Due to multiple testing, Bonferroni adjusted probabilities were applied (Appendix 54). Results showed that the relative frequency of pleasant competition-related events started to increase two days before the competition and reached its peak one hour before the contest. This category of events significantly decreased on the day following the competition (Table 5.3; Appendix 54). Relative frequency of unpleasant competition-related events peaked immediately after the competition and decreased on the following day. No competition-extraneous events were reported in immediate temporal proximity to the competition and no competition-related concerns were recorded three days after the contest.

**Table 5.2** **Means, standard deviations and results of Time main effects testing of pre- and post-competition emotions**

| Scale (3-15) | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | Day 6 | Day 7 | Day 8 BC | Day 8 AC | Day 9 | Day 10 | Day 11 | F (11,407) | BCP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Guilt | 3.46 (0.74) | 3.36 (0.64) | 3.14 (0.39) | 3.28 (0.56) | 3.31 (0.68) | 3.17 (0.46) | 3.27 (0.80) | 3.38 (1.02) | 5.33 (2.86) | 3.79 (1.61) | 3.21 (0.39) | 3.27 (0.60) | 15.32 | <0.001 |
| Shyness | 3.26 (0.58) | 3.21 (0.56) | 3.14 (0.39) | 3.27 (0.52) | 3.26 (0.48) | 3.17 (0.46) | 3.15 (0.42) | 3.69 (1.30) | 3.90 (1.77) | 3.41 (0.94) | 3.25 (0.48) | 3.20 (0.47) | 4.88 | 0.033 |
| Disgust | 3.23 (0.48) | 3.12 (0.32) | 3.13 (0.32) | 3.19 (0.66) | 3.10 (0.23) | 3.19 (0.52) | 3.05 (0.21) | 3.41 (1.48) | 3.82 (2.28) | 3.24 (0.48) | 3.13 (0.33) | 3.08 (0.30) | 2.421 | 1.000 |
| Self-hostility | 3.27 (0.65) | 3.18 (0.31) | 3.07 (0.14) | 3.14 (0.27) | 3.25 (0.59) | 3.11 (0.33) | 3.20 (0.46) | 3.69 (1.61) | 5.12 (2.56) | 3.51 (1.20) | 3.10 (0.19) | 3.15 (0.32) | 16.44 | <0.001 |
| Shame | 3.23 (0.61) | 3.27 (0.66) | 3.21 (0.57) | 3.21 (0.49) | 3.21 (0.50) | 3.20 (0.58) | 3.15 (0.44) | 3.64 (1.41) | 3.84 (1.46) | 3.32 (0.74) | 3.17 (0.37) | 3.13 (0.33) | 6.17 | 0.011 |
| Sadness | 3.46 (0.73) | 3.33 (0.78) | 3.26 (0.54) | 3.27 (0.44) | 3.39 (1.04) | 3.34 (0.70) | 3.30 (0.65) | 3.56 (1.17) | 5.08 (2.86) | 3.96 (1.84) | 3.43 (0.76) | 3.22 (0.45) | 9.96 | <0.001 |
| Fear | 3.27 (0.63) | 3.28 (0.55) | 3.19 (0.38) | 3.28 (0.55) | 3.27 (0.52) | 3.27 (0.50) | 3.74 (1.15) | 6.79 (2.64) | 3.72 (1.50) | 3.28 (0.70) | 3.10 (0.23) | 3.09 (0.23) | 50.28 | <0.001 |
| Anger | 3.63 (0.93) | 3.51 (0.76) | 3.53 (0.75) | 3.62 (0.79) | 3.56 (0.75) | 3.72 (1.06) | 3.61 (1.20) | 3.95 (1.88) | 5.62 (3.09) | 3.73 (1.20) | 3.47 (1.10) | 3.22 (0.47) | 9.58 | <0.001 |
| Enjoyment | 8.17 (2.36) | 7.42 (2.28) | 7.22 (2.07) | 7.08 (2.48) | 7.35 (2.43) | 7.23 (2.29) | 7.49 (2.23) | 7.38 (3.13) | 7.67 (3.68) | 7.12 (2.63) | 7.03 (2.12) | 7.54 (2.63) | 1.12 | 1.000 |
| Surprise | 4.82 (1.58) | 4.29 (1.09) | 4.49 (1.26) | 4.31 (1.14) | 4.34 (1.35) | 4.70 (1.65) | 4.78 (1.48) | 6.05 (2.15) | 5.77 (2.91) | 4.30 (1.52) | 4.41 (1.32) | 4.75 (1.91) | 9.09 | <0.001 |
| Interest | 6.86 (1.79) | 6.18 (1.91) | 6.13 (1.98) | 6.17 (2.05) | 5.95 (1.90) | 6.18 (1.83) | 6.56 (1.98) | 9.33 (3.12) | 7.77 (2.91) | 5.87 (2.22) | 6.05 (1.99) | 6.53 (2.23) | 13.89 | <0.001 |

Legend: BC = 1 hour before the competition; AC = immediately after the competition; F = F-ratio; BCP = Bonferroni corrected probabilities; Shaded cells = significant change from previous assessment (adjacent) evaluated with Bonferroni adjusted probabilities

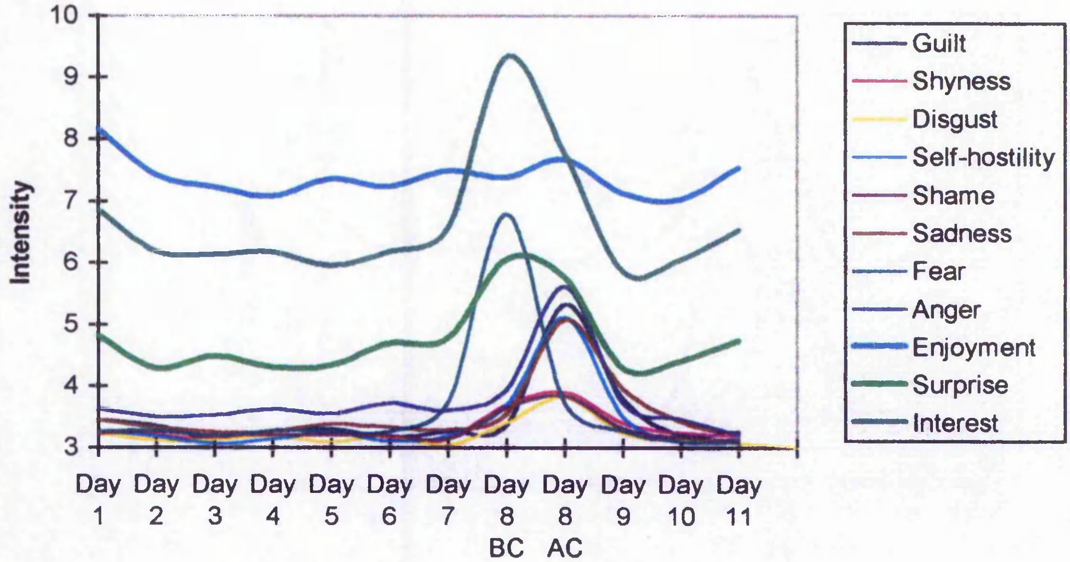
**Table 5.3** **Frequencies and percentages of pleasant competition-related (PCR), unpleasant competition-related (UCR), pleasant competition-extraneous (PCE) and unpleasant competition-extraneous concerns (UCE) by day or assessment**

| Day / assessment | Total ES (f) | TNC (f) | TNC (%) | PCR (f) | PCR (%) | UCR (f) | UCR (%) | PCE (f) | PCE (%) | UCE (f) | UCE (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Day 1 | 180 | 69 | 38.33 | 16 | 8.89 | 4 | 2.22 | 17 | 9.44 | 32 | 17.78 |
| Day 2 | 184 | 63 | 34.24 | 11 | 5.98 | 1 | 0.54 | 22 | 11.96 | 29 | 15.76 |
| Day 3 | 185 | 83 | 44.86 | 21 | 11.35 | 0 | 0.00 | 34 | 18.38 | 28 | 15.14 |
| Day 4 | 189 | 78 | 41.27 | 15 | 7.94 | 1 | 0.53 | 18 | 9.52 | 44 | 23.28 |
| Day 5 | 184 | 76 | 41.30 | 15 | 8.15 | 1 | 0.54 | 27 | 14.67 | 33 | 17.93 |
| Day 6 | 177 | 67 | 37.85 | 22 | 12.43 | 1 | 0.56 | 24 | 13.56 | 20 | 11.30 |
| Day 7 | 184 | 83 | 45.11 | 45 | 24.46 | 13 | 7.07 | 14 | 7.61 | 11 | 5.98 |
| Day 8 - BC | 39 | 39 | 100.00 | 33 | 84.62 | 6 | 15.38 | 0 | 0.00 | 0 | 0.00 |
| Day 8 - AC | 39 | 39 | 100.00 | 21 | 53.85 | 18 | 46.15 | 0 | 0.00 | 0 | 0.00 |
| Day 9 | 180 | 58 | 32.22 | 6 | 3.33 | 16 | 8.89 | 21 | 11.67 | 15 | 8.33 |
| Day 10 | 174 | 57 | 32.76 | 2 | 1.15 | 4 | 2.30 | 35 | 20.11 | 16 | 9.20 |
| Day 11 | 182 | 49 | 26.92 | 0 | 0.00 | 0 | 0.00 | 30 | 16.48 | 19 | 10.44 |
| Total | 1897 | 761 | 40.12 | 207 | 10.91 | 65 | 3.43 | 242 | 12.76 | 247 | 13.02 |

Legend: BC = before competition; AC = after competition; ES = experience sampling; TNC = total number of reported concerns; (f) = frequencies of concerns; (%) = percentages of experience samplings in which the specific category of concerns was reported; Shaded cells = significant change from previous assessment (adjacent), evaluated with Bonferroni adjusted probabilities

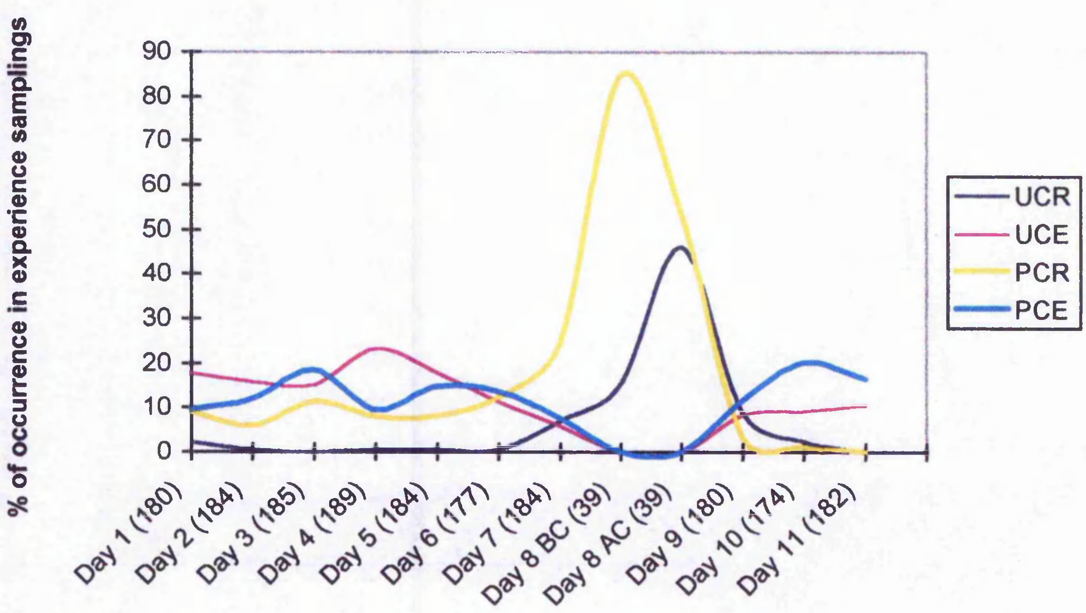
Figure 5.1 shows temporal patterns of pre- and post-competition emotions, whereas Figure 5.2 depicts temporal patterns of relative frequencies (percentages of occurrence in relation to total number of ESM for a certain day or assessment) of pleasant and unpleasant competition-extraneous and competition-related sources of concern. These graphical representations indicate that, on average, athletes experienced substantial changes in emotional states from the day preceding the competition to the day following the competition. Athletes' affective experience was dominated by positive emotions throughout the whole period of testing. An increase in negative emotions was observed immediately after the competition. Yet, even in this critical period positive emotions prevailed. Fear peaked one hour before the competition and was accompanied by significant increases in interest and surprise. These emotional changes were associated with an increase in percentage of reported competition-related events or thoughts as significant episodes influencing athletes' psychological state. The day before the competition was characterised by reports of pleasant competition-related activities or thoughts. The competition itself was preponderantly perceived as a positive event (84.62%). Only 15.38% of the athletes reported competition-related sources of concern that were considered to be unpleasant. This percentage increased immediately after the competition when it reached its maximal value (46.15%). On the following day a sudden drop in competition-related concerns occurred. This was accompanied by a decrease in both negative and positive emotions. The last two days of experience sampling were typified by emotional patterns that were similar to those observed in the week leading to the competition, with very low negative emotions and low to moderate levels of positive emotions. Also, relative occurrence of competition-extraneous sources of concern returned to its pre-competition levels, whilst competition-related events or thought declined and reached nil values three days after the competition.

**Figure 5.1 Temporal patterns of pre- and post-competition emotions**




Legend: BC = before competition; AC = after competition

**Figure 5.2 Temporal patterns of relative frequencies* of pleasant and unpleasant competition-extraneous and competition-related sources of concern**




Legend: UCR = unpleasant competition-related concerns; UCE = unpleasant competition-extraneous concerns; PCR = pleasant competition-related concerns; PCE = pleasant competition-extraneous events; * = percentages of occurrence in relation to total number of ESM reports for a certain day or assessment; (number) = number of total ESM reports on day or assessment

### *5.42 Analysis of controllability and importance of reported sources of concern and correlational analysis of personality traits and concern-related variables*

Controllability and importance of reported sources of concern were analysed. In order to do so, data were aggregated to provide a single estimate for each participant. Means and standard deviations of occurrence and controllability of sources of concern were computed for all categories of concern together and for each of the four categories separately (Table 5.4). Means and standard deviations of importance of sources of concern were calculated for the competition-related and competition-extraneous categories, regardless of their hedonic tone, and for all concerns together. Unpleasant competition-extraneous events or thoughts were the most frequently reported sources of concern, followed by pleasant competition-extraneous and pleasant competition-related concerns. Unpleasant competition-related cognitions or events occurred on average in only 1.62 out of 48.68 (average number of valid reports per participant) ESM reports per athlete. Occurrence of negative competition-related and competition-extraneous concerns were positively correlated with competitive trait anxiety. In contrast, a negative correlation between competitive trait anxiety and occurrence of positive competition-related cognitions or events was observed. Extraversion was positively correlated with frequency of pleasant competition-extraneous concerns.

In the examined period of time, a greater importance was, on average, attributed to competition-related than competition-extraneous events or cognitions ($t(38)=5.17$; $p<0.01$). No significant correlations were detected between importance of various categories of concern and personality traits. Athletes perceived having greater control over pleasant than unpleasant competition-related concerns ($t(23)=6.63$; $p<0.01$). The same held true for competition-extraneous concerns ($t(33)=5.87$; $p<0.01$). No difference was found between controllability of unpleasant competition-related and competition-extraneous concerns ($t(22)=0.57$; $p>0.05$). In contrast, pleasant events or thoughts related to competition were perceived to be significantly more controllable than competition-extraneous concerns ($t(34)=3.72$; $p<0.01$). Finally, a low negative correlation was observed between competitive trait anxiety and general controllability of sources of concerns. No other significant relationship was detected between personality traits and concern controllability.

**Table 5.4 Means and standard deviations of occurrence[5.2], controllability and importance of reported sources of concern and correlations with personality traits**

| Concern-related variables | Category of sources of concerns | Mean | S.D. | Product-moment correlation | | |
|---|---|---|---|---|---|---|
| | | | | N | E | SCAT |
| OCCURRENCE (frequency) | All concerns | 19.28 | 7.02 | 0.13 | 0.35 | 0.16 |
| | Pleasant competition-related | 5.31 | 2.90 | -0.18 | 0.16 | ** -0.45 |
| | Unpleasant competition-related | 1.62 | 2.03 | 0.25 | 0.05 | ** 0.55 |
| | Pleasant - competition-extraneous | 5.97 | 4.79 | 0.02 | * 0.37 | -0.08 |
| | Unpleasant competition-extraneous | 6.39 | 4.08 | 0.20 | 0.04 | * 0.40 |
| IMPORTANCE (scale 1-7) | All concerns | 5.53 | 0.72 | -0.20 | 0.21 | -0.15 |
| | Competition-related | 6.05 | 0.89 | -0.23 | 0.25 | -0.16 |
| | Competition-extraneous | 5.16 | 0.91 | -0.11 | 0.03 | -0.16 |
| CONTROLLABILITY (scale 1-7) | All concerns | 4.39 | 0.89 | -0.17 | 0.13 | * -0.38 |
| | Pleasant competition-related | 5.46 | 0.79 | -0.18 | -0.01 | -0.02 |
| | Unpleasant competition-related | 3.38 | 1.21 | 0.27 | -0.24 | 0.14 |
| | Pleasant competition-extraneous | 4.72 | 1.21 | 0.00 | 0.18 | -0.21 |
| | Unpleasant competition-extraneous | 3.29 | 1.13 | -0.11 | 0.03 | -0.11 |

Legend: N = Neuroticism; E = Extraversion; SCAT = CTA; * = p<0.05; ** = p<0.01

[5.2] Occurrence in relation to total number of valid ESM reports per person

### *5.43 Multivariate multilevel linear models of pre-competition and post-competition discrete emotions*

Six multivariate multilevel linear models (Goldstein, 1987; Snijders & Bosker, 1999) of competitive emotions were defined using the programme MLWin 1.1 (Rashbash et al., 2000). The basic ideas of multilevel liner modelling and the advantages associated with its employment have been discussed in the previous chapter (p. 151). In Study 1a, univariate multilevel models were employed to investigate the determinants of directional interpretations of competitive anxiety. In contrast, this study used a multivariate version of multilevel linear modelling. The term "multivariate" refers here to the presence of two or more dependent variables or criteria. Specifically, it refers to the fact that athletes' pre- and post-competition emotional states were assessed on twelve discrete emotions, which represented twelve intercorrelated dependent variables. When compared to univariate models, multivariate hierarchical linear modelling offers several advantages. Firstly, it permits the analysis of the extent to which correlations between criteria (dependent variables) depend on specific levels of variability (e.g., person, day and beep level). Secondly, multivariate analyses are statistically more powerful tests of specific effects for single dependent variables than univariate analyses. This is visible in the form of smaller standard errors. Thirdly, differences in magnitude of effect of an explanatory variable on two or more criteria (dependent variables) can only be analysed in repeated measures by means of multivariate procedures (Snijders & Bosker, 1999).

The main purpose of this study was to examine personal and situational determinants of emotional states experienced in the period leading to and following a competition. For this purpose, twelve different emotions were monitored using the DES-IV, eleven of which were subsequently analysed. The criterion for grouping the emotions into sets of dependent variables to be entered in the multivariate multilevel equations was based on the results of two factor analyses. Principal component analyses of the emotional scales of the DES-IV on both mean scores aggregated per subject and within-subject $z$ scores identified three oblique factors with eigenvalues greater than 1. These were a hostility factor (disgust and anger), a positive emotions factor (surprise, enjoyment and interest) and a negative emotions factor (shyness, shame, sadness, fear, self-hostility and guilt). They accounted for 67.69% and 64.54% of the total between-subject and within-subject variance, respectively (Appendix 55). A pre- and post-competition multivariate multilevel linear model was constructed for each set of emotions. The data set comprised one or more daily observations on three groups of dependent variables nested within days within subjects. These four levels are referred to as beep, day, person and criteria level. Multivariate multilevel linear models of pre- and post-competition hostility, negative and positive emotions, in which participant and day of measurement were the two main sources of dependency among measurements, were defined. These sources of dependency were modelled in the multilevel equation by estimating a beep-level, a day-level and a person-level variance. There was no criteria-level variation specified because this level existed solely to define the multivariate structure. Since multiple dependent variables were measured on the same individuals, their dependence could be taken into account.

First, multivariate multilevel linear models of pre-competition hostility and negative emotions for main effects only were constructed. These models encompassed five predictors at beep-level, one predictor at day-level and three predictors at person-level. The response variables were anger and disgust for Hostility and guilt, shyness, shame, sadness, self-hostility and fear for Negative Emotions. The predictors at beep-level were presence of source of concern (Concern), concern context (Competition), hedonic value (Pleasantness), controllability (Control) and importance (Importance) of the reported source of concern. The predictor "Concern" indicated whether a subjectively significant event or thought had been reported, whilst the variable "Competition" indicated whether the reported event or thought was explicitly related to the forthcoming competition. Temporal proximity to competition (Day) represented the only predictor at day level. Finally, expected performance at the competition (ExpPer), CTA (SCAT) and neuroticism (Neuro) were included in the equation as person-level predictors. The relationship between the $h$ component of pre-competition hostility or negative emotions and the beep- and day-level predictors was modelled for the $i$-th person as follows:

$$(\text{Pre - Hostility or Negative Emotions})_{hijt} = \beta_{0hi} + \beta_{1h}(\text{Concern})_{ijt} + \beta_{2hi}(\text{Competition})_{ijt} + \beta_{3h}(\text{Pleasantness})_{ijt} + \beta_{4h}(\text{Control})_{ijt} + \beta_{5h}(\text{Importance})_{ijt} + \beta_{6hi}(\text{Day})_{ij} + \nu_{hjt} + \varepsilon_{hijt},$$

where (Pre-Hostility or Negative Emotions)$_{hijt}$ is the intensity of the discrete emotion of anger, disgust, guilt, shyness, shame, sadness, self-hostility or fear of person $i$ at the $t$-th beep of day $j$ in the pre-competition period. The intercept of person $i$ on a specific discrete emotion is denoted by $\beta_{0hi}$. The regression coefficients of the predictors on the hostility components are denoted by $\beta_{1h...6h.}$ The symbol $\varepsilon_{hijt}$ represents the random effect or error term of the hostility or negative emotion component $h$ at beep level. It is normally distributed, has mean zero, beep-level variance $\sigma_{1h}^2$ and is assumed to follow a first-order autoregressive process. $\beta_{6hi}$ is the regression coefficient of proximity to competition on the component of hostility or negative emotions $h$, which was allowed to vary at person-level in order to account for potential moderating effects of personality traits on changes in discrete emotions associated with proximity to competition. Finally, $v_{hjt}$ represents the normally distributed residual variation among the daily averages of anger, disgust, guilt, shyness, shame, sadness, self-hostility or fear. This term has mean zero and day-level variance $\sigma_{2h}^2$.

The person-level intercept $\beta_{0hi}$ denotes the effect of personal characteristics on the average intensity of the $h$ component of hostility or negative emotions of the person $i$-th. It can be interpreted as the average value of a specific discrete emotion of a person $i$ when beep- and day-level predictors are held constant. The variation of the individual intercepts was defined as a linear function of self-referenced expected performance (ExpPer), CTA (SCAT) and neuroticism (Neuro) by the following equation

$$\beta_{0hi} = \beta_{00h} + \beta_{01h}(\text{ExpPer})_i + \beta_{02h}(\text{SCAT})_i + \beta_{03h}(\text{Neuro})_i + v_{hi},$$

where $\beta_{00h}$ is the overall intercept (estimated marginal grand mean) of the $h$-th component of hostility or negative emotions and $v_{hi}$ is the normally distributed error term at person-level with mean zero and person-level variance $\sigma_{3h}^2$.

To test the moderating effects of personality factors on changes in pre-competitive hostility or negative emotions attributed to the temporal proximity to competition, variables representing the interaction between proximity to competition and personality traits were included in the above beep- and day-level model. The effect of proximity to competition was allowed to vary as a function of CTA and neuroticism by adding the two cross-level interaction terms of $\beta_{7h}(\text{SCAT})_i(\text{Day})_{ij}$ and $\beta_{8h}(\text{Neuro})_i(\text{Day})_{ij}$ to the main effects model. To test and account for the impact of CTA on the effect of the context of a reported source of concern on hostility or negative emotions, the cross-level term $\beta_{9h}(\text{SCAT})_i(\text{Competition})_{ijt}$ representing the interaction between these two variables was included in the equation. Finally, as it was hypothesised that the influence of competition-related concerns on athletes' psychological state would depend on the temporal proximity to the competition, the cross-level interaction term of $\beta_{10h}(\text{Day})_{ij}(\text{Competition})_{ijt}$ was added to the equation.

The model of pre-competition positive emotions for main effects included the response variables of enjoyment, surprise and interest, the predictors entered in the previous two models and the person-level variable of extraversion (Extra). This model was defined by the following equation:

$$(\text{Pre - Positive Emotions})_{hijt} = \beta_{0hi} + \beta_{1h}(\text{Concern})_{ijt} + \beta_{2hi}(\text{Competition})_{ijt} + \\ + \beta_{3h}(\text{Pleasantness})_{ijt} + \beta_{4h}(\text{Control})_{ijt} + \beta_{5h}(\text{Importance})_{ijt} + \beta_{6hi}(\text{Day})_{ij} + v_{hjt} + \varepsilon_{hijt}$$

where

$$\beta_{0hi} = \beta_{00h} + \beta_{01h}(\text{ExpPer})_i + \beta_{02h}(\text{SCAT})_i + \beta_{03h}(\text{Neuro})_i + \beta_{04h}(\text{Extra})_i$$

and (Pre - Positive Emotions)$_{hijt}$ is the intensity of the discrete emotion of enjoyment, surprise or interest of person $i$ at the $t$-th beep of day $j$ before the competition.

Finally, significance of Personality traits by Day to competition, Personality traits by Concern context and Day to competition by Concern context interaction effects were tested by adding the cross-level interaction terms of $\beta_{7h}(\text{SCAT})_i(\text{Day})_{ij}$, $\beta_{8h}(\text{Neuro})_i(\text{Day})_{ij}$, $\beta_{9h}(\text{SCAT})_i(\text{Competition})_{ij}$, and $\beta_{10h}(\text{Day})_{ij}(\text{Competition})_{ijt}$ to the main effects model.

Separate main effects multivariate multilevel linear models of post-competition hostility, positive emotions and negative emotions were constructed and tested. The models of post-competition hostility and negative emotions were defined as follows:

$$(\text{Post - Hostility or Negative Emotions})_{hijt} = \beta_{0hi} + \beta_{1h}(\text{Concern})_{ijt} + \beta_{2hi}(\text{Competition})_{ijt} + \\ \beta_{3h}(\text{Pleasantness})_{ijt} + \beta_{4h}(\text{Control})_{ijt} + \beta_{5h}(\text{Importance})_{ijt} + \beta_{6hi}(\text{Day})_{ij} + v_{hjt} + \varepsilon_{hijt},$$

where

$$\beta_{0hi} = \beta_{00h} + \beta_{01h}(\text{ActPer})_i + \beta_{02h}(\text{ExpPer-ActPer})_i + \beta_{03h}(\text{SCAT})_i + \beta_{04h}(\text{Neuro})_i + v_{hi}.$$

$\beta_{01h}(\text{ActPer})_i$ denoted the effect of self-referenced actual performance on the $h$-th component of pre-competition emotions in person $i$. $\beta_{02h}(\text{ExpPer-ActPer})_i$ referred to the effect of the difference between self-referenced expected and actual performance on the $h$-th component of pre-competition emotions in the $i$-th person.

Post-competition positive emotions were defined by the following multilevel model:

$$(\text{Post - Positive Emotions})_{hijt} = \beta_{0hi} + \beta_{1h}(\text{Concern})_{ijt} + \beta_{2hi}(\text{Competition})_{ijt} + \\ + \beta_{3h}(\text{Pleasantness})_{ijt} + \beta_{4h}(\text{Control})_{ijt} + \beta_{5h}(\text{Importance})_{ijt} + \beta_{6hi}(\text{Day})_{ij} + v_{hjt} + \varepsilon_{hijt}$$

where

$$\beta_{0hi} = \beta_{00h} + \beta_{01h}(\text{ActPer})_i + \beta_{02h}(\text{ExpPer-ActPer})_i + \beta_{03h}(\text{SCAT})_i + \beta_{04h}(\text{Neuro})_i + \\ + \beta_{05h}(\text{Extra})_i + v_{hi}.$$

Moderating effects of personality factors on changes in post-competition emotions attributed to perceived self-referenced performance were tested. The effect of this performance-related predictor on post-competition emotions was allowed to vary as a function of CTA and neuroticism. Consequently, the cross-level interaction terms of $\beta_{7h}(\text{SCAT})_i(\text{ActPer})_i$ and $\beta_{8h}(\text{Neuro})_i(\text{ActPer})_i$, were added to the three models of post-competition emotions. Furthermore, to investigate the effects of personality traits on temporal patterns of post-competition emotions, when the effects of other situational variables have been accounted for (concern variables), the cross-level terms of $\beta_{11h}(\text{SCAT})_i(\text{Day})_{ij}$ and $\beta_{12h}(\text{Neuro})_i(\text{Day})_{ij}$ were added to the equation. Lastly, the interaction term of $\beta_{13h}(\text{Day})_{ij}(\text{Competition})_{ijt}$, testing the time-dependent effect of sources of concern context on post-competition emotional states, was also included in the full models of post-competition emotions.

All the continuous predictors at beep- (control and importance of reported event or thought) and person-level (expected performance, actual performance, discrepancy between actual and expected performance, CTA, neuroticism and extraversion) were standardised. The time variable "Day", denoting the "day to competition" in models of pre-competition emotions and the "day after competition" in models of post-competition emotions, was centred. It assumed values from -3.5 to 3.5 in pre-competition models, with 3.5 denoting the day of the competition, and values from -1.5 to 1.5 in post-competition models, with -1.5 corresponding to the day of the competition. This was done to reduce the chances of numerical errors in the IGLS estimation method of model parameters (Rashbash et al., 2000), which was employed in the present analysis. The variable "Concern" was dummy coded as 1 or 0. In contrast, effect coding was used for the categorical variables "Competition" (1 if competition-related concern, -1 if competition-extraneous concern, 0 if no concern) and "Pleasantness" (1 if pleasant concern, -1 if unpleasant concern, 0 if no concern) so that the estimated effect of "Concern" would not change after their inclusion (Hardy, 1993). The concern appraisal variables of "Control" and "Importance" were assigned the value zero if no source of concern was reported.

One hundred and thirty-one observations with missing data on any of the predictors were deleted. This resulted in a total of 1897 valid observations. Significance of the regression coefficients was established by dividing the estimated effect by its standard error. This ratio is approximately normally distributed (Snijders & Bosker, 1999). Two-tailed tests were used. The likelihood ratio test (Bryk & Raudenbush, 1992) was employed to test the significance of the variances and autocorrelation at each level. For this purpose, one-tailed tests were used and an alpha level of 0.05 was adopted (vanEck et al, 1998). The amount of variance in competitive emotions explained by the models was established by calculating the proportional reduction of error ($R^2$) for predicting an individual score on emotions at beep level using the method described by Snijders & Bosker (1999) (Appendices 56-61).

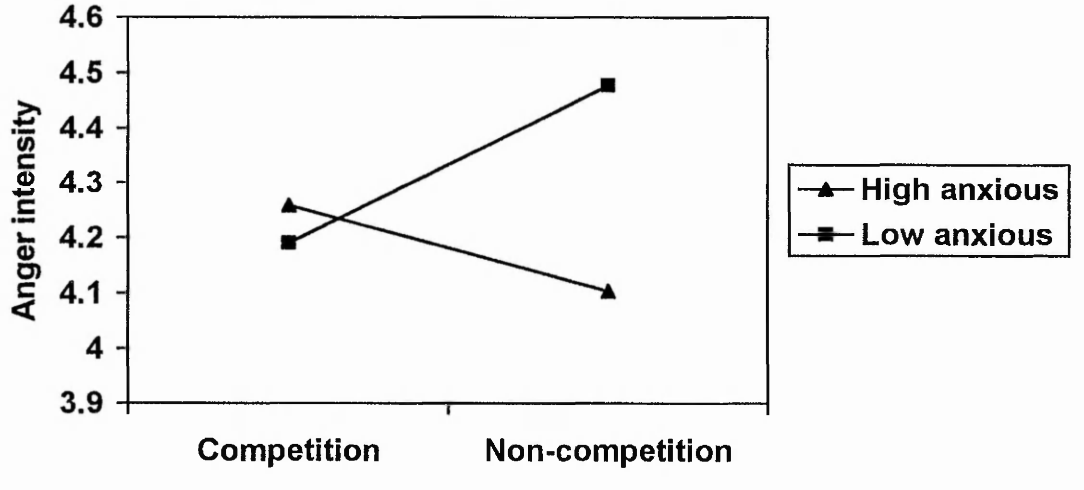
**Table 5.5 Multivariate multilevel model estimates for pre-competition hostility**

| Predictor | | Disgust | | | | Anger | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | β | SE β | Z | | β | SE β | Z | |
| Beep level | Intercept | 3.11 | 0.04 | 77.80 | ** | 3.11 | 0.08 | 39.39 | ** |
| | Concern | 0.13 | 0.04 | 3.25 | ** | 0.91 | 0.08 | 12.58 | ** |
| | Context (Competition) | 0.03 | 0.04 | 0.36 | | -0.05 | 0.06 | -0.77 | |
| | Pleasantness | -0.13 | 0.04 | -3.36 | ** | -0.84 | 0.07 | 12.94 | ** |
| | Control | -0.01 | 0.04 | -0.31 | | -0.13 | 0.06 | 2.25 | * |
| | Importance | -0.06 | 0.03 | -1.94 | | 0.12 | 0.05 | 2.20 | * |
| Day level | Day | 0.00 | 0.01 | 0.09 | | 0.04 | 0.02 | 1.84 | |
| Person level | Expected performance | -0.01 | 0.04 | -0.32 | | -0.14 | 0.08 | -1.45 | |
| | Competitive trait anxiety (SCAT) | 0.07 | 0.05 | 1.44 | | -0.10 | 0.09 | -1.09 | |
| | Neuroticism (Neuro) | -0.02 | 0.05 | -0.33 | | 0.19 | 0.09 | 1.99 | * |
| Person by Day level | SCAT by Day | 0.01 | 0.01 | 0.62 | | 0.03 | 0.02 | 1.22 | |
| | Neuro by Day | -0.02 | 0.01 | -1.36 | | -0.05 | 0.02 | 1.95 | |
| Person by Beep level | SCAT by Competition | 0.02 | 0.03 | 0.63 | | 0.11 | 0.05 | 2.06 | * |
| Day by Beep level | Day by Competition | 0.01 | 0.02 | 0.69 | | -0.04 | 0.03 | 1.35 | |
| Variance terms | Person level | | | 0.03 | * | | | 0.15 | ** |
| | Day level | | | 0.05 | ** | | | 0.15 | ** |
| | Beep level | | | 0.46 | ** | | | 1.25 | ** |
| | Autocorrelation | | | 0.03 | | | | 0.01 | |
| $R^2$ (beep level) | | | | 0.04 | | | | 0.26 | ** |

Legend: * = p<0.05; ** = p<0.01

Table 5.5 represents the results of the multivariate multilevel regression analysis for pre-competition hostility. The model explained a significant portion of the total variance of the composite criterium (deviance test: $\chi^2(26)=393.30$; $p<0.01$). The predictors included in the model explained only 4% of the total variance for disgust and 26% of the total variance for anger. Significant main effects for presence, hedonic tone, controllability and importance of reported concerns were obtained on anger. Neuroticism also contributed to the prediction of anger. Controlling for other explanatory variables, occurrence of unpleasant events or cognitions was on average associated with an increase in pre-competition anger of 1.75 points on a 13-point scale. Although statistically significant, the effects of neuroticism and concern controllability and importance on anger intensity were only minor. To illustrate, sources of concerns whose controllability was appraised to be two standard deviations below average contributed to an increase in anger of only 0.26 points. Finally, a significant Context of concern by CTA (SCAT by Competition) interaction effect was observed. Analysis of contrasts revealed that individuals with lower scores on competitive anxiety tended to react with greater increases in anger when exposed to unpleasant competition-extraneous sources of concern than athletes with higher levels of competitive trait anxiety (Figure 5.3). No difference between the two groups was observed in anger associated with competition-related concerns.

**Figure 5.3 Modelled effects of CTA and context of concern on level of anger**[5.3]



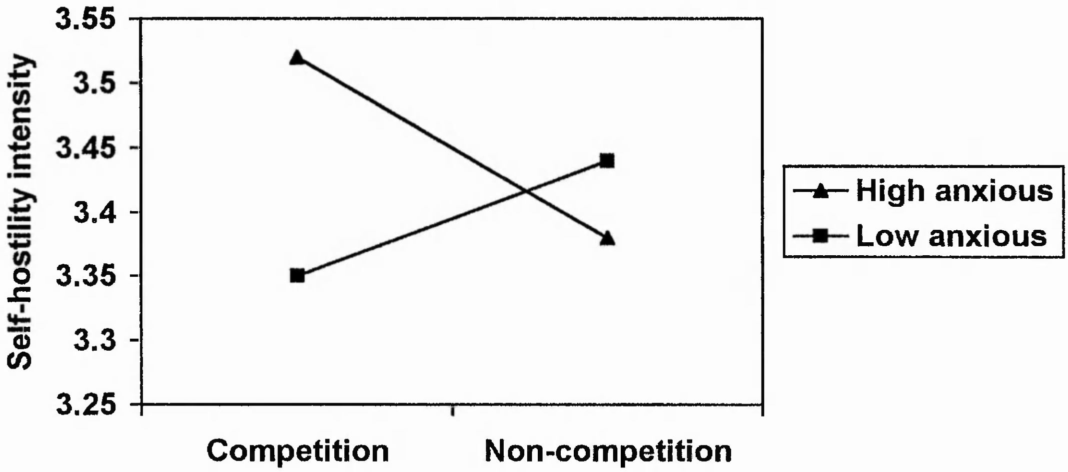

[5.3] The depicted values represent estimates at 1 standard deviation above and 1 standard deviation below the means for CTA with all the other variables in the model held constant.

In summary, multilevel regression analysis of pre-competition hostility showed that average disgust and anger were very low throughout the whole pre-competition period. Their intensity varied more within a day than between days or between individuals (Table 5.5.). Anger was more variable than disgust. Anger and disgust were correlated at beep- and person-level (Appendix 56). Individuals higher on neuroticism reported slightly higher levels of anger than individuals lower on neuroticism. Both disgust and anger were associated with the experience of unpleasant sources of concern. Anger was also associated with unpleasant events that were less controllable and more important to the individual. Anger was higher in athletes with low levels of CTA following exposure to competition-extraneous sources of concerns.

Multivariate multilevel regression analysis of pre-competition negative emotions showed that, in general, male martial artists tended to experience very low levels of negative emotions during the week preceding the competition, which slightly increased upon the occurrence of unpleasant events or cognitions (Table 5.6). The model predicted a significant portion of the total variance of pre-competition negative emotions (deviance test: $\chi^2(84)=543.67$; $p<0.01$). Although some significant main effects were observed for the response variables of guilt, shame and shyness, the present model did not significantly contribute to their prediction. Consequently, these significant effects should be interpreted with caution. The emotion of sadness was associated with the occurrence of some kind of unpleasant event, which was not specifically related to the forthcoming competition.

Multilevel regression analysis for pre-competition self-hostility yielded five significant main effects and one significant interaction effect. Self-hostility was predicted by the presence of a source of concern, concern pleasantness and importance, day to competition, expected performance and the interaction between CTA and concern context (Table 5.6), the last effect being depicted in Figure 5.4. Pre-competition self-hostility reached its highest levels in high-anxious athletes who expected to perform below their usual standard and who experienced a goal incongruent competition-related concern of above average importance (Table 5.6). Although the main effects model of self-hostility yielded a small but significant main effect for temporal proximity to the competition, the introduction of interaction terms reduced its individual contribution to non-significant levels. This suggests that the interaction terms explained part of the day-level variance.

**Figure 5.4 Modelled effects of CTA and context of concern on level of self-hostility[5.4]**




In evaluating the meaning of these findings it should be noted that, although statistically significant, the changes in intensity of self-hostility were very small. The maximal predicted intensity of pre-competition self-hostility in a situation where significant explanatory variables exhibited extreme values was 4.26 on a scale ranging from 3 to 15. This is only 1.15 higher than the average pre-competition self-hostility observed 3 or 4 days before the competition in situations where no event was reported (intercept of the model).

While all the above-mentioned emotions varied the most at beep level, fear varied the most at day level. Significant main effects were obtained for presence, context, control and pleasantness of concern and for temporal proximity to competition (Table 5.6). The highest levels of fear were associated with reports of less controllable unpleasant competition-related events or thoughts in temporal proximity to the competition. Additionally, significant cross-level interaction effects were observed for Time to competition by Neuroticism, Time to competition by Concern context and CTA by Concern context. The first interaction effect showed that individuals higher in neuroticism tended to experience a steeper increase in daily average of fear as the competition approached (Figure 5.5).

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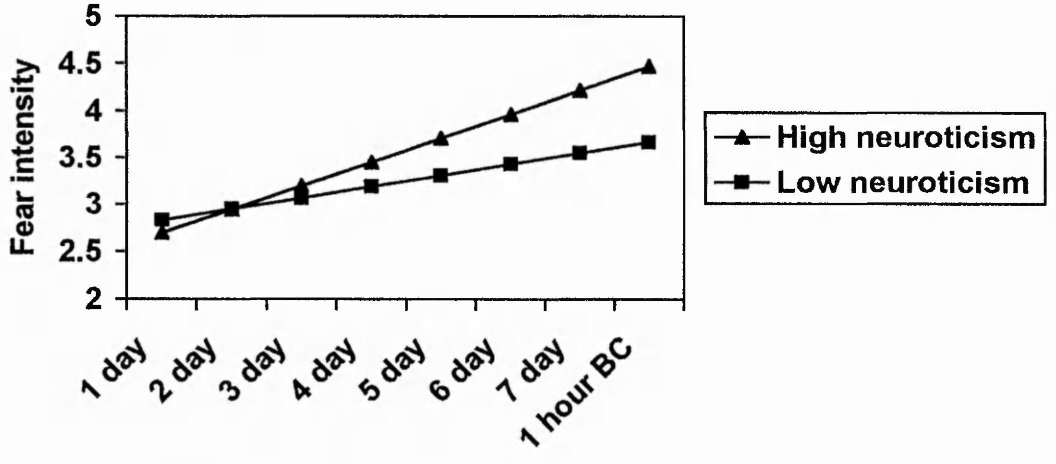
[5.4] The depicted values represent estimates at 1 standard deviation above and 1 standard deviation below the means for CTA with all the other variables in the model held constant.

**Figure 5.5 Modelled effects of neuroticism and time to competition on levels of fear**[5.5]




Legend: BC = before competition

[5.5] The depicted values represent estimates at 1 standard deviation above and 1 standard deviation below the means for neuroticism with all the other variables in the model held constant.

**Table 5.6** **Multivariate multilevel model estimates for pre-competition negative emotions**

| Predictor | | Guilt | | | | Shyness | | | | Self-hostility | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | β | SE β | Z | | β | SE β | Z | | β | SE β | Z | |
| Beep level | Intercept | 3.20 | 0.07 | 47.06 | ** | 3.18 | 0.06 | 53.05 | ** | 3.11 | 0.04 | 70.64 | ** |
| | Concern | 0.26 | 0.04 | 5.95 | ** | 0.17 | 0.04 | 4.69 | ** | 0.31 | 0.04 | 8.05 | ** |
| | Context (Competition) | 0.01 | 0.04 | 0.32 | | 0.04 | 0.03 | 1.42 | | 0.00 | 0.03 | 0.03 | |
| | Pleasantness | -0.30 | 0.04 | -7.45 | ** | -0.11 | 0.03 | -3.38 | ** | -0.28 | 0.03 | -8.09 | ** |
| | Control | 0.10 | 0.04 | 2.86 | ** | 0.00 | 0.03 | 0.07 | | 0.02 | 0.03 | 0.55 | |
| | Importance | 0.05 | 0.03 | 1.36 | | 0.02 | 0.03 | 0.82 | | 0.06 | 0.03 | 2.21 | * |
| Day level | Day | -0.02 | 0.01 | -1.31 | | 0.01 | 0.01 | 1.18 | | 0.03 | 0.01 | 2.27 | * |
| Person level | Expected performance | -0.07 | 0.07 | -0.99 | | -0.07 | 0.06 | -1.10 | | -0.09 | 0.04 | -2.05 | * |
| | Trait anxiety (SCAT) | 0.06 | 0.08 | 0.71 | | 0.05 | 0.07 | 0.70 | | 0.02 | 0.05 | 0.30 | |
| | Neuroticism (Neuro) | 0.04 | 0.08 | 0.52 | | 0.07 | 0.08 | 0.92 | | 0.05 | 0.05 | 1.00 | |
| Person by Day level | SCAT by Day | 0.01 | 0.02 | 0.38 | | -0.00 | 0.01 | -0.15 | | 0.02 | 0.01 | 1.62 | |
| | Neuro by Day | -0.01 | 0.02 | -0.38 | | 0.00 | 0.01 | 0.08 | | -0.02 | 0.01 | -1.31 | |
| Person by Beep level | SCAT by Competition | 0.05 | 0.03 | 1.36 | | 0.08 | 0.03 | 2.89 | ** | 0.06 | 0.03 | 2.00 | * |
| Day by Beep level | Day by Competition | 0.04 | 0.02 | 2.38 | * | 0.00 | 0.01 | 0.08 | | 0.00 | 0.01 | 0.21 | |
| Variance terms | Person level | | | 0.14 | ** | | | 0.11 | ** | | | 0.05 | ** |
| | Day level | | | 0.11 | ** | | | 0.07 | ** | | | 0.05 | ** |
| | Beep level | | | 0.45 | ** | | | 0.31 | ** | | | 0.37 | ** |
| | Autocorrelation | | | 0.08 | ** | | | 0.02 | | | | 0.09 | ** |
| $R^2$ (beep level) | | | | 0.10 | | | | 0.04 | | | | 0.13 | ** |

*(continued)*

**Table 5.6 - continued**

| | Predictor | Shame | | | | Sadness | | | | Fear | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | β | SE β | Z | | β | SE β | Z | | β | SE β | Z | |
| Beep level | Intercept | 3.20 | 0.08 | 41.49 | ** | 3.27 | 0.07 | 44.19 | ** | 3.49 | 0.08 | 44.13 | ** |
| | Concern | 0.12 | 0.03 | 3.62 | ** | 0.27 | 0.05 | 5.98 | ** | 0.52 | 0.05 | 10.46 | ** |
| | Context (Competition) | 0.05 | 0.03 | 1.72 | | 0.01 | 0.04 | 0.26 | | 0.32 | 0.04 | 10.46 | ** |
| | Pleasantness | -0.02 | 0.03 | -0.77 | | -0.34 | 0.04 | -8.50 | ** | -0.24 | 0.05 | -5.40 | ** |
| | Control | -0.04 | 0.03 | -1.29 | | -0.05 | 0.04 | -1.43 | | -0.08 | 0.04 | -1.96 | * |
| | Importance | -0.01 | 0.03 | -0.38 | | 0.00 | 0.03 | 0.06 | | 0.04 | 0.04 | 1.14 | |
| Day level | Day | 0.01 | 0.01 | 1.13 | | 0.01 | 0.01 | 0.86 | | 0.23 | 0.03 | 8.59 | ** |
| Person level | Expected performance | -0.13 | 0.08 | -1.57 | | -0.13 | 0.08 | -1.71 | | -0.15 | 0.08 | -1.79 | |
| | Trait anxiety (SCAT) | 0.04 | 0.10 | 0.45 | | -0.04 | 0.09 | -0.47 | | -0.01 | 0.10 | 0.11 | |
| | Neuroticism (Neuro) | 0.09 | 0.10 | 0.91 | | 0.18 | 0.09 | 1.90 | | 0.18 | 0.10 | 1.81 | |
| Person by Day level | SCAT by Day | -0.01 | 0.01 | -1.00 | | 0.03 | 0.02 | 1.59 | | 0.01 | 0.03 | 0.43 | |
| | Neuro by Day | 0.01 | 0.01 | 1.20 | | -0.02 | 0.02 | 1.35 | | 0.07 | 0.03 | 2.39 | * |
| Person by Beep level | SCAT by Competition | 0.07 | 0.03 | 2.72 | ** | 0.02 | 0.03 | 0.71 | | 0.14 | 0.04 | 3.73 | ** |
| Day by Beep level | Day by Competition | -0.00 | 0.01 | 0.17 | | 0.02 | 0.02 | 1.13 | | 0.15 | 0.02 | 7.63 | ** |
| Variance terms | Person level | | | 0.21 | ** | | | 0.17 | ** | | | 0.12 | * |
| | Day level | | | 0.02 | * | | | 0.13 | ** | | | 0.59 | ** |
| | Beep level | | | 0.30 | ** | | | 0.47 | ** | | | 0.52 | ** |
| | Autocorrelation | | | 0.01 | | | | 0.12 | ** | | | 0.01 | |
| $R^2$ (beep level) | | | | 0.06 | | | | 0.17 | ** | | | 0.44 | ** |

Legend: * = p<0.05; ** = p<0.01; SCAT = Sport Competition Anxiety Test

With regard to the interaction effect between CTA and context of concern, analysis of contrasts revealed that competition-related sources of concern were associated with higher levels of fear than competition-extraneous sources of concern in both high- and low-anxious athletes. However, the discrepancy between the average levels of fear associated with the two types of concern was greater in high-anxious athletes. Also, competition-related fear was generally higher in high-anxious than in low-anxious athletes, whereas competition-extraneous fear was slightly higher in low-anxious athletes than in high-anxious athletes (Figure 5.6).

**Figure 5.6 Modelled effects of CTA and context of concern on level of fear[5.6]**

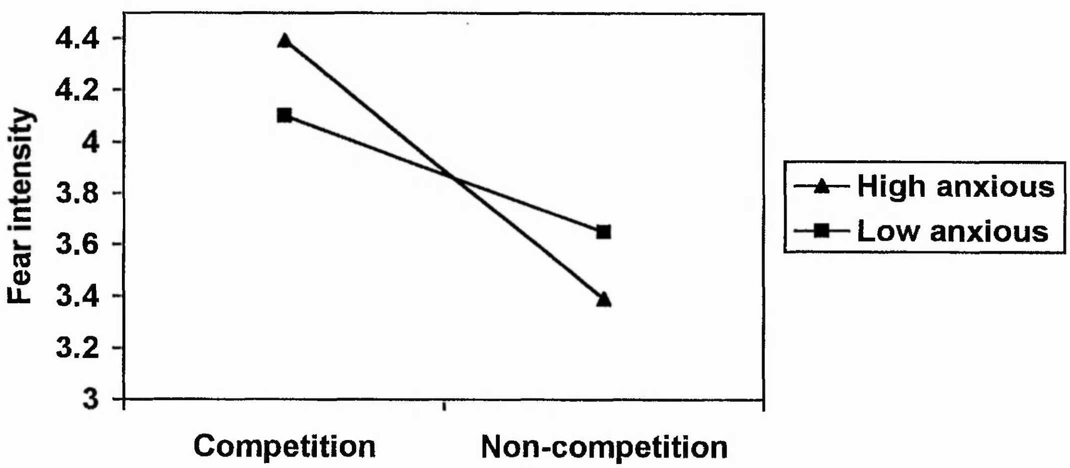
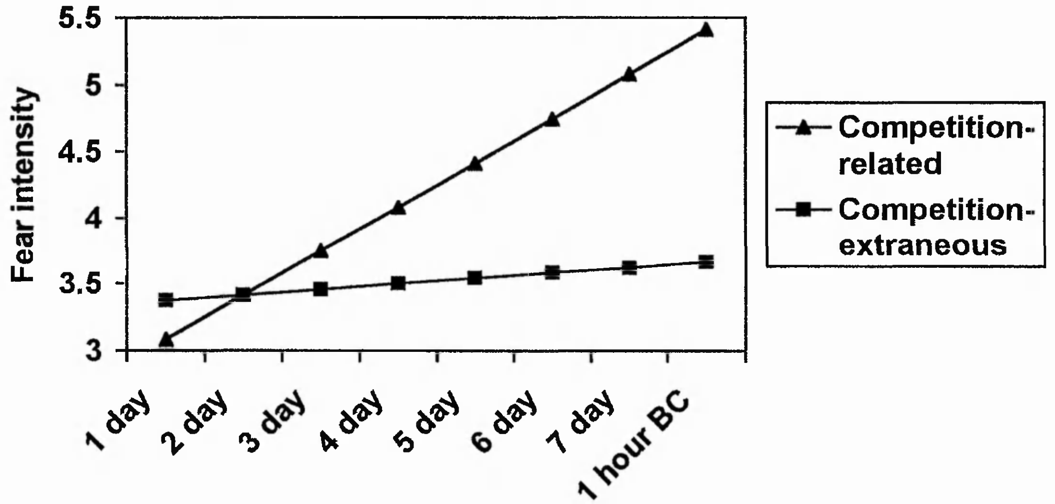



Figure 5.7 represents the interaction effect of temporal proximity to competition and context of concern on pre-competition fear. As it can be seen from the graphical representation, competition-extraneous sources of concern were associated with relatively stable low levels of fear throughout the whole pre-competitive period. In contrast, competition-related sources of concern evoked increasingly higher levels of fear as the competition approached.

[5.6] The depicted values represent estimates at 1 standard deviation above and 1 standard deviation below the means for CTA with all the other variables in the model held constant.

**Figure 5.7** **Modelled effects of context of concern and time to competition on levels of fear**




Legend: BC = before competition

Table 5.7 shows the results of the multivariate multilevel regression analysis of the pre-competition positive emotions of enjoyment, surprise and interest. Overall, pre-competition positive emotions were higher in intensity than negative emotions and hostility. Enjoyment was significantly affected by pleasantness of sources of concern, increasing in presence of a pleasant concern and decreasing in presence of an unpleasant concern by on average 1.39 points on a 13-point scale. Significant main effects were also observed for proximity to competition, expected performance and extraversion. Athletes higher in extraversion and those with higher self-referenced performance expectancies tended to be happier throughout the week preceding the competition than athletes with lower performance expectancies and lower levels of extraversion. In general, proximity to competition had a small negative effect on the level of pre-competition enjoyment.

Increases in surprise were accompanied by pleasant, relatively unimportant events over which athletes could not exert much control. Surprise and interest were higher in individuals with better performance expectancies. Finally, athletes exhibited the highest levels of interest upon occurrence of a pleasant event or cognition that was associated with the forthcoming competition.

**Table 5.7** **Multivariate multilevel model estimates for pre-competition positive emotions**

| | Predictor | Enjoyment | | | | Surprise | | | | Interest | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | β | SE β | Z | | β | SE β | Z | | β | SE β | Z | |
| Beep level | Intercept | 7.29 | 0.27 | 27.31 | ** | 4.30 | 0.17 | 26.04 | ** | 5.90 | 0.21 | 27.71 | ** |
| | Concern | -0.08 | 0.11 | -0.76 | | 0.59 | 0.08 | 7.06 | ** | 1.06 | 0.12 | 8.71 | ** |
| | Context (Competition) | 0.08 | 0.09 | 0.87 | | 0.05 | 0.07 | 0.74 | | 0.43 | 0.10 | 4.23 | ** |
| | Pleasantness | 1.39 | 0.10 | 13.92 | ** | 0.62 | 0.08 | 8.32 | ** | -0.28 | 0.03 | -8.09 | ** |
| | Control | 0.06 | 0.09 | 0.69 | | -0.26 | 0.07 | -3.79 | ** | 0.04 | 0.10 | 0.44 | |
| | Importance | -0.03 | 0.08 | -0.39 | | -0.14 | 0.06 | -2.19 | * | 0.09 | 0.09 | 1.02 | |
| Day level | Day | -0.14 | 0.03 | -4.15 | ** | 0.03 | 0.02 | 1.48 | | -0.45 | 0.36 | -1.25 | |
| Person level | Expected performance | 0.67 | 0.29 | 2.34 | * | 0.37 | 0.18 | 2.13 | * | 0.44 | 0.22 | 1.97 | * |
| | Trait anxiety (SCAT) | 0.20 | 0.34 | 0.59 | | -0.14 | 0.21 | -0.68 | | -0.13 | 0.26 | -0.47 | |
| | Neuroticism (Neuro) | 0.15 | 0.36 | 0.42 | | 0.16 | 0.22 | 0.73 | | 0.18 | 0.29 | 0.62 | |
| | Extraversion (Extra) | 0.58 | 0.29 | 1.99 | * | 0.11 | 0.18 | 0.60 | | 0.15 | 0.23 | 0.65 | |
| Person by Day level | SCAT by Day | -0.02 | 0.04 | -0.57 | | -0.02 | 0.03 | -0.69 | | -0.02 | 0.04 | -0.50 | |
| | Neuro by Day | -0.06 | 0.04 | -1.49 | | -0.03 | 0.03 | -1.07 | | -0.03 | 0.04 | -0.59 | |
| Person by Beep level | SCAT by Competition | -0.03 | 0.08 | -0.38 | | 0.10 | 0.06 | 1.58 | | -0.01 | 0.09 | 0.16 | |
| Day by Beep level | Day by Competition | -0.05 | 0.04 | -1.13 | | 0.04 | 0.03 | 1.23 | | 0.06 | 0.04 | 1.41 | |

*(continued)*

**Table 5.7 - continued**

| Term | | Enjoyment | | Surprise | | Interest | |
|---|---|---|---|---|---|---|---|
| Variance terms | Person level | 2.50 | ** | 0.92 | ** | 1.45 | ** |
| | Day level | 0.83 | ** | 0.29 | ** | 0.82 | ** |
| | Beep level | 2.72 | ** | 1.61 | ** | 3.38 | ** |
| | Autocorrelation | 0.00 | | 0.01 | | 0.01 | |
| $R^2$ (beep level) | | 0.24 | ** | 0.15 | * | 0.22 | ** |

Legend: *=p<0.05; **=p<0.01; SCAT = Sport Competition Anxiety Test

Tables 5.8 to 5.10 show the results of multilevel regression analyses of post-competition emotions. Post-competition hostility in absence of sources of concern was low (Table 5.8). Disgust was associated with the occurrence of unpleasant, relatively uncontrollable sources of concern and showed a mild downward trend across a three-day post-competition period. A similar trend was also observed for anger. Increases in anger were associated with unpleasant sources of concern that were considered to be subjectively important. Results related to the emotion of disgust must, however, be interpreted with caution as the model predicted only 13% of the total variance.

The multilevel model of post-competition negative emotions accounted for a significant portion of the total variance of each response variable (Table 5.9). Day level variance was significantly larger than beep level variance for guilt, self-hostility and shame. All post-competition negative emotions were associated with the occurrence of unpleasant events or cognitions. Intensity of guilt, shame and self-hostility depended also on the context of the source of concern. In general, these emotions tended to be higher for competition-related concerns. Only sadness could be predicted by the appraisal variable of controllability, whereas importance of concern exerted a significant effect on level of guilt, self-hostility, sadness and fear. Self-referenced actual performance at the competition was negatively related to post-competition guilt, self-hostility, shame, sadness and fear. Discrepancy between expected and actual performance did not additionally contribute to the explanation of the total variance of post-competition negative emotions.

All negative emotions gradually decreased after the competition. No significant main effects for personality traits were found. However, significant Personality by Time and Personality by Performance interaction effects were observed. Guilt, self-hostility, sadness and shame remained low and stable in low-anxious athletes. In contrast, high-anxious athletes experienced higher levels of guilt, self-hostility, sadness and shame immediately after the competition, which, however, gradually decreased during the following three days (Figures 5.8 to 5.11). Significant CTA by Self-referenced performance interaction effects were observed for the emotions of guilt and shyness. Increases in levels of guilt and shyness were recorded in high-anxious athletes with below average ratings of self-referenced performance. Performance ratings did not influence the levels of guilt and shyness in low-anxious athletes (Figures 5.12 and 5.13). Finally, a Time by Concern context significant interaction was found for self-hostility (Figure 5.14).

**Table 5.8 Multivariate multilevel model estimates for post-competition hostility**

| Predictor | | Disgust | | | | Anger | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | β | SE β | Z | | β | SE β | Z | |
| Beep level | Intercept | 3.16 | 0.09 | 34.01 | ** | 3.51 | 0.13 | 28.10 | ** |
| | Concern | 0.33 | 0.08 | 4.38 | ** | 0.97 | 0.12 | 8.32 | ** |
| | Context (Competition) | -0.02 | 0.08 | -0.26 | | -0.15 | 0.11 | -1.35 | |
| | Pleasantness | -0.37 | 0.06 | -5.87 | ** | -1.12 | 0.10 | -11.68 | ** |
| | Control | -0.18 | 0.06 | -3.04 | ** | -0.12 | 0.09 | -1.35 | |
| | Importance | 0.05 | 0.06 | 0.75 | | 0.36 | 0.10 | 3.81 | ** |
| Day level | Day | -0.15 | 0.07 | -2.07 | * | -0.46 | 0.10 | -2.07 | * |
| Person level | ActPer | 0.06 | 0.14 | 0.45 | | -0.28 | 0.18 | -1.55 | |
| | Δ ExpPer - ActPer | 0.01 | 0.13 | 0.06 | | -0.11 | 0.18 | 0.64 | |
| | Competitive trait anxiety (SCAT) | 0.06 | 0.14 | 0.45 | | 0.15 | 0.14 | 1.06 | |
| | Neuroticism (Neuro) | -0.01 | 0.11 | -0.07 | | -0.06 | 0.14 | -0.38 | |
| Person by Person level | SCAT by Actual performance | 0.13 | 0.11 | 1.19 | | -0.16 | 0.14 | -1.23 | |
| | Neuro by Actual performance | -0.12 | 0.14 | -0.86 | | 0.01 | 0.19 | 0.06 | |
| Person by Day level | SCAT by Day | -0.04 | 0.08 | -0.51 | | -0.18 | 0.11 | -1.66 | |
| | Neuro by Day | 0.02 | 0.08 | 0.24 | | 0.03 | 0.11 | 0.25 | |
| Day by Beep level | Day by Competition | 0.04 | 0.08 | 0.57 | | -0.10 | 0.12 | -0.88 | |
| Variance terms | Person level | | | 0.09 | | | | 0.15 | |
| | Day level | | | 0.59 | ** | | | 0.90 | ** |
| | Beep level | | | 0.35 | ** | | | 0.90 | ** |
| | Autocorrelation | | | 0.20 | ** | | | 0.11 | ** |
| $R^2$ (beep level) | | | | 0.13 | | | | 0.47 | ** |

Legend: * = p<0.05; ** = p<0.01; SCAT = competitive trait anxiety; ExpPer = Expected performance; Neuro = Neuroticism; Δ ExpPer - ActPer = difference between expected and actual performance

**Table 5.9 Multivariate multilevel model estimates for post-competition negative emotions**

| Predictor | | Guilt | | | | Shyness | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | β | SE β | Z | | β | SE β | Z | |
| Beep level | Intercept | 3.49 | 0.09 | 28.83 | ** | 3.31 | 0.09 | 38.45 | ** |
| | Concern | 0.72 | 0.09 | 7.89 | ** | 0.33 | 0.08 | 4.19 | ** |
| | Context (Competition) | 0.34 | 0.09 | 3.95 | ** | 0.13 | 0.07 | 1.79 | |
| | Pleasantness | -0.45 | 0.08 | -5.97 | ** | -0.15 | 0.06 | -2.33 | * |
| | Control | -0.03 | 0.07 | -0.45 | | 0.11 | 0.06 | 1.72 | |
| | Importance | 0.32 | 0.07 | 4.35 | ** | 0.10 | 0.07 | 1.44 | |
| Day level | Day | -0.31 | 0.10 | -3.24 | ** | -0.13 | 0.06 | -2.15 | * |
| Person level | ActPer | -0.36 | 0.18 | -1.96 | * | -0.22 | 0.13 | -1.75 | |
| | Δ ExpPer - ActPer | 0.13 | 0.17 | 0.76 | | 0.11 | 0.13 | 0.90 | |
| | Competitive trait anxiety (SCAT) | 0.23 | 0.15 | 1.57 | | 0.14 | 0.10 | 1.33 | |
| | Neuroticism (Neuro) | 0.23 | 0.15 | 0.16 | | 0.06 | 0.10 | 0.60 | |
| Person by Person level | SCAT by Actual performance | -0.32 | 0.13 | -2.48 | * | -0.20 | 0.90 | -2.22 | * |
| | Neuro by Actual performance | 0.06 | 0.17 | 0.32 | | -0.08 | 0.12 | -0.67 | |
| Person by Day level | SCAT by Day | -0.24 | 0.10 | -2.37 | * | -0.12 | 0.07 | -1.82 | |
| | Neuro by Day | -0.08 | 0.10 | -0.84 | | -0.06 | 0.06 | -0.88 | |
| Day by Beep level | Day by Competition | -0.18 | 0.09 | -1.94 | | -0.01 | 0.08 | -0.08 | |
| Variance terms | Person level | | | 0.11 | | | | 0.09 | ** |
| | Day level | | | 0.95 | ** | | | 0.28 | ** |
| | Beep level | | | 0.53 | ** | | | 0.57 | ** |
| | Autocorrelation | | | 0.06 | | | | 0.01 | |
| $R^2$ (beep level) | | | | 0.53 | ** | | | 0.34 | ** |

*(continued)*

**Table 5.9 - continued**

| Predictor | | Self-hostility | | | | Shame | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | β | SE β | Z | | β | SE β | Z | |
| Beep level | Intercept | 3.31 | 0.09 | 36.38 | ** | 3.22 | 0.07 | 46.71 | ** |
| | Concern | 0.69 | 0.08 | 8.86 | ** | 0.33 | 0.06 | 5.80 | ** |
| | Context (Competition) | 0.42 | 0.08 | 5.57 | ** | 0.13 | 0.05 | 2.58 | ** |
| | Pleasantness | -0.36 | 0.07 | -5.40 | ** | -0.11 | 0.05 | -2.48 | ** |
| | Control | -0.05 | 0.06 | -0.73 | | 0.04 | 0.05 | 0.82 | |
| | Importance | 0.16 | 0.07 | 2.38 | ** | 0.05 | 0.05 | 1.09 | |
| Day level | Day | -0.25 | 0.08 | -2.94 | ** | -0.13 | 0.04 | -2.84 | ** |
| Person level | ActPer | -0.26 | 0.13 | -1.96 | * | -0.24 | 0.10 | -2.33 | ** |
| | Δ ExpPer - ActPer | 0.13 | 0.13 | 1.00 | | -0.01 | 0.10 | -0.08 | |
| | Competitive trait anxiety (SCAT) | 0.20 | 0.11 | 1.91 | | 0.07 | 0.08 | 0.88 | |
| | Neuroticism (Neuro) | -0.05 | 0.11 | -0.44 | | 0.07 | 0.08 | 0.88 | |
| Person by Person level | SCAT by Actual performance | -0.09 | 0.10 | -0.95 | | -0.13 | 0.07 | -1.77 | |
| | Neuro by Actual performance | 0.01 | 0.13 | 0.05 | | -0.10 | 0.10 | -1.01 | |
| Person by Day level | SCAT by Day | -0.26 | 0.09 | -2.90 | ** | -0.13 | 0.05 | 2.77 | ** |
| | Neuro by Day | 0.00 | 0.10 | 0.04 | | -0.02 | 0.05 | -0.39 | |
| Day by Beep level | Day by Competition | -0.21 | 0.08 | -2.56 | ** | 0.00 | 0.06 | 0.00 | |
| Variance terms | Person level | | | 0.00 | | | | 0.06 | ** |
| | Day level | | | 0.77 | ** | | | 1.07 | ** |
| | Beep level | | | 0.43 | ** | | | 0.59 | ** |
| | Autocorrelation | | | 0.09 | ** | | | 0.01 | |
| $R^2$ (beep level) | | | | 0.52 | ** | | | 0.56 | ** |

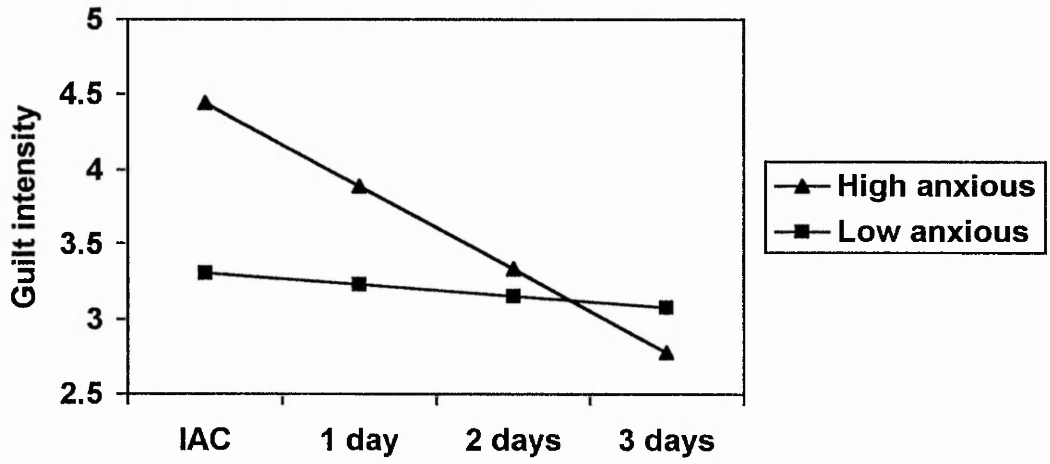
*(continued)*

**Table 5.9 - continued**

| | Predictor | Sadness | | | | Fear | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | β | SE β | Z | | β | SE β | Z | |
| Beep level | Intercept | 3.63 | 0.12 | 46.71 | ** | 3.18 | 0.07 | 44.11 | ** |
| | Concern | 0.59 | 0.10 | 6.21 | ** | 0.25 | 0.05 | 4.96 | ** |
| | Context (Competition) | 0.02 | 0.09 | 0.18 | | -0.00 | 0.05 | -0.04 | |
| | Pleasantness | -0.76 | 0.08 | -9.68 | ** | -0.22 | 0.04 | -5.21 | ** |
| | Control | -0.19 | 0.07 | -2.54 | ** | 0.05 | 0.04 | 1.25 | |
| | Importance | 0.33 | 0.08 | 4.39 | ** | 0.15 | 0.04 | 3.59 | ** |
| Day level | Day | -0.41 | 0.10 | -4.11 | ** | -0.13 | 0.05 | -2.55 | ** |
| Person level | ActPer | -0.41 | 0.18 | -2.32 | ** | -0.22 | 0.11 | -2.02 | * |
| | Δ ExpPer - ActPer | 0.11 | 0.17 | 0.67 | | -0.12 | 0.11 | -1.12 | |
| | Competitive trait anxiety (SCAT) | 0.14 | 0.14 | 1.02 | | 0.06 | 0.09 | 0.72 | |
| | Neuroticism (Neuro) | 0.12 | 0.14 | 0.82 | | 0.05 | 0.09 | 0.52 | |
| Person by Person level | SCAT by Actual performance | -0.23 | 0.12 | -1.83 | | -0.12 | 0.08 | -1.58 | |
| | Neuro by Actual performance | -0.12 | 0.17 | -0.74 | | -0.11 | 0.10 | -1.06 | |
| Person by Day level | SCAT by Day | -0.28 | 0.11 | -2.64 | ** | -0.10 | 0.06 | -1.84 | |
| | Neuro by Day | -0.03 | 0.11 | -0.32 | | -0.06 | 0.06 | -1.00 | |
| Day by Beep level | Day by Competition | 0.13 | 0.10 | 1.38 | | -0.05 | 0.05 | -0.96 | |
| Variance terms | Person level | | | 0.06 | | | | 0.08 | ** |
| | Day level | | | 0.28 | ** | | | 0.15 | ** |
| | Beep level | | | 0.17 | ** | | | 0.27 | ** |
| | Autocorrelation | | | 0.11 | ** | | | 0.08 | |
| $R^2$ (beep level) | | | | 0.27 | ** | | | 0.40 | ** |

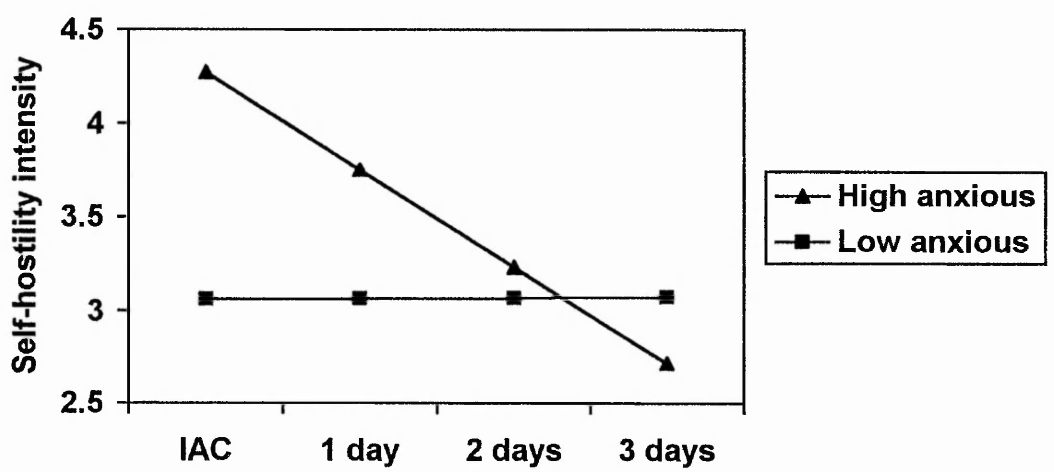
Legend: * = p<0.05; ** = p<0.01; SCAT = Sport Competition Anxiety Test; ActPer = Actual performance; Δ ExpPer - ActPer = difference between expected and actual performance

**Figure 5.8 Modelled effects of CTA and time after competition on levels of guilt[5.7]**




Legend: IAC = immediately after competition

**Figure 5.9 Modelled effects of CTA and time after competition on levels of self-hostility[5.7]**




Legend: IAC = immediately after competition

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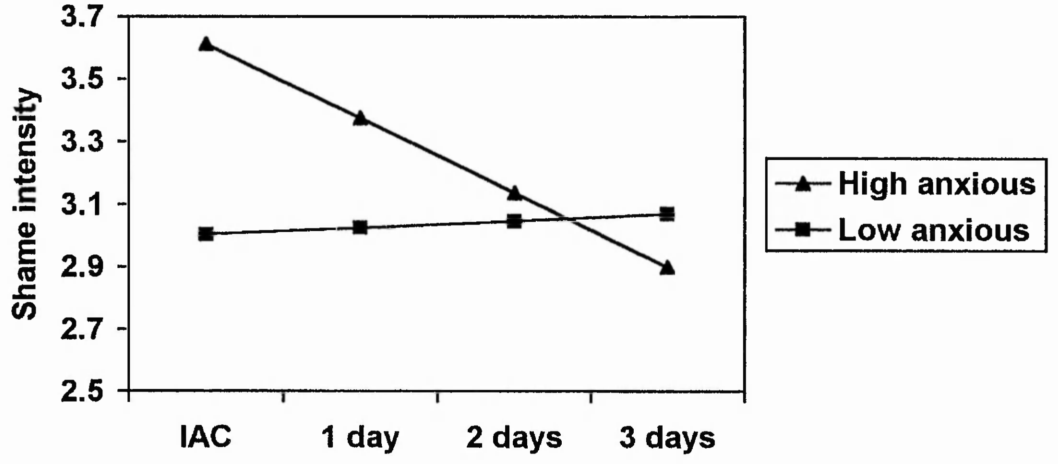
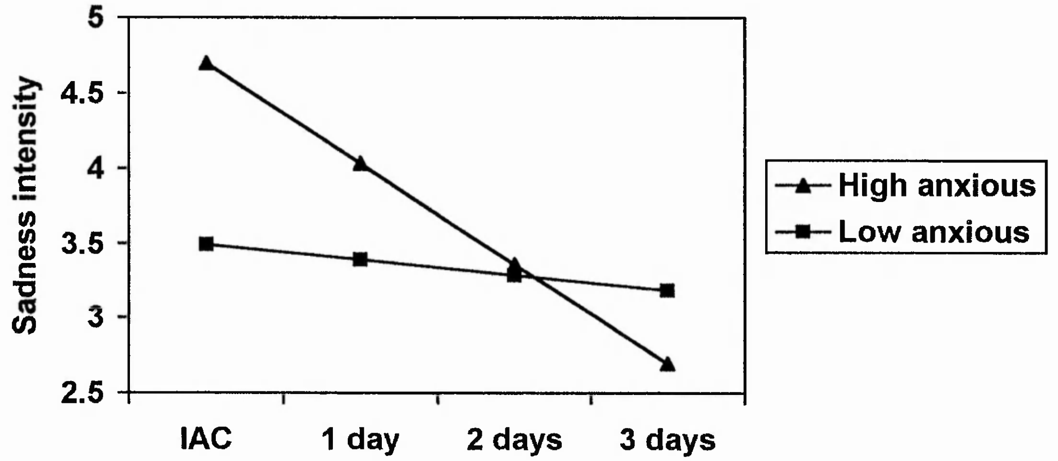
[5.7] The depicted values represent estimates at 1 standard deviation above and 1 standard deviation below the means for CTA with all the other variables in the model held constant.

**Figure 5.10 Modelled effects of CTA and time after competition on levels of shame[5.8]**




Legend: IAC = immediately after competition

**Figure 5.11 Modelled effects of CTA and time after competition on levels of sadness[5.8]**




Legend: IAC = immediately after competition

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[5.8] The depicted values represent estimates at 1 standard deviation above and 1 standard deviation below the means for CTA with all the other variables in the model held constant.

**Figure 5.12** **Modelled effects of CTA and self-referenced performance on level of post-competition guilt[5.9]**

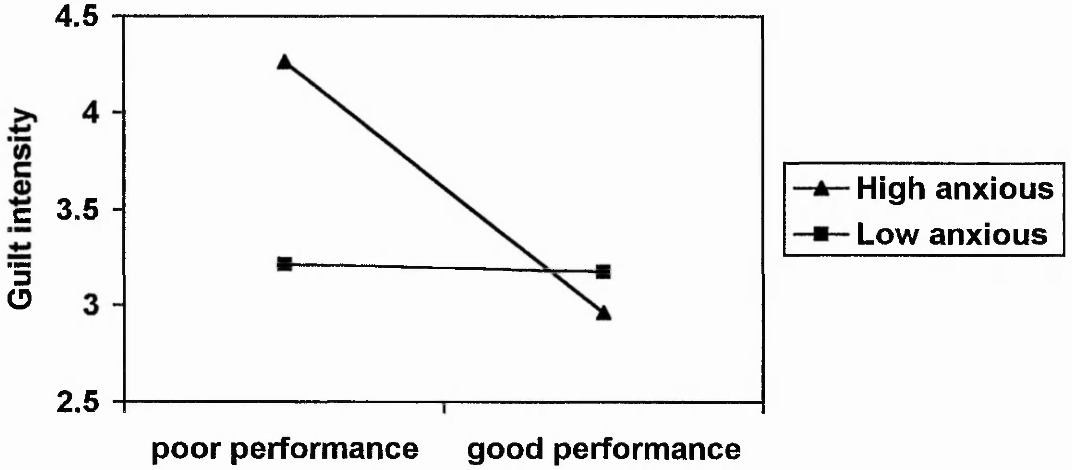
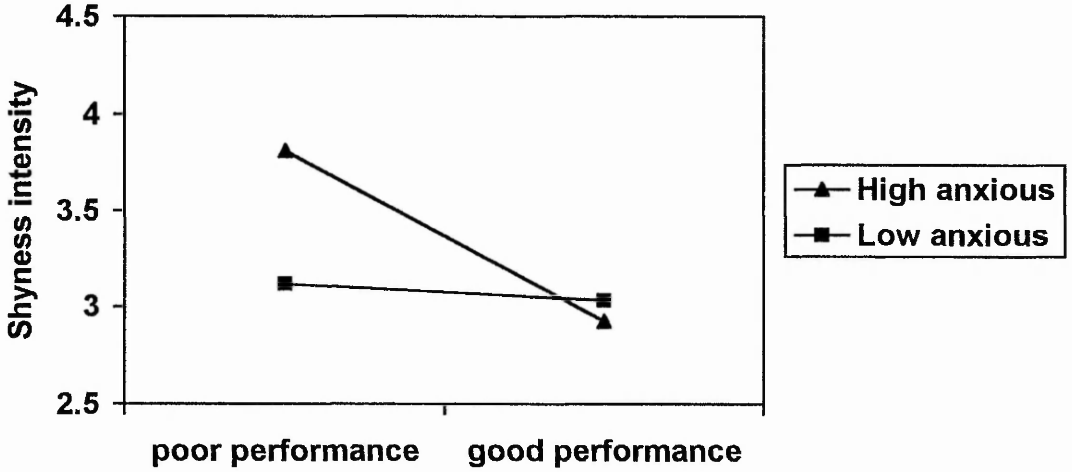



**Figure 5.13** **Modelled effects of CTA and self-referenced performance on level of post-competition shyness[5.9]**

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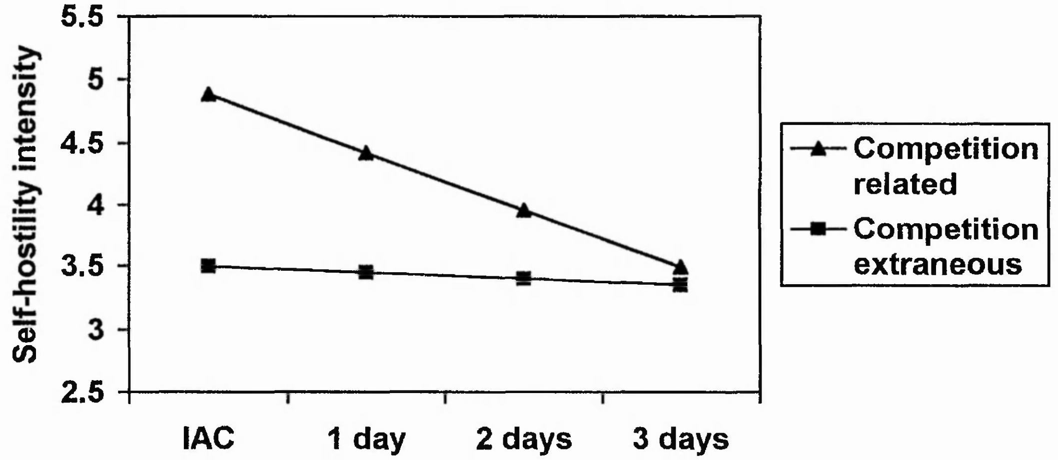
[5.9] The depicted values represent estimates at 1 standard deviation above and 1 standard deviation below the means for CTA and self-referenced actual performance with all the other variables in the model held constant.

**Figure 5.14 Modelled effects of context of concern and time after competition on levels of self-hostility**

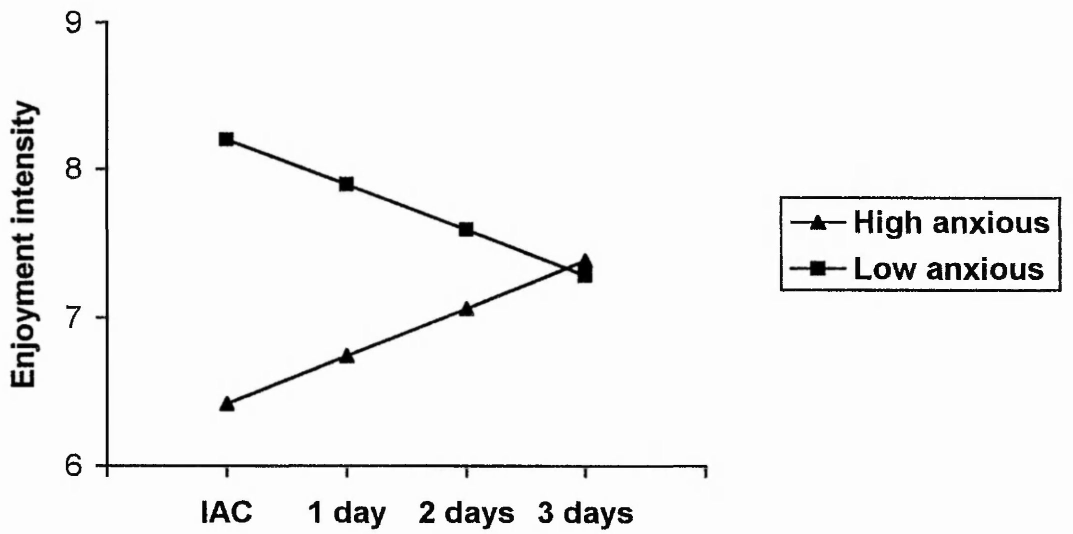



Legend: IAC = immediately after competition

Figure 5.14 depicts the interaction effect of context of concern and time after competition on level of self-hostility. Analysis of simple contrasts showed that competition-extraneous events or cognitions were not associated with increases in self-hostility, whereas competition-related concerns were. However, the effect of competition-related concerns on level of self-hostility was mediated by time. More precisely, competition-related concerns evoked a significant increase in self-hostility only in the first part of the post-competition period (immediately and one day after the competition).

Similarly to what was observed in the pre-competition period, post-competition positive emotions were higher than negative emotions (Table 5.10). Unlike negative emotions, they did not show a downward or upward trend after the competition. In fact, enjoyment, surprise and interest fluctuated more within days than between days. Enjoyment increased upon occurrence of pleasant events and decreased upon occurrence of unpleasant events. Interest and surprise were more strongly affected by pleasant than unpleasant episodes. Surprise was influenced by event controllability and event context. A significant main effect for actual performance was observed in all response variables. In general, better self-referenced performance was associated with higher levels of positive emotions after competition. A significant CTA by Day after competition interaction effect emerged for enjoyment. High-anxious individuals experienced significantly lower enjoyment immediately after the competition than low-anxious athletes. Their emotional state improved with time. In contrast, low-anxious individuals showed more enjoyment on the day of the competition than on the following days (Figure 5.15).

**Figure 5.15 Modelled effects of CTA and day after competition on level of enjoyment[5.10]**




Legend: IAC = immediately after the competition

Finally, a significant interaction effect of time past competition and concern context was found for the emotion of surprise. Surprise was higher for competition-related than for competition-extraneous concerns in close proximity to the competition (Figure 5.16). With time this relationship reversed and competition-extraneous events became stronger elicitors of surprise than competition-related sources of concern.

[5.10] The depicted values represent estimates at 1 standard deviation above and 1 standard deviation below the means for CTA with all the other variables in the model held constant.

**Table 5.10 Multivariate multilevel model estimates for post-competition positive emotions**

| | Predictor | Enjoyment | | | | Surprise | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | β | SE β | Z | | β | SE β | Z | |
| Beep level | Intercept | 7.29 | 0.28 | 26.32 | ** | 4.31 | 0.21 | 20.70 | ** |
| | Concerns | -0.12 | 0.17 | -0.66 | | 0.68 | 0.14 | 3.94 | ** |
| | Context (Competition) | 0.18 | 0.16 | 1.13 | | 0.30 | 0.13 | 2.35 | * |
| | Pleasantness | 1.80 | 0.15 | 12.33 | ** | 1.04 | 0.12 | 8.97 | ** |
| | Control | 0.21 | 0.14 | 1.46 | | -0.46 | 0.11 | -4.04 | ** |
| | Importance | -0.11 | 0.15 | -0.75 | | 0.18 | 0.12 | 1.55 | |
| Day level | Day | -0.01 | 0.13 | -0.06 | | 0.07 | 0.10 | 0.68 | |
| Person level | ActPer | 1.41 | 0.43 | 3.28 | ** | 0.82 | 0.32 | 2.56 | * |
| | Δ ExpPer - ActPer | 0.66 | 0.42 | 1.55 | | 0.27 | 0.32 | 0.85 | |
| | Competitive trait anxiety (SCAT) | -0.29 | 0.34 | -0.84 | | 0.29 | 0.26 | 1.11 | |
| | Neuroticism (Neuro) | 0.35 | 0.36 | 0.96 | | 0.03 | 0.27 | 0.11 | |
| | Extraversion (Extra) | 0.27 | 0.31 | 0.89 | | 0.03 | 0.23 | 0.11 | |
| Person by Person level | SCAT by Actual performance | 0.00 | 0.32 | 0.01 | | -0.25 | 0.24 | -1.07 | |
| | Neuro by Actual performance | 0.24 | 0.33 | 0.73 | | 0.27 | 0.24 | 1.11 | |
| Person by Day level | SCAT by Day | 0.31 | 0.14 | 2.33 | * | 0.19 | 0.10 | 1.90 | |
| | Neuro by Day | -0.10 | 0.13 | -0.74 | | -0.19 | 0.10 | -1.93 | |
| Day by Beep level | Day by Competition | -0.23 | 0.17 | -1.31 | | -0.47 | 0.14 | -3.49 | ** |
| Variance terms | Person level | | | 2.21 | ** | | | 1.21 | ** |
| | Day level | | | 1.09 | ** | | | 0.46 | ** |
| | Beep level | | | 2.17 | ** | | | 1.43 | ** |
| | Autocorrelation | | | 0.02 | | | | 0.10 | ** |
| $R^2$ (beep level) | | | | 0.39 | ** | | | 0.30 | ** |

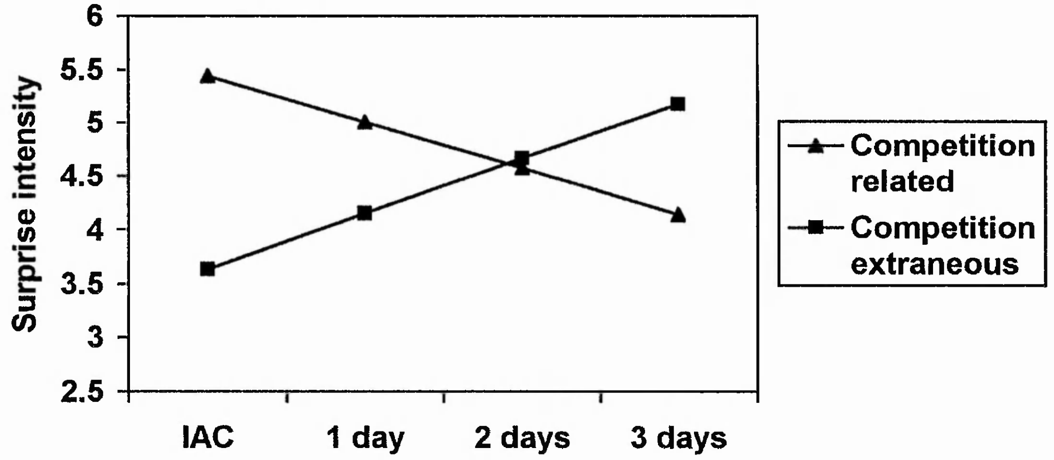
*(continued)*

**Table 5.10 - continued**

| | Predictor | Interest | | | |
|---|---|---|---|---|---|
| | | β | SE β | Z | |
| Beep level | Intercept | 5.94 | 0.26 | 22.74 | ** |
| | Concern | 0.77 | 0.20 | 3.94 | ** |
| | Context (Competition) | 0.28 | 0.18 | 1.57 | |
| | Pleasantness | 1.74 | 0.16 | 10.65 | ** |
| | Control | -0.04 | 0.16 | -0.22 | |
| | Importance | 0.28 | 0.17 | 1.65 | |
| Day level | Day | 0.06 | 0.13 | 0.50 | |
| Person level | ActPer | 0.95 | 0.40 | 2.38 | * |
| | Δ ExpPer - ActPer | 0.30 | 0.40 | 0.75 | |
| | Competitive trait anxiety (SCAT) | 0.02 | 0.32 | 0.05 | |
| | Neuroticism (Neuro) | 0.23 | 0.34 | 0.68 | |
| | Extraversion (Extra) | -0.14 | 0.28 | -0.51 | |
| Person by Person level | SCAT by Actual performance | -0.27 | 0.30 | -0.91 | |
| | Neuro by Actual performance | 0.10 | 0.31 | 0.32 | |
| Person by Day level | SCAT by Day | 0.04 | 0.14 | 0.26 | |
| | Neuro by Day | -0.04 | 0.11 | -0.41 | |
| Day by Beep level | Day by Competition | -0.23 | 0.17 | -1.31 | |
| Variance terms | Person level | | | 1.86 | ** |
| | Day level | | | 0.76 | ** |
| | Beep level | | | 2.99 | ** |
| | Autocorrelation | | | 0.01 | |
| $R^2$ (beep level) | | | | 0.31 | ** |

Legend: * = p<0.05; ** = p<0.01; SCAT = Sport Competition Anxiety Test; ActPer = Actual performance; Δ ExpPer - ActPer = difference between expected and actual performance

**Figure 5.16 Modelled effects of context of concern and time after competition on levels of surprise**




Legend: IAC = immediately after competition

## 5.5 Discussion

The present study is a process analysis of pre- and post-competition emotional states in male martial artists. Unlike previous investigations, which exclusively focused on competition-related emotions, this study examined athletes' emotional experience associated with both competition-related and competition-extraneous sources of concern. This approach was adopted for a number of reasons. First, it was assumed that athletes would be affected by competition-related as well as competition-extraneous sources of concerns. In fact, several studies have shown that athletes are not immune to sport- and competition-extraneous stressors (Gould et al., 1993; Scanlan et al., 1991). Second, emotional states attributable to competition-extraneous concerns were expected to exert an indirect effect on competition-related emotional states and vice versa. This particular supposition was based on previous research which found that the impact of positive and negative stressors on the behaviour and psychological state of an individual can generalise from one sphere of activity (e.g., family, leisure and health) to another (e.g., Barling & MacIntyre, 1993). Third, this type of global approach was meant to provide a more realistic view of the importance of the competitive event in relation to other sources of concern that athletes experience in temporal proximity to the competition.

In order to examine the impact of the competition on athletes' psychological state and compare it to that of other types of positive and negative stressors, patterns of emotions and sources of concern were monitored throughout a one-week pre-competitive and a three-day post-competitive period. Results showed that in 40.12% of the assessments athletes reported a significant episode that altered their emotional state. The majority of these events were perceived as pleasurable (Table 5.3). Only 16.45% of the ESM reports described unpleasant concerns. This is consonant with previous research on frequency of negative stressful events in daily life (van Eck et al., 1998). More than half of the reported concerns (64.26%) were unrelated to the competitive event and pertained to work, family, school, interpersonal relationships, leisure and other miscellaneous daily hassles (Appendix 50). This finding supported the hypothesis that competition-extraneous concerns would be a salient part of athletes' experience even in temporal proximity to the competition. Further analysis of data revealed that the total number of reported pleasant and unpleasant competition-extraneous concerns was virtually identical (49.45% for pleasant concerns; 50.51% for unpleasant concerns). In contrast, most of the reported competition-related concerns were regarded as positive and pleasurable events (76.10%). Additionally, nearly half of the total number of pleasant episodes and only 20.83% of the total number of unpleasant episodes pertained to competition. Taken collectively, these findings suggested that the competitive event was a strong positive motivator and a source of enjoyment.

Analysis of the temporal patterns of competition-related and competition-extraneous sources of concerns showed that, during the week preceding the competition, the percentage of pleasant competition-related and competition-extraneous episodes was practically identical, whilst, in the post-competition period, pleasant competition-extraneous concerns were significantly more frequent (Table 5.3). One day before the competition, pleasant and unpleasant competition-related concerns increased and competition-extraneous concerns decreased in absolute and relative frequency. On the day of the competition, two assessments were carried out. The first was scheduled one hour before the start of the competition, while the second took place immediately after the contest. Data from these two assessments showed that all athletes considered the competition to be an influential event that contributed to their momentary emotional state. No competition-extraneous concerns were reported in these two assessments. Occurrence of unpleasant competition-related episodes was very low in the week preceding the competition (on average below 1%) but slightly increased one day before the contest (7.07%). Only six out of 39 athletes reported some kind of negative competition-related concerns one hour before competing. These were mainly related to perceived physical or mental unpreparedness and to various environmental stressors, such as not having enough room to warm up (Appendix 50). The number of reports of unpleasant competition-related episodes increased immediately after the competition to 46.15%. These included physical injuries incurred during the contest, poor self-referenced performance, losing, exhaustion and problems pertaining to the organisation of the contest (Appendix 50). Reports of negative competition-related cognitions or events dropped from 46.15% to 8.89% one day after the competition and reached nil values on the last day of the study (Table 5.3). It is noteworthy that frequency of pleasant episodes that were not related to competition remained relatively stable over time, while frequency of unpleasant events unrelated to competition tended to be lower post-competition than pre-competition. This suggests that the amount of mental and physical commitment associated with the forthcoming competition might have had a negative impact on other aspects of athletes' life. In this regard, previous research has shown that, for instance, "excessive time demands" that resulted from trying to balance sport with other life pursuits were a significant source of negative stress in elite skaters (Gould et al., 1993).

With respect to cognitive appraisal of concern importance and controllability, results showed that, within the examined time frame, more importance was attributed to competition-related than competition-extraneous events or cognitions (Table 5.4). Overall, unpleasant competition-related events were perceived to be less controllable that pleasant competition-related events. Moreover, pleasant competition-related episodes were perceived to be significantly more controllable than pleasant competition-extraneous events. These findings may partly explain why competition exerted a strong positive motivating effect on the examined group of athletes. Namely, perceived personal control over a situation or task is the central idea defining the synonymous concepts of perceived competence (Harter, 1981) and self-efficacy (Bandura, 1986). It has been shown that perceived competence determines people's level of motivation, as reflected in the challenges they undertake, the effort they expend in the activity and their perseverance in the face of difficulties (Burton & Martens, 1986; McAuley, 1992; Roberts, Kleiber, & Duda, 1981). This means that individuals with a high level of perceived sport competence (read control over a competitive situation) are likely to actively seek participation in sport activities and view competition as a source of potential challenges and benefits. In support of these suppositions, research on the relationship between perceived self-efficacy and sport-related emotions showed that high levels of perceived sport competence were predictive of pre-competition positive affectivity and enjoyment in sport (Ommundsen & Vaglum, 1991; Treasure, Monson, & Lox, 1996).

Analysis of the magnitude and temporal patterns of discrete emotions showed that, with the exception of fear, negative emotions were generally low and stationary in the pre-competition period, reached their peak immediately after the contest and then dropped back to their initial levels. Significant post-competition changes were observed for the emotions of self-hostility, guilt, anger and sadness (Table 5.2). Analysis of sources of concern indicated that these increases in negative emotions were to be attributed to physical injuries incurred during contest and athletes' dissatisfaction with their performance or with the organisation of the tournament. However, it is noteworthy that, although statistically significant, these changes were very small in magnitude. For example, guilt was the negative emotion that exhibited the greatest post-competition increment. Yet, this increment corresponded to only 1.95 on a 13-point scale. Although shyness and disgust also reached their maximal intensity immediately after the competition, these changes were not statistically significant when compared to adjacent assessments. In contrast, fear significantly increased one hour before the start of the competition and decreased once the contest was over. The positive emotions of interest, enjoyment and surprise were higher than negative emotions during the whole period of testing, with interest and enjoyment approaching moderate levels. Enjoyment remained stable across time, while surprise and interest increased one hour before and decreased one day after the contest.

In summary, analysis of the course of pre- and post-competition emotional states and sources of concern showed that the competition was in general perceived as a challenging, positive and important event. This conclusion is based on the fact that athletes' emotional experience was typified by moderate levels of positive emotions and low levels of negative emotions throughout the whole period of testing and was accompanied by relatively frequent reports of pleasant competition-related concerns. The observed increases in fear, interest and surprise one hour before the start of the contest are indicative of athletes' energy mobilisation in the attempt to meet the demands of the competition. The slight deterioration in athletes' average post-competition emotional state observed was very short in duration and limited in magnitude, showing that, in general, the competition did not have a serious negative impact on athletes' post-competition psychological state.

The above analysis tells us whether a decrease or increase in the level of a particular emotion occurred simultaneously in most of the respondents. As all athletes were exposed to the competitive experience at the same point in time, significant changes in emotions could be observed in immediate temporal proximity to the competitive event. However, it should be noted that this kind of analysis does not uncover the psychological impact of sources of concern that did not simultaneously occur in a significant portion of the participants. In order to establish the relative impact of the competitive event on the emotional state of individual athletes and compare it to that of other sources of concern experienced during the 11 days of testing, multivariate multilevel regression analyses of pre- and post-competition emotions were carried out. Apart from allowing comparison between the psychological consequences of competition-related and competition-extraneous concerns, these regression analyses explored the moderating effects of actual and expected performance, personality traits and certain aspects of primary and secondary appraisals on athletes' pre- and post-competition emotions. Finally, this type of analysis helped differentiate between mood, defined as a relatively long lasting affective state that lacks a relationship with an object (Frijda, 1993), and emotions, defined as affective reactions to a specific event.

Multivariate multilevel analysis of pre-competition emotional states showed that pre-competition negative mood[5.11] was minimal (Tables 5.5 and 5.6), whereas positive mood was low to moderate (Table 5.7). Increases in negative emotions and hostility were associated with the occurrence of unpleasant events, regardless of whether they were related or unrelated to the forthcoming competition (Table 5.5). Fear was the only negative emotion directly affected by context of concern. On average, unpleasant competition-related episodes were associated with higher levels of fear than competition-extraneous events or cognitions. Notably, fear also increased as a function of temporal proximity to the competition. In absence of eliciting events or cognitions and controlling for other significant predictors, fear increased by 1.84 points as the competition approached. It is also noteworthy that analysis of simple contrasts showed that pleasant competition-related episodes evoked significantly more fear than unpleasant competition-

[5.11] Mood intensity was defined as the mean of the random intercept (estimated marginal grand mean) of a multilevel regression equation. In fact, the value expressed by the intercept represents the average intensity of a specific emotion in absence of eliciting episodes and when the rest of the predictors are accounted for.

extraneous events. These findings suggest that, in general, the competitive event represented the greatest and most important source of threat that the examined group of athletes experienced in the pre-competitive period. At first glance this observation disputes the proposition that competition is a strong positive motivating agent. However, before reaching a final verdict several issues need to be considered. First, it is important to mention that the competitive event was not only associated with higher levels of pre-competition fear but also with higher levels of interest (Table 5.7). Second, fear is an emotional response associated with both coercive and freely chosen evaluative situations which is indicative of the degree of importance of the evaluative episode (Martens et al., 1990). This means that not all fear-evoking episodes are seen as events that need to be avoided and not all activities and situations that motivate approach behaviour are threat-free. Appraisals of potential threats and benefits can co-exist. Competition is not a mandatory aspect of sport participation. It is a freely chosen activity. As such, it is associated with approach action tendencies. Yet, since it entails an evaluative process of which outcome cannot be fully predicted, it is also associated with threat appraisals. In this respect, Study 2 showed that most athletes perceive competition as a source of both threat and challenge. Furthermore, it is noteworthy that the peak mean value of fear one hour before the contest was 6.79 on a scale ranging from 3 to 15. In terms of subjective feelings this value corresponds to relatively low to moderate levels of fear. As explained earlier, low to moderate levels of fear are a feature of facilitative patterns of pre-competitive emotions which, in turn, are characterised by favourable goal expectations and approach action tendencies.

An additional explanation for the fact that in the present study the competition was perceived as both a strong pleasurable event and a threat relates to some personal characteristics of the sample. Namely, the examined group of martial artists was high in extraversion (Table 5.1). One of the extraversion facets is excitement-seeking, which is akin to some aspects of sensation seeking (Costa & McCrae, 1992). Sensation seeking refers to the need for varied, novel and complex experiences and the willingness to take physical and social risks for the sake of such experiences (Zuckerman, 1979). It is possible that the examined athletes, being extraverts and sensation seekers[5.12], were motivated to participate in combat sports for the risk and thrill that they entail.

[5.12] A hypothesis that was confirmed a posteriori. The examined sample of athletes had a mean score of excitement-seeking that corresponded to the 88th percentile of the norms for American male adults.

Besides occurrence, pleasantness and context of concern, another cognitive appraisal variable that added to the prediction of pre-competition fear was perceived controllability of the source of concern. As expected, events that where perceived as being less controllable were associated with slightly higher levels of fear. Furthermore, three cross-level interaction effects contributed to the prediction of fear intensity. First, it was found that individuals higher in neuroticism experienced greater increases in fear as the competition neared than individuals low on this personality trait (Figure 5.5). Second, competition-related fear was generally higher in athletes with high levels of CTA, whereas competition-extraneous fear was slightly higher in athletes with lower levels of CTA (Figure 5.6). Finally, while intensity of fear evoked by competition-extraneous events did not change across time, competition-related cognitions or events yielded increasingly higher levels of fear as the competition approached (Figure 5.7). With regard to the first interaction effect, an earlier study found that neuroticism was associated with level but not trend of pre-competitive tension as measured by the POMS (Prapavessis & Grove, 1994). Differences in results between the present investigation and the earlier study might have been due to several reasons pertaining to the instrument used, sample size, sport examined and time of testing. This study examined a group of 39 martial artists across a one-week pre-competitive period, whereas Prapavessis and Grove (1994) tested 106 rifle shooters throughout a two-day period. Although it has been previously stated that the present study did not find a significant main effect of neuroticism on fear, it is important to say that this main effect actually approached significance ($p = 0.07$). It is possible that a larger sample would have yielded statistically significant results. As far as the interaction between time to competition and neuroticism is concerned, Prapavessis and Grove (1994) might have failed to find a significant interaction effect for two main reasons. First, they monitored athletes' emotional states throughout a 48-hour pre-competitive period, which might have not been long enough to detect any differences in temporal patterns. Second, they examined a sport that requires and is associated with low levels of arousal. In contrast, it has been shown that individual, subjectively scored contact sports, such as martial arts, boxing or wrestling generally evoke high levels of anxiety, tension, arousal or fear (Martens et al., 1990). So it reasonable to expect that combat sport contests will be associated with much greater temporal changes in anxiety and fear than rifle shooting competitions. It follows that the likelihood of finding significant personality by time interaction effects on pre-competitive fear or anxiety is greater in combat sports than in rifle shooting. This could explain why the two studies yielded different results.

As mentioned earlier, a significant CTA by Context of concern interaction effect on fear was observed. Although both high- and low-anxious individuals experienced higher levels of fear in association with competition-related than competition-extraneous concerns, the difference between levels of fear evoked by the two categories of concern was greater in high-anxious athletes (Figure 5.6). For this group of athletes, the competitive event was indeed the major source of threat confronted during the first eight days of experience sampling. This supposition is supported further by the fact that a similar interaction effect was found for shame, shyness and self-hostility (Table 5.6; Figure 5.4). High-anxious athletes exhibited higher shame, shyness and self-hostility in relation to the competition than in relation to other sources of concern. Moreover, their level of competition-related shame, shyness and self-hostility was higher than that of low-anxious athletes. Considering the relational meaning of these emotions, this suggests that competitive anxious athletes tended to associate the competitive event with thoughts or feelings of ego vulnerability (shyness), disappointment in the self and self-blame for an eventual failure (shame and self-hostility) to a greater extent than did low-anxious athletes. It is also significant that high-anxious athletes reported more unpleasant and less pleasant competition-related concerns than did athletes low on CTA (Table 5.4). Collectively, these findings indicate that high-anxious individuals do not get as much satisfaction and enjoyment out of the competitive event as do individuals low on this personality trait. This is consonant with the results obtained in Study 1a and previous published research (e.g., Lewthwaite & Scanlan, 1989; Ommundsen & Vaglum, 1991; Passer, 1983; Rainey & Cunningham, 1988).

No main effect of concern context on pre-competition negative emotions other than fear was observed and no significant interaction effects were found for sadness and disgust (Tables 5.5 and 5.6). The effect of concern context on anger, guilt, shyness, self-hostility and shame depended on either level of CTA or temporal proximity to the competition. Anger was the emotion that in the pre-competitive period exhibited the highest increase upon occurrence of unpleasant events. The average increase in anger associated with unpleasant events was 1.75 points on a 13-point scale for concerns of average controllability and importance, in individuals with average neuroticism and average CTA. Pre-competition anger was slightly higher in neurotic individuals and for unpleasant events of below average controllability and above average importance.

Interestingly, low scorers on CTA exhibited higher anger upon occurrence of unpleasant competition-extraneous events than did high-anxious athletes. No difference between these two groups of athletes was found in competition-related anger (Figure 5.3). One possible explanation of these results is through the extraversion facet of assertiveness. Assertiveness is the tendency to act dominantly and forcefully. Individuals high on assertiveness are aggressive, self-confident and enthusiastic (Costa & McCrae, 1992). As it has been shown that anxiety is negatively correlated with assertiveness (Costa & McCrae, 1992), it is possible that the higher levels of anger that low-anxious individuals exhibited upon the occurrence of negative stressors were just a reflection of their occasional assertive behaviour. The fact that this tendency was not observed for competition-related concerns could be attributed to the small number of unpleasant competition-related episodes reported across the pre-competition period (28 reports) and the content of these events.

A significant interaction effect of concern context and day to competition on the emotion of guilt and a main effect of temporal proximity to the competition on self-hostility and enjoyment were observed (Tables 5.6 and 5.7). As the competition approached, the impact of competition-related episodes on guilt level increased. Also, with the nearing of the competition, self-hostility slightly increased and enjoyment decreased even in absence of reports of unpleasant episodes. From these results and from the results of multilevel regression analysis of fear it is obvious that the impact of the competitive event on athletes' psychological state increased in temporal proximity to competition. Although small, these effects were mainly negative. So it appears that multilevel regression analysis of pre-competition emotions yielded a slightly gloomier picture of the impact of the competitive event on athletes' psychological state as compared to that provided by analysis of variance. This was due to the fact that analysis of variance tested the significance of changes in emotions across time without controlling for any moderating variable. In contrast, multilevel regression analysis accounted for a number of significant predictors of pre-competition emotions and, consequently, could estimate the independent contribution of time to competition to the prediction of emotion intensity. More precisely, analysis of variance showed that the emotions of enjoyment and self-hostility were relatively stable across time (Table 5.2). On the other hand, multilevel regression analysis revealed that the intensity of these emotions depended greatly on the occurrence of sources of concern. Analysis of the occurrence of pleasant and unpleasant episodes during the week preceding the competition showed that pleasant and unpleasant episodes were equally frequent in the first half of the week, whilst the second half of the week was typified by a greater number of pleasant episodes (Table 5.3). Assuming that the average degree of pleasantness of events was relatively stable across time, this means that a decrease in self-hostility and an increase in enjoyment should have been detected in the second part of the pre-competitive period. Results from the analysis of variance showed that this was not the case. So two alternative conclusions can be drawn from the synthesis of these findings. The first conclusion is related to the possibility that positive episodes that occurred in immediate proximity of the competition were less pleasurable than those recorded during the first four days of experience sampling. Analysis of events reported throughout the pre-competitive period showed that the proportion of reports of pleasant competition-related events increased with time (Table 5.3). Since no main effects of concern context on enjoyment and self-hostility were observed, the first conclusion could be that the degree of perceived pleasantness of positive competition-related events decreased as the competition approached. This supposition is a possibility for two main reasons. The first reason pertains to the fact that pleasantness of sources of concern was defined as a dichotomous variable. The second reason relates to the fact that the constructed multilevel linear models did not include an interaction term that would account for the time dependency of the effect of pleasant competition-related concerns on pre-competition emotions. An alternative explanation for the significant time to competition main effects on self-hostility and enjoyment is based on the assumption of temporal stability of pleasantness of competition-related events. Assuming that pleasantness of competition-related episodes did not change with time, it could be concluded that temporal proximity to the competition yielded a slight deterioration in athletes' daily mood caused by the perceived importance of the imminent evaluative encounter and the uncertainty of outcome associated with it. These possibilities open interesting avenues of research in the field of competition-related emotions.

Analysis of pre-competition positive emotions showed that, when controlling for other predictors, pleasant events were associated with an increase in enjoyment and surprise and a slight decrease in interest, whilst unpleasant events produced a significant decrease in enjoyment, a slight increase in interest, but did not affect surprise (Table 5.7). As expected, extraversion explained a significant portion of the total variance for the emotion of enjoyment, with higher levels of extraversion being associated with higher enjoyment.

Expected performance was found to be a significant predictor of enjoyment, surprise, interest and self-hostility. Better performance expectancies were associated with higher levels of positive emotions and lower levels of self-hostility. A tendency for expected performance to yield increases in other negative emotions was also observed (Table 5.6). However, due to the high standard errors of the regression coefficients, these main effects were not statistically significant. Yet, it is important to acknowledge that in the regression analyses of fear ($p=0.07$) and sadness ($p=0.09$) they approached significance. As noted earlier, a series of studies had previously found a negative correlation between pre-competitive anxiety and absolute and self-referenced performance expectancies (e.g., Alexander & Krane, 1996; Hanton & Jones, 1995; Scanlan & Passer, 1978) and a significant relationship between expected performance and perceived functionality of anxiety (e.g., Wiggins & Brustad, 1996). However, no data were available on the relationship between other discrete emotions and athletic performance expectations. So, when compared to earlier research, the present investigation has provided a more thorough picture of the athlete-competition relationship. As well as showing that the prospect of performing poorly at a competition was perceived as a threat (deducible from fear or anxiety), it also suggested that, in general, athletes reckoned that they could not improve their performance one week before the contest (deducible from sadness). Additionally, it indicated that athletes felt responsible for their unsatisfactory level of preparedness for the contest (deducible from self-hostility).

Overall, athletes' post-competition emotional experience was characterised by low to moderate levels of positive emotions and very low levels of negative emotions and hostility (Tables 5.2, 5.8, 5.9 and 5.10). A significant main effect of time after competition was observed on all negative emotions and hostility, but not on positive emotions. Accounting for other significant predictors, all negative emotions gradually decreased after the competition, whereas enjoyment, interest and surprise remained stable. This means that post-competition negative and hostile mood was higher in proximity to competition. It is worth mentioning, however, that these changes in time ranged from 0.39 (for fear and shyness) to 1.38 (for anger) points on a 13-point scale over the four-day post-competitive period. The higher levels of anger observed in proximity of the competition might have been a peculiarity of the type of sport examined in this study. Anger has been repeatedly associated with successful performance in martial arts. For example, McGowan and Miller (1989) showed that anger was a good predictor of success in karate. Similar results were observed in a recent study which examined pre-competition mood as measured by the POMS in a sample of 208 male karate practitioners (Terry & Slade, 1995). To explain these findings, McGowan and Miller (1989) proposed that successful karate competitors might use anger as a pre-competition "psyching" strategy. In fact, visualising images of anger has been shown to be associated with improved strength performance (Murphy et al., 1988). So, the fact that in the present study higher levels of anger were observed in proximity to the competition, even after accounting for the effect of event-related variables (occurrence and pleasantness), may indicate that it was part of athletes' usual mental strategy. Future research will need to establish the pattern and functionality of pre- and post-competition emotions in different types of sport.

As explained earlier, multilevel regression analysis of post-competition negative emotions and hostility yielded a significant time after competition main effect. In addition to this, significant main effects of context and pleasantness of concern were observed for guilt, self-hostility and shame, with unpleasant competition-related episodes yielding greater increments in these negative emotions than unpleasant competition-extraneous episodes (Table 5.9). These findings suggest that the competition was on average the most stressful and psychologically detrimental event that the group of martial artists experienced throughout the four-day post-competition period. The fact that the participants took part in "full-contact" sparring events in a single elimination tournament system may partly explain these results. Namely, the participants were instructed to report their emotional state immediately after the competition. This means that, unless they won the championship, they completed their ESM report soon after losing a match. As performance outcome has been shown to affect post-competitive emotions (e.g., Wilson & Kerr, 1999), it is reasonable to assume that, regardless of what the participants thought about their overall performance, the experience of a defeat at the end of their participation in the tournament exerted a negative impact on their psychological state.

In this regard, previous research has found that losing or poor performance were associated with increases in post-competition guilt, shame, sadness, tension, confusion, anger, disappointment and feelings of incompetence (e.g., Biddle & Hill, 1992; Hassmén & Blomstrand, 1995; Wilson & Kerr, 1999). Increases in guilt, self-hostility, anger and shame are thought to be mainly related to attributional or reflective appraisal processes which have the purpose of explaining the causes of a poor or good performance (Vallerand, 1987; Weiner, 1985). It is maintained that individuals who attribute failure to external unstable factors (e.g. others' hindrance) will respond with anger, whilst individuals who ascribe their poor performance to internal unstable causes (e.g., lack of effort) will react with feelings of guilt, shame and self-hostility (Weiner, 1985). It is important to note, however, that there is evidence that these emotions may occur as an immediate response to a defeat, failure or poor self-referenced performance even in absence of reflective or attributional appraisal processes (Belciug, 1992; McAuley & Duncan, 1990; Willimczik & Rethorst, 1995). In the present investigation the appraisal dimension of event controllability, which is indirectly related to locus of causality, failed to predict post-competition guilt, self-hostility and shame (Table 5.9). This tentatively suggests that the observed increases in guilt, self-hostility and shame were not the result of athletes' attributional appraisal but represented athletes' immediate response to being eliminated from the tournament (defeat). Unfortunately, no reliable conclusion on the matter can be reached in the current study. More research on attributional appraisal and post-competition emotional states in martial arts is needed.

In contrast to other negative emotions, sadness was determined by perceived event controllability (Table 5.9). This is in accordance with previous research (Lazarus, 1993; Izard, 1991). It has been shown that sadness is usually associated with a disappointment, the failure in achieving an important goal or the experience of an irrevocable physical or psychological loss (Izard, 1991). The fact that a loss, disappointment or failure is irrevocable and/or irremediable means that it is beyond personal control. In the present study, sadness was predicted by self-referenced performance and temporal proximity to competition. This indicates that the competitive event was associated with at least two independent sources of disappointment, loss or failure, the first being poor self-referenced performance and the second being elimination from the tournament.

One of the most influential predictors of post-competition emotions was self-referenced performance (Table 5.9 and 5.10). By contrast, discrepancy between expected and actual performance did not independently explain a significant portion of the total variance of any of the examined emotions. Higher self-referenced performance was related to higher post-competition enjoyment, surprise and interest and lower guilt, self-hostility, shame, sadness and fear. Self-referenced performance did not contribute to the prediction of disgust and anger, which suggests that athletes in general did not attribute their poor performance to external factors (e.g., venue, referees, organisation, audience). As explained earlier, several studies have confirmed the dependency of post-competition emotional states on performance. Since the effects of failure on athletes' negative emotional states have been already discussed, only the relationship between positive emotions and performance will be here examined. Enjoyment (happiness or joy) has been associated with winning, success or good self-referenced performance (e.g., Rethorst & Willimczik, 1991; Vallerand, 1987; Willimczik & Rethorst, 1995). Enjoyment is considered a predominantly outcome-dependent emotion, as opposed to attribution-dependent emotions which are a product of the specific causal attribution made for the outcome (Weiner, 1979). It is maintained that enjoyment is experienced intensively following success, regardless of the perceived cause of the outcome (Willimczik & Rethorst, 1995). The present study supports this contention. In fact, actual performance was one of the best predictors of post-competition enjoyment (Table 5.10). Controlling for other explanatory variables, a self-referenced performance of one standard deviation above the group average was associated with an average increase in enjoyment of 1.41 on a 13-point scale. No main effect of concern controllability on enjoyment was observed, indicating that attributional appraisal dimensions of internal causality and controllability were not significant determinants of enjoyment intensity. It is also important to note that enjoyment was not related to context of concern or temporal proximity to competition. This indicates that the competition affected the level of post-competition enjoyment only through performance and that the occurrence of competition-related events did not yield greater changes in enjoyment than competition-extraneous events. Also, elimination from the tournament did not seem to have any substantial impact on enjoyment, unless it was explicitly reported as a significant unpleasant event. Similar results were obtained for the emotion of interest.

In contrast to interest and enjoyment, intensity of post-competition surprise was determined by context of concern, with competitive-related episodes being associated with higher levels of surprise than competitive-extraneous episodes (Table 5.10). Yet, surprise was higher for competition-related concerns only immediately and one day after the contest. Three days after the competition this relationship reversed and competition-extraneous events became stronger elicitors of surprise than competition-related concerns (Figure 5.16). Finally, pleasantness and controllability of events explained a significant portion of the total variance of surprise, with pleasant and uncontrollable episodes being associated with higher levels of this emotion. The highest levels of post-competition surprise were noticed immediately after the contest among athletes whose self-referenced performance was above the group average and who experienced a pleasant competition-related event that was beyond their control. It appears that the examined group of athletes reacted with surprise mainly upon externally dictated circumstances that favoured their performance, such as a favourable draw or favourable judging. This is consonant with Weiner's (1979) attributional theory of emotion and motivation which postulates that surprise is an emotional response to unexpected uncontrollable events (e.g. luck). It must be noted, however, that two earlier studies found that surprise was positively correlated with poor performance (Biddle & Hill, 1992; McAuley et al., 1983), whereas another study on elite track and field athletes found no relationship between self-referenced performance and surprise (Belciug, 1992). The observed differences between the present study and earlier investigations could be attributed to type of sport, personal factors, organisation of the competitions and level of participation. Namely, performance outcome in martial arts sparring contests is much more uncontrollable, uncertain and dependent on external factors (e.g., referees, opponent's reaction, drawing) than performance outcome in track and field competitions. This creates a better chance for external factors such as "bad" or "good luck" to come into play and affect the performance in martial arts. McAuley et al. (1983) tested a group of undergraduate students enrolled in physical education classes who competed in a table tennis match against an opponent of similar ability. As no real drawing was involved and the participants were matched by ability, the possibility that uncontrollable external factors would influence performance outcome was significantly reduced. An alternative explanation for the contrasting findings regards the possibility that martial arts practitioners developed a different approach to performance outcome as compared to athletes competing in table tennis, squash or track and field. In principle, martial arts place a strong focus on mental discipline and the development of character as well as physical skills (Konzak & Klavora, 1980). It has been shown that martial arts training may increase assertiveness, ability to relax, self-discipline, self-esteem and sense of responsibility (Konzak & Klavora, 1980; Trulson, Kim, & Padgett, 1985). The examined group of Tae Kwon Do and Karate practitioners showed a tendency to accept responsibility for their poor performance, responding with guilt, self-hostility and shame but not surprise and anger. Yet, at the same time, they demonstrated their ability to admit that their good performance was sometimes attributable to external factors (surprise reaction to good performance). It is possible that the two groups of squash and table tennis players had a different approach to competition as compared to the group of martial artists examined in this study.

Finally, similarly to what observed in the multilevel regression analyses of pre-competition emotions, CTA was a significant moderator of athletes' post-competition emotional states. A significant CTA by Performance interaction effect was found for the emotions of guilt and shyness (Table 5.9, Figures 5.12 and 5.13). While perceived self-referenced performance did not affect the intensity of these two emotions in low-anxious athletes, high-anxious individuals responded with increased levels of guilt and shyness to below average performance. These results lend support to previous research which demonstrated that athletes with high levels of CTA are more reactive to failure and negative social evaluation and experience greater shame and upset in the event of poor performance (Gould et al., 1983; Hall, 1980; Passer, 1983; Ping, 1993; Rainey & Cunningham, 1988). That competitive trait anxious individuals are more psychologically vulnerable to evaluative situations was confirmed further by the significant interaction effects of CTA and day after competition on guilt, self-hostility, shame, sadness and enjoyment (Figures 5.8, 5.9, 5.10, 5.11 and 5.15). Low-anxious athletes exhibited minimal or nil levels of guilt, self-hostility, sadness and shame throughout the whole four-day post-competitive period, whereas high-anxious athletes experienced higher levels of these negative emotions immediately after the competition, which gradually dissipated in the next three days. Interestingly, individuals low in CTA showed more enjoyment in immediate temporal proximity to the competition than on the following days. By contrast, high-anxious individuals experienced their lowest levels of enjoyment immediately after the contest (Figure 5.15). In the last two days of experience sampling, enjoyment in high- and low-anxious athletes reached similar levels. Since the effect of self-referenced performance was partialled out, these results indicate that regardless of the level of success, competitive trait anxious individuals perceive competition as a source of psychological discomfort. This tendency is likely to be generated from the type of competitive motives that high-anxious athletes usually endorse. Ping (1993) showed that university athletes with high levels of cognitive CTA identified social approval, self-challenge and high ability demonstration as the principal motives for participation in competitive sport. These three classes of motives are related to self-esteem enhancement. They entail the possibility of failure and, consequently, constitute sources of potential threat which are likely to yield negative affect. In contrast, athletes with a low level of cognitive CTA were mainly motivated by the intrinsic enjoyment associated with the competitive activity and the desire to win. This means that they were driven by at least one motive that was not evaluative in nature and did not encompass the possibility of failure. This motivational "background" is likely to result in a positive profile of pre- and post-competition emotions.

Another interesting finding from Ping's (1993) study was that low-anxious athletes were motivated by the desire to win, whereas high-anxious athletes were motivated by self-challenge and high ability demonstration. Desire to win is based on competitive goals whose outcome is relatively unpredictable. Self-challenge and high ability demonstration are based on mastery goals in which perceptions of ability are self-referenced and dependent upon improvement and whose outcome is fairly predictable (Roberts, 1992). These patterns of motives suggest that high-anxious individuals may try to reduce their competitive anxiety by relying on motives that entail goals with a relatively controllable outcome. At the same time, these emotional patterns suggest that high-anxious athletes base their sense of self-esteem on external sources of information such as performance outcome and social feedback, whereas low-anxious athletes do not. This could explain why in the present study high-anxious athletes reacted to a poor performance with an increase in guilt and shyness but low-anxious athletes did not.

## 5.6 Conclusions

By decomposing influences on momentary pre- and post-competition emotional states in a multilevel analytic framework, this study identified situational and personal variables that moderated athletes' affective responses in the week preceding and three days after a major competition in martial arts. Results showed that athletes' pre- and post-competition emotional states were characterised by very low levels of negative emotions and low to moderate levels of positive emotions. The competitive event was on average one of the most important and most stressful events that athletes experienced in the examined period. Analysis of pre-competition sources of concern and emotional states revealed that the competition was perceived as mainly a positive challenging event, which also encompassed some elements of threat and psychological discomfort most likely due to the perceived importance of the contest and the demands associated with it. Temporal proximity to competition, type and cognitive appraisal of sources of concern, expected performance, neuroticism, extraversion and CTA determined magnitude and/or temporal patterns of athletes' pre-competition emotional states. Neuroticism was related to temporal changes in fear. Extraversion influenced the level of enjoyment. CTA determined the level of competition-related fear, shame, shyness and self-hostility and competition-extraneous anger. Expected performance significantly influenced pre-competition self-hostility, enjoyment, surprise and interest. When compared with competition-extraneous concerns, competition-related episodes yielded higher levels of fear. Goal congruity of sources of concern (pleasantness) explained a significant portion of the total variance of each emotion with the exception of shame. Controllability of concern predicted pre-competition anger, guilt, fear and surprise, whilst perceived importance explained anger, self-hostility and surprise. Temporal proximity to competition affected levels of fear, self-hostility and enjoyment and moderated the effect of competition-related concerns on guilt and fear.

Analysis of post-competition stress showed that, on average, the competitive event exerted a slight negative effect on athletes' psychological well-being. Multilevel regression analysis of post-competition emotional states showed that the competition was associated with an increase in negative affectivity which peaked immediately after the contest. Competition-related cognitions and events evoked higher guilt, self-hostility, shame and surprise. The effect of competition-related events or cognitions on self-hostility and surprise was moderated by time after competition. Neuroticism and extraversion did not play a significant role in the explanation of post-competitive emotions. CTA did not exert a significant main effect on any of the examined emotions but moderated the effect of time after competition on guilt, self-hostility, shame, sadness and enjoyment. Additionally, CTA moderated the effects of perceived self-referenced performance on guilt and shyness. Self-referenced performance exerted a main effect on guilt, self-hostility, shame, fear, sadness, enjoyment, surprise and interest. With regard to cognitive appraisal dimensions, pleasantness of concern predicted each of the examined emotions, whereas importance of concern was related to anger, guilt, self-hostility, sadness and fear. Finally, controllability explained a significant portion of the total variance of disgust, sadness and surprise. Although these results may suggest that the contest was a detrimental experience for the examined group of martial artists, it is necessary to keep in mind that the psychological aftermath of the competitive event was limited both in magnitude and time. Most importantly, the limited negative effect of the contest on athletes' emotional states was circumscribed to individuals with average to high levels of CTA. Low-anxious athletes did not appear to be negatively affected by the competitive episode. On the contrary, their emotional state was more positive in temporal proximity to the competition than it was earlier before or later after the event.

The amount and depth of information on the athlete-competition relationship offered by the present investigation is indicative of the utility of a multivariate multilevel time-based approach to the study of the competitive process. This study has provided a global idea of the complexity of the competitive process and has confirmed the importance of some personal and situational factors as determinants and moderators of athletes' psychological responses to competition. Future research will need to detail various aspects of the competitive process in both genders and in different sports and age groups.

# CHAPTER VI

## Summary, discussion and conclusions

This chapter comprises two sections. The first section provides a summary of the issues addressed and studies reported in this thesis. It also discusses the theoretical and practical implications emanating from the research and outlines a number of suggestions for future research in the field of competitive emotions. The second section provides brief conclusions.

### 6.1 Summary and discussion

#### 6.11 Examined issues

This thesis attempted to examine specific aspects of competitive stress with particular emphasis on the emotional component of the stress process. The underlying aim was to facilitate a greater overall understanding of the athlete-competition relationship. For this purpose, an interactional model of competitive stress, which synthesises previous theoretical and empirical work on competitive emotions and emphasises the temporal dimensions of the athlete-competition relationship, has been proposed. This model encompasses the relations among the competitive situation, athlete's appraisal of it and the athlete's emotional response, coping and performance (Figure 2.1). It posits that an individual's psychological reaction to competition is a function of his or her appraisal of the competitive situation, which, in turn, is determined by the interplay of a set of situational and personal factors. Another fundamental assumption of the model is that competitive stress is a process that unfolds over time. Emotions, appraisal of the situation, coping strategies and situational variables are liable to constant changes. These postulates imply that a thorough understanding of the athlete-competition relationship can be only achieved through a multivariate process-oriented analysis of competitive stress.

In the light of the proposed model, analysis of the existent literature on competitive emotions indicated that three issues needed to be urgently addressed. First, a dearth of research on competitive emotions other than anxiety indicated that a more comprehensive approach to the study of athletes' emotional responses to competition was needed. In this regard, the interactional model of competitive stress posits that the way an individual appraises the competitive situation determines the quality, intensity, hedonic tone, duration, frequency and functionality of his or her emotional response. In other words, competitive stress is by no means solely associated with anxiety, but can evoke a wide range of qualitatively different emotions that image the nature of the athlete-competition relationship. Consequently, it is contended that limiting ourselves to the study of anxiety as the exclusive marker of athletes' emotional experience denies the possibility of establishing the real meaning that a competitive event has for an athlete. Additionally, as elaborated and demonstrated in two studies, the ambiguous nature of anxiety, reflected in the disputes associated with its conceptualisation and measurement, contributes further to the necessity of studying a number of easily definable and measurable discrete emotions. So, for the above-mentioned reasons it was important to demonstrate the weaknesses associated with studies examining athletes' psychological reactions to competition solely through measures of anxiety.

The second major issue addressed in this thesis was the adoption of a time-based approach to the study of the athlete-competition relationship. As stated earlier, competitive stress is a process. The fact that competitive stress is defined as a process implies that its components and the interrelationship between components change across time. Changes in emotional states reflect the meaning of what is happening as the competitive situation develops and the effectiveness of the coping strategies adopted. In other words, emotional changes describe the dynamics of the athlete-competition relationship in terms of harms, threats or benefits that an athlete perceives as being associated with a competitive event. Given the above suppositions, considering just one period or combining together stages of the competitive process can provide only a limited and distorted picture of what is happening and does not allow an analysis of why something is happening. Despite the obvious advantages of a time-based analysis of the athlete-competition relationship, most studies have examined various components and determinants of pre- or post-competitive stress at one single point in time. To date, few investigations have examined the temporal patterns of competition-related emotions, the majority of which studied competitive anxiety. Two previous investigations have examined the temporal changes of cognitive variables associated with pre-competitive but not post-competitive anxiety. No previous studies have analysed the pre- or post-competitive temporal patterns of coping or cognitive appraisal dimensions associated with a wider range of emotions. So, given the scarcity of information on competitive stress from a time-based perspective, one of the main scopes of this thesis was to promote a process-oriented approach and provide some initial findings concerning various aspects of the competitive process in a specific sport.

The third issue that needed to be addressed pertained to the methodology used for studying competitive stress from a process-oriented perspective. It was necessary to establish a method that would reliably monitor the temporal pattern of variable components, moderators and determinants of competitive stress. Previous studies on temporal patterns of competitive emotions have adopted a conventional time-to-competition paradigm, which usually involved three to six assessments of athletes' emotional states across a certain period of time before or after a competition (e.g., Donzelli et al., 1990; Gould et al., 1984; Jones et al., 1991). This methodology has been proven to be efficient for the analysis of temporal patterns of competitive emotions and their relationship to some stable personal and situational variables. However, this method was not deemed to be particularly suited for detecting fine-grained temporal relationships between emotions and changeable antecedents and moderators. For this purpose, the ESM, involving a substantial number of frequent repeated measures that take place in the participants' natural environment, was considered to be more appropriate. However, since there were some concerns about the possibility that this method would alter athletes' emotional state prior to a competition, it was necessary to establish whether this powerful process-oriented research tool could be implemented for the study of competitive stress.

### 6.12 Summary of the studies

The issues identified above were addressed in form of four separate studies. The first study (Chapter 3) examined the appropriateness of the ESM, the conventional time-to-competition paradigm and retrospective measurements for analysing the dynamic aspects of pre-competitive stress. It also studied the temporal patterns of pre-competitive emotions and cognitive intrusion in male Tae Kwon Do practitioners. Results revealed that the ESM constitutes the most appropriate method for the in-depth examination of complex dynamic aspects of the competitive process. With respect to retrospective assessments, it was concluded that they provide a reliable general idea about athletes' pre-competitive emotional states but they cannot reveal finer temporal and qualitative aspects of athletes' emotional experience. Analysis of the temporal patterns of pre-competitive emotions in male Tae Kwon Do practitioners showed that their pre-competitive emotional experience was characterised by positive emotions of moderate intensity. As the competition approached, emotional states of different hedonic tone denoting readiness to compete increased in intensity and reached their peak one hour before the contest. Although anxiety symptoms as measured by the CSAI-2 were on average considered facilitative to performance, substantial intra-individual differences were observed. This suggested that qualitative differences between facilitative and debilitative anxiety patterns and factors determining them needed to be analysed and the construct validity of the CSAI-2 needed to be tested.

The second study (Study 1a - Chapter 4) was based on data collected in the first investigation. Its scope was to test some of the propositions presented in the interactional model of competitive stress regarding the definition and directional interpretation of competitive anxiety. Results supported the hypothesis that competitive anxiety is not a unitary emotion but a complex changeable emotional state, which is determined by situational and personal factors.

In order to analyse further the proposed definition of anxiety and determine whether and to what extent the findings obtained in the second study were due to the suspect metric characteristics of the CSAI-2, a third study was conducted (Study 2 - Chapter 4). A battery of questionnaires comprising the somatic and cognitive subscales of the CSAI-2, the DES-IV, the STAI, a functionality of emotions one-item scale and two items assessing level of challenge and threat was administered to a group of 202 male and female athletes competing in individual sports. They were tested on recalled pre-competitive emotions experienced before their worst and best competition ever and momentary pre-competitive emotions experienced one hour before a competition. The study gave additional support to the contention that competitive anxiety, as currently measured, is not a unitary and clearly definable emotion but a complex ambiguous and changeable emotional state. Results from this study also suggested that the cognitive subscale of the CSAI-2 has poor construct validity and its use should be avoided. In contrast, it was found that the DES-IV constitutes a valid and informative instrument for the study of athletes' emotional responses to competition. It was concluded that, from a practical and theoretical viewpoint, there is not much sense in focusing on the complex and controversial affective phenomenon of anxiety without considering other important aspects of an individual's emotional experience.

The purpose of the fourth and final study (Study 3 - Chapter 5) was to integrate and elaborate further the findings from the previous three studies with regard to the interactional model of competitive stress. The ESM was employed to examine some of the hypothesised situational and personal determinants of pre- and post-competition discrete emotions. Specifically, the effect of extraversion, neuroticism and competitive trait anxiety on intensity and temporal patterns of pre- and post-competition emotions and the relationship between some aspects of primary and secondary cognitive appraisal and athletes' emotional responses were examined. Also the impact of the competitive event on athletes' psychological state was compared to that of competition-extraneous sources of concern. Results showed that the competitive event was on average one of the most important and most stressful episodes that athletes experienced in the examined period. Analysis of pre- and post-competition sources of concern and emotional states revealed that the competition was mainly perceived as a positive challenging event, which also encompassed some elements of threat and psychological discomfort. Temporal proximity to competition, type and cognitive appraisal of sources of concern, expected and actual performance, neuroticism, extraversion and competitive trait anxiety determined magnitude and/or temporal patterns of athletes' pre- and post-competition emotional states. Overall, this study demonstrated the complexity of competitive stress and the importance of adopting an interactional multivariate multilevel process-oriented approach to the study of the athlete-competition relationship.

## 6.13 Theoretical and practical implications and future research avenues

Several theoretical and practical implications emerge from this thesis, the first being related to the advantages associated with the adoption of a interactional multivariate process-oriented approach, as initially proposed by Folkman and Lazarus (1984), to the study of competitive stress. The present investigations showed that competition-related cognitive appraisals and emotional states do change over time. The changes in profiles of emotions and cognitions reflect the momentary importance that athletes attribute to the competitive event, as compared to other sources of concern, as well as athletes' perceived ability to cope with the demands of the competition. For example, the fact that fear increased as the competition approached and that these increments were associated with competition-related but not with competition-extraneous concerns indicates that the contest was on average the most threatening event that the examined group of martial artists experienced during the period of testing. It is important to note that, whilst a process analysis allowed the comparison between the competition and other stressful events in terms of the impact that they exerted on athletes' psychological state, a single assessment of athletes' emotional states would not have permitted such a comparison. Additionally, given the considerable number of factors that can influence an individual's emotional state, a process analysis of competitive stress can help reach a more reliable conclusion as to whether a certain emotional profile is to be attributed to a certain episode, situation or cognition. To illustrate, research has shown that emotional states are liable to systematic weekly and daily fluctuations. Positive emotions are more elevated on weekends than weekdays (Stone, 1987), whilst positive affects associated with higher activation peak in the afternoon and positive affects associated with the dimension of pleasantness reach their maximum in the evening (Egloff, Tausch, Kohlmann, & Krohne, 1995). It follows that Saturday afternoon assessments of athletes' emotional states may yield significantly different results than Wednesday morning assessments, without these differences being caused by an external event. By adopting a process-oriented approach and assessing emotions at different times a day for several days, cyclical diurnal variations can be differentiated from event-caused changes in emotional states. Apart from allowing the analysis of the magnitude and temporal course of emotional states, a process analysis can also discover interindividual differences that would otherwise remain undetected. For example, Fenz and associates (Fenz, 1975; Fenz & Epstein, 1967; Fenz & Jones, 1972) have shown that the temporal pattern of physiological response before a sky dive, rather than the mean intensity, could differentiate more experienced from less experienced parachutists. Similarly, results from Study 1 revealed several significant Time by Group interaction effects on pre-competitive emotions without observing significant Group main effects. Also, Study 1a revealed a significant time to competition by neuroticism interaction effect on cognitive anxiety direction, but no significant neuroticism main effects. Finally, Study 3 showed six significant Time by Personality trait interaction effects on pre- or post-competition emotions without, at the same time, detecting a significant personality trait main effect on the same emotions. All these findings support the importance of adopting a process-oriented approach to the study of competitive stress. It is hoped that future research will continue on this path.

The observed mediating effects of personality factors on temporal patterns of pre- and post-competitive emotions introduce another theoretical issue regarding the necessity of adopting an interactional approach to competitive stress. As mentioned earlier, the interactional model of competitive stress posits that cognitive appraisal of the competitive situation is determined by a set of situational and personal factors that interact to produce an individual's response to the competitive event. In this regard, Study

1a found that neuroticism and competitive trait anxiety moderated the effect of temporal proximity to competition on cognitive anxiety direction. Additionally, temporal proximity to competition and competitive trait anxiety exerted a main effect on cognitive anxiety direction. Study 3 showed that neuroticism and competitive trait anxiety moderated the effects of temporal proximity to competition, context of sources of concern and perceived self-referenced performance on pre- and post-competition emotional states. Overall, these results indicate that, for the sake of a better understanding of athletes-competition relationship and a better prediction of emotion functionality, both situational and personal factors need to be accounted for.

From a practical viewpoint, the adoption of a process-oriented approach can help sport psychologists analyse athletes' cognitive appraisals of sources of stress, emotional reactions and coping modes and so greatly assist with the construction of adequate individual-oriented intervention programmes. In addition, a process analysis can help sport psychologists reliably evaluate the efficacy of these programmes. For example, daily diaries of stressful events, competition-related cognitions, coping attempts and emotional responses throughout a tournament can provide invaluable information about an athlete-competition relationship, the main sources of stress encountered and the efficiency of the athlete's coping strategies. Also, a process analysis of the effects of mental practice on various aspects of an athlete's performance permits a reliable assessment of the efficacy of the technique employed. With regard to the interactional nature of the competitive process, the findings from the present studies indicate that, in order to construct adequate intervention programmes, sport psychologists need to take into account both situational and personal factors. For example, it is important to analyse the specific demands of a particular sport on the participants. As observed earlier, the contact open-skilled subjectively scored sports of Tae Kwon Do and Karate greatly differ from the non-contact close-skilled objectively scored sports of rifle-shooting (Prapavessis & Grove, 1994) or running (Durtschi & Weiss, 1984; Wiggins, 1998). These between-sport differences partly determine the "typical" and the "optimal" emotional states that the participants experience prior to competition. Consequently, pre-competition mental preparation techniques will differ from sport to sport in both aim and structure. Apart from accounting for sport-specific situational factors, sport psychologists should acknowledge the fact that individuals differ in their reactions to various aspects of the competitive event. For example, the present studies have shown that competitive trait anxious martial artists are more susceptible to negative emotional states before and after the competitive event, regardless of their expected or actual performance. This indicates that they might benefit from pre- and post-competition stress management interventions and psychological skills training. In contrast, low-anxious martial artists may be exempted from this type of intervention, as they react very positively to the competition. Other studies have identified differential reactions to competitive stress with respect to gender (Swain & Jones, 1993), locus of control (Hall, 1980), neuroticism, hardiness (Prapavessis & Grove, 1994) and skill level (Perkins & Williams, 1994). Acknowledging the importance of these factors as determinants of the competitive process helps ensure the construction and implementation of efficient individual-oriented intervention programmes.

Given the scarcity of findings on competitive stress as a process, the implications for future research are countless. Here, only a few will be briefly outlined. For example, future studies may want to examine the moderating effects of various situational and personal variables such as level of competition, type of sport, duration of competition, gender, skill level and the personality dispositions of sensation seeking, conscientiousness and self-confidence on the various components of competitive stress. Diurnal and weekly variations in competition-related and competition-extraneous emotional states need to be also examined. In this regard, the advantages associated with the use of a polynomial trend analyses of temporal patterns of competitive emotions, as compared to the usual linear analyses, need to be explored. Another interesting research direction regards the analysis of competition-school, competition-family or competition-work spillover, which refers to the correlation between the quality of experiences experienced in the sport-competition domain and the family, work or school domains. These investigations would enable establishment of the effects of competition-extraneous sources of concern on performance and competition-related emotional states. As far as post-competition stress is concerned, more research on the intuitive and reflective attributional appraisals and their effect on magnitude and temporal patterns of post-competition emotions is needed. In this respect, it would be, for instance, interesting to explore the differences between individual and team sports, objectively scored and subjectively scored sports, genders and individuals with different personality dispositions. Additionally, as the present thesis did not specifically examine the coping component of competitive stress, future studies may want to analyse the use and efficacy of problem-focused and emotion-focused coping strategies pre- and post-competition in different sports and in athletes with different personality dispositions. More research is also needed in relation to primary and secondary cognitive appraisal dimensions and their effect on athletes' emotional response. Specifically, the relationship between the appraisal dimensions of goal relevance, goal congruence, type of ego-involvement, blame or credit, coping potential and future expectations and specific competition-related emotional profiles need to be examined. The totality of these investigations would offer a realistic and thorough picture of the competitive process.

A third major theoretical and practical implication emerging from this research regards the necessity of measuring a wide spectrum of easily definable emotions instead of relying on measurements of single complex emotional states, such as anxiety. As repeatedly mentioned in this thesis, most of the existent literature on pre-competitive emotions and competitive stress consists of studies on competitive anxiety. However, it has been shown that anxiety is not the only emotional state associated with a competitive situation. A wide range of discrete emotions comprising joy, interest/excitement, sadness, guilt, shame, shyness, surprise, self-hostility, pride, disgust and anger accompany pre- and post-competition experiences. As Lazarus (1993) noted, these discrete emotions convey fundamental information about the existing relationship between the individual (athletes) and the environment (competition). Focusing solely on anxiety denies the possibility of analysing athletes' perception of the benefits, threats and harms associated with the competitive event. It tells nothing about whether an attribution of accountability or responsibility for the perceived harms or benefits has been made. Nor does it provide unequivocal information about athletes' perception of their coping abilities and future expectations. Additionally, the fact that anxiety is a complex and changeable emotional state, which is associated with both challenge and threat appraisals, adds to the necessity of analysing more than one emotion with clearly defined action tendencies. In this regard, the present studies have shown that measures of emotions such enjoyment, interest, fear, guilt, self-hostility and sadness provide a much clearer picture of the nature of the athlete-competition relationship, as compared to single-scale anxiety measures. These observations suggest that future research on competitive stress should examine a wide spectrum of discrete emotions varying in hedonic tone and activation level. Also, future studies may want to analyse and test further the proposed model of debilitative and facilitative patterns of anxiety in terms of primary and secondary appraisals associated with differential patterns of anxiety and the effects of these anxiety patterns on performance.

The necessity and utility of assessing more than one discrete emotion other than anxiety also applies to sport psychologists in practice. Relying exclusively on the existing measures of anxiety can result in a limited and distorted picture of athletes' emotional responses to competition with no indication of athletes' underlying motivation for sport participation. This, in turn, can result in a poor understanding of athletes' needs and, consequently, in the construction of inadequate intervention programmes.

## 6.2 Conclusions

The main purpose of this thesis has been to examine specific aspects of competitive stress with particular emphasis on the emotional component of the stress process. For this purpose, a multivariate multilevel interactional process-oriented approach that views competitive stress as a complex process that unfolds over time and advocates the simultaneous analysis of a broad range of discrete emotions has been adopted. Results have provided evidence for the utility of this approach and for the appropriateness of the ESM as a research tool for a process-oriented study of competitive stress. It has been shown that temporal, situational and personal factors moderate the magnitude, patterns and functionality of pre- and post-competitive emotions. Specifically, temporal proximity to competition, type and cognitive appraisals of sources of concern, expected performance, neuroticism, extraversion and competitive trait anxiety determined magnitude and/or temporal patterns of pre-competition emotional states. Type and cognitive appraisal of sources of concern, temporal proximity to competition, competitive trait anxiety and self-referenced performance predicted post-competition emotions.

The traditional conceptualisation of competitive state anxiety has been challenged by suggesting that the current psychometric measurement, namely the cognitive subscale of the CSAI-2, is inadequate as it confounds positive challenge-related emotions with threat-related emotions. Additionally, it has been shown that anxiety is a complex, ambiguous and variable affective phenomenon that cannot provide clear information about the athlete-competition relationship. In contrast, it has been found that DES-IV, an instrument gauging the whole range of fundamental emotions as defined by the DET, constitutes a valid and informative instrument for the study of athletes' emotional responses to competition.

There are a host of questions arising from this research, which is inevitable given the preliminary and exploratory nature of a number of investigations. Future studies will hopefully clarify these issues and continue to foster a more complete understanding of this complex phenomenon.

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## APPENDIX 1

**Example of letter sent to Tae Kwon Do main instructors as part of the participant recruitment procedure**

**Club name**
**Address**

*For the attention of the main instructor*

Nottingham, 1 April 1999

***Dear "main instructor's name",***

My name is Ester Mataija and I am a PhD student at the Nottingham Trent University. As part of my dissertation I am studying the effects of competitive anxiety and other emotional states on performance in martial arts. In order to construct efficient mental training programmes we need to examine the emotional states that facilitate performance at beginner and intermediate level.

Hence, we would greatly appreciate if your institution would collaborate in providing the participants for the study. Actually, all the participants would benefit from participation since they would be offered a free personalised 3 x 2 hours workshop on mental preparation strategies for competition. Besides, upon publication of the data obtained from the study, your institution would be publicly acknowledged for its special contribution to sport science.

I would appreciate a reply from you as soon as possible, so that we can proceed with the recruitment procedures, or, in case you prefer not to collaborate, direct our efforts elsewhere

Please find enclosed the introductory letter (brief description of the study) and some recruitment and study material that would be used in the investigation.

Yours faithfully,

Ester Mataija
PhD candidate
The Nottingham Trent University
Department of Life Sciences
Clifton Lane
NG11 8NS

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Tel. & fax home (after 19.00h): (0115) 965 4428
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emataija@hotmail.com

## APPENDIX 2

### Introductory letter for participant recruitment

Nottingham, 31 March 1999

Dear Athlete,

As part of my Ph.D. dissertation, I am studying the evolution of precompetitive anxiety and mood. Considering the negative impact that competitive anxiety may have on athletic performance, the results obtained from the present study will represent a contribution to the development of appropriate interventions aimed at the regulation of competitive anxiety. By participating in the study you will contribute to the future well-being of all athletes. Consequently, I warmly invite you to do so. As a reward for your participation, I will provide you with a summary of the results emerging from this study and you will be invited to participate in three 2-hour (FREE) workshops on psychological preparation for sport.

If you encounter any problem or have any questions, you can contact me whenever you want at the addresses or telephone numbers below. If you wish, you may also contact my director of studies, Dr. Attila Szabo at the address or phone number reported below.

Thank you very much for your time and participation.

Yours faithfully,

Ester Mataija
PhD candidate
The Nottingham Trent University
Department of Life Sciences
Tel. Home: (0115) 9654428 - Work: (0115) 8483454

Director of studies:
Dr. Attila Szabo
The Nottingham Trent University
Department of Life Sciences
Tel. Work: (0115) 8483362

## APPENDIX 3

## INFORMED CONSENT FORM

Ester Mataija, who is a postgraduate researcher at the Department of Life Sciences of The Nottingham Trent University, has requested my participation in a research study on the dynamic aspects of competitive anxiety and affects.

My participation will involve:

1.) Completion of three questionnaires upon my agreement to participation
2.) A 15-minute interview at the end of the study
3.A.) If I am assigned to experimental group A:
    3.1.) Completion of two brief questionnaires three (3) random times a day, between 9.00 a.m. and 9.00 p.m., over a period of one week before a major competition in which I participate
    3.2.) Completion of two brief questionnaires 1 hour before the competition
    3.3.) Completion of 4 x 2 brief questionnaires 2 days after the competition
3.B.) If I am assigned to experimental group B:
    3.1.) Completion of two brief questionnaires 1 week, 4 days, 1 day, and 1 hour before competition
    3.2.) Completion of 4 x 2 brief questionnaires 2 days after the competition
3.C.) If I am assigned to experimental group C:
    3.1.) Completion of 4 x 2 brief questionnaires two days after the competition

- ♦ I understand that there are no foreseeable risks of discomfort related to my participation in this study.
- ♦ I understand that I am free to withdraw my consent and discontinue participation at any time without negative consequences.
- ♦ I understand that my participation in this study is confidential.
- ♦ I understand that the results of this study may be published.
- ♦ I understand the purpose of this study and I was informed that there is no hidden motives related to my participation.

I have carefully studied the above conditions and understand and agree to participate in this study.

(Please print)

Name: Signature:

_______________________________________________

Witness name: Witness signature:

_______________________________________________

Date:

_______________________________________________

## APPENDIX 4

### Demographic Questionnaire

THIS INFORMATION WILL BE KEPT STRICTLY CONFIDENTIAL

Name: Surname:

___

Age: Height: Weight:

___

Address:

___

Phone:

Day: ________________ Mobile: ________________

Evening: ______________

Best (preferred) time of contact: (days of the week; time of the day):

___

For how long (years, months) have you been training in martial arts regularly?

___

What is your level of sport participation? (Circle the answer that applies to you).
a) recreational
b) competitive - regional level
c) competitive - national level

How would you rate your current performance in martial arts in relation to your ultimate goals?
a) extremely poor
b) poor
c) average
d) good
e) excellent

How much do you think you could improve your performance in martial arts in the near future (6 months)?
a) no improvements
b) slight improvements
c) moderate improvements
d) great improvements

Why did you take up martial arts (e.g. enjoyment, health, etc.)?

___

Why do you currently train martial arts?

___

## APPENDIX 5

## SCAT and accompanying instructions

The effect of highly competitive sports can be powerful and very different among athletes. The inventory you are about to complete measures how you generally feel about competition. Please complete this inventory as honestly as you can. Sometimes athletes feel they should not admit any nervousness, anxiety, or worry about competition because this is undesirable. Actually, these feelings are quite common, and to help us understand them we want you to share your feelings with us candidly. If you are worried about the competition or have butterflies or other feelings that you know are signs of anxiety, please indicate these feelings accurately on the inventory. Similarly, if you feel calm and relaxed, indicate these feelings as accurately as you can. Your answer will not be shared with anyone. We will be looking only at group responses.

### Illinois Competition Questionnaire

Form A

Directions:

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 labelled A, if your choice is SOMETIMES, blacken the square labelled B, and if your choice is OFTEN, blacken the square labelled 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 ***sports and games***.

| | | | |
|---|---|---|---|
| 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 sportsman 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 ☐ |

## APPENDIX 6

### Example of items from the NEO PI-R (Form S) and accompanying instructions

*Instructions from the Item Booklet - Form S of the Revised NEO Personality Inventory (NEO PI-R; Costa, McCrae, 1992)*

Please read all these instructions carefully before beginning. Mark all your answers on the answer sheet and write only where indicated. DO NOT write in this test booklet.

On the accompanying answer sheet, please write your name in the space provided. Indicate your sex by placing a check in the appropriate box under "Sex". Enter the date and your identification number, if you have been given one, in the spaces provided. Check "Yourself" in the space labelled "Person being rated" since you are describing yourself. Write in your age and check the box next to "S" in the space labelled "NEO Form".

This questionnaire contains 240 statements. Please read each item carefully and circle one answer that best corresponds to your agreement or disagreement.

Circle "SD" if the statement is definitely false or if you strongly disagree.
Circle "D" if the statement is mostly false or you disagree.
Circle "N" if the statement is about equally true or false, if you cannot decide, or if you are neutral on the statement.
Circle "A" if the statement is mostly true or if you agree.
Circle "SA" if the statement is definitely true or if you strongly agree.

There are no right or wrong answers, and you need not be an "expert" to complete this questionnaire. Describe yourself honestly and state your opinions as accurately as possible.

Answer every item. Note that the answers are numbered down the columns on the answer sheet. Please make sure that your answer is marked in the correctly numbered space. If you make a mistake or change your mind, DO NOT ERASE IT! Make an "X" through the incorrect response and then draw a circle around the correct response. After you have answered the 240 items, answer the three questions labelled A, B, and C on the answer sheet. Turn to page 3 in this booklet and begin with item 1.

*Sample of items:*

1. I am not a worrier.
2. I really like most people I meet.
22. I often crave excitement.
35. I don't take civic duties like voting very seriously.
44. I try to be courteous to everyone I meet.
57. I have sometimes experienced intense joy or ecstasy.
81. I have little difficulty resisting temptation.
87. I am not a cheerful optimist.
103. I seldom pay much attention to my feelings of the moment.
179. I believe all human beings are worthy of respect.

# APPENDIX 7

## Questionnaires for the retrospective assessments of pre-competitive emotions and cognitive intrusion and accompanying instructions

The sets of questionnaires comprised:
a) Positive-Negative Affects Questionnaire
b) Percentage of thinking time
c) Modified version of the CSAI-2 (cognitive and somatic anxiety only)

These questionnaires were administered to all experimental groups two days after the competition. Participants had to complete the same set of questionnaires according to how they felt 1 week, 4 days, 1 day and 1 hour before the competition.

The set of questionnaires reported in this appendix was used to retrospectively assess pre-competitive emotions and cognitive intrusion 1 week before the competition. For the other pre-competitive periods tested (4 days, 1 day and 1 hour prior to competition), the questionnaires remained the same, but the instructions were modified accordingly.

**Name:** ______________ **Surname:** ____________________
**Date** __________ **1999 Time of completion** ____________

**1 WEEK BEFORE COMPETITION**

a)
Please indicate how you felt **1 week before competition** by using the rating scale below:

| not at all **1 2 3 4 5 6 7** extremely much |
|---|

1. Angry/hostile ___
2. Happy ___
3. Irritated ___
4. Frustrated ___
5. Pleased ___
6. Guilty ___
7. Energetic ___
8. Stressed ___
9. Depressed/blue ___
10. Joyful ___
11. Unhappy ___
12. Worried/Anxious ___
13. Relaxed ___
14. Enjoyment/having fun__

b)
**To what extent was the competition occupying your mind at that stage?**

(Please rate this in terms of a percentage, by circling the appropriate value below.)

% % %

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100

c)

A number of statements that athletes have used to describe their feelings before competition are given below. The questionnaire is divided into 2 sections. Read each statement and then write the appropriate number, in each of the two sections, to the right statement to indicate **HOW YOU FELT 1 WEEK BEFORE COMPETITION** (Column 1, shaded). There are no right or wrong answers. Do not spend too much time on any one statement, but choose the answer which describes your feelings at that time using the rating scale below:

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| **not at all** | **somewhat** | **moderately so** | **very much so** |

Indicate how much you considered your feeling as being negative or positive in relation to your upcoming performance (Column 2 – not shaded) using the rating scale below (NB. if you have scored "1" – not at all- on the first scale, then respond in relation to that feeling e.g. If you respond "not at all" to question 5, then you would respond on this scale as if you did not feel jittery.):

| -3 | -2 | -1 | 0 | +1 | +2 | +3 |
|---|---|---|---|---|---|---|
| **very negative** | | | **unimportant** | | | **very positive** |

| Statement | intensity of feeling (1) | affects performance (2) |
|---|---|---|
| 1. I was concerned about this competition. | | |
| 2. I felt nervous. | | |
| 3. I had self-doubts. | | |
| 4. I felt jittery. | | |
| 5. I was concerned I might not do as well in that competition as I could. | | |
| 6. My body felt tense. | | |
| 7. I was concerned about losing. | | |
| 8. I felt tense in my stomach. | | |
| 9. I was concerned about choking under pressure. | | |
| 10. My body felt relaxed. | | |
| 11. I was concerned about performing poorly. | | |
| 12. My heart was racing. | | |
| 13. I was concerned about reaching my goal. | | |
| 14. I felt my stomach sinking. | | |
| 15. I was concerned that others would be disappointed with my performance. | | |
| 16. My hands were clammy. | | |
| 17. I was concerned I wouldn't be able to concentrate. | | |
| 18. My body felt tight. | | |

# APPENDIX 8

## Questionnaires for the momentary assessment of pre-competitive emotions and cognitive intrusion of the Repeated Measurements group

The sets of questionnaires comprised:
a) Positive-Negative Affects Questionnaire
b) Percentage of thinking time
c) Modified version of the CSAI-2 (cognitive and somatic anxiety only)

These questionnaires were administered to the Repeated Measurement group 1 week, 4 days, 1 day and 1 hour before the competition.

**Name:** ______________ **Surname:** ____________________
**Date** __________ **1999 Time of completion** ____________

A)
Please indicate how you feel ***at this very moment*** by using the rating scale below:

| not at all **1 2 3 4 5 6 7** extremely much |
|---|

1. Angry/hostile ___
2. Happy ___
3. Irritated ___
4. Frustrated ___
5. Pleased ___
6. Guilty ___
7. Energetic ___
8. Stressed ___
9. Depressed/blue ___
10. Joyful ___
11. Unhappy ___
12. Worried/Anxious ___
13. Relaxed ___
14. Enjoyment/having fun __

B)
**To what extent is the competition occupying your mind at this stage?**

(Please rate this in terms of a percentage, by circling the appropriate value below.)

% % %

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100

C)

A number of statements that athletes have used to describe their feelings before competition are given below. The questionnaire is divided into 2 sections. Read each statement and then write the appropriate number, in each of the two sections, to the right statement to indicate **HOW YOU FEEL RIGHT NOW** (Column 1, shaded). There are no right or wrong answers. Do not spend too much time on any one statement, but choose the answer which describes your feelings right now using the rating scale below:

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| **not at all** | **somewhat** | **moderately so** | **very much so** |

Indicate how much you consider your feeling as being negative or positive in relation to your upcoming performance (Column 2 – not shaded) using the rating scale below (NB. if you have scored "1" – not at all- on the first scale, then respond in relation to that feeling e.g. If you respond "not at all" to question 5, then you would respond on this scale as if you did not feel jittery.):

| -3 | -2 | -1 | 0 | +1 | +2 | +3 |
|---|---|---|---|---|---|---|
| **very negative** | | | **unimportant** | | | **very positive** |

| Statement | intensity of feeling (1) | affects performance (2) |
|---|---|---|
| 1. I am concerned about this competition. | | |
| 2. I feel nervous. | | |
| 3. I have self-doubts. | | |
| 4. I feel jittery. | | |
| 5. I am concerned I may not do as well in this competition as I could. | | |
| 6. My body feels tense. | | |
| 7. I'm concerned about losing. | | |
| 8. I feel tense in my stomach. | | |
| 9. I am concerned about choking under pressure. | | |
| 10. My body feels relaxed. | | |
| 11. I'm concerned about performing poorly | | |
| 12. My heart is racing | | |
| 13. I am concerned about reaching my goal. | | |
| 14. I feel my stomach sinking. | | |
| 15. I am concerned that others will be disappointed with my performance. | | |
| 16. My hands are clammy. | | |
| 17. I'm concerned I won't be able to concentrate. | | |
| 18. My body feels tight. | | |

## APPENDIX 9

## Questionnaires for the momentary assessment of pre-competitive emotions and cognitive intrusion of the Experience Sampling Method group

The ESM group was assessed three times a day in the week preceding the competition and 1 hour before the event. These 22 sets of questionnaires were contained in a 14 x 21 cm booklet. In this appendix, general instructions and sets of questionnaires for the first assessment on the first day of the study, second assessment on the fifth day of the study and for the day of the competition are reported.

## BOOKLET

*Page 1*

***Dear Athlete,***

Thank you for your participation in this study.

Before giving you some instructions, I would like to remind you that, upon completion of the study, you will be invited to attend three workshops, at no cost to you, each lasting about two hours. These workshops will be on the techniques of psychological preparation for sport.

Ester Mataija

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*Page 2*

**General instructions for week 1 and day of competition**

Your participation in the first week of the study will include:

1. Completion of two questionnaires at three random times a day between 9.00 a.m. and 9.00 p.m. upon the reception of a signal from your pager. You should try to complete

the two questionnaires as soon as possible, but not later than 30 minutes after the pager sounds off.

Your participation on the day of competition will include:

1. Completion of two questionnaires 1 hour before the competition.
2. Returning the completed booklet and pager on the day of competition to the researcher.

<u>Page 3</u>

### *DETAILED INSTRUCTIONS AND EXAMPLE*

REMEMBER TO CARRY THE PAGER, BOOKLET AND A PEN / PENCIL WITH YOU EVERY DAY FROM 9.00 A.M. TO 9.00 P.M. DURING THE TIME OF THE STUDY.
To ensure that you do not forget the pager and booklet at home, place them with your wrist-watch, purse or any item that you always carry with you.
IN CASE OF PROBLEMS, PLEASE CONTACT IMMEDIATELY THE RESEARCHER.
You will receive 3 calls daily except for Wednesday and Saturday when, immediately after 8.00 p.m., there will be one extra call from the National Lottery with the winning lottery numbers. You may also occasionally receive some calls from users who by mistake dial the number of your pager. Hence, make sure that on Wednesday and on Saturday you do not complete the questionnaires upon the signal of the National Lottery, but ONLY upon the calls from the researcher which will be coded in a particular way. Every call from the researcher will be denoted by a numeric message composed of 3 figures (first screen), the message slot number and the time the message was received (second screen). The 3 figures in the message (fist screen) will denote the week (1), the day of the week (from 1 to 7) and the number of the daily call (1, 2 or 3). Thus, message 123 means first week, second day, 3rd daily call. Message 171 means first week, seventh day, 1st daily call. You will disregard any message not corresponding to the code of the researcher.
When you receive a call from the researcher you will complete the questionnaires, input the time of the call (the time reported on your pager) the actual time of completion (when you started to complete the questionnaires) and few more questions. If you are not able to answer the questionnaires within 30 minutes after the pager sounded off, you should leave the questionnaires blank and write down in the appropriate space the reason why you could not respond.
At the end of each day, after 9.00 p.m., you will erase the read messages from the pager memory slot.
On the day of competition you will complete the two questionnaires 1 hour before the competition. On the same day you will return the completed booklet to the researcher who will be at the competition.
If for any reason you do not want to be disturbed by the sound of the pager select "SILENT Mode". When in Silent Mode, the pager vibrates upon receiving a message instead of emitting a "beep". In this case MAKE SURE that the pager be in contact with your body (belt, pocket) so that you can detect the vibrations.

*Page 4*

**Example:**

Situation: During the second day of the first week of the study you receive your first daily call at 10:32 a.m.

1) Pager sounds or vibrates at 10:32 a.m.
2) Press any button of the pager or wait for 8 seconds
3) Press –. The first screen will display the following message: 121, meaning week 1, day 2, daily call 1.
4) Press – again or wait for 12 seconds. The second screen will display the following data: 01 10:32A, meaning slot number 01, time of call 10:32 a.m.
5) Open your booklet at the appropriate page, i.e. week 1, day 2, call 1 and fill out the sheet (questions, date, time of call, time of completion, questionnaires) immediately. If you are in a meeting or in an impossible situation to complete the questionnaires, you may do it a little later, but not later than 30 minutes after your pager call.
6) You continue your normal daily routine and wait for the next call.

*Page 5*

***HOW TO USE THE PAGER (Grey model)***

**CONTROL BUTTONS**

READ/ON Button (–). Used to read messages and to activate pager functions. Also used to scroll through the hour and the minute digits for time setting.
SELECT / MENU Button (Δ). Used to scroll through the pager menus.

SETTING SILENT / AUDIO MODE

To set SILENT Mode press Δ repeatedly until "SILENT ?" appears on display, then press –. The pager will vibrate for 4 seconds and the speaker symbol on the bottom left corner will disappear. To set AUDIO Mode press Δ until "AUDIBLE ?" is displayed then press –. The pager will emit a "beep" tone and the speaker symbol appears on the bottom left corner. When in AUDIO Mode, the pager emits a "beep" tone upon receiving a message. When in SILENT Mode, the pager vibrates upon receiving a message.

RECEIVING AND READING A MESSAGE

When a message is received, the pager emits an alert and the number of unread messages is displayed. The alert automatically stops after 8 seconds or upon pressing any button. To read messages, press –. The first screen of your message is displayed and the backlight is on (example 222 ). To "freeze" the message, hold – while viewing. A continuation symbol (➢) on the right bottom of the message indicates there are additional screens for that message. To advance the display to the next screen, press –. If no buttons are pressed the display will also automatically advance to the next screen after 12 seconds. The screen following the message is the timestamp screen which shows the time the message was received as well as the message slot number (the order that the message was received) (example 02  13:45P). The pager automatically returns to the STANDBY Mode after 12 seconds if no other buttons are pressed. When an unread message is stored in memory, the pager gives a reminder chirp or vibrates every two minutes.

ERASING MESSAGES

To erase all read press Δ until "ERASE ALL" is displayed, then press –. All unread messages are moved to the first memory slot and carry the new message slot number. You must read a message before it can be erased. Do not erase the message before answering the questionnaires.

In case of problems in handling the pager contact immediately the researchers at the given co-ordinates (see page 1).

Page 6 *(Set of questionnaires for first assessment on the first day of the study- 7 days before the competition)*

**Week 1 – Day 1 – Call 1 (111) Date ________ 1999**
**Time of call ________ Time of completion ________**

Please indicate how you feel ***at this very moment*** by using the rating scale below:

| not at all | **1** | **2** | **3** | **4** | **5** | **6** | **7** | extremely much |
|---|---|---|---|---|---|---|---|---|

1. Angry/hostile ___
2. Happy ___
3. Irritated ___
4. Frustrated ___
5. Pleased ___
6. Guilty ___
7. Energetic ___
8. Stressed ___
9. Depressed/blue ___
10. Joyful ___
11. Unhappy ___
12. Worried/Anxious ___
13. Relaxed ___
14. Enjoyment/having fun __

**To what extent is the competition occupying your mind at this stage?**

(Please rate this in terms of a percentage, by circling the appropriate value below.)

% % %

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100

Page 7

A number of statements that athletes have used to describe their feelings before competition have been given below. The questionnaire is divided into 2 sections. Read each statement and then write the appropriate number, in each of the two sections, to the right statement to indicate **HOW YOU FEEL RIGHT NOW** (Column 1, shaded). There are no right or wrong answers. Do not spend too much time on any one statement, but choose the answer which describes your feelings right now using the rating scale below:

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| **not at all** | **somewhat** | **moderately so** | **very much so** |

Indicate how much you consider your feeling as being negative or positive in relation to your upcoming performance (Column 2 – not shaded) using the rating scale below (NB. if you have scored "1" – not at all- on the first scale, then respond in relation to that feeling e.g. If you respond "not at all" to question 5, then you would respond on this scale as if you did not feel jittery.):

| -3 | -2 | -1 | 0 | +1 | +2 | +3 |
|---|---|---|---|---|---|---|
| **very negative** | | | **unimportant** | | | **very positive** |

| Statement | intensity of feeling (1) | affects performance (2) |
|---|---|---|
| 1. I am concerned about this competition. | | |
| 2. I feel nervous. | | |
| 3. I have self-doubts. | | |
| 4. I feel jittery. | | |
| 5. I am concerned I may not do as well in this competition as I could. | | |
| 6. My body feels tense. | | |
| 7. I'm concerned about losing. | | |
| 8. I feel tense in my stomach | | |
| 9. I'm concerned about choking under pressure. | | |
| 10. My body feels relaxed. | | |
| 11. I'm concerned about performing poorly. | | |
| 12. My heart is racing. | | |
| 13. I am concerned about reaching my goal. | | |
| 14. I feel my stomach sinking. | | |
| 15. I am concerned that others will be disappointed with my performance. | | |
| 16. My hands are clammy. | | |
| 17. I'm concerned I won't be able to concentrate | | |
| 18. My body feels tight. | | |

## APPENDIX 10

## QBASIC PROGRAM FOR OBTAINING A LIST OF MORNING / AFTERNOON / EVENING RANDOM PAGER CALL TIMES AND *SCHEDULE OF RANDOM PAGER CALLS*

### QBASIC PROGRAM FOR OBTAINING A LIST OF MORNING / AFTERNOON / EVENING RANDOM PAGER CALL TIMES

PROGRAM

```
FOR X = 1 TO 7 : PRINT "Day"; X; " "
FOR Y = 0 TO 2
C = 4 * Y
h% = INT ( RND * 4 ) + 9 + C
m% = INT ( RND * 60 )
PRINT h%; " : "; m%; " ";
NEXT Y
NEXT X
```

### *SCHEDULE OF RANDOM PAGER CALLS OBTAINED BY RUNNING THE QBASIC PROGRAM*

| Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | Day 6 | Day 7 |
|---|---|---|---|---|---|---|
| 11:32 | 09:45 | 12:47 | 12:21 | 10:17 | 12:49 | 11:58 |
| 15:17 | 16:42 | 14:57 | 15:46 | 15:38 | 15:59 | 13:32 |
| 18:46 | 17:39 | 20:03 | 17:35 | 18:16 | 20:13 | 17:59 |

## APPENDIX 11

## RELIABILITY OF POSITIVE AFFECTIVITY AND NEGATIVE AFFECTIVITY SCALES

Separate Cronbach alphas were computed for momentary and retrospective assessments by time of assessment (7 days, 4 days, 1 day, 1 hour pre-competition).

### Cronbach alphas for positive affectivity

| | Time to competition | | | |
|---|---|---|---|---|
| Measurements | 1 week | 4 days | 1 day | 1 hour |
| Momentary | 0.85 | 0.89 | 0.91 | 0.88 |
| Retrospective | 0.94 | 0.88 | 0.92 | 0.90 |

### Cronbach alphas for negative affectivity

| | Time to competition | | | |
|---|---|---|---|---|
| Measurements | 1 week | 4 days | 1 day | 1 hour |
| Momentary | 0.88 | 0.84 | 0.81 | 0.75 |
| Retrospective | 0.90 | 0.87 | 0.87 | 0.79 |

## APPENDIX 12

## ONE-WAY ANOVAs TESTING THE SIGNIFICANCE OF DIFFERENCES IN PERSONALITY TRAITS AND DEMOGRAPHIC VARIABLES BETWEEN EXPERIMENTAL GROUPS

Levene's tests (homogeneity of variance) not significant

### Variable: AGE

| Group | M | SE | SD |
|---|---|---|---|
| Pager | 25.00 | 1.34 | 6.29 |
| RM | 25.68 | 1.25 | 5.87 |
| Retro | 23.59 | 1.40 | 6.57 |

| Source | SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Between groups | 50.030 | 2 | 25.015 | 0.641 | 0.530 |
| Within groups | 2458.091 | 63 | 39.017 | | |
| Total | 2508.121 | 65 | | | |

### Variable: TRAINING EXPERIENCE

| Group | M | SE | SD |
|---|---|---|---|
| Pager | 6.64 | 1.04 | 4.86 |
| RM | 5.41 | 0.12 | 0.58 |
| Retro | 5.09 | 1.14 | 5.33 |

| Source | SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Between groups | 29.303 | 2 | 14.652 | 0.644 | 0.529 |
| Within groups | 1434.227 | 63 | 22.766 | | |
| Total | 1463.530 | 65 | | | |

### Variable: EVALUATION OF CURRENT PERFORMANCE

| Group | M | SE | SD |
|---|---|---|---|
| Pager | 3.36 | 0.14 | 0.66 |
| RM | 3.64 | 0.12 | 0.58 |
| Retro | 3.23 | 0.15 | 0.69 |

| Source | SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Between groups | 1.909 | 2 | 0.955 | 2.309 | 0.108 |
| Within groups | 26.045 | 63 | 0.413 | | |
| Total | 27.955 | 65 | | | |

**Variable: EXPECTED IMPROVEMENTS OF PERFORMANCE IN NEAR FUTURE**

| Group | M | SE | SD |
|---|---|---|---|
| Pager | 3.32 | 0.12 | 0.57 |
| RM | 3.55 | 0.14 | 0.67 |
| Retro | 3.73 | 0.10 | 0.46 |

| Source | SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Between groups | 1.848 | 2 | 0.924 | 2.828 | 0.067 |
| Within groups | 20.591 | 63 | 0.327 | | |
| Total | 22.439 | 65 | | | |

**Variable: SCAT (SPORT COMPETITION ANXIETY TEST)**

| Group | M | SE | SD |
|---|---|---|---|
| Pager | 25.00 | 0.76 | 3.55 |
| RM | 24.64 | 0.94 | 4.39 |
| Retro | 26.09 | 0.78 | 3.65 |

| Source | SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Between groups | 25.212 | 2 | 12.606 | 0.837 | 0.438 |
| Within groups | 948.909 | 63 | 15.062 | | |
| Total | 974.121 | 65 | | | |

**Set of variables: PERSONALITY DOMAINS (NEO PI-R)**

**Variable: NEUROTICISM**

| Group | M | SE | SD |
|---|---|---|---|
| Pager | 94.22 | 5.77 | 27.04 |
| RM | 91.55 | 4.40 | 20.63 |
| Retro | 97.27 | 4.61 | 21.62 |

| Source | SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Between groups | 361.303 | 2 | 180.652 | 0.334 | 0.718 |
| Within groups | 34105.682 | 63 | 541.360 | | |
| Total | 34466.985 | 65 | | | |

**Variable: EXTRAVERSION**

| Group | M | SE | SD |
|---|---|---|---|
| Pager | 121.77 | 4.97 | 23.33 |
| RM | 121.09 | 4.22 | 19.78 |
| Retro | 110.32 | 2.11 | 9.89 |

| Source | SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Between groups | 181661.636 | 2 | 908.318 | 2.638 | 0.079 |
| Within groups | 21692.455 | 63 | 344.325 | | |
| Total | 23509.091 | 65 | | | |

**Variable: OPENNESS**

| Group | M | SE | SD |
|---|---|---|---|
| Pager | 118.59 | 3.79 | 17.77 |
| RM | 117.41 | 3.38 | 15.86 |
| Retro | 120.96 | 3.03 | 14.19 |

| Source | SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Between groups | 143.394 | 2 | 71.697 | 0.280 | 0.757 |
| Within groups | 16137.591 | 63 | 256.152 | | |
| Total | 16280.985 | 65 | | | |

**Variable: AGREEABLENESS**

| Group | M | SE | SD |
|---|---|---|---|
| Pager | 119.86 | 3.63 | 17.01 |
| RM | 121.05 | 2.76 | 12.96 |
| Retro | 119.68 | 4.34 | 20.37 |

| Source | SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Between groups | 24.121 | 2 | 12.061 | 0.041 | 0.959 |
| Within groups | 18314.318 | 63 | 290.703 | | |
| Total | 18338.439 | 65 | | | |

**Variable: CONSCIENTIOUSNESS**

| Group | M | SE | SD |
|---|---|---|---|
| Pager | 108.73 | 3.90 | 18.30 |
| RM | 109.77 | 4.45 | 20.85 |
| Retro | 101.55 | 5.88 | 27.57 |

| Source | SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Between groups | 882.636 | 2 | 441.318 | 0.866 | 0.426 |
| Within groups | 32121.682 | 63 | 509.868 | | |
| Total | 33004.318 | 65 | | | |

## APPENDIX 13

## MANOVA, UNIVARIATE ANALYSES AND PAIRWISE COMPARISONS ACCOMPANYING TABLES 3.4 AND 3.5

3 (EXPERIMENTAL GROUP) X 4 (TIME TO COMPETITION) MANOVAs WITH REPEATED MEASURES ON THE 2ND FACTOR ON ESM AND RM GROUPS' MOMENTARY MEASUREMENTS AND RA GROUP'S RETROSPECTIVE ASSESSMENTS

**Variable: POSITIVE AFFECTIVITY – TOTAL SCORE**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.270 | 7.266 | 3 | 59.000 | 0.000 |
| Time * Group | 0.320 | 3.804 | 6 | 120.000 | 0.002 |

TESTS OF BETWEEN-SUBJECTS EFFECTS

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Group | 589.242 | 2 | 294.621 | 2.044 | 0.138 |
| Error | 8793.802 | 61 | 144.161 | | |

**Group: ESM**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.168 | 1.142 | 3 | 17.000 | 0.361 |

MAUCHLY'S TEST OF SPHERICITY

| Effect | Mauchly's W | Chi-Square | df | Sign. | G-G | H-F |
|---|---|---|---|---|---|---|
| Time | 0.504 | 12.158 | 5 | 0.033 | 0.696 | 0.784 |

**Group: RM**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.468 | 5.575 | 3 | 19.000 | 0.006 |

MAUCHLY'S TEST OF SPHERICITY

| Effect | Mauchly's W | Chi-Square | df | Sign. | G-G | H-F |
|---|---|---|---|---|---|---|
| Time | 0.762 | 5.371 | 5 | 0.373 | 0.836 | 0.959 |

PAIRWISE COMPARISON

Factor: TIME

| Pair | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1 week – 4 days | 2.091 | 1.326 | 0.130 | 0.780 |
| 1 week – 1 day | 5.182 | 1.508 | 0.002 | 0.012 |
| 1 week – 1 hour | 3.773 | 1.130 | 0.003 | 0.018 |
| 4 days - 1 day | 3.091 | 1.025 | 0.007 | 0.042 |
| 4 days - 1 hour | 1.682 | 1.221 | 0.183 | 1.000 |
| 1 day - 1 hour | -1.409 | 1.314 | 0.296 | 1.000 |

**Group: RA**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.522 | 6.903 | 3 | 19.000 | 0.002 |

MAUCHLY'S TEST OF SPHERICITY

| Effect | Mauchly's W | Chi-Square | df | Sign. | G-G | H-F |
|---|---|---|---|---|---|---|
| Time | 0.374 | 19.408 | 5 | 0.002 | 0.665 | 0.735 |

PAIRWISE COMPARISON

Factor: TIME

| Pair | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1 week – 4 days | -0.318 | 1.507 | 0.837 | 1.000 |
| 1 week – 1 day | 5.091 | 2.319 | 0.039 | 0.234 |
| 1 week – 1 hour | 9.909 | 2.424 | 0.001 | 0.006 |
| 4 days - 1 day | 5.409 | 1.547 | 0.002 | 0.012 |
| 4 days - 1 hour | 10.227 | 2.155 | 0.000 | 0.000 |
| 1 day - 1 hour | 4.818 | 1.491 | 0.004 | 0.024 |

**Variable: POSITIVE AFFECTIVITY ITEMS**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| BETWEEN SUBJECTS | | | | | |
| Group | 0.552 | 3.618 | 12 | 114.000 | 0.000 |
| WITHIN SUBJECTS | | | | | |
| Time | 0.746 | 7.168 | 18 | 44.000 | 0.000 |
| Time * Group | 0.716 | 1.394 | 36 | 90.000 | 0.105 |

FOLLOW-UP UNIVARIATE TESTS OF BETWEEN-SUBJECTS EFFECTS

| Source | Dependent variable | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|---|
| Group | HAPPY | 14.656 | 2 | 7.328 | 1.619 | 0.206 |
| | PLEASED | 0.586 | 2 | 4.793 | 0.009 | 0.991 |
| | ENERGETIC | 79.538 | 2 | 39.769 | 10.594 | 0.000 |
| | JOYFUL | 13.232 | 2 | 6.616 | 1.052 | 0.356 |
| | RELAXED | 12.437 | 2 | 6.218 | 0.926 | 0.402 |
| | ENJOYMENT | 64.027 | 2 | 32.014 | 5.229 | 0.008 |
| Error | HAPPY | 276.087 | 61 | 4.526 | | |
| | PLEASED | 335.553 | 61 | 5.501 | | |
| | ENERGETIC | 228.988 | 61 | 3.754 | | |
| | JOYFUL | 383.709 | 61 | 6.290 | | |
| | RELAXED | 409.679 | 61 | 6.716 | | |
| | ENJOYMENT | 373.452 | 61 | 6.122 | | |

PAIRWISE COMPARISON

ITEM "Enjoyment"

| Pair | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| ESM – RM | -0.384 | 0.382 | 0.319 | 0.957 |
| RA – RM | 0.818 | 0.373 | 0.032 | 0.096 |
| RA – ESM | 1.202 | 0.382 | 0.003 | 0.009 |

ITEM "Energetic"

| Pair | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| ESM – RM | -0.304 | 0.299 | 0.314 | 0.942 |
| RA – RM | 1.304 | 0.299 | 0.000 | 0.001 |
| RA – ESM | 1.000 | 0.292 | 0.001 | 0.003 |

## Variable: NEGATIVE AFFECTIVITY - TOTAL SCORE

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE
Alpha level: 0.01 (reason: multiple testing)

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.545 | 23.539 | 3 | 59.000 | 0.000 |
| Time * Group | 0.259 | 2.975 | 6 | 120.000 | 0.010 |

TESTS OF BETWEEN-SUBJECTS EFFECTS

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Group | 296.838 | 2 | 148.419 | 1.558 | 0.219 |
| Error | 5810.373 | 61 | 95.252 | | |

**Group: ESM**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.456 | 4.755 | 3 | 17.000 | 0.014 |

MAUCHLY'S TEST OF SPHERICITY

| Effect | Mauchly's W | Chi-Square | df | Sign. | G-G | H-F |
|---|---|---|---|---|---|---|
| Time | 0.534 | 10.816 | 5 | 0.055 | 0.785 | 0.903 |

UNIVARIATE TESTS OF WITHIN-SUBJECTS EFFECTS

| Source | Type III SS | df | MS | F | Sign. | G-G | H-F |
|---|---|---|---|---|---|---|---|
| Time | 261.716 | 3 | 87.239 | 5.487 | 0.002 | 0.005 | 0.003 |
| Error | 906.206 | 57 | 15.898 | | | | |

PAIRWISE COMPARISON

Factor: TIME

| Pair | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1 week – 4 days | 0.380 | 1.465 | 0.793 | 1.000 |
| 1 week – 1 day | -0.891 | 1.375 | 0.525 | 1.000 |
| 1 week – 1 hour | -4.109 | 1.381 | 0.008 | 0.047 |
| 4 days - 1 day | -1.388 | 0.859 | 0.113 | 0.681 |
| 4 days - 1 hour | -4.643 | 1.324 | 0.002 | 0.011 |
| 1 day - 1 hour | -3.255 | 0.927 | 0.002 | 0.011 |

**Group: RM**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.566 | 4.866 | 3 | 19.000 | 0.010 |

MAUCHLY'S TEST OF SPHERICITY

| Effect | Mauchly's W | Chi-Square | df | Sign. | G-G | H-F |
|---|---|---|---|---|---|---|
| Time | 0.286 | 24.678 | 5 | 0.000 | 0.556 | 0.599 |

PAIRWISE COMPARISON

Factor: TIME

| Pair | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1 week – 4 days | -0.727 | 1.132 | 0.528 | 1.000 |
| 1 week – 1 day | -4.909 | 1.977 | 0.022 | 0.129 |
| 1 week – 1 hour | -5.864 | 2.037 | 0.009 | 0.054 |
| 4 days - 1 day | -4.182 | 1.289 | 0.004 | 0.023 |
| 4 days - 1 hour | -5.136 | 1.352 | 0.001 | 0.006 |
| 1 day - 1 hour | -0.955 | 1.056 | 0.376 | 1.000 |

**Group: RA**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.285 | 15.868 | 3 | 19.000 | 0.000 |

MAUCHLY'S TEST OF SPHERICITY

| Effect | Mauchly's W | Chi-Square | df | Sign. | G-G | H-F |
|---|---|---|---|---|---|---|
| Time | 0.278 | 25.272 | 5 | 0.000 | 0.572 | 0.617 |

PAIRWISE COMPARISON

Factor: TIME

| Pair | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1 week – 4 days | 0.045 | 1.183 | 0.970 | 1.000 |
| 1 week – 1 day | -6.409 | 2.324 | 0.012 | 0.071 |
| 1 week – 1 hour | -11.909 | 2.131 | 0.001 | 0.004 |
| 4 days - 1 day | -6.455 | 1.621 | 0.000 | 0.000 |
| 4 days - 1 hour | -11.955 | 1.693 | 0.000 | 0.000 |
| 1 day - 1 hour | -5.500 | 1.230 | 0.000 | 0.001 |

**Variable: NEGATIVE AFFECTIVITY ITEMS**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| BETWEEN SUBJECTS | | | | | |
| Group | 0.337 | 1.392 | 16 | 110.000 | 0.159 |
| WITHIN SUBJECTS | | | | | |
| Time | 0.861 | 9.792 | 24 | 38.000 | 0.000 |
| Time * Group | 0.973 | 1.539 | 48 | 78.000 | 0.045 |

**Variable: PERCENTAGE OF THINKING TIME (COGNITIVE INTRUSION)**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE
Alpha level: 0.01 (reason: multiple testing)

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.948 | 358.054 | 3 | 59.000 | 0.000 |
| Time * Group | 0.282 | 3.276 | 6 | 120.000 | 0.005 |

TESTS OF BETWEEN-SUBJECTS EFFECTS

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Group | 6725.255 | 2 | 3362.628 | 4.867 | 0.011 |
| Error | 42146.874 | 61 | 690.932 | | |

**Group: ESM**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.942 | 92.223 | 3 | 17.000 | 0.000 |

PAIRWISE COMPARISON
Factor: TIME

| Pair | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1 week – 4 days | -3.899 | 5.839 | 0.512 | 1.000 |
| 1 week – 1 day | -33.149 | 5.501 | 0.000 | 0.000 |
| 1 week – 1 hour | -59.983 | 4.920 | 0.000 | 0.000 |
| 4 days - 1 day | -29.250 | 4.523 | 0.000 | 0.000 |
| 4 days - 1 hour | -56.088 | 3.928 | 0.000 | 0.000 |
| 1 day - 1 hour | -29.834 | 3.844 | 0.000 | 0.000 |

**Group: RM**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.922 | 74.902 | 3 | 19.000 | 0.000 |

PAIRWISE COMPARISON
Factor: TIME

| Pair | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1 week – 4 days | -7.955 | 5.332 | 0.151 | 0.906 |
| 1 week – 1 day | -35.909 | 3.984 | 0.000 | 0.000 |
| 1 week – 1 hour | -54.091 | 4.195 | 0.000 | 0.000 |
| 4 days - 1 day | -27.955 | 3.732 | 0.000 | 0.000 |
| 4 days - 1 hour | -46.136 | 4.134 | 0.000 | 0.000 |
| 1 day - 1 hour | -18.182 | 2.042 | 0.000 | 0.000 |

**Group: RA**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.974 | 239.161 | 3 | 19.000 | 0.000 |

PAIRWISE COMPARISON
Factor: TIME

| Pair | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1 week – 4 days | -23.636 | 3.325 | 0.000 | 0.000 |
| 1 week – 1 day | -49.545 | 4.081 | 0.000 | 0.000 |
| 1 week – 1 hour | -76.818 | 3.249 | 0.000 | 0.000 |
| 4 days - 1 day | -25.909 | 3.062 | 0.000 | 0.000 |
| 4 days - 1 hour | -53.182 | 2.581 | 0.000 | 0.000 |
| 1 day - 1 hour | -27.273 | 3.732 | 0.000 | 0.000 |

**Variable: COGNITIVE AND SOMATIC ANXIETY INTENSITY**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| BETWEEN SUBJECTS | | | | | |
| Group | 0.019 | 0.285 | 4 | 122.000 | 0.887 |
| WITHIN SUBJECTS | | | | | |
| Time | 0.715 | 28.136 | 6 | 56.000 | 0.000 |
| Time * Group | 0.448 | 2.742 | 12 | 114.000 | 0.003 |

MAUCHLY'S TEST OF SPHERICITY

| Effect | Variable | Mauchly's W | Chi-Square | df | Sign. | G-G | H-F |
|---|---|---|---|---|---|---|---|
| Time | CAI | 0.557 | 34.996 | 5 | 0.000 | 0.718 | 0.769 |
| | SAI | 0.457 | 46.715 | 5 | 0.000 | 0.660 | 0.709 |

FOLLOW-UP UNIVARIATE TESTS OF WITHIN-SUBJECTS EFFECTS

| Source | Variable | Type III SS | df | MS | F | Sign. | G-G | H-F |
|---|---|---|---|---|---|---|---|---|
| Time | CAI | 1553.451 | 3 | 517.817 | 54.461 | 0.000 | 0.000 | 0.000 |
| | SAI | 3703.726 | 3 | 1234.575 | 105.987 | 0.000 | 0.000 | 0.000 |
| T*G | CAI | 269.495 | 6 | 44.916 | 4.724 | 0.000 | 0.001 | 0.000 |
| | SAI | 326.224 | 6 | 54.370 | 4.668 | 0.000 | 0.002 | 0.001 |
| Error | CAI | 1739.973 | 183 | 9.508 | | | | |
| | SAI | 2131.647 | 183 | 11.648 | | | | |

**Variable: CAI**
**Group: ESM**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.618 | 9.171 | 3 | 17.000 | 0.001 |

PAIRWISE COMPARISON
Factor: TIME

| Pair | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1 week – 4 days | 0.957 | 1.082 | 0.387 | 1.000 |
| 1 week – 1 day | -0.409 | 0.907 | 0.657 | 1.000 |
| 1 week – 1 hour | -4.250 | 1.038 | 0.001 | 0.006 |
| 4 days - 1 day | -1.366 | 0.994 | 0.184 | 1.000 |
| 4 days - 1 hour | -5.208 | 1.218 | 0.000 | 0.000 |
| 1 day - 1 hour | -3.842 | 0.739 | 0.000 | 0.000 |

**Group: RM**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.443 | 5.031 | 3 | 19.000 | 0.010 |

PAIRWISE COMPARISON
Factor: TIME

| Pair | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1 week – 4 days | -1.273 | 0.628 | 0.056 | 0.337 |
| 1 week – 1 day | -3.227 | 1.011 | 0.004 | 0.024 |
| 1 week – 1 hour | -5.455 | 1.345 | 0.001 | 0.006 |
| 4 days - 1 day | -1.955 | 0.841 | 0.030 | 0.180 |
| 4 days - 1 hour | -4.182 | 1.209 | 0.002 | 0.012 |
| 1 day - 1 hour | -2.227 | 0.760 | 0.008 | 0.050 |

**Group: RA**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.826 | 30.113 | 3 | 19.000 | 0.000 |

PAIRWISE COMPARISON
Factor: TIME

| Pair | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1 week – 4 days | -2.818 | 0.533 | 0.000 | 0.000 |
| 1 week – 1 day | -6.773 | 0.789 | 0.000 | 0.000 |
| 1 week – 1 hour | -9.500 | 1.207 | 0.000 | 0.000 |
| 4 days - 1 day | -3.955 | 0.594 | 0.000 | 0.000 |
| 4 days - 1 hour | -6.682 | 1.066 | 0.000 | 0.000 |
| 1 day - 1 hour | -2.727 | 0.787 | 0.002 | 0.012 |

**Variable: SAI**
**Group: ESM**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.709 | 13.791 | 3 | 17.000 | 0.000 |

PAIRWISE COMPARISON
Factor: TIME

| Pair | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1 week – 4 days | -1.124 | 0.763 | 0.157 | 0.942 |
| 1 week – 1 day | -1.558 | 0.854 | 0.084 | 0.500 |
| 1 week – 1 hour | -7.258 | 1.222 | 0.000 | 0.000 |
| 4 days - 1 day | -0.433 | 1.003 | 0.671 | 1.000 |
| 4 days - 1 hour | -6.134 | 1.418 | 0.000 | 0.000 |
| 1 day - 1 hour | -5.701 | 0.940 | 0.000 | 0.000 |

**Group: RM**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.691 | 14.140 | 3 | 19.000 | 0.000 |

PAIRWISE COMPARISON
Factor: TIME

| Pair | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1 week – 4 days | -0.955 | 0.612 | 0.134 | 0.805 |
| 1 week – 1 day | -4.455 | 0.911 | 0.000 | 0.000 |
| 1 week – 1 hour | -9.136 | 1.379 | 0.000 | 0.000 |
| 4 days - 1 day | -3.500 | 0.764 | 0.000 | 0.000 |
| 4 days - 1 hour | -8.182 | 1.232 | 0.000 | 0.000 |
| 1 day - 1 hour | -4.682 | 0.943 | 0.000 | 0.000 |

**Group: RA**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.849 | 35.711 | 3 | 19.000 | 0.000 |

PAIRWISE COMPARISON
Factor: TIME

| Pair | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1 week – 4 days | -2.091 | 0.542 | 0.001 | 0.006 |
| 1 week – 1 day | -7.182 | 1.046 | 0.000 | 0.000 |
| 1 week – 1 hour | -13.364 | 1.272 | 0.000 | 0.000 |
| 4 days - 1 day | -5.091 | 0.928 | 0.000 | 0.000 |
| 4 days - 1 hour | -11.273 | 1.331 | 0.000 | 0.000 |
| 1 day - 1 hour | -6.182 | 1.098 | 0.000 | 0.000 |

**Variable: COGNITIVE AND SOMATIC ANXIETY DIRECTION**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE
Alpha level: 0.01 (multiple testing)

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| BETWEEN SUBJECTS | | | | | |
| Group | 0.090 | 1.436 | 4 | 122.000 | 0.226 |
| WITHIN SUBJECTS | | | | | |
| Time | 0.310 | 4.196 | 6 | 56.000 | 0.001 |
| Time * Group | 0.381 | 2.233 | 12 | 114.000 | 0.014 |

MAUCHLY'S TEST OF SPHERICITY

| Effect | Variable | Mauchly's W | Chi-Square | df | Sign. | G-G | H-F |
|---|---|---|---|---|---|---|---|
| Time | CAD | 0.387 | 56.806 | 5 | 0.000 | 0.627 | 0.667 |
| | SAD | 0.194 | 97.883 | 5 | 0.000 | 0.505 | 0.532 |

## APPENDIX 14

## MANOVA, UNIVARIATE ANALYSES AND PAIRWISE COMPARISONS ACCOMPANYING TABLES 3.6, 3.7 AND 3.8

3 (EXPERIMENTAL GROUP) X 4 (TIME TO COMPETITION) MANOVAs WITH REPEATED MEASURES ON THE 2ND FACTOR ON RETROSPECTIVE ASSESSMENTS

**Variable: POSITIVE AFFECTIVITY – TOTAL SCORE**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.266 | 7.233 | 3 | 60.000 | 0.000 |
| Time * Group | 0.208 | 2.355 | 6 | 122.000 | 0.035 |

TESTS OF BETWEEN-SUBJECTS EFFECTS

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Group | 723.910 | 2 | 361.955 | 2.625 | 0.081 |
| Error | 8550.628 | 62 | 137.913 | | |

**Variable: POSITIVE AFFECTIVITY ITEMS**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| BETWEEN SUBJECTS | | | | | |
| Group | 0.495 | 3.184 | 12 | 114.000 | 0.000 |
| WITHIN SUBJECTS | | | | | |
| Time | 0.803 | 10.210 | 18 | 45.000 | 0.000 |
| Time * Group | 0.544 | 0.955 | 36 | 92.000 | 0.549 |

FOLLOW-UP UNIVARIATE TESTS OF BETWEEN-SUBJECTS EFFECTS

| Source | Dependent variable | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|---|
| Group | HAPPY | 17.708 | 2 | 8.854 | 1.999 | 0.145 |
| | PLEASED | 0.875 | 2 | 0.438 | 0.077 | 0.926 |
| | ENERGETIC | 69.761 | 2 | 34.881 | 9.455 | 0.000 |
| | JOYFUL | 19.275 | 2 | 9.638 | 1.634 | 0.204 |
| | RELAXED | 1.207 | 2 | 0.604 | 0.098 | 0.907 |
| | ENJOYMENT | 74.761 | 2 | 37.380 | 6.430 | 0.003 |
| Error | HAPPY | 275.239 | 62 | 4.439 | | |
| | PLEASED | 350.340 | 62 | 5.651 | | |
| | ENERGETIC | 228.723 | 62 | 3.689 | | |
| | JOYFUL | 365.763 | 62 | 5.899 | | |
| | RELAXED | 382.831 | 62 | 6.175 | | |
| | ENJOYMENT | 360.455 | 62 | 5.814 | | |

PAIRWISE COMPARISON

ITEM "Energetic"

| Pair | Mean difference | SE | Sign. |
|---|---|---|---|
| ESM – RM | -0.447 | 0.293 | 0.132 |
| RA – RM | 0.807 | 0.290 | 0.007 |
| RA – ESM | 1.254 | 0.293 | 0.000 |

ITEM "Enjoyment"

| Pair | Mean difference | SE | Sign. |
|---|---|---|---|
| ESM – RM | -0.636 | 0.368 | 0.089 |
| RA – RM | 0.682 | 0.363 | 0.065 |
| RA – ESM | 1.318 | 0.368 | 0.001 |

**Variable: NEGATIVE AFFECTIVITY - TOTAL SCORE**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE
Alpha level: 0.01 (reason: multiple testing)

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.624 | 33.189 | 3 | 60.000 | 0.000 |
| Time * Group | 0.185 | 2.069 | 6 | 122.000 | 0.062 |

TESTS OF BETWEEN-SUBJECTS EFFECTS

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Group | 378.681 | 2 | 189.341 | 1.935 | 0.153 |
| Error | 6066.957 | 62 | 97.854 | | |

**Variable: NEGATIVE AFFECTIVITY ITEMS**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| BETWEEN SUBJECTS | | | | | |
| Group | 0.285 | 1.164 | 16 | 112.000 | 0.308 |
| WITHIN SUBJECTS | | | | | |
| Time | 0.883 | 12.316 | 24 | 39.000 | 0.000 |
| Time * Group | 0.820 | 1.159 | 48 | 80.000 | 0.277 |

**Variable: PERCENTAGE OF THINKING TIME (COGNITIVE INTRUSION)**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE
Alpha level: 0.01 (reason: multiple testing)

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.962 | 500.205 | 3 | 60.000 | 0.000 |
| Time * Group | 0.191 | 2.152 | 6 | 122.000 | 0.052 |

TESTS OF BETWEEN-SUBJECTS EFFECTS

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Group | 4968.970 | 2 | 2484.485 | 4.824 | 0.012 |
| Error | 31929.491 | 62 | 514.992 | | |

**Variable: COGNITIVE AND SOMATIC ANXIETY INTENSITY**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| BETWEEN SUBJECTS | | | | | |
| Group | 0.036 | 0.573 | 4 | 124.000 | 0.682 |
| WITHIN SUBJECTS | | | | | |
| Time | 0.812 | 41.109 | 6 | 57.000 | 0.000 |
| Time * Group | 0.252 | 1.395 | 12 | 116.000 | 0.178 |

**Variable: COGNITIVE AND SOMATIC ANXIETY DIRECTION**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE
Alpha level: 0.01 (multiple testing)

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| BETWEEN SUBJECTS | | | | | |
| Group | 0.086 | 1.389 | 4 | 124.000 | 0.242 |
| WITHIN SUBJECTS | | | | | |
| Time | 0.374 | 5.666 | 6 | 57.000 | 0.000 |
| Time * Group | 0.385 | 2.305 | 12 | 116.000 | 0.012 |

## APPENDIX 15

## MANOVA, UNIVARIATE ANALYSES AND PAIRWISE COMPARISONS ACCOMPANYING TABLES 3.10 AND 3.11

2 (EXPERIMENTAL GROUP) X 2 (TYPE OF ASSESSMENT) X 4 (TIME TO COMPETITION) MANOVAs WITH REPEATED MEASURES ON THE 2ND AND 3RD FACTOR ON MOMENTARY AND RETROSPECTIVE DATA OF THE "ESM" AND "RM" GROUP

**Variable: POSITIVE AFFECTIVITY – TOTAL SCORE**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE
Alpha level: 0.01 (reason: multiple testing)
TA = type of assessment (retrospective versus momentary)

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.169 | 2.582 | 3.000 | 38.000 | 0.068 |
| Time*Group | 0.040 | 0.524 | 3.000 | 38.000 | 0.668 |
| TA | 0.000 | 0.003 | 1.000 | 40.000 | 0.958 |
| TA*Group | 0.063 | 2.692 | 1.000 | 40.000 | 0.109 |
| Time*TA | 0.103 | 1.460 | 3.000 | 38.000 | 0.241 |
| Time*TA*G | 0.127 | 1.842 | 3.000 | 38.000 | 0.156 |

TESTS OF BETWEEN-SUBJECTS EFFECTS

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Group | 21.569 | 1 | 21.569 | 0.079 | 0.780 |
| Error | 10864.719 | 40 | 271.618 | | |

**Variable: POSITIVE AFFECTIVITY ITEMS**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE
Alpha level: 0.01 (reason: multiple testing)

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| BETWEEN SUBJECTS | | | | | |
| Group | 0.206 | 1.511 | 6 | 35.000 | 0.203 |
| WITHIN SUBJECTS | | | | | |
| Time | 0.778 | 4.480 | 18.000 | 23.000 | 0.000 |
| Time*Group | 0.553 | 1.578 | 18.000 | 23.000 | 0.150 |
| TA | 0.296 | 2.451 | 6.000 | 35.000 | 0.044 |
| TA*Group | 0.247 | 1.910 | 6.000 | 35.000 | 0.107 |

| | | | | | |
|---|---|---|---|---|---|
| Time*TA | 0.360 | 0.718 | 18.000 | 23.000 | 0.761 |
| Time*TA*G | 0.494 | 1.250 | 18.000 | 23.000 | 0.303 |

**Variable: NEGATIVE AFFECTIVITY – TOTAL SCORE**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE
Alpha level: 0.01 (reason: multiple testing)

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.501 | 12.731 | 3.000 | 38.000 | 0.000 |
| Time*Group | 0.074 | 1.013 | 3.000 | 38.000 | 0.397 |
| TA | 0.039 | 1.611 | 1.000 | 40.000 | 0.212 |
| TA*Group | 0.117 | 5.276 | 1.000 | 40.000 | 0.027 |
| Time*TA | 0.177 | 2.729 | 3.000 | 38.000 | 0.057 |
| Time*TA*G | 0.101 | 1.419 | 3.000 | 38.000 | 0.252 |

TESTS OF BETWEEN-SUBJECTS EFFECTS

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Group | 24.504 | 1 | 24.504 | 0.153 | 0.698 |
| Error | 6421.640 | 40 | 160.541 | | |

**Variable: NEGATIVE AFFECTIVITY ITEMS**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE
Alpha level: 0.01 (reason: multiple testing)

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| BETWEEN SUBJECTS | | | | | |
| Group | 0.141 | 0.678 | 8 | 33.000 | 0.707 |
| WITHIN SUBJECTS | | | | | |
| Time | 0.890 | 6.224 | 24.000 | 17.000 | 0.000 |
| Time * Group | 0.571 | 0.941 | 24.000 | 17.000 | 0.564 |
| TA | 0.458 | 3.479 | 8.000 | 33.000 | 0.005 |
| TA*Group | 0.326 | 1.997 | 8.000 | 33.000 | 0.078 |
| Time*TA | 0.511 | 0.741 | 24.000 | 17.000 | 0.755 |
| Time*TA*G | 0.719 | 1.810 | 24.000 | 17.000 | 0.105 |

FOLLOW-UP UNIVARIATE TESTS OF WITHIN-SUBJECTS EFFECT "TYPE OF ASSESSMENT" (TA)
Alpha level: 0.01 (multiple testing)

| Source | Dependent variable | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|---|
| TA | ANGRY | 0.515 | 1 | 0.515 | 7.261 | 0.010 |
| | IRRITATED | 2.472 | 1 | 2.272 | 7.466 | 0.009 |
| | FRUSTRATED | 0.4399 | 1 | 0.439 | 1.456 | 0.235 |
| | GUILTY | 0.555 | 1 | 0.555 | 3.380 | 0.073 |
| | STRESSED | 1.596 | 1 | 1.596 | 2.085 | 0.156 |
| | DEPRESSED | 0.417 | 1 | 0.417 | 2.028 | 0.162 |
| | UNHAPPY | 0.001 | 1 | 0.001 | 0.002 | 0.962 |
| | WORRIED | 3.141 | 1 | 3.141 | 9.952 | 0.003 |
| Error | ANGRY | 2.906 | 41 | 0.071 | | |
| | IRRITATED | 13.575 | 41 | 0.331 | | |
| | FRUSTRATED | 12.355 | 41 | 0.301 | | |
| | GUILTY | 6.736 | 41 | 0.164 | | |
| | STRESSED | 31.392 | 41 | 0.766 | | |
| | DEPRESSED | 8.436 | 41 | 0.206 | | |
| | UNHAPPY | 15.185 | 41 | 0.370 | | |
| | WORRIED | 17.059 | 41 | 0.416 | | |

## Variable: PERCENTAGE OF THINKING TIME (COGNITIVE INTRUSION)

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE
Alpha level: 0.01 (reason: multiple testing)

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.953 | 256.113 | 3.000 | 38.000 | 0.000 |
| Time*Group | 0.117 | 1.674 | 3.000 | 38.000 | 0.189 |
| TA | 0.000 | 0.021 | 1.000 | 40.000 | 0.357 |
| TA*Group | 0.065 | 2.789 | 1.000 | 40.000 | 0.103 |
| Time*TA | 0.103 | 0.299 | 3.000 | 38.000 | 0.003 |
| Time*TA*G | 0.061 | 0.818 | 3.000 | 38.000 | 0.492 |

TESTS OF BETWEEN-SUBJECTS EFFECTS

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Group | 10138.972 | 1 | 10138.972 | 8.038 | 0.007 |
| Error | 50453.761 | 40 | 1261.344 | | |

PAIRWISE COMPARISONS
Effect: GROUP

| Pair | Mean difference | SE | Sign. |
|---|---|---|---|
| ESM – RM | -10.999 | 4.000 | 0.007 |

**Type of assessment: MOMENTARY**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.927 | 163.873 | 3 | 39.000 | 0.000 |

PAIRWISE COMPARISON
Factor: TIME

| Pair | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1 week – 4 days | -5.573 | 3.885 | 0.154 | 0.924 |
| 1 week – 1 day | -34.595 | 3.313 | 0.000 | 0.000 |
| 1 week – 1 hour | -56.897 | 3.206 | 0.000 | 0.000 |
| 4 days - 1 day | -28.256 | 2.858 | 0.000 | 0.000 |
| 4 days - 1 hour | -50.969 | 2.890 | 0.000 | 0.000 |
| 1 day - 1 hour | -22.713 | 2.212 | 0.000 | 0.000 |

**Type of assessment: RETROSPECTIVE**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.952 | 264.398 | 3 | 40.000 | 0.000 |

PAIRWISE COMPARISON
Factor: TIME

| Pair | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1 week – 4 days | -12.955 | 2.292 | 0.000 | 0.000 |
| 1 week – 1 day | -39.302 | 2.831 | 0.000 | 0.000 |
| 1 week – 1 hour | -63.256 | 2.528 | 0.000 | 0.000 |
| 4 days - 1 day | -26.047 | 1.701 | 0.000 | 0.000 |
| 4 days - 1 hour | -50.000 | 1.997 | 0.000 | 0.000 |
| 1 day - 1 hour | -23.953 | 1.827 | 0.000 | 0.000 |

**Variable: COGNITIVE AND SOMATIC ANXIETY INTENSITY**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE
Alpha level: 0.01 (reason: multiple testing)

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| BETWEEN SUBJECTS | | | | | |
| Group | 0.001 | 0.011 | 2 | 39.000 | 0.989 |
| WITHIN SUBJECTS | | | | | |
| Time | 0.762 | 18.695 | 6.000 | 35.000 | 0.000 |
| Time*Group | 0.201 | 1.466 | 6.000 | 35.000 | 0.218 |
| TA | 0.201 | 4.905 | 2.000 | 39.000 | 0.013 |
| TA*Group | 0.042 | 0.845 | 2.000 | 39.000 | 0.437 |
| Time*TA | 0.322 | 2.769 | 6.000 | 35.000 | 0.026 |
| Time*TA*G | 0.330 | 2.868 | 6.000 | 35.000 | 0.022 |

**Variable: COGNITIVE AND SOMATIC ANXIETY DIRECTION**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE
Alpha level: 0.01 (reason: multiple testing)

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| BETWEEN SUBJECTS | | | | | |
| Group | 0.120 | 2.651 | 2 | 39.000 | 0.083 |
| WITHIN SUBJECTS | | | | | |
| Time | 0.408 | 4.023 | 6.000 | 35.000 | 0.004 |
| Time*Group | 0.191 | 1.377 | 6.000 | 35.000 | 0.215 |
| TA | 0.017 | 0.328 | 2.000 | 39.000 | 0.723 |
| TA*Group | 0.014 | 0.279 | 2.000 | 39.000 | 0.758 |
| Time*TA | 0.226 | 1.705 | 6.000 | 35.000 | 0.149 |
| Time*TA*G | 0.079 | 0.503 | 6.000 | 35.000 | 0.802 |

## APPENDIX 16

## MANOVA, UNIVARIATE ANALYSES AND PAIRWISE COMPARISONS ACCOMPANYING TABLE 3.14

MANOVAs WITH REPEATED MEASURES ON THE TIME-TO-COMPETITION FACTOR PERTAINING TO MOMENTARY DATA MEASUREMENTS

**Variable: POSITIVE AFFECTIVITY – TOTAL SCORE**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.192 | 3.082 | 3 | 39.000 | 0.038 |

MAUCHLY'S TEST OF SPHERICITY

| Effect | Mauchly's W | Chi-Square | df | Sign. | G-G | H-F |
|---|---|---|---|---|---|---|
| Time | 0.504 | 12.158 | 5 | 0.033 | 0.696 | 0.784 |

**Set of variables: POSITIVE AFFECTIVITY ITEMS**
**Variable: HAPPY**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.183 | 2.916 | 3 | 39.000 | 0.046 |

MAUCHLY'S TEST OF SPHERICITY

| Effect | Mauchly's W | Chi-Square | df | Sign. | G-G | H-F |
|---|---|---|---|---|---|---|
| Time | 0.732 | 18.616 | 5 | 0.002 | 0.842 | 0.910 |

**Variable: PLEASED**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.309 | 5.818 | 3 | 39.000 | 0.002 |

PAIRWISE COMPARISON
Factor: TIME

| Pair | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1 week – 4 days | 0.578 | 0.221 | 0.012 | 0.069 |
| 1 week – 1 day | 0.810 | 0.279 | 0.006 | 0.035 |
| 1 week – 1 hour | 1.135 | 0.269 | 0.000 | 0.001 |
| 4 days - 1 day | 0.237 | 0.244 | 0.318 | 1.000 |
| 4 days - 1 hour | 0.577 | 0.233 | 0.016 | 0.097 |
| 1 day - 1 hour | 0.341 | 0.180 | 0.000 | 0.000 |

**Variable: ENERGETIC**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.359 | 7.284 | 3 | 39.000 | 0.001 |

PAIRWISE COMPARISON
Factor: TIME

| Pair | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1 week – 4 days | -0.124 | 0.179 | 0.487 | 1.000 |
| 1 week – 1 day | -0.222 | 0.237 | 0.354 | 1.000 |
| 1 week – 1 hour | -1.048 | 0.223 | 0.000 | 0.000 |
| 4 days - 1 day | -0.124 | 0.232 | 0.590 | 1.000 |
| 4 days - 1 hour | -0.884 | 0.245 | 0.001 | 0.004 |
| 1 day - 1 hour | -0.703 | 0.263 | 0.006 | 0.033 |

**Variable: JOYFUL**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.168 | 2.625 | 3 | 39.000 | 0.064 |

MAUCHLY'S TEST OF SPHERICITY

| Effect | Mauchly's W | Chi-Square | df | Sign. | G-G | H-F |
|---|---|---|---|---|---|---|
| Time | 0.648 | 25.949 | 5 | 0.000 | 0.771 | 0.830 |

**Variable: RELAXED**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.397 | 8.555 | 3 | 39.000 | 0.000 |

PAIRWISE COMPARISON
Factor: TIME

| Pair | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1 week – 4 days | 0.791 | 0.202 | 0.000 | 0.002 |
| 1 week – 1 day | 1.139 | 0.248 | 0.000 | 0.000 |
| 1 week – 1 hour | 1.242 | 0.291 | 0.000 | 0.001 |
| 4 days - 1 day | 0.376 | 0.231 | 0.107 | 0.641 |
| 4 days - 1 hour | 0.523 | 0.300 | 0.085 | 0.510 |
| 1 day - 1 hour | 0.147 | 0.224 | 0.509 | 1.000 |

**Variable: ENJOYMENT/FUN**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.143 | 2.164 | 3 | 39.000 | 0.108 |

**Variable: NEGATIVE AFFECTIVITY - TOTAL SCORE**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE
Alpha level: 0.01 (reason: multiple testing)

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.402 | 8.731 | 3 | 39.000 | 0.000 |

PAIRWISE COMPARISON
Factor: TIME

| Pair | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1 week – 4 days | -0.186 | 0.911 | 0.837 | 1.000 |
| 1 week – 1 day | -2.996 | 1.250 | 0.021 | 0.127 |
| 1 week – 1 hour | -5.028 | 1.246 | 0.000 | 0.001 |
| 4 days - 1 day | -2.817 | 0.806 | 0.001 | 0.006 |
| 4 days - 1 hour | -4.896 | 0.934 | 0.000 | 0.000 |
| 1 day - 1 hour | -2.078 | 0.720 | 0.006 | 0.034 |

**Set of variables: NEGATIVE AFFECTIVITY ITEMS**

**Variable: ANGRY**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.137 | 2.066 | 3 | 39.000 | 0.121 |

**Variable: IRRITATED**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.076 | 1.062 | 3 | 39.000 | 0.376 |

**Variable: FRUSTRATED**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.207 | 3.392 | 3 | 39.000 | 0.027 |

MAUCHLY'S TEST OF SPHERICITY

| Effect | Mauchly's W | Chi-Square | df | Sign. | G-G | H-F |
|---|---|---|---|---|---|---|
| Time | 0.546 | 36.913 | 5 | 0.000 | 0.745 | 0.801 |

**Variable: GUILTY**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.072 | 1.007 | 3 | 39.000 | 0.400 |

**Variable: STRESSED**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE
Alpha level: 0.01 (reason: multiple testing)

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.471 | 11.591 | 3 | 39.000 | 0.000 |

PAIRWISE COMPARISON
Factor: TIME

| Pair | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1 week – 4 days | -0.120 | 0.231 | 0.602 | 1.000 |
| 1 week – 1 day | -0.496 | 0.273 | 0.077 | 0.460 |
| 1 week – 1 hour | -1.480 | 0.320 | 0.000 | 0.000 |
| 4 days - 1 day | -0.372 | 0.232 | 0.112 | 0.672 |
| 4 days - 1 hour | -1.333 | 0.253 | 0.000 | 0.000 |
| 1 day - 1 hour | -0.961 | 0.197 | 0.000 | 0.000 |

**Variable: DEPRESSED**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE
Alpha level: 0.01 (reason: multiple testing)

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.128 | 1.908 | 3 | 39.000 | 0.144 |

**Variable: UNHAPPY**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE
Alpha level: 0.01 (reason: multiple testing)

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.038 | 0.516 | 3 | 39.000 | 0.674 |

**Variable: WORRIED**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE
Alpha level: 0.01 (reason: multiple testing)

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.663 | 25.612 | 3 | 39.000 | 0.000 |

PAIRWISE COMPARISON
Factor: TIME

| Pair | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1 week – 4 days | -0.287 | 0.210 | 0.174 | 1.000 |
| 1 week – 1 day | -1.218 | 0.273 | 0.000 | 0.000 |
| 1 week – 1 hour | -2.472 | 0.292 | 0.000 | 0.000 |
| 4 days - 1 day | -0.938 | 0.231 | 0.000 | 0.001 |
| 4 days - 1 hour | -2.228 | 0.267 | 0.000 | 0.000 |
| 1 day - 1 hour | -1.294 | 0.252 | 0.000 | 0.000 |

**Variable: PERCENTAGE OF THINKING TIME (COGNITIVE INTRUSION)**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE
Alpha level: 0.01 (reason: multiple testing)

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.927 | 163.873 | 3 | 39.000 | 0.000 |

PAIRWISE COMPARISON
Factor: TIME

| Pair | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1 week – 4 days | -5.573 | 3.885 | 0.154 | 0.924 |
| 1 week – 1 day | -34.595 | 3.313 | 0.000 | 0.000 |
| 1 week – 1 hour | -56.897 | 3.206 | 0.000 | 0.000 |
| 4 days - 1 day | -28.256 | 2.858 | 0.000 | 0.000 |
| 4 days - 1 hour | -50.969 | 2.890 | 0.000 | 0.000 |
| 1 day - 1 hour | -22.713 | 2.212 | 0.000 | 0.000 |

**Set of variables: COGNITIVE AND SOMATIC ANXIETY INTENSITY**

**Variable: COGNITIVE ANXIETY INTENSITY**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.500 | 12.977 | 3 | 39.000 | 0.000 |

PAIRWISE COMPARISON
Factor: TIME

| Pair | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1 week – 4 days | -0.222 | 0.621 | 0.720 | 1.000 |
| 1 week – 1 day | -1.885 | 0.710 | 0.011 | 0.067 |
| 1 week – 1 hour | -4.881 | 0.855 | 0.000 | 0.000 |
| 4 days - 1 day | -1.670 | 0.633 | 0.011 | 0.064 |
| 4 days - 1 hour | -4.852 | 0.862 | 0.000 | 0.000 |
| 1 day - 1 hour | -3.182 | 0.569 | 0.000 | 0.000 |

**Variable: SOMATIC ANXIETY INTENSITY**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.672 | 26.635 | 3 | 39.000 | 0.000 |

PAIRWISE COMPARISON
Factor: TIME

| Pair | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1 week – 4 days | -1.019 | 0.473 | 0.035 | 0.210 |
| 1 week – 1 day | -3.075 | 0.659 | 0.000 | 0.000 |
| 1 week – 1 hour | -8.242 | 0.921 | 0.000 | 0.000 |
| 4 days - 1 day | -1.992 | 0.654 | 0.004 | 0.022 |
| 4 days - 1 hour | -7.388 | 0.943 | 0.000 | 0.000 |
| 1 day - 1 hour | -5.396 | 0.695 | 0.000 | 0.000 |

**Set of variables: COGNITIVE AND SOMATIC ANXIETY DIRECTION**

**Variable: COGNITIVE ANXIETY DIRECTION**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE
Alpha level: 0.01 (multiple testing)

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.112 | 1.646 | 3 | 39.000 | 0.194 |

**Variable: SOMATIC ANXIETY DIRECTION**

MULTIVARIATE TEST STATISTICS: PILLAI'S TRACE
Alpha level: 0.01 (multiple testing)

| Effect | Value | F | Hypothetical df | Error df | Sign. |
|---|---|---|---|---|---|
| WITHIN SUBJECTS | | | | | |
| Time | 0.204 | 3.322 | 3 | 39.000 | 0.029 |

MAUCHLY'S TEST OF SPHERICITY

| Effect | Mauchly's W | Chi-Square | df | Sign. | G-G | H-F |
|---|---|---|---|---|---|---|
| Time | 0.194 | 97.883 | 5 | 0.000 | 0.505 | 0.532 |

# APPENDIX 17

## PRINCIPAL COMPONENT ANALYSIS OF MEAN SCORES ON THE PNAQ ITEMS ACCOMPANYING TABLE 4.2

**Rotated Pattern Matrix (OBLIMIN, Gamma = 0.0000)**

| | 1 | 2 | 3 |
|---|---|---|---|
| PLEASED | 0.909 | -0.002 | -0.017 |
| JOYFUL | 0.903 | 0.140 | -0.133 |
| HAPPY | 0.861 | -0.111 | -0.086 |
| ENJOYMENT | 0.820 | -0.144 | -0.124 |
| ENERGETIC | 0.767 | -0.103 | 0.395 |
| RELAXED | 0.666 | 0.226 | -0.538 |
| DEPRESSED | -0.086 | 0.948 | -0.129 |
| UNHAPPY | -0.009 | 0.829 | -0.028 |
| IRRITATED | 0.037 | 0.636 | 0.406 |
| FRUSTRATED | -0.156 | 0.517 | 0.476 |
| WORRIED | -0.176 | 0.034 | 0.797 |
| STRESSED | -0.165 | 0.130 | 0.794 |
| GUILTY | 0.116 | 0.138 | 0.546 |
| ANGRY | 0.032 | 0.403 | 0.240 |

**"Variance" Explained by Rotated Components**

| 1 | 2 | 3 |
|---|---|---|
| 4.340 | 2.775 | 2.826 |

**Percent of Total Variance Explained**

| 1 | 2 | 3 |
|---|---|---|
| 31.000 | 19.819 | 20.183 |

**Direct and Indirect Contributions of Factors To Variance**

| | 1 | 2 | 3 |
|---|---|---|---|
| 1 | 4.193 | | |
| 2 | 0.020 | 2.573 | |
| 3 | 0.127 | 0.181 | 2.518 |

**Correlations among Oblique Factors or Components**

| | 1 | 2 | 3 |
|---|---|---|---|
| 1 | 1.000 | | |
| 2 | -0.125 | 1.000 | |
| 3 | -0.207 | 0.357 | 1.000 |

**Rotated Structure Matrix**

| | 1 | 2 | 3 |
|---|---|---|---|
| PLEASED | 0.913 | -0.122 | -0.206 |
| JOYFUL | 0.913 | -0.021 | -0.270 |
| HAPPY | 0.893 | -0.250 | -0.303 |
| ENJOYMENT | 0.863 | -0.291 | -0.344 |
| ENERGETIC | 0.698 | -0.058 | 0.200 |
| RELAXED | 0.749 | -0.049 | -0.595 |
| DEPRESSED | -0.178 | 0.913 | 0.227 |
| UNHAPPY | -0.107 | 0.821 | 0.270 |
| IRRITATION | -0.127 | 0.777 | 0.625 |
| FRUSTRATED | -0.319 | 0.706 | 0.692 |
| WORRIED | -0.345 | 0.340 | 0.845 |
| STRESSED | -0.345 | 0.434 | 0.875 |
| GUILTY | -0.015 | 0.318 | 0.572 |
| ANGRY | -0.068 | 0.485 | 0.377 |

# APPENDIX 18

# PRINCIPAL COMPONENT ANALYSIS OF WITHIN-SUBJECT Z SCORES ON THE PNAQ ITEMS ACCOMPANYING TABLE 4.3

**Rotated Pattern Matrix (OBLIMIN, Gamma = 0.0000)**

| | 1 | 2 | 3 |
|---|---|---|---|
| DEPRESSED | 0.684 | -0.078 | -0.076 |
| IRRITATED | 0.657 | 0.015 | 0.296 |
| UNHAPPY | 0.646 | -0.153 | -0.022 |
| FRUSTRATED | 0.593 | -0.080 | 0.228 |
| ANGRY | 0.524 | -0.082 | 0.055 |
| HAPPY | -0.100 | 0.791 | -0.028 |
| ENJOYMENT | 0.017 | 0.784 | 0.058 |
| PLEASED | -0.030 | 0.757 | -0.032 |
| JOYFUL | -0.131 | 0.742 | 0.079 |
| RELAXED | 0.103 | 0.662 | -0.367 |
| ENERGETIC | -0.080 | 0.515 | 0.583 |
| WORRIED | 0.064 | -0.172 | 0.708 |
| STRESSED | 0.416 | -0.144 | 0.527 |
| GUILTY | 0.486 | 0.117 | -0.147 |

**"Variance" Explained by Rotated Components**

| 1 | 2 | 3 |
|---|---|---|
| 2.596 | 3.336 | 1.499 |

**Percent of Total Variance Explained**

| 1 | 2 | 3 |
|---|---|---|
| 18.545 | 23.827 | 10.709 |

**Direct and Indirect Contributions of Factors To Variance**

| | 1 | 2 | 3 |
|---|---|---|---|
| 1 | 2.402 | | |
| 2 | 0.146 | 3.175 | |
| 3 | 0.049 | 0.015 | 1.436 |

**Correlations among Oblique Factors or Components**

| | 1 | 2 | 3 |
|---|---|---|---|
| 1 | 1.000 | | |
| 2 | -0.359 | 1.000 | |
| 3 | 0.123 | -0.137 | 1.000 |

**Rotated Structure Matrix**

| | 1 | 2 | 3 |
|---|---|---|---|
| DEPRESSED | 0.703 | -0.314 | 0.019 |
| IRRITATED | 0.688 | -0.262 | 0.374 |
| UNHAPPY | 0.698 | -0.382 | 0.078 |
| FRUSTRATED | 0.649 | -0.324 | 0.312 |
| ANGRY | 0.560 | -0.278 | 0.131 |
| HAPPY | -0.388 | 0.831 | -0.149 |
| ENJOYMENT | -0.258 | 0.770 | -0.047 |
| PLEASED | -0.306 | 0.773 | -0.139 |
| JOYFUL | -0.388 | 0.778 | -0.039 |
| RELAXED | -0.180 | 0.676 | -0.445 |
| ENERGETIC | -0.193 | 0.464 | 0.503 |
| WORRIED | 0.213 | -0.292 | 0.740 |
| STRESSED | 0.533 | -0.366 | 0.598 |
| GUILTY | 0.425 | -0.037 | -0.103 |

# APPENDIX 19

# EMPTY MODEL OF COGNITIVE ANXIETY DIRECTION AND COMPUTATION OF PROPORTIONAL REDUCTION OF ERROR ($R^2$) ACCOMPANYING TABLE 4.6

**Model 1: Estimates for empty model of cognitive anxiety direction**

| Effect | Coefficient and variance components (SE) |
|---|---|
| Intercept | 2.93 (1.50) |
| Person-level variance | 93.27 (20.93) |
| Day-level variance | 12.26 (2.13) |
| Beep-level variance | 16.55 (1.39) |

Deviance: 3362.12 (531 cases)

**Model 2: Variance components for multilevel regression model with fixed slopes**

| Random effect | Variance components (SE) |
|---|---|
| Person-level variance | 49.01 (11.20) |
| Day-level variance | 7.69 (1.47) |
| Beep-level variance | 12.91 (1.08) |

Deviance: 3188.02 (531 cases)

Proportional reduction of error at beep-level = 1-(total unexplained variance in model 2 / total unexplained variance in model 1)

$\mathbf{R^2 = 1 - (v_{2i} + v_{2jt} + \varepsilon_{2ijt})/(v_{1i} + v_{1jt} + \varepsilon_{1ijt}) = 0.43}$

## APPENDIX 20

## EMPTY MODEL OF COGNITIVE ANXIETY DIRECTION FOR LOW-ANXIOUS ATHLETES AND COMPUTATION OF PROPORTIONAL REDUCTION OF ERROR ($R^2$) ACCOMPANYING TABLE 4.8

**Model 1: Estimates for empty model of cognitive anxiety direction**

| Effect | Coefficient and variance components (SE) |
|---|---|
| Intercept | 7.78 (2.18) |
| Person-level variance | 44.40 (21.25) |
| Day-level variance | 8.10 (2.90) |
| Beep-level variance | 9.59 (1.80) |

Deviance: 658.53 (113 cases)

**Model 2: Variance components for multilevel regression model with fixed slopes**

| Random effect | Variance components (SE) |
|---|---|
| Person-level variance | 29.26 (14.27) |
| Day-level variance | 7.49 (2.38) |
| Beep-level variance | 6.57 (1.24) |

Deviance: 624.59 (113 cases)

Proportional reduction of error at beep-level = 1-(total unexplained variance in model 2 / total unexplained variance in model 1)

$$\mathbf{R^2 = 1 - (\nu_{2i} + \nu_{2jt} + \varepsilon_{2ijt})/(\nu_{1i} + \nu_{1jt} + \varepsilon_{1ijt}) = 0.30}$$

## APPENDIX 21

## EMPTY MODEL OF COGNITIVE ANXIETY DIRECTION FOR HIGH-ANXIOUS ATHLETES AND COMPUTATION OF PROPORTIONAL REDUCTION OF ERROR ($R^2$) ACCOMPANYING TABLE 4.9

**Model 1: Estimates for empty model of cognitive anxiety direction**

| Effect | Coefficient and variance components (SE) |
|---|---|
| Intercept | -6.88 (1.76) |
| Person-level variance | 19.48 (13.07) |
| Day-level variance | 22.55 (8.50) |
| Beep-level variance | 21.94 (4.76) |

Deviance: 587.20 (84 cases)

**Model 2: Variance components for multilevel regression model with fixed slopes**

| Random effect | Variance components (SE) |
|---|---|
| Person-level variance | 24.10 (13.62) |
| Day-level variance | 6.02 (3.50) |
| Beep-level variance | 14.43 (3.07) |

Deviance: 535.74 (84 cases)

Proportional reduction of error at beep-level = 1-(total unexplained variance in model 2 / total unexplained variance in model 1)

$\mathbf{R^2 = 1 - (\nu_{2i} + \nu_{2jt} + \varepsilon_{2ijt})/(\nu_{1i} + \nu_{1jt} + \varepsilon_{1ijt}) = 0.30}$

# APPENDIX 22

# EMPTY MODEL OF SOMATIC ANXIETY DIRECTION AND COMPUTATION OF PROPORTIONAL REDUCTION OF ERROR ($R^2$) ACCOMPANYING TABLE 4.10

**Model 1: Estimates for empty model of somatic anxiety direction**

| Effect | Coefficient and variance components (SE) |
|---|---|
| Intercept | 3.75 (1.03) |
| Person-level variance | 41.29 (9.96) |
| Day-level variance | 13.28 (2.34) |
| Beep-level variance | 18.61 (1.56) |

Deviance: 3382.18 (531 cases)

**Model 2: Variance components for multilevel regression model with fixed slopes**

| Random effect | Variance components (SE) |
|---|---|
| Person-level variance | 31.25 (7.27) |
| Day-level variance | 6.78 (1.21) |
| Beep-level variance | 9.73 (0.82) |

Deviance: 3049.47 (531 cases)

Proportional reduction of error at beep-level = 1-(total unexplained variance in model 2 / total unexplained variance in model 1)

$$\mathbf{R^2 = 1 - (\nu_{2i} + \nu_{2jt} + \varepsilon_{2ijt})/(\nu_{1i} + \nu_{1jt} + \varepsilon_{1ijt}) = 0.35}$$

## APPENDIX 23

## FORWARD STEPWISE MULTIPLE REGRESSION ANALYSIS OF COGNITIVE ANXIETY DIRECTION ONE HOUR BEFORE THE COMPETITION ACCOMPANYING TABLE 4.13

Minimum tolerance for entry into model = 0.000000
Forward stepwise with Alpha-to-Enter=0.100 and Alpha-to-Remove=0.100

**Step 1** **R = 0.649** **R-Square = 0.421**

***Term entered: PAS***

| Effect | Coefficient | Standard error | Standard coef. | df | F | p |
|---|---|---|---|---|---|---|
| In | | | | | | |
| 1 Constant | | | | | | |
| 8 PAS | 9.012 | 1.650 | 0.649 | 1 | 29.830 | 0.000 |
| Out | Part. Corr. | | | | | |
| 2 G | -0.025 | . | . | 1 | 0.026 | 0.874 |
| 3 E | -0.217 | . | . | 1 | 1.972 | 0.168 |
| 4 SCAT | -0.255 | . | . | 1 | 2.789 | 0.103 |
| 5 NEURO | -0.074 | . | . | 1 | 0.218 | 0.643 |
| 6 EXTRA | -0.053 | . | . | 1 | 0.113 | 0.739 |
| 7 CAI | -0.416 | . | . | 1 | 8.371 | 0.006 |
| 9 ADS | -0.449 | . | . | 1 | 10.107 | 0.003 |

**Step 2** **R = 0.733** **R-Square = 0.538**

***Term entered: ADS***

| Effect | Coefficient | Standard error | Standard coef. | df | F | p |
|---|---|---|---|---|---|---|
| In | | | | | | |
| 1 Constant | | | | | | |
| 8 PAS | 7.262 | 1.591 | 0.523 | 1 | 20.836 | 0.000 |
| 9 ADS | -5.058 | 1.591 | -0.364 | 1 | 10.107 | 0.003 |
| Out | Part. Corr. | | | | | |
| 2 G | 0.094 | . | . | 1 | 0.344 | 0.561 |
| 3 E | -0.127 | . | . | 1 | 0.641 | 0.428 |
| 4 SCAT | -0.169 | . | . | 1 | 1.152 | 0.290 |
| 5 NEURO | -0.047 | . | . | 1 | 0.085 | 0.772 |
| 6 EXTRA | -0.059 | . | . | 1 | 0.138 | 0.712 |
| 7 CAI | -0.345 | . | . | 1 | 5.265 | 0.027 |

**Step 3** **R = 0.770** **R-Square = 0.593**

***Term entered: CAI***

| Effect | Coefficient | Standard error | Standard coef. | df | F | p |
|---|---|---|---|---|---|---|
| In | | | | | | |
| 1 Constant | | | | | | |
| 7 CAI | -3.944 | 1.719 | -0.284 | 1 | 5.265 | 0.027 |
| 8 PAS | 5.552 | 1.686 | 0.400 | 1 | 10.846 | 0.002 |
| 9 ADS | -4.105 | 1.568 | -0.296 | 1 | 6.853 | 0.013 |
| Out | Part. Corr. | | | | | |
| 2 G | 0.148 | . | . | 1 | 0.856 | 0.361 |
| 3 E | -0.060 | . | . | 1 | 0.139 | 0.712 |
| 4 SCAT | -0.091 | . | . | 1 | 0.317 | 0.577 |
| 5 NEURO | -0.075 | . | . | 1 | 0.213 | 0.647 |
| 6 EXTRA | -0.041 | . | . | 1 | 0.064 | 0.801 |

**Dep Var: CAD** **N: 43** **Multiple R: 0.770** **Squared multiple R: 0.593**

**Adjusted squared multiple R: 0.562** **Standard error of estimate: 9.195**

| Effect | Coefficient | Std Error | Std Coef | Tolerance | t | p(2 tail) |
|---|---|---|---|---|---|---|
| CONSTANT | -0.233 | 1.402 | 0.000 | . | -0.166 | 0.869 |
| CAI | -3.944 | 1.719 | -0.284 | 0.681 | -2.295 | 0.027 |
| PAS | 5.552 | 1.686 | 0.400 | 0.708 | 3.293 | 0.002 |
| ADS | -4.105 | 1.568 | -0.296 | 0.819 | -2.618 | 0.013 |

**Analysis of Variance**

| Source | Sum-of-Squares | df | Mean-Square | F-ratio | p |
|---|---|---|---|---|---|
| Regression | 4802.048 | 3 | 1600.683 | 18.931 | 0.000 |
| Residual | 3297.626 | 39 | 84.555 | | |

Durbin-Watson D Statistic 2.189
First Order Autocorrelation -0.102

Legend: CAD = cognitive anxiety direction; CAI = cognitive anxiety intensity; PAS = positive affect scale; ADS = anger-depression scale; G = guilt, E = energetic; SCAT = sport competition anxiety scale; NEURO = Neuroticism; EXTRA = Extraversion

## APPENDIX 24

## MEANS OF AFFECTIVE FACTORS THROUGHOUT THE WEEK PRECEDING THE COMPETITION AND ONE HOUR BEFORE THE COMPETITION

| WHOLE WEEK BEFORE COMPETITION | | DAY OF THE COMPETITION | |
|---|---|---|---|
| Variable | mean (S.D.) | Variable | mean (S.D.) |
| CAD | 2.17 (10.99) | CAD | -0.23 (13.89) |
| SAD | 4.02 (7.83) | SAD | -1.05 (11.58) |
| CAI | 18.73 (6.34) | CAI | 22.95 (6.60) |
| SAI | 13.71 (4.37) | SAI | 20.32 (6.13) |
| Guilt | 1.18 (0.60) | Guilt | 1.16 (0.37) |
| Energetic | 3.90 (1.67) | Energetic | 4.95 (1.45) |
| ADS | 1.61 (0.83) | ADS | 1.78 (0.71) |
| PAS | 3.40 (1.38) | PAS | 3.23 (1.50) |
| Tension | 2.38 (1.38) | Tension | 4.04 (1.78) |

**Mean and standard deviations of affective factors on each day of the week preceding the competition (N = 43)**

| | DAY OF STUDY | | | | | | |
|---|---|---|---|---|---|---|---|
| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| CAD | 3.44 (9.12) | 3.28 (9.77) | 1.52 (10.07) | 2.87 (10.43) | 2.28 (11.32) | 1.97 (11.95) | 1.15 (12.19) |
| SAD | 5.23 (6.91) | 5.34 (5.95) | 4.24 (6.07) | 3.96 (7.48) | 3.42 (6.20) | 5.46 (8.82) | 3.71 (8.52) |
| CAI | 18.38 (5.91) | 17.81 (6.38) | 18.31 (6.89) | 17.75 (5.52) | 18.52 (5.95) | 18.08 (6.51) | 19.58 (6.34) |
| SAI | 12.15 (3.39) | 12.17 (2.87) | 12.86 (3.27) | 13.16 (3.39) | 13.65 (3.66) | 13.19 (4.01) | 14.61 (4.30) |
| Guilt | 1.20 (0.75) | 1.09 (0.39) | 1.13 (0.42) | 1.21 (0.67) | 1.01 (0.25) | 1.18 (0.69) | 1.31 (0.80) |
| Energetic | 3.70 (1.78) | 3.33 (1.52) | 3.44 (1.55) | 3.85 (1.49) | 3.84 (1.57) | 4.32 (1.79) | 4.11 (1.75) |
| ADS | 1.61 (0.89) | 1.52 (0.75) | 1.67 (0.90) | 1.51 (0.72) | 1.54 (0.86) | 1.57 (0.73) | 1.75 (0.96) |
| PAS | 4.08 (1.30) | 3.37 (1.42) | 2.95 (1.25) | 3.37 (1.32) | 3.30 (1.08) | 3.39 (1.53) | 3.33 (1.45) |
| Tension | 2.06 (1.16) | 2.09 (0.97) | 1.94 (0.89) | 2.24 (1.32) | 2.10 (1.24) | 2.41 (1.32) | 2.72 (1.47) |

Legend: CAD = cognitive anxiety direction; CAI = cognitive anxiety intensity; PAS = positive affect scale; ADS = anger-depression scale; SAI = somatic anxiety intensity; SAD = somatic anxiety direction

## APPENDIX 25

## FORWARD STEPWISE MULTIPLE REGRESSION ANALYSIS OF SOMATIC ANXIETY DIRECTION ONE HOUR BEFORE THE COMPETITION ACCOMPANYING TABLE 4.14

Regression analysis after removal of three outliers with standardised residuals 4.157, 3.248 and 3.119.

Minimum tolerance for entry into model = 0.000000
Forward stepwise with Alpha-to-Enter=0.100 and Alpha-to-Remove=0.100

**Step 1** **R = 0.734** **R-Square = 0.538**

***Term entered: SAI***

| Effect | Coefficient | Standard error | Standard coef. | df | F | p |
|---|---|---|---|---|---|---|
| In | | | | | | |
| 1 Constant | | | | | | |
| 9 SAI | -8.069 | 1.213 | -0.734 | 1 | 44.281 | 0.000 |
| Out | Part. Corr. | | | | | |
| 2 G | -0.026 | . | . | 1 | 0.026 | 0.874 |
| 3 E | 0.241 | . | . | 1 | 2.279 | 0.140 |
| 4 SCAT | -0.266 | . | . | 1 | 2.818 | 0.102 |
| 5 NEURO | -0.715 | . | . | 1 | 38.796 | 0.000 |
| 6 EXTRA | 0.132 | . | . | 1 | 0.657 | 0.423 |
| 7 PAS | 0.383 | . | . | 1 | 6.343 | 0.016 |
| 8 ADS | -0.133 | . | . | 1 | 0.669 | 0.419 |
| 10 SAI2 | 0.071 | . | . | 1 | 0.186 | 0.668 |

**Step 2** **R = 0.880** **R-Square = 0.775**

***Term entered: NEURO***

| Effect | Coefficient | Standard error | Standard coef. | df | F | p |
|---|---|---|---|---|---|---|
| In | | | | | | |
| 1 Constant | | | | | | |
| 5 NEURO | -5.429 | 0.872 | -0.486 | 1 | 38.796 | 0.000 |
| 9 SAI | -7.895 | 0.859 | -0.718 | 1 | 84.457 | 0.000 |
| Out | Part. Corr. | | | | | |
| 2 G | 0.230 | . | . | 1 | 2.009 | 0.165 |
| 3 E | 0.016 | . | . | 1 | 0.009 | 0.923 |

*(continued)*

*(continued)*

| Out | Part. Corr. | | | df | F | p |
|---|---|---|---|---|---|---|
| 4 SCAT | 0.075 | . | . | 1 | 0.202 | 0.665 |
| 6 EXTRA | -0.141 | . | . | 1 | 0.734 | 0.397 |
| 7 PAS | 0.050 | . | . | 1 | 0.089 | 0.767 |
| 8 ADS | 0.069 | . | . | 1 | 0.173 | 0.680 |
| 10 SAI2 | -0.111 | . | . | 1 | 0.449 | 0.507 |

**Dep Var: SAD N: 40 Multiple R: 0.880 Squared multiple R: 0.775**

**Adjusted squared multiple R: 0.762 Standard error of estimate: 5.302**

| Effect | Coefficient | Std Error | Std Coef | Tolerance | t | p(2 tail) |
|---|---|---|---|---|---|---|
| CONSTANT | -2.565 | 0.839 | 0.000 | . | -3.058 | 0.004 |
| NEURO | -5.429 | 0.872 | -0.486 | 0.999 | -6.229 | 0.000 |
| SAI | -7.895 | 0.859 | -0.718 | 0.999 | -9.190 | 0.000 |

**Analysis of Variance**

| Source | Sum-of-Squares | df | Mean-Square | F-ratio | p |
|---|---|---|---|---|---|
| Regression | 3573.314 | 2 | 1786.657 | 63.560 | 0.000 |
| Residual | 1040.061 | 37 | 28.110 | | |

Durbin-Watson D Statistic 2.615
First Order Autocorrelation -0.311

Legend: SAD = somatic anxiety direction; SAI = somatic anxiety intensity; SAI2 = quadratic term of somatic anxiety intensity; PAS = positive affect scale; ADS = anger-depression scale; G = guilt, E = energetic; SCAT = sport competition anxiety scale; NEURO = Neuroticism; EXTRA = Extraversion

## APPENDIX 26

### Demographic Questionnaire

THIS INFORMATION WILL BE KEPT STRICTLY CONFIDENTIAL

Name: Surname:

---

Age: Sport:

---

Sex: Address:

---

Phone:

Day: ________________ Mobile: ________________

Evening: ______________

Best (preferred) time of contact: (days of the week; time of the day):

---

For how long (years, months) have you been training in your sport regularly?

---

What is your level of sport participation? (Circle the answer that applies to you).
a) recreational
b) competitive - regional level
c) competitive - national level

How would you rate your current performance in your sport in relation to your ultimate goals?
a) extremely poor
b) poor
c) average
d) good
e) excellent

How much do you think you could improve your performance in your sport in the near future (6 months)?
a) no improvements
b) slight improvements
c) moderate improvements
d) great improvements

Why did you take up your sport (e.g. enjoyment, health, etc.)?

---

Why do you currently train your sport?

---

## APPENDIX 27

## INFORMED CONSENT FORM

Ester Mataija, who is a postgraduate researcher at the Department of Life Sciences of The Nottingham Trent University, has requested my participation in a research study on the dynamic aspects of competitive anxiety.

My participation will involve:

a) completion of one questionnaire upon my confirmed agreement to participate in the study

b) completion of two questionnaires 5 or more days before a major competition

c) completion of one questionnaire 1 hour before the competition

- I understand that there are no foreseeable risks of discomfort related to my participation in this study.
- I understand that I am free to withdraw my consent and discontinue participation at any time without negative consequences.
- I understand that my participation in this study is confidential.
- I understand that the data from this study may be published.
- I understand the purpose of this study and know that there are no hidden motives of which I have not been informed.

I have carefully studied the above and understand and agree to participate in this study.

(Please print)

Name: Signature:

---

Witness name: Witness signature:

---

Date:

---

## APPENDIX 28

## PRE-COMPETITIVE EMOTIONS SELF-EVALUATION QUESTIONNAIRE

Directions: Think about how you felt before your best/worst ever competition. A number of statements which people have used to describe their feelings have been given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you felt BEFORE your BEST EVER / WORST EVER competition. Do not spend too much time on any one statement, but give the answer which seems to describe most accurately your feelings on that occasion (i.e. before your best/worst ever competition).

| Statement | not at all | slightly | moderately | considera-bly | very strongly |
|---|---|---|---|---|---|
| I was concerned about that competition | 1 | 2 | 3 | 4 | 5 |
| I was regretful | 1 | 2 | 3 | 4 | 5 |
| I felt content | 1 | 2 | 3 | 4 | 5 |
| I felt at ease | 1 | 2 | 3 | 4 | 5 |
| I felt my stomach sinking | 1 | 2 | 3 | 4 | 5 |
| I felt like somebody was "good-for-nothing" | 1 | 2 | 3 | 4 | 5 |
| I felt joyful, like everything was going my way, everything was rosy | 1 | 2 | 3 | 4 | 5 |
| I felt sad and gloomy, almost like crying | 1 | 2 | 3 | 4 | 5 |
| I felt like what I was doing or watching was interesting | 1 | 2 | 3 | 4 | 5 |
| My body felt tight | 1 | 2 | 3 | 4 | 5 |
| I felt like the competition was a threat | 1 | 2 | 3 | 4 | 5 |
| I felt upset | 1 | 2 | 3 | 4 | 5 |
| I felt unhappy, blue, downhearted | 1 | 2 | 3 | 4 | 5 |
| I felt over-excited and "rattled" | 1 | 2 | 3 | 4 | 5 |
| My hands were clammy | 1 | 2 | 3 | 4 | 5 |
| I was tense | 1 | 2 | 3 | 4 | 5 |
| I felt discouraged, like I couldn't make it, nothing was going right | 1 | 2 | 3 | 4 | 5 |
| I felt anxious | 1 | 2 | 3 | 4 | 5 |
| I felt nervous | 1 | 2 | 3 | 4 | 5 |
| I felt like somebody was a low-life, not worth the time of the day | 1 | 2 | 3 | 4 | 5 |
| I was worrying over possible misfortunes | 1 | 2 | 3 | 4 | 5 |
| I was concerned about losing | 1 | 2 | 3 | 4 | 5 |
| I felt comfortable | 1 | 2 | 3 | 4 | 5 |
| I felt mad at someone | 1 | 2 | 3 | 4 | 5 |
| I felt joyful | 1 | 2 | 3 | 4 | 5 |
| I had self-doubts | 1 | 2 | 3 | 4 | 5 |
| I felt glad about something | 1 | 2 | 3 | 4 | 5 |
| I was concerned I wouldn't be able to concentrate | 1 | 2 | 3 | 4 | 5 |
| My body felt relaxed | 1 | 2 | 3 | 4 | 5 |
| I felt rested | 1 | 2 | 3 | 4 | 5 |
| I felt like people would have looked at me when something went wrong | 1 | 2 | 3 | 4 | 5 |
| I felt pleasant | 1 | 2 | 3 | 4 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| I felt self-confident | 1 | 2 | 3 | 4 | 5 |
| I was concerned about choking under pressure | 1 | 2 | 3 | 4 | 5 |
| I felt like I was better than somebody | 1 | 2 | 3 | 4 | 5 |
| I felt like things were so rotten they could have made me sick | 1 | 2 | 3 | 4 | 5 |
| I felt like people would laugh at me | 1 | 2 | 3 | 4 | 5 |
| I felt angry, irritated, annoyed | 1 | 2 | 3 | 4 | 5 |
| I felt scared, uneasy, like something might have harmed me | 1 | 2 | 3 | 4 | 5 |
| I felt like something stank, put a bad taste in my mouth | 1 | 2 | 3 | 4 | 5 |
| I felt "high strung" | 1 | 2 | 3 | 4 | 5 |
| My heart was racing | 1 | 2 | 3 | 4 | 5 |
| I felt fearful, like I was in danger, very tense | 1 | 2 | 3 | 4 | 5 |
| I was relaxed | 1 | 2 | 3 | 4 | 5 |
| I was concerned that others would be disappointed with my performance | 1 | 2 | 3 | 4 | 5 |
| I felt surprised, like when something suddenly happens I had no idea would happen | 1 | 2 | 3 | 4 | 5 |
| I felt I could not stand myself | 1 | 2 | 3 | 4 | 5 |
| I felt like screaming at somebody or banging on something | 1 | 2 | 3 | 4 | 5 |
| I felt bashful, embarrassed | 1 | 2 | 3 | 4 | 5 |
| I felt afraid, shaky, and jittery | 1 | 2 | 3 | 4 | 5 |
| I was worried | 1 | 2 | 3 | 4 | 5 |
| I felt jittery | 1 | 2 | 3 | 4 | 5 |
| I felt embarrassed at the thought that someone would see me make a mistake | 1 | 2 | 3 | 4 | 5 |
| I felt disgusted, like something was sickening | 1 | 2 | 3 | 4 | 5 |
| I felt shy, like I wanted to hide | 1 | 2 | 3 | 4 | 5 |
| I was concerned about performing poorly | 1 | 2 | 3 | 4 | 5 |
| I felt so interested in what I was doing, caught up in it | 1 | 2 | 3 | 4 | 5 |
| I felt regret, sorry about something I did | 1 | 2 | 3 | 4 | 5 |
| I felt like the competition was a challenge | 1 | 2 | 3 | 4 | 5 |
| I felt tense in my stomach | 1 | 2 | 3 | 4 | 5 |
| I felt secure | 1 | 2 | 3 | 4 | 5 |
| I felt like I feel when something unexpected happens | 1 | 2 | 3 | 4 | 5 |
| I felt alert, curious, kind of excited about something | 1 | 2 | 3 | 4 | 5 |
| I was concerned I might not do as well in that competition as I could | 1 | 2 | 3 | 4 | 5 |
| I felt like I had done something wrong | 1 | 2 | 3 | 4 | 5 |
| I felt sick about myself | 1 | 2 | 3 | 4 | 5 |
| I felt amazed, like I couldn't believe what had happened, it was so unusual | 1 | 2 | 3 | 4 | 5 |
| I felt happy | 1 | 2 | 3 | 4 | 5 |
| I was concerned about reaching my goal | 1 | 2 | 3 | 4 | 5 |
| I felt like I had to be blamed for something | 1 | 2 | 3 | 4 | 5 |
| I felt sheepish, like I wanted not to be seen | 1 | 2 | 3 | 4 | 5 |
| I felt mad at myself | 1 | 2 | 3 | 4 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| My body felt tense | 1 | 2 | 3 | 4 | 5 |
| I felt calm | 1 | 2 | 3 | 4 | 5 |

Using the rating scale below, circle the number representing how much you considered your overall emotional state BEFORE your BEST EVER/WORST EVER competition as being helpful or harmful in relation to your performance.

| -3 | -2 | -1 | 0 | +1 | +2 | +3 |
|---|---|---|---|---|---|---|
| very harmful | | | unimportant | | | very helpful |

Tick or write down in the appropriate space the emotion (one only) that most accurately describes the way you felt before your best/worst competition.

- ❑ Guilt
- ❑ Shyness
- ❑ Shame
- ❑ Anxiety
- ❑ Disgust
- ❑ Surprise
- ❑ Interest
- ❑ Excitement
- ❑ Enjoyment
- ❑ Fear
- ❑ Contempt
- ❑ Sadness
- ❑ Hostility inward (angry with yourself)
- ❑ Anger
- ❑ Other (what?)________________________

## APPENDIX 29

## PRECOMPETITIVE EMOTIONS SELF-EVALUATION QUESTIONNAIRE

Directions: A number of statements which people have used to describe their feelings have been given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel RIGHT NOW. Do not spend too much time on any one statement, but give the answer which seems to describe most accurately your CURRENT feelings.

| Statement | not at all | slightly | moderately | considera-bly | very strongly |
|---|---|---|---|---|---|
| I am concerned about this competition | 1 | 2 | 3 | 4 | 5 |
| I am regretful | 1 | 2 | 3 | 4 | 5 |
| I feel content | 1 | 2 | 3 | 4 | 5 |
| I feel at ease | 1 | 2 | 3 | 4 | 5 |
| I feel my stomach sinking | 1 | 2 | 3 | 4 | 5 |
| I feel like somebody is "good-for-nothing" | 1 | 2 | 3 | 4 | 5 |
| I feel joyful, like everything is going my way, everything is rosy | 1 | 2 | 3 | 4 | 5 |
| I feel sad and gloomy, almost like crying | 1 | 2 | 3 | 4 | 5 |
| I feel like what I am doing or watching is interesting | 1 | 2 | 3 | 4 | 5 |
| My body feels tight | 1 | 2 | 3 | 4 | 5 |
| I feel like the competition is a threat | 1 | 2 | 3 | 4 | 5 |
| I feel upset | 1 | 2 | 3 | 4 | 5 |
| I feel unhappy, blue, downhearted | 1 | 2 | 3 | 4 | 5 |
| I feel over-excited and "rattled" | 1 | 2 | 3 | 4 | 5 |
| My hands are clammy | 1 | 2 | 3 | 4 | 5 |
| I am tense | 1 | 2 | 3 | 4 | 5 |
| I feel discouraged, like I can't make it, nothing is going right | 1 | 2 | 3 | 4 | 5 |
| I feel anxious | 1 | 2 | 3 | 4 | 5 |
| I feel nervous | 1 | 2 | 3 | 4 | 5 |
| I feel like somebody is a low-life, not worth the time of the day | 1 | 2 | 3 | 4 | 5 |
| I am worrying over possible misfortunes | 1 | 2 | 3 | 4 | 5 |
| I am concerned about losing | 1 | 2 | 3 | 4 | 5 |
| I feel comfortable | 1 | 2 | 3 | 4 | 5 |
| I feel mad at someone | 1 | 2 | 3 | 4 | 5 |
| I feel joyful | 1 | 2 | 3 | 4 | 5 |
| I have self-doubts | 1 | 2 | 3 | 4 | 5 |
| I feel glad about something | 1 | 2 | 3 | 4 | 5 |
| I am concerned I won't be able to concentrate | 1 | 2 | 3 | 4 | 5 |
| My body feels relaxed | 1 | 2 | 3 | 4 | 5 |
| I feel rested | 1 | 2 | 3 | 4 | 5 |
| I feel like people will look at me when something goes wrong | 1 | 2 | 3 | 4 | 5 |
| I feel pleasant | 1 | 2 | 3 | 4 | 5 |
| I feel self-confident | 1 | 2 | 3 | 4 | 5 |
| I am concerned about choking under pressure | 1 | 2 | 3 | 4 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| I feel like I am better than somebody | 1 | 2 | 3 | 4 | 5 |
| I feel like things are so rotten they could make me sick | 1 | 2 | 3 | 4 | 5 |
| I feel like people will laugh at me | 1 | 2 | 3 | 4 | 5 |
| I feel angry, irritated, annoyed | 1 | 2 | 3 | 4 | 5 |
| I feel scared, uneasy, like something might harm me | 1 | 2 | 3 | 4 | 5 |
| I feel like something stinks, puts a bad taste in my mouth | 1 | 2 | 3 | 4 | 5 |
| I feel "high strung" | 1 | 2 | 3 | 4 | 5 |
| I am worried | 1 | 2 | 3 | 4 | 5 |
| My heart is racing | 1 | 2 | 3 | 4 | 5 |
| I feel fearful, like I am in danger, very tense | 1 | 2 | 3 | 4 | 5 |
| I am relaxed | 1 | 2 | 3 | 4 | 5 |
| I am concerned that others will be disappointed with my performance | 1 | 2 | 3 | 4 | 5 |
| I feel surprised, like when something suddenly happens I had no idea would happen | 1 | 2 | 3 | 4 | 5 |
| I feel I can't stand myself | 1 | 2 | 3 | 4 | 5 |
| I feel like screaming at somebody or banging on something | 1 | 2 | 3 | 4 | 5 |
| I feel bashful, embarrassed | 1 | 2 | 3 | 4 | 5 |
| I feel afraid, shaky, and jittery | 1 | 2 | 3 | 4 | 5 |
| I feel jittery | 1 | 2 | 3 | 4 | 5 |
| I feel embarrassed at the thought that someone will see me make a mistake | 1 | 2 | 3 | 4 | 5 |
| I feel disgusted, like something is sickening | 1 | 2 | 3 | 4 | 5 |
| I feel shy, like I want to hide | 1 | 2 | 3 | 4 | 5 |
| I am concerned about performing poorly | 1 | 2 | 3 | 4 | 5 |
| I feel so interested in what I am doing, caught up in it | 1 | 2 | 3 | 4 | 5 |
| I feel regret, sorry about something I did | 1 | 2 | 3 | 4 | 5 |
| I feel like the competition is a challenge | 1 | 2 | 3 | 4 | 5 |
| I feel tense in my stomach | 1 | 2 | 3 | 4 | 5 |
| I feel secure | 1 | 2 | 3 | 4 | 5 |
| I feel like I feel when something unexpected happens | 1 | 2 | 3 | 4 | 5 |
| I feel alert, curious, kind of excited about something | 1 | 2 | 3 | 4 | 5 |
| I am concerned I might not do as well in this competition as I could | 1 | 2 | 3 | 4 | 5 |
| I feel like I did something wrong | 1 | 2 | 3 | 4 | 5 |
| I feel sick about myself | 1 | 2 | 3 | 4 | 5 |
| I feel amazed, like I can't believe what's happened, it was so unusual | 1 | 2 | 3 | 4 | 5 |
| I feel happy | 1 | 2 | 3 | 4 | 5 |
| I am concerned about reaching my goal | 1 | 2 | 3 | 4 | 5 |
| I feel like I ought to be blamed for something | 1 | 2 | 3 | 4 | 5 |
| I feel sheepish, like I want not to be seen | 1 | 2 | 3 | 4 | 5 |
| I feel mad at myself | 1 | 2 | 3 | 4 | 5 |
| My body feels tense | 1 | 2 | 3 | 4 | 5 |
| I feel calm | 1 | 2 | 3 | 4 | 5 |

Using the rating scale below, circle the number representing how much you consider your overall emotional state at the very moment as being helpful or harmful in relation to your forthcoming performance.

| -3 | -2 | -1 | 0 | +1 | +2 | +3 |
|---|---|---|---|---|---|---|
| very harmful | | | unimportant | | | very helpful |

Tick or write down in the appropriate space the emotion (one only) that most accurately describes the way you feel at the very moment.

- ❑ Guilt
- ❑ Shyness
- ❑ Shame
- ❑ Anxiety
- ❑ Disgust
- ❑ Surprise
- ❑ Interest
- ❑ Excitement
- ❑ Enjoyment
- ❑ Fear
- ❑ Contempt
- ❑ Sadness
- ❑ Hostility inward (angry with yourself)
- ❑ Anger
- ❑ Other (what?)________________________

## APPENDIX 30

## INTERNAL CONSISTENCY OF THE STAI, DES-IV SUBSCALES AND THE COGNITIVE AND SOMATIC SUBSCALE OF THE CSAI-2 ON TWO RETROSPECTIVE AND ONE MOMENTARY ASSESSMENTS

| Scale | Best recalled competition | Worst recalled competition | Actual competition |
|---|---|---|---|
| CSAI-2, cognitive subscale | 0.83 | 0.92 | 0.83 |
| CSAI-2, somatic subscale | 0.82 | 0.87 | 0.84 |
| SAI | 0.85 | 0.89 | 0.85 |
| DES - Fear | 0.88 | 0.93 | 0.85 |
| DES - Enjoyment | 0.70 | 0.73 | 0.80 |
| DES - Interest | 0.72 | 0.83 | 0.82 |
| DES - Surprise | 0.85 | 0.77 | 0.74 |
| DES - Guilt | 0.78 | 0.79 | 0.87 |
| DES - Hostility inward | 0.76 | 0.77 | 0.86 |
| DES - Sadness | 0.70 | 0.88 | 0.87 |
| DES - Shame | 0.84 | 0.88 | 0.87 |
| DES - Shyness | 0.79 | 0.81 | 0.76 |
| DES - Disgust | 0.76 | 0.84 | 0.94 |
| DES - Anger | 0.79 | 0.88 | 0.91 |
| DES - Contempt | 0.62 (0.84)* | 0.67 (0.82)* | 0.70 (0.85)* |

* In brackets, internal consistency for the scale DES - Contempt with the item "I felt/feel like I was/am better than somebody" excluded.

# APPENDIX 31

## PRINCIPAL AXIS FACTOR ANALYSIS WITH OBLIMIN ROTATION OF THE PESQ SCALES ACCOMPANYING TABLE 4.18
## (Data from recalled facilitative emotional states prior the best competition)

**Rotated Pattern Matrix (OBLIMIN, Gamma = 0.0000)**

| Scale | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| DES - HOSTILITY INWARD | 0.904 | 0.009 | -0.028 | 0.069 |
| DES - SHYNESS | 0.902 | -0.038 | 0.081 | 0.041 |
| DES - SHAME | 0.868 | 0.075 | -0.045 | -0.128 |
| DES - GUILT | 0.763 | -0.033 | 0.041 | -0.060 |
| DES - DISGUST | 0.734 | 0.102 | 0.044 | 0.263 |
| CSAI-2 - SOMATIC | -0.010 | 0.964 | 0.001 | -0.003 |
| STAI | -0.078 | 0.804 | -0.456 | 0.030 |
| DES - FEAR | 0.094 | 0.746 | 0.174 | 0.035 |
| CSAI-2 - COGNITIVE | 0.265 | 0.667 | 0.177 | -0.006 |
| DES - ENJOYMENT | 0.104 | -0.171 | 0.876 | -0.032 |
| DES - INTEREST | -0.333 | 0.250 | 0.641 | 0.144 |
| DES - ANGER | 0.217 | -0.054 | -0.043 | 0.916 |
| DES - CONTEMPT | -0.091 | -0.007 | 0.031 | 0.699 |
| DES - SADNESS | 0.430 | 0.184 | -0.103 | 0.125 |
| DES - SURPRISE | 0.363 | 0.052 | 0.472 | -0.029 |

**"Variance" Explained by Rotated Factors**

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| 4.196 | 2.802 | 1.715 | 1.526 |

**Percent of Total Variance Explained**

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| 27.976 | 18.681 | 11.431 | 10.177 |

**Percent of Common Variance Explained**

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| 40.982 | 27.366 | 16.745 | 14.908 |

**Correlations among Oblique Factors or Components**

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1 | 1.000 | | | |
| 2 | 0.222 | 1.000 | | |
| 3 | 0.115 | 0.037 | 1.000 | |
| 4 | 0.143 | 0.324 | 0.097 | 1.000 |

# APPENDIX 32

## PRINCIPAL AXIS FACTOR ANALYSIS WITH OBLIMIN ROTATION OF THE PESQ SCALES ACCOMPANYING TABLE 4.19
## (Data from facilitative emotional states prior an actual competition)

**Rotated Pattern Matrix (OBLIMIN, Gamma = 0.0000)**

| Scale | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| DES - GUILT | 0.884 | -0.014 | 0.060 | 0.009 |
| DES - SHYNESS | 0.874 | 0.013 | 0.084 | -0.075 |
| DES - HOSTILITY INWARD | 0.819 | 0.090 | 0.119 | -0.016 |
| DES - SHAME | 0.672 | 0.148 | -0.055 | -0.175 |
| DES - SADNESS | 0.566 | 0.220 | 0.271 | -0.024 |
| DES - SURPRISE | 0.510 | -0.063 | 0.104 | 0.314 |
| CSAI-2 - SOMATIC | -0.068 | 0.986 | 0.063 | 0.091 |
| STAI | 0.028 | 0.760 | 0.142 | -0.418 |
| DES - FEAR | 0.240 | 0.653 | 0.149 | 0.079 |
| CSAI-2 - COGNITIVE | 0.408 | 0.642 | -0.256 | 0.064 |
| DES - DISGUST | 0.107 | -0.052 | 0.943 | -0.079 |
| DES - ANGER | 0.126 | 0.010 | 0.892 | -0.029 |
| DES - CONTEMPT | -0.050 | 0.044 | 0.755 | 0.065 |
| DES - ENJOYMENT | 0.197 | -0.259 | -0.056 | 0.770 |
| DES - INTEREST | -0.288 | 0.306 | 0.034 | 0.748 |

**"Variance" Explained by Rotated Factors**

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| 3.945 | 2.819 | 2.687 | 1.505 |

**Percent of Total Variance Explained**

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| 26.301 | 18.790 | 17.913 | 10.035 |

**Percent of Common Variance Explained**

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| 36.010 | 25.726 | 24.525 | 13.739 |

**Correlations among Oblique Factors or Components**

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1 | 1.000 | | | |
| 2 | 0.284 | 1.000 | | |
| 3 | 0.360 | 0.170 | 1.000 | |
| 4 | -0.017 | -0.075 | -0.000 | 1.000 |

# APPENDIX 33

## PRINCIPAL AXIS FACTOR ANALYSIS WITH OBLIMIN ROTATION OF THE PESQ SCALES ACCOMPANYING TABLE 4.20
## (Data from debilitative emotional states prior the worst competition)

**Rotated Pattern Matrix (OBLIMIN, Gamma = 0.0000)**

| Scale | 1 | 2 | 3 |
|---|---|---|---|
| STAI | 0.964 | -0.083 | -0.064 |
| CSAI-2 - SOMATIC | 0.958 | 0.026 | 0.220 |
| CSAI-2 - COGNITIVE | 0.782 | 0.109 | 0.198 |
| DES - FEAR | 0.751 | 0.136 | 0.090 |
| DES - ENJOYMENT | -0.532 | 0.266 | 0.352 |
| DES - ANGER | -0.084 | 0.856 | -0.044 |
| DES - CONTEMPT | -0.123 | 0.842 | 0.075 |
| DES - SURPRISE | -0.081 | 0.773 | 0.375 |
| DES - DISGUST | 0.178 | 0.692 | -0.076 |
| DES - SHYNESS | 0.345 | 0.527 | -0.261 |
| DES - INTEREST | 0.272 | 0.031 | 0.680 |
| DES - SADNESS | 0.366 | 0.385 | -0.387 |
| DES - HOSTILITY INWARD | 0.338 | 0.481 | -0.326 |
| DES - GUILT | 0.343 | 0.409 | -0.299 |
| DES - SHAME | 0.323 | 0.387 | -0.017 |

**"Variance" Explained by Rotated Factors**

| 1 | 2 | 3 |
|---|---|---|
| 4.285 | 3.830 | 1.280 |

**Percent of Total Variance Explained**

| 1 | 2 | 3 |
|---|---|---|
| 28.566 | 25.535 | 8.534 |

**Percent of Common Variance Explained**

| 1 | 2 | 3 |
|---|---|---|
| 45.607 | 40.768 | 13.625 |

**Correlations among Oblique Factors or Components**

| | 1 | 2 | 3 |
|---|---|---|---|
| 1 | 1.000 | | |
| 2 | 0.362 | 1.000 | |
| 3 | -0.208 | 0.004 | 1.000 |

## APPENDIX 34

## FORWARD STEPWISE MULTIPLE REGRESSION ANALYSIS OF FUNCTIONALITY OF EMOTIONAL STATE ONE HOUR BEFORE AN ACTUAL COMPETITION ACCOMPANYING TABLE 4.21

Regression analysis after removal of one outlier with leverage 0.201.

Minimum tolerance for entry into model = 0.000000
Forward stepwise with Alpha-to-Enter=0.100 and Alpha-to-Remove=0.100

**Step 1** **R = 0.435** **R-Square = 0.189**

***Term entered: IEF***

| Effect | Coefficient | Standard error | Standard coef. | df | F | p |
|---|---|---|---|---|---|---|
| In | | | | | | |
| Constant | | | | | | |
| IEF | 0.603 | 0.089 | 0.435 | 1 | 46.359 | 0.000 |
| Out | Part. Corr. | | | | | |
| NEF | -0.363 | . | . | 1 | 30.033 | 0.000 |
| AFF | -0.220 | . | . | 1 | 10.092 | 0.002 |
| ADCF | -0.233 | . | . | 1 | 11.367 | 0.001 |
| AFF-IEF | 0.191 | . | . | 1 | 7.457 | 0.007 |
| AFF-NEF | -0.273 | . | . | 1 | 15.920 | 0.000 |

**Step 2** **R = 0.544** **R-Square = 0.296**

***Term entered: NEF***

| Effect | Coefficient | Standard error | Standard coef. | df | F | p |
|---|---|---|---|---|---|---|
| In | | | | | | |
| Constant | | | | | | |
| NEF | -0.455 | 0.083 | -0.328 | 1 | 30.033 | 0.000 |
| IEF | 0.566 | 0.083 | 0.407 | 1 | 46.364 | 0.000 |
| Out | Part. Corr. | | | | | |
| AFF | -0.067 | . | . | 1 | 0.880 | 0.349 |
| ADCF | -0.071 | . | . | 1 | 0.989 | 0.321 |
| AFF - IEF | 0.126 | . | . | 1 | 3.181 | 0.076 |
| AFF - NEF | -0.030 | . | . | 1 | 0.177 | 0.675 |

**Dep Var: Functionality of emotional state**

**N: 201** **Multiple R: 0.544** **Squared multiple R: 0.296**

**Adjusted squared multiple R: 0.289** **Standard error of estimate: 1.172**

| Effect | Coefficient | Std Error | Std Coef | Tolerance | t | p(2 tail) |
|---|---|---|---|---|---|---|
| CONSTANT | 0.701 | 0.083 | 0.000 | . | 8.477 | 0.000 |
| NEF | -0.455 | 0.083 | -0.328 | 0.993 | -5.480 | 0.000 |
| IEF | 0.566 | 0.083 | 0.407 | 0.993 | 6.809 | 0.000 |

**Analysis of Variance**

| Source | Sum-of-Squares | df | Mean-Square | F-ratio | p |
|---|---|---|---|---|---|
| Regression | 114.191 | 2 | 57.096 | 41.578 | 0.000 |
| Residual | 271.898 | 198 | 1.373 | | |

Durbin-Watson D Statistic: 1.807
First Order Autocorrelation: 0.095

Legend: IEF = interest - enjoyment factor; NEF = negative emotions factor; AFF = anxiety - fear factor; ADCF = anger - disgust - contempt factor; AFF - IEF = interaction term "anger-fear factor by interest - enjoyment factor"; AFF - NEF = interaction term "anger - fear factor by negative emotions factor"

## APPENDIX 35

## CORRELATIONAL ANALYSIS OF FUNCTIONALITY OF EMOTIONAL STATE AND EMOTIONAL FACTORS EXTRACTED FROM DATA COLLECTED BEFORE AN ACTUAL COMPETITION (N=202)

### *a) Emotional factors and functionality of emotional state*

| | FES | NEF | AFF | ADCF | IEF | AFF - IEF |
|---|---|---|---|---|---|---|
| FES | 1.000 | | | | | |
| NEF | -0.360** | 1.000 | | | | |
| AFF | -0.271** | 0.460** | 1.000 | | | |
| ADCF | -0.230* | 0.486** | 0.253** | 1.000 | | |
| IEF | 0.436** | -0.080 | -0.174 | -0.048 | 1.000 | |
| AFF - IEF | 0.118 | -0.196 | -0.099 | 0.009 | -0.120 | 1.000 |
| AFF - NEF | -0.303** | 0.699** | 0.315** | 0.410** | -0.139 | -0.228* |

Legend: FES = functionality of emotional state; IEF = interest - enjoyment factor; NEF = negative emotions factor; AFF = anxiety - fear factor; ADCF = anger - disgust - contempt factor; AFF - IEF = interaction term "anger-fear factor by interest - enjoyment factor"; AFF - NEF = interaction term "anger - fear factor by negative emotions factor"; ** = p <0.01 (Bonferroni adjusted probabilities); * = p<0.05 (Bonferroni adjusted probabilities)

### *a) Emotional scales and functionality of emotional state*

| | FES | CSAI-2 C | CSAI-2 S | STAI | DES - Fear |
|---|---|---|---|---|---|
| FES | 1.000 | | | | |
| CSAI-2 C | -0.191 | 1.000 | | | |
| CSAI-2 S | -0.106 | 0.674** | 1.000 | | |
| STAI | -0.317** | 0.565** | 0.754** | 1.000 | |
| DES - Fear | -0.340** | 0.546** | 0.749** | 0.618** | 1.000 |
| DES - Enjoyment | 0.274** | -0.063 | -0.189 | -0.553** | -0.085 |
| DES - Interest | 0.457** | 0.095 | 0.235 | -0.176 | 0.110 |
| DES - Surprise | -0.110 | 0.224 | 0.063 | -0.000 | 0.223 |
| DES - Guilt | -0.371** | 0.427** | 0.209 | 0.282** | 0.427** |
| DES -Hostility Inward | -0.428** | 0.433** | 0.289** | 0.361** | 0.547** |
| DES - Sadness | -0.351** | 0.413** | 0.363** | 0.436** | 0.587** |
| DES - Shame | -0.231 | 0.544** | 0.299** | 0.367** | 0.324** |
| DES - Shyness | -0.284** | 0.413** | 0.254* | 0.331** | 0.460** |
| DES - Disgust | -0.268* | 0.029 | 0.161 | 0.285** | 0.361** |
| DES - Anger | -0.310** | 0.088 | 0.217 | 0.321** | 0.373** |
| DES - Contempt | -0.021 | -0.001 | 0.221 | 0.202 | 0.200 |

*(continued)*

*(continued)*

| | DES - Enjoyment | DES - Interest | DES - Surprise | DES - Guilt | DES -Hostility Inward |
|---|---|---|---|---|---|
| DES - Enjoyment | 1.000 | | | | |
| DES - Interest | 0.465** | 1.000 | | | |
| DES - Surprise | 0.295** | 0.149 | 1.000 | | |
| DES - Guilt | 0.104 | -0.189 | 0.484** | 1.000 | |
| DES - Hostility Inward | 0.030 | -0.176 | 0.456** | 0.827** | 1.000 |
| DES - Sadness | -0.066 | -0.073 | 0.361** | 0.661** | 0.788** |
| DES - Shame | -0.148 | -0.229 | 0.328** | 0.618** | 0.555** |
| DES - Shyness | 0.037 | -0.241 | 0.457** | 0.806** | 0.805** |
| DES - Disgust | -0.050 | -0.125 | 0.295** | 0.425** | 0.454** |
| DES - Anger | -0.035 | -0.076 | 0.329** | 0.463** | 0.494** |
| DES - Contempt | -0.002 | 0.093 | 0.184 | 0.254* | 0.280** |

| | DES - Sadness | DES - Shame | DES - Shyness | DES - Disgust | DES - Anger | DES - Contempt |
|---|---|---|---|---|---|---|
| DES - Sadness | 1.000 | | | | | |
| DES - Shame | 0.480** | 1.000 | | | | |
| DES - Shyness | 0.668** | 0.722** | 1.000 | | | |
| DES - Disgust | 0.530** | 0.304** | 0.471** | 1.000 | | |
| DES - Anger | 0.547** | 0.279** | 0.452** | 0.932** | 1.000 | |
| DES - Contempt | 0.358** | 0.170 | 0.299** | 0.724** | 0.693** | 1.000 |

Legend: FES = functionality of emotional state; DES = differential emotions scale; STAI = state-trait anxiety inventory; CSAI-2 C = cognitive subscale of the CSAI-2; CSAI S = somatic subscale of the CSAI-2; ** = p<0.01 (Bonferroni adjusted probabilities); * = p<0.05 (Bonferroni adjusted probabilities)

## APPENDIX 36

## CANONICAL CORRELATION OF APPRAISAL OF THE COMPETITION AS A SOURCE OF THREAT OR CHALLENGE AND EMOTIONAL FACTORS EXTRACTED FROM DATA RELATED TO AN ACTUAL COMPETITION

N = 202.

| | |
|---|---|
| RAO F = 24.611 | df = 8.0, 392.0 Prob = 0.000 |
| R-Square = 0.557 | Shrunk R-Square = 0.539 |
| T-Square = 0.327 | Shrunk T-Square = 0.300 |
| P-Square = 0.327 | Shrunk P-Square = 0.300 |

**Within basic set "y" correlations**

| | THREAT | CHALLENGE |
|---|---|---|
| THREAT | 1.000 | |
| CHALLENGE | 0.138 | 1.000 |

**Within basic set "x" correlations**

| | NEF | AFF | ADCF | IEF |
|---|---|---|---|---|
| NEF | 1.000 | | | |
| AFF | 0.460 | 1.000 | | |
| ADCF | 0.486 | 0.253 | 1.000 | |
| IEF | -0.080 | -0.174 | -0.048 | 1.000 |

**Between basic "y" (column) and basic "x" (row) correlations**

| | THREAT | CHALLENGE |
|---|---|---|
| NEF | 0.308 | -0.111 |
| AFF | 0.569 | 0.175 |
| ADCF | 0.066 | -0.208 |
| IEF | -0.034 | 0.438 |

**Estimated (from x-set) "y" intercorrelations (R-square on diagonal)**

| | THREAT | CHALLENGE |
|---|---|---|
| THREAT | 0.344 | |
| CHALLENGE | 0.141 | 0.337 |

**Significance tests for prediction of each basic "y" variable**

| Variable | F-statistic | Probability |
|---|---|---|
| THREAT | 25.822 | 0.000 |
| CHALLENGE | 25.073 | 0.000 |

**Betas predicting basic "y" (column) from basic "x" (row) variables**

| | THREAT | CHALLENGE |
|---|---|---|
| NEF | 0.119 | -0.144 |
| AFF | 0.559 | 0.379 |
| ADCF | -0.130 | -0.211 |
| IEF | 0.067 | 0.482 |

**Standard errors of betas**

| | THREAT | CHALLENGE |
|---|---|---|
| NEF | 0.072 | 0.072 |
| AFF | 0.066 | 0.066 |
| ADCF | 0.066 | 0.066 |
| IEF | 0.059 | 0.059 |

**T-statistics for betas**

| | THREAT | CHALLENGE |
|---|---|---|
| NEF | 1.657 | -1.992 |
| AFF | 8.492 | 5.722 |
| ADCF | -1.969 | -3.175 |
| IEF | 1.149 | 8.189 |

**Probabilities for betas**

| | THREAT | CHALLENGE |
|---|---|---|
| NEF | 0.099 | 0.048 |
| AFF | 0.000 | 0.000 |
| ADCF | 0.050 | 0.002 |
| IEF | 0.252 | 0.000 |

**Stewart-Love canonical redundancy index = 0.341**

**Canonical correlations**

| 1 | 2 |
|---|---|
| 0.651 | 0.481 |

**Bartlett test of residual correlations**

Correlations 1 through 2
Chi-square statistic = 160.757 df = 8 p = 0.000

Correlations 2 through 2
Chi-square statistic = 51.967 df = 3 p = 0.000

**Canonical coefficients for dependent (y) set**

| | 1 | 2 |
|---|---|---|
| THREAT | 0.676 | -0.750 |
| CHALLENGE | 0.650 | 0.773 |

**Canonical loadings (y variable by factor correlations)**

| | 1 | 2 |
|---|---|---|
| THREAT | 0.765 | -0.643 |
| CHALLENGE | 0.743 | 0.670 |

**Canonical redundancies for dependent set**

| | 1 | 2 |
|---|---|---|
| | 0.241 | 0.100 |

**Canonical coefficients for independent (x) set**

| | 1 | 2 |
|---|---|---|
| NEF | -0.020 | -0.417 |
| AFF | 0.959 | -0.263 |
| ADCF | -0.346 | -0.136 |
| IEF | 0.551 | 0.670 |

**Canonical loadings (x variable by factor correlations)**

| | 1 | 2 |
|---|---|---|
| NEF | 0.208 | -0.658 |
| AFF | 0.766 | -0.606 |
| ADCF | -0.139 | -0.437 |
| IEF | 0.402 | 0.756 |

**Canonical redundancies for independent set**

| | 1 | 2 |
|---|---|---|
| | 0.086 | 0.090 |

Legend: IEF = interest - enjoyment factor; NEF = negative emotions factor; AFF = anxiety - fear factor; ADCF = anger - disgust - contempt factor

## APPENDIX 37

## FACTOR ANALYSIS OF THE ITEMS OF THE PESQ USING DATA RELATED TO RECALLED FACILITATIVE EMOTIONAL STATES EXPERIENCED BEFORE ATHLETES' BEST COMPETITION ("threat" and "challenge" items excluded)

N = 178 Number of items = 72

Rotated Pattern Matrix (OBLIMIN, Gamma = 0.0000)

| Items | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DES_FE3 | 0.837 | -0.033 | -0.025 | -0.083 | 0.055 |
| CSAI_S7 | 0.754 | -0.077 | 0.021 | 0.071 | 0.085 |
| CSAI_S1 | 0.606 | -0.141 | 0.050 | 0.022 | 0.165 |
| DES_FE1 | 0.595 | 0.098 | 0.083 | 0.060 | -0.052 |
| DES_FE2 | 0.529 | -0.002 | 0.056 | 0.204 | 0.256 |
| CSAI_S9 | 0.507 | -0.477 | 0.295 | -0.004 | -0.072 |
| STAI_15 | -0.060 | 0.783 | 0.107 | -0.119 | -0.032 |
| CSAI_S5 | -0.275 | 0.705 | 0.096 | 0.040 | -0.011 |
| STAI_17 | 0.105 | 0.674 | 0.074 | -0.055 | -0.011 |
| STAI_12 | 0.244 | 0.580 | 0.044 | 0.001 | -0.149 |
| STAI_10 | 0.218 | 0.576 | 0.087 | 0.105 | -0.191 |
| STAI_11 | -0.095 | 0.568 | 0.079 | 0.110 | -0.008 |
| STAI_2 | -0.057 | 0.559 | -0.135 | 0.054 | -0.139 |
| DES_EN3 | 0.125 | 0.530 | 0.002 | -0.105 | -0.059 |
| STAI_3 | -0.141 | 0.511 | -0.094 | 0.045 | -0.246 |
| DES_IN3 | 0.169 | 0.210 | 0.587 | 0.115 | -0.133 |
| DES_AN1 | 0.027 | -0.022 | -0.008 | 0.824 | -0.162 |
| DES_CO2 | -0.066 | 0.020 | 0.091 | 0.808 | 0.086 |
| DES_CO1 | -0.050 | 0.048 | 0.051 | 0.785 | -0.003 |
| DES_AN3 | 0.099 | -0.096 | -0.113 | 0.764 | 0.099 |
| DES_AN2 | -0.121 | -0.073 | -0.002 | 0.702 | 0.139 |
| DESSA1 | 0.078 | 0.019 | 0.065 | -0.017 | 0.835 |
| DESSA2 | -0.054 | -0.026 | -0.048 | 0.097 | 0.720 |
| DES_SA2 | 0.038 | -0.088 | -0.083 | 0.045 | 0.715 |
| DESSA3 | -0.029 | 0.010 | -0.143 | 0.189 | 0.501 |
| CSAI_C8 | 0.167 | 0.196 | 0.107 | -0.148 | -0.090 |
| STAI_7 | -0.049 | -0.387 | 0.045 | 0.121 | -0.111 |
| STAI_18 | -0.030 | -0.383 | 0.060 | 0.120 | -0.120 |
| CSAI_C7 | 0.048 | 0.088 | 0.018 | -0.117 | 0.253 |
| CSAI_C2 | 0.205 | 0.008 | 0.004 | 0.067 | 0.080 |
| CSAI_C6 | -0.090 | 0.043 | -0.141 | -0.068 | 0.113 |
| DES_SU1 | -0.041 | 0.070 | 0.025 | 0.021 | 0.208 |
| DES_SU3 | -0.000 | -0.024 | -0.034 | -0.061 | 0.088 |
| DES_SU2 | -0.153 | 0.091 | 0.131 | 0.007 | 0.074 |
| DES_SA3 | -0.129 | 0.029 | 0.029 | 0.046 | -0.093 |
| DES_SA1 | 0.001 | 0.074 | 0.160 | 0.006 | 0.240 |
| DESSHA2 | 0.078 | 0.039 | -0.058 | 0.005 | 0.058 |
| DESSHY2 | -0.025 | 0.034 | -0.057 | 0.041 | 0.116 |
| DES_DI2 | -0.026 | 0.144 | 0.147 | 0.123 | 0.195 |
| DES_GU1 | -0.035 | 0.031 | 0.020 | 0.092 | -0.168 |
| DESSHY3 | -0.089 | 0.046 | -0.023 | 0.219 | 0.205 |
| DES_GU3 | 0.045 | 0.045 | 0.079 | -0.076 | 0.155 |
| DESSHY1 | 0.146 | 0.086 | -0.237 | -0.056 | -0.089 |
| DESSHA3 | 0.166 | 0.009 | -0.294 | -0.093 | 0.036 |
| DES_DI3 | 0.328 | -0.038 | -0.149 | 0.078 | 0.174 |
| DESSHA1 | -0.019 | -0.160 | -0.292 | -0.024 | 0.019 |
| DES_GU2 | -0.109 | -0.058 | 0.031 | -0.064 | 0.025 |
| CSAI_C4 | 0.373 | 0.102 | -0.293 | 0.111 | -0.049 |

*(CONTINUED)*

| Items | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| STAI_1 | 0.004 | -0.130 | 0.143 | -0.072 | 0.239 |
| CSAI_C5 | 0.041 | -0.021 | 0.088 | 0.110 | 0.354 |
| CSAI_C1 | 0.168 | -0.396 | 0.194 | 0.154 | -0.034 |
| DES_CO3 | -0.099 | 0.161 | 0.493 | 0.304 | -0.065 |
| DES_IN1 | 0.188 | 0.248 | 0.211 | 0.163 | -0.054 |
| CSAI_S2 | 0.290 | -0.452 | 0.498 | -0.052 | -0.036 |
| CSAI_S8 | 0.366 | -0.234 | 0.250 | 0.113 | 0.048 |
| STAI_14 | 0.371 | -0.168 | 0.373 | 0.173 | 0.062 |
| DES_EN2 | 0.139 | 0.401 | 0.329 | -0.029 | 0.059 |
| DES_DI1 | 0.182 | -0.006 | -0.162 | 0.374 | 0.362 |
| STAI_6 | 0.394 | -0.484 | 0.149 | -0.032 | -0.126 |
| STAI_8 | 0.122 | 0.164 | -0.346 | 0.297 | 0.043 |
| CSAI_S4 | 0.191 | -0.488 | 0.003 | 0.111 | -0.002 |
| CSAI_S3 | 0.300 | 0.009 | 0.025 | -0.036 | 0.095 |
| CSAI_S6 | 0.331 | -0.388 | 0.171 | 0.227 | 0.173 |
| STAI_5 | 0.186 | -0.171 | 0.146 | 0.154 | -0.201 |
| DES_IN2 | 0.360 | 0.312 | 0.339 | 0.022 | 0.029 |
| STAI_13 | -0.103 | 0.306 | 0.250 | 0.077 | -0.380 |
| CSAI_C9 | 0.307 | 0.145 | 0.268 | 0.196 | 0.062 |
| DES_EN1 | 0.123 | 0.403 | 0.079 | 0.062 | -0.221 |
| STAI_4 | 0.138 | -0.004 | 0.161 | 0.117 | 0.377 |
| CSAI_C3 | 0.417 | 0.107 | -0.193 | -0.007 | 0.280 |
| STAI_16 | -0.083 | 0.450 | 0.454 | 0.085 | -0.016 |
| STAI_9 | -0.242 | 0.462 | 0.131 | -0.045 | -0.221 |

| Items | 6 | 7 | 8 | 9 |
|---|---|---|---|---|
| DES_FE3 | 0.155 | -0.010 | 0.040 | -0.023 |
| CSAI_S7 | 0.144 | -0.056 | -0.112 | -0.032 |
| CSAI_S1 | 0.144 | 0.073 | -0.012 | 0.147 |
| DES_FE1 | 0.224 | -0.341 | 0.198 | 0.033 |
| DES_FE2 | 0.103 | 0.088 | 0.107 | 0.041 |
| CSAI_S9 | 0.054 | 0.069 | 0.095 | 0.050 |
| STAI_15 | 0.016 | 0.022 | 0.086 | 0.012 |
| CSAI_S5 | 0.119 | 0.084 | 0.056 | -0.010 |
| STAI_17 | 0.075 | -0.006 | 0.108 | -0.073 |
| STAI_12 | -0.259 | 0.143 | -0.076 | 0.127 |
| STAI_10 | -0.127 | 0.214 | 0.118 | 0.010 |
| STAI_11 | -0.069 | 0.113 | -0.056 | 0.222 |
| STAI_2 | 0.047 | 0.266 | -0.167 | -0.010 |
| DES_EN3 | -0.075 | 0.408 | -0.091 | -0.126 |
| STAI_3 | -0.168 | 0.141 | 0.202 | 0.037 |
| DES_IN3 | 0.125 | 0.072 | -0.087 | -0.059 |
| DES_AN1 | -0.056 | 0.015 | 0.293 | -0.140 |
| DES_CO2 | -0.005 | -0.129 | -0.122 | 0.029 |
| DES_CO1 | -0.009 | -0.006 | -0.166 | 0.152 |
| DES_AN3 | -0.082 | 0.056 | 0.096 | -0.127 |
| DES_AN2 | 0.055 | -0.058 | 0.190 | -0.029 |
| DESSA1 | -0.073 | 0.025 | 0.068 | -0.008 |
| DESSA2 | 0.010 | 0.146 | 0.039 | -0.036 |
| DES_SA2 | -0.107 | 0.192 | -0.031 | 0.274 |
| DESSA3 | 0.096 | 0.099 | 0.078 | -0.000 |
| CSAI_C8 | 0.751 | -0.003 | 0.061 | -0.004 |
| STAI_7 | 0.657 | 0.110 | 0.031 | -0.200 |
| STAI_18 | 0.631 | 0.112 | 0.034 | -0.185 |
| CSAI_C7 | 0.585 | -0.022 | 0.051 | 0.195 |
| CSAI_C2 | 0.581 | 0.047 | 0.139 | 0.095 |
| CSAI_C6 | 0.507 | 0.259 | 0.313 | 0.085 |
| DES_SU1 | 0.028 | 0.750 | 0.125 | 0.052 |
| DES_SU3 | 0.051 | 0.741 | 0.157 | 0.007 |
| DES_SU2 | 0.146 | 0.680 | -0.112 | 0.066 |

*(CONTINUED)*

| Items | 6 | 7 | 8 | 9 |
|---|---|---|---|---|
| DES_SA3 | 0.073 | -0.074 | 0.829 | 0.151 |
| DES_SA1 | 0.039 | 0.055 | 0.824 | -0.140 |
| DESSHA2 | 0.001 | -0.010 | 0.783 | 0.023 |
| DESSHY2 | 0.076 | 0.111 | 0.743 | 0.050 |
| DES_DI2 | 0.030 | -0.079 | 0.729 | -0.146 |
| DES_GU1 | 0.052 | -0.023 | 0.686 | 0.271 |
| DESSHY3 | 0.064 | 0.105 | 0.683 | 0.024 |
| DES_GU3 | -0.075 | 0.072 | 0.637 | 0.362 |
| DESSHY1 | 0.002 | 0.300 | 0.608 | -0.118 |
| DESSHA3 | 0.089 | 0.183 | 0.580 | 0.184 |
| DES_DI3 | -0.162 | 0.213 | 0.571 | -0.146 |
| DESSHA1 | 0.133 | 0.238 | 0.512 | 0.345 |
| DES_GU2 | 0.007 | 0.006 | 0.407 | 0.600 |
| CSAI_C4 | 0.007 | 0.080 | 0.081 | 0.475 |
| STAI_1 | 0.040 | -0.031 | -0.034 | 0.305 |
| CSAI_C5 | 0.091 | 0.256 | 0.226 | 0.242 |
| CSAI_C1 | 0.218 | 0.052 | -0.066 | 0.155 |
| DES_CO3 | -0.010 | 0.085 | 0.065 | 0.143 |
| DES_IN1 | 0.000 | 0.162 | -0.122 | 0.142 |
| CSAI_S2 | 0.129 | 0.073 | 0.154 | -0.141 |
| CSAI_S8 | 0.364 | 0.060 | -0.045 | 0.125 |
| STAI_14 | 0.144 | 0.017 | 0.021 | -0.124 |
| DES_EN2 | 0.063 | 0.238 | 0.132 | -0.120 |
| DES_DI1 | -0.053 | 0.157 | 0.427 | -0.116 |
| STAI_6 | 0.234 | 0.304 | -0.035 | -0.110 |
| STAI_8 | 0.477 | -0.027 | -0.134 | 0.110 |
| CSAI_S4 | 0.428 | 0.136 | -0.155 | 0.110 |
| CSAI_S3 | 0.130 | 0.292 | 0.396 | -0.082 |
| CSAI_S6 | -0.022 | 0.270 | -0.118 | 0.064 |
| STAI_5 | 0.074 | -0.028 | 0.353 | -0.040 |
| DES_IN2 | -0.001 | 0.089 | -0.297 | -0.027 |
| STAI_13 | -0.041 | 0.229 | -0.181 | 0.024 |
| CSAI_C9 | 0.332 | 0.012 | -0.299 | 0.015 |
| DES_EN1 | -0.132 | 0.355 | 0.163 | -0.015 |
| STAI_4 | 0.131 | -0.214 | 0.033 | -0.009 |
| CSAI_C3 | 0.353 | 0.042 | 0.173 | 0.005 |
| STAI_16 | -0.294 | 0.164 | 0.060 | -0.003 |
| STAI_9 | -0.026 | 0.226 | 0.182 | 0.003 |

Legend:
DES - item from the differential emotions scale; STAI - item from the state-trait anxiety inventory; CSAI_C = item from the cognitive subscale of the CSAI-2; CSAI_S = item from the somatic subscale of the CSAI-2. The detailed legend of items' codes is on page 439.

**"Variance" Explained by Rotated Factors**

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 5.821 | 7.125 | 3.072 | 4.355 | 4.303 |

| 6 | 7 | 8 | 9 |
|---|---|---|---|
| 4.850 | 3.987 | 8.111 | 1.973 |

**Percent of Total Variance Explained**

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 8.084 | 9.896 | 4.266 | 6.048 | 5.976 |

| 6 | 7 | 8 | 9 |
|---|---|---|---|
| 6.736 | 5.538 | 11.266 | 2.740 |

**Percent of Common Variance Explained**

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 13.351 | 16.344 | 7.046 | 9.989 | 9.869 |

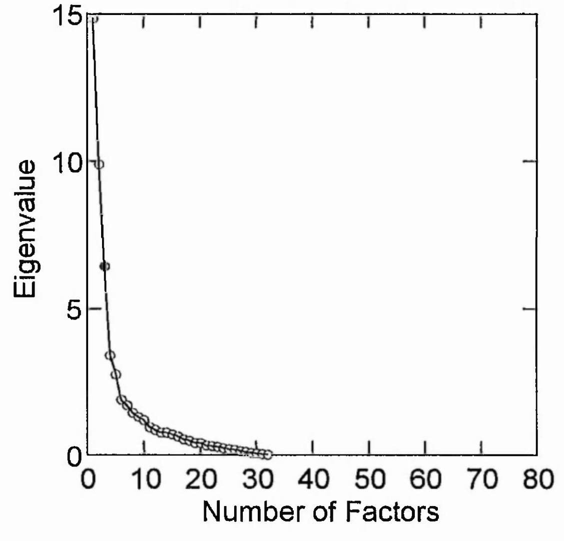
| 6 | 7 | 8 | 9 |
|---|---|---|---|
| 11.125 | 9.146 | 18.606 | 4.525 |

**Correlations among Oblique Factors or Components**

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | 1.000 | | | | |
| 2 | -0.133 | 1.000 | | | |
| 3 | 0.217 | 0.078 | 1.000 | | |
| 4 | 0.213 | -0.011 | 0.162 | 1.000 | |
| 5 | 0.148 | -0.195 | -0.084 | 0.153 | 1.000 |
| 6 | 0.383 | -0.228 | 0.086 | 0.176 | 0.187 |
| 7 | 0.164 | 0.272 | 0.100 | 0.111 | 0.054 |
| 8 | 0.109 | 0.029 | -0.104 | 0.125 | 0.190 |
| 9 | 0.030 | 0.054 | -0.044 | 0.054 | 0.179 |

| | 6 | 7 | 8 | 9 |
|---|---|---|---|---|
| 6 | 1.000 | | | |
| 7 | 0.094 | 1.000 | | |
| 8 | 0.128 | 0.242 | 1.000 | |
| 9 | 0.094 | 0.101 | 0.113 | 1.000 |

Scree Plot



## APPENDIX 38

## FACTOR ANALYSIS OF THE ITEMS OF THE PESQ USING DATA RELATED TO RECALLED DEBILITATIVE EMOTIONAL STATES EXPERIENCED BEFORE ATHLETES' WORST COMPETITION ("threat" and "challenge" items excluded)

N = 139      Number of items = 72

Rotated Pattern Matrix (OBLIMIN, Gamma = 0.0000)

| Items | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DES_FE2 | 0.845 | 0.024 | 0.029 | 0.017 | 0.028 |
| DES_FE3 | 0.817 | 0.060 | -0.060 | 0.091 | 0.030 |
| DES_FE1 | 0.769 | 0.088 | -0.027 | -0.034 | 0.159 |
| CSAI_S7 | 0.762 | 0.150 | -0.008 | 0.119 | -0.049 |
| STAI_5 | 0.587 | -0.162 | 0.308 | -0.180 | -0.096 |
| STAI_9 | -0.086 | -0.864 | 0.097 | 0.045 | -0.044 |
| STAI_17 | 0.013 | -0.852 | -0.216 | -0.040 | -0.018 |
| CSAI_S5 | 0.007 | -0.850 | -0.079 | -0.051 | -0.112 |
| STAI_11 | 0.006 | -0.836 | -0.122 | -0.019 | -0.042 |
| STAI_12 | -0.033 | -0.834 | 0.167 | -0.053 | 0.038 |
| STAI_3 | 0.057 | -0.794 | -0.027 | 0.022 | -0.044 |
| STAI_13 | -0.024 | -0.773 | 0.061 | -0.008 | 0.068 |
| DES_EN1 | -0.068 | -0.738 | 0.145 | -0.088 | 0.051 |
| STAI_15 | -0.057 | -0.718 | -0.110 | 0.031 | -0.093 |
| STAI_16 | -0.103 | -0.703 | -0.051 | -0.028 | -0.111 |
| DES_EN2 | 0.179 | -0.689 | 0.108 | 0.112 | -0.005 |
| DES_EN3 | -0.106 | -0.650 | 0.087 | 0.042 | -0.088 |
| STAI_2 | -0.043 | -0.627 | 0.133 | 0.346 | 0.232 |
| DES_CO3 | -0.119 | -0.618 | 0.059 | 0.227 | -0.026 |
| STAI_10 | 0.052 | -0.579 | -0.081 | -0.097 | 0.104 |
| DES_IN3 | -0.062 | -0.060 | 0.863 | -0.003 | -0.074 |
| DES_IN2 | -0.047 | 0.034 | 0.719 | 0.059 | -0.041 |
| DES_IN1 | 0.214 | -0.100 | 0.562 | 0.336 | -0.015 |
| DES_AN2 | 0.013 | -0.007 | -0.181 | 0.757 | 0.200 |
| DES_CO1 | -0.029 | 0.001 | 0.131 | 0.736 | -0.004 |
| DES_SU2 | 0.220 | -0.184 | 0.069 | 0.720 | 0.122 |
| DES_AN3 | -0.112 | 0.031 | 0.047 | 0.699 | 0.010 |
| DES_SU1 | 0.011 | 0.016 | 0.108 | 0.657 | 0.103 |
| DES_AN1 | -0.195 | -0.102 | -0.013 | 0.645 | -0.091 |
| DES_SU3 | 0.071 | -0.102 | 0.086 | 0.610 | 0.067 |
| DES_DI3 | 0.117 | 0.184 | -0.086 | 0.607 | -0.111 |
| DES_CO2 | -0.094 | -0.231 | -0.039 | 0.501 | -0.016 |
| DESSHA1 | 0.084 | 0.023 | -0.114 | 0.208 | 0.836 |
| DESSHA3 | 0.219 | 0.115 | -0.052 | 0.101 | 0.742 |
| DESSHA2 | -0.023 | 0.020 | -0.271 | 0.130 | 0.727 |
| CSAI_C6 | -0.195 | 0.058 | 0.100 | 0.034 | 0.643 |
| CSAI_C8 | 0.096 | 0.072 | 0.274 | -0.209 | 0.603 |
| CSAI_C7 | 0.115 | 0.100 | 0.322 | -0.170 | 0.584 |
| CSAI_C9 | 0.034 | -0.110 | 0.369 | -0.252 | 0.522 |
| DESSA2 | 0.023 | 0.061 | -0.198 | 0.109 | -0.030 |
| DESSA1 | -0.061 | 0.090 | -0.112 | 0.044 | -0.144 |
| STAI_4 | 0.203 | 0.077 | -0.103 | -0.131 | -0.163 |
| DESSA3 | 0.221 | 0.000 | -0.154 | 0.187 | 0.122 |
| CSAI_C4 | -0.012 | 0.009 | 0.198 | 0.026 | 0.306 |
| STAI_6 | 0.233 | 0.069 | 0.063 | 0.076 | 0.073 |
| CSAI_S4 | 0.198 | 0.287 | 0.152 | 0.253 | 0.100 |
| CSAI_S6 | 0.393 | 0.105 | -0.066 | 0.135 | 0.099 |
| STAI_7 | 0.180 | 0.300 | 0.207 | 0.039 | 0.047 |

*(CONTINUED)*

| Items | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DES_SA1 | 0.007 | -0.030 | -0.002 | 0.069 | -0.043 |
| DESSHY3 | 0.096 | -0.028 | -0.119 | 0.102 | 0.225 |
| DES_SA2 | 0.246 | 0.123 | -0.035 | 0.015 | 0.126 |
| DES_GU3 | 0.115 | 0.053 | -0.014 | 0.032 | 0.096 |
| STAI_1 | 0.227 | 0.195 | 0.085 | 0.090 | -0.011 |
| DESSHY1 | 0.315 | 0.036 | -0.066 | 0.012 | 0.455 |
| DES_SA3 | -0.284 | 0.035 | 0.050 | 0.056 | 0.405 |
| DES_DI2 | 0.016 | 0.056 | 0.125 | 0.477 | 0.065 |
| DESSHY2 | 0.206 | 0.088 | -0.165 | 0.146 | 0.249 |
| STAI_8 | 0.074 | -0.022 | 0.098 | 0.024 | 0.423 |
| DES_GU1 | 0.129 | 0.149 | 0.023 | 0.117 | -0.086 |
| CSAI_C3 | 0.321 | 0.266 | 0.116 | -0.049 | 0.204 |
| STAI_14 | 0.264 | 0.134 | 0.049 | -0.074 | -0.031 |
| CSAI_C5 | 0.095 | 0.006 | 0.146 | 0.125 | 0.461 |
| CSAI_S3 | 0.482 | -0.043 | 0.106 | 0.067 | 0.179 |
| DES_GU2 | 0.121 | 0.117 | 0.036 | 0.050 | 0.143 |
| CSAI_S9 | 0.148 | 0.319 | 0.029 | -0.009 | 0.097 |
| CSAI_S1 | 0.400 | 0.141 | 0.038 | -0.019 | 0.285 |
| CSAI_C2 | 0.255 | 0.139 | 0.365 | -0.004 | 0.330 |
| CSAI_S8 | 0.314 | 0.207 | 0.199 | 0.144 | -0.115 |
| CSAI_S2 | 0.328 | 0.220 | 0.164 | -0.082 | -0.029 |
| DES_DI1 | 0.241 | -0.082 | 0.023 | 0.348 | 0.105 |
| CSAI_C1 | 0.318 | 0.156 | 0.248 | -0.065 | 0.118 |

| Items | 6 | 7 | 8 | 9 |
|---|---|---|---|---|
| DES_FE2 | -0.038 | 0.142 | -0.008 | 0.095 |
| DES_FE3 | 0.115 | 0.004 | 0.138 | 0.024 |
| DES_FE1 | 0.063 | 0.100 | -0.033 | 0.021 |
| CSAI_S7 | 0.146 | 0.003 | 0.126 | 0.111 |
| STAI_5 | -0.153 | 0.001 | 0.141 | 0.327 |
| STAI_9 | 0.125 | -0.013 | 0.091 | -0.015 |
| STAI_17 | -0.134 | -0.082 | -0.114 | -0.028 |
| CSAI_S5 | -0.057 | 0.026 | -0.128 | 0.038 |
| STAI_11 | -0.094 | -0.063 | 0.086 | 0.160 |
| STAI_12 | -0.013 | 0.018 | -0.155 | -0.018 |
| STAI_3 | -0.132 | -0.004 | 0.015 | -0.105 |
| STAI_13 | -0.005 | -0.171 | 0.036 | 0.004 |
| DES_EN1 | 0.131 | -0.045 | -0.079 | 0.058 |
| STAI_15 | 0.112 | 0.021 | -0.184 | -0.032 |
| STAI_16 | -0.009 | 0.074 | -0.186 | -0.054 |
| DES_EN2 | 0.399 | 0.017 | -0.037 | -0.019 |
| DES_EN3 | 0.373 | -0.059 | -0.021 | -0.125 |
| STAI_2 | 0.043 | -0.066 | -0.041 | -0.054 |
| DES_CO3 | -0.214 | 0.081 | 0.157 | -0.098 |
| STAI_10 | 0.640 | -0.088 | 0.122 | 0.044 |
| DES_IN3 | -0.071 | -0.100 | -0.063 | 0.056 |
| DES_IN2 | 0.029 | 0.001 | 0.016 | -0.044 |
| DES_IN1 | 0.068 | -0.303 | 0.083 | -0.030 |
| DES_AN2 | -0.153 | 0.124 | 0.007 | -0.021 |
| DES_CO1 | 0.141 | -0.067 | 0.039 | 0.048 |
| DES_SU2 | -0.157 | 0.082 | -0.087 | -0.213 |
| DES_AN3 | -0.190 | -0.022 | 0.202 | 0.361 |
| DES_SU1 | 0.500 | -0.071 | -0.010 | -0.129 |
| DES_AN1 | -0.099 | 0.195 | 0.225 | 0.248 |
| DES_SU3 | 0.270 | -0.044 | -0.031 | 0.048 |
| DES_DI3 | 0.190 | 0.224 | -0.031 | 0.096 |
| DES_CO2 | -0.100 | 0.144 | 0.232 | 0.429 |
| DESSHA1 | -0.010 | -0.128 | -0.066 | -0.105 |
| DESSHA3 | -0.024 | -0.240 | -0.057 | 0.247 |
| DESSHA2 | 0.042 | -0.042 | -0.013 | 0.261 |

*(CONTINUED)*

| Items | 6 | 7 | 8 | 9 |
|---|---|---|---|---|
| CSAI_C6 | 0.097 | 0.215 | 0.273 | 0.045 |
| CSAI_C8 | -0.001 | 0.264 | 0.114 | -0.066 |
| CSAI_C7 | -0.079 | 0.271 | 0.066 | 0.001 |
| CSAI_C9 | 0.121 | 0.137 | 0.209 | 0.021 |
| DESSA2 | -0.098 | 0.765 | 0.031 | 0.133 |
| DESSA1 | 0.066 | 0.675 | 0.224 | 0.120 |
| STAI_4 | -0.012 | 0.558 | 0.266 | 0.329 |
| DESSA3 | -0.062 | 0.532 | 0.117 | 0.133 |
| CSAI_C4 | -0.154 | 0.519 | 0.115 | -0.089 |
| STAI_6 | -0.178 | 0.274 | 0.576 | -0.084 |
| CSAI_S4 | -0.032 | -0.073 | 0.563 | -0.136 |
| CSAI_S6 | 0.105 | 0.034 | 0.544 | 0.043 |
| STAI_7 | 0.012 | -0.028 | 0.518 | 0.154 |
| DES_SA1 | -0.053 | 0.061 | 0.091 | 0.823 |
| DESSHY3 | -0.055 | 0.057 | -0.040 | 0.663 |
| DES_SA2 | 0.068 | 0.034 | 0.010 | 0.620 |
| DES_GU3 | 0.192 | 0.319 | -0.154 | 0.517 |
| STAI_1 | 0.118 | 0.215 | -0.227 | 0.437 |
| DESSHY1 | 0.032 | -0.064 | -0.173 | 0.435 |
| DES_SA3 | -0.070 | 0.230 | 0.275 | 0.333 |
| DES_DI2 | -0.043 | 0.044 | -0.001 | 0.330 |
| DESSHY2 | 0.423 | 0.107 | 0.008 | 0.324 |
| STAI_8 | 0.077 | 0.063 | 0.274 | 0.310 |
| DES_GU1 | 0.292 | 0.414 | -0.220 | 0.309 |
| CSAI_C3 | 0.068 | 0.329 | 0.181 | -0.176 |
| STAI_14 | -0.030 | 0.261 | 0.319 | 0.158 |
| CSAI_C5 | 0.272 | 0.339 | -0.021 | -0.149 |
| CSAI_S3 | -0.234 | -0.070 | 0.342 | 0.143 |
| DES_GU2 | 0.162 | 0.467 | -0.177 | 0.136 |
| CSAI_S9 | 0.194 | 0.190 | 0.466 | -0.076 |
| CSAI_S1 | 0.088 | 0.034 | 0.311 | -0.073 |
| CSAI_C2 | -0.289 | 0.312 | -0.031 | -0.061 |
| CSAI_S8 | 0.267 | 0.108 | 0.485 | -0.055 |
| CSAI_S2 | -0.161 | 0.159 | 0.271 | 0.052 |
| DES_DI1 | -0.187 | 0.431 | -0.145 | 0.011 |
| CSAI_C1 | 0.112 | 0.110 | 0.370 | -0.008 |

Legend:
DES - item from the differential emotions scale; STAI - item from the state-trait anxiety inventory; CSAI_C = item from the cognitive subscale of the CSAI-2; CSAI_S = item from the somatic subscale of the CSAI-2. The detailed legend of items' codes is on page 439.

**"Variance" Explained by Rotated Factors**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|
| 6.911 | 10.366 | 3.425 | 5.776 | 5.988 | 2.411 | 5.289 | 4.553 | 4.854 |

**Percent of Total Variance Explained**

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 9.734 | 14.600 | 4.824 | 8.135 | 8.433 |

| 6 | 7 | 8 | 9 |
|---|---|---|---|
| 3.395 | 7.449 | 6.413 | 6.836 |

**Percent of Common Variance Explained**

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 13.941 | 20.910 | 6.910 | 11.652 | 12.079 |

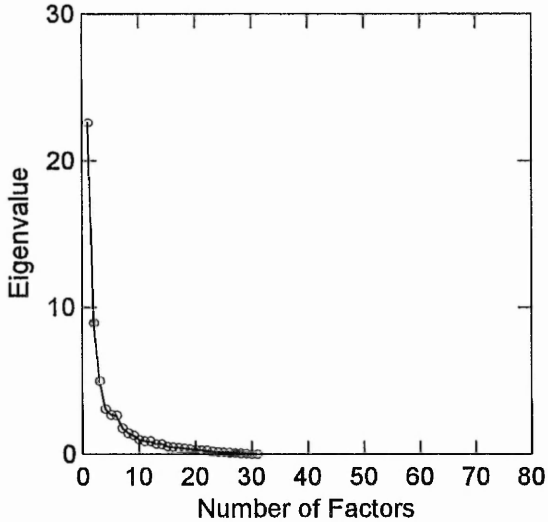
| 6 | 7 | 8 | 9 |
|---|---|---|---|
| 4.863 | 10.669 | 9.185 | 9.791 |

**Correlations among Oblique Factors or Components**

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | 1.000 | | | | |
| 2 | 0.314 | 1.000 | | | |
| 3 | 0.241 | -0.027 | 1.000 | | |
| 4 | 0.141 | -0.110 | 0.063 | 1.000 | |
| 5 | 0.319 | 0.133 | 0.185 | 0.209 | 1.000 |
| 6 | 0.129 | -0.033 | 0.044 | 0.079 | 0.082 |
| 7 | 0.294 | 0.300 | 0.053 | 0.176 | 0.246 |
| 8 | 0.262 | 0.235 | 0.279 | 0.113 | 0.202 |
| 9 | 0.268 | 0.125 | -0.094 | 0.230 | 0.198 |

| | 6 | 7 | 8 | 9 |
|---|---|---|---|---|
| 6 | 1.000 | | | |
| 7 | -0.011 | 1.000 | | |
| 8 | -0.066 | 0.238 | 1.000 | |
| 9 | 0.033 | 0.323 | 0.139 | 1.000 |

Scree Plot



# APPENDIX 39

## FACTOR ANALYSIS OF THE ITEMS OF THE PESQ USING DATA RELATED TO MOMENTARY EMOTIONAL STATES EXPERIENCED BEFORE AN ACTUAL COMPETITION ("threat" and "challenge" items excluded)

**N = 202 Number of items = 72**

**Rotated Pattern Matrix (OBLIMIN, Gamma = 0.0000)**

| Items | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DESSA2 | 0.684 | -0.100 | 0.065 | 0.238 | -0.005 |
| DESSA1 | 0.669 | -0.081 | 0.008 | 0.053 | 0.100 |
| STAI_4 | 0.555 | -0.090 | 0.027 | 0.472 | 0.094 |
| CSAI_C5 | 0.516 | -0.053 | 0.002 | -0.005 | -0.161 |
| DES_EN3 | -0.031 | 0.799 | 0.140 | -0.003 | -0.117 |
| STAI_12 | -0.016 | 0.784 | 0.113 | -0.042 | -0.052 |
| STAI_15 | 0.172 | 0.780 | -0.118 | 0.016 | -0.200 |
| STAI_17 | 0.028 | 0.774 | -0.052 | 0.037 | -0.029 |
| STAI_10 | -0.143 | 0.743 | 0.056 | -0.067 | 0.086 |
| STAI_16 | -0.006 | 0.739 | 0.271 | 0.157 | -0.065 |
| STAI_9 | -0.130 | 0.735 | 0.045 | -0.052 | -0.108 |
| CSAI_S5 | -0.031 | 0.694 | -0.253 | -0.067 | 0.037 |
| STAI_3 | -0.128 | 0.691 | -0.000 | -0.059 | 0.046 |
| STAI_11 | -0.055 | 0.684 | -0.223 | -0.033 | 0.041 |
| STAI_2 | 0.035 | 0.653 | 0.105 | -0.009 | -0.099 |
| DES_EN2 | 0.057 | 0.637 | 0.178 | -0.007 | 0.071 |
| STAI_13 | -0.070 | 0.630 | 0.117 | 0.114 | -0.226 |
| DES_EN1 | -0.158 | 0.560 | 0.119 | -0.047 | 0.114 |
| DES_IN2 | 0.157 | 0.294 | 0.598 | -0.091 | 0.153 |
| DES_IN3 | 0.131 | 0.320 | 0.565 | -0.061 | 0.080 |
| DES_DI1 | 0.008 | -0.021 | -0.087 | 0.903 | 0.052 |
| DES_DI3 | 0.003 | 0.050 | -0.117 | 0.903 | 0.106 |
| DES_DI2 | -0.009 | 0.011 | -0.126 | 0.893 | 0.116 |
| DES_AN3 | 0.029 | -0.012 | -0.056 | 0.863 | 0.060 |
| DES_AN1 | -0.045 | 0.003 | -0.032 | 0.856 | 0.105 |
| DES_CO2 | 0.009 | -0.122 | 0.287 | 0.803 | -0.055 |
| DES_AN2 | 0.080 | 0.009 | -0.140 | 0.751 | 0.107 |
| DES_CO1 | 0.094 | 0.083 | 0.204 | 0.688 | -0.096 |
| DES_FE3 | 0.100 | 0.031 | -0.098 | 0.095 | 0.844 |
| CSAI_S7 | 0.003 | -0.020 | -0.107 | 0.113 | 0.781 |
| CSAI_S6 | -0.017 | -0.032 | 0.186 | 0.190 | 0.707 |
| DES_FE2 | 0.242 | -0.008 | 0.022 | 0.101 | 0.662 |
| CSAI_S9 | -0.041 | -0.159 | 0.084 | 0.016 | 0.611 |
| CSAI_S8 | -0.106 | -0.138 | 0.163 | 0.040 | 0.527 |
| DESSHA1 | 0.012 | -0.083 | 0.044 | 0.052 | -0.088 |
| DESSHA3 | 0.128 | -0.070 | -0.017 | 0.041 | 0.049 |
| DESSHA2 | -0.070 | -0.059 | -0.001 | 0.136 | 0.036 |
| CSAI_C1 | -0.012 | -0.208 | 0.236 | -0.115 | 0.013 |
| STAI_7 | 0.069 | -0.213 | -0.011 | 0.115 | 0.240 |
| CSAI_S4 | -0.018 | -0.111 | -0.119 | 0.290 | 0.359 |
| CSAI_C8 | 0.154 | -0.018 | -0.035 | -0.166 | -0.026 |
| CSAI_C7 | 0.069 | 0.125 | -0.036 | -0.160 | 0.202 |
| DES_SU2 | 0.017 | 0.128 | 0.144 | 0.035 | 0.049 |
| DES_SU1 | 0.039 | 0.186 | 0.032 | 0.100 | 0.038 |
| DESSHY3 | 0.056 | 0.061 | 0.079 | 0.220 | -0.017 |
| DES_SA2 | 0.228 | -0.095 | 0.112 | 0.131 | -0.025 |
| DES_SA3 | 0.151 | 0.011 | -0.109 | 0.092 | 0.238 |
| DES_SA1 | 0.239 | 0.040 | -0.141 | 0.081 | 0.200 |
| DES_GU3 | 0.171 | -0.016 | -0.048 | 0.098 | -0.032 |

*(CONTINUED)*

| Items | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DES_GU2 | 0.184 | 0.039 | -0.035 | 0.094 | 0.035 |
| DES_GU1 | 0.131 | 0.049 | -0.053 | 0.146 | -0.024 |
| DESSA3 | 0.421 | -0.019 | -0.115 | 0.169 | 0.222 |
| DESSHY1 | 0.170 | 0.050 | -0.124 | 0.023 | 0.374 |
| DES_SU3 | -0.061 | 0.032 | 0.402 | 0.129 | -0.148 |
| DESSHY2 | 0.033 | -0.090 | -0.045 | 0.197 | -0.070 |
| CSAI_C6 | -0.105 | 0.007 | -0.237 | -0.054 | 0.013 |
| DES_CO3 | 0.097 | 0.284 | 0.205 | 0.387 | -0.245 |
| CSAI_C9 | 0.032 | 0.128 | 0.434 | -0.222 | 0.132 |
| STAI_5 | -0.067 | -0.098 | 0.248 | 0.015 | 0.400 |
| DES_IN1 | -0.051 | 0.360 | 0.452 | 0.010 | 0.205 |
| CSAI_C3 | 0.112 | -0.138 | -0.014 | 0.069 | 0.283 |
| CSAI_C4 | 0.188 | 0.020 | -0.164 | -0.103 | 0.360 |
| STAI_1 | 0.264 | -0.090 | -0.079 | 0.426 | -0.070 |
| CSAI_S2 | 0.156 | -0.224 | 0.380 | 0.057 | 0.452 |
| DES_FE1 | 0.457 | -0.034 | 0.062 | 0.050 | 0.476 |
| STAI_6 | -0.053 | -0.294 | 0.305 | 0.101 | 0.430 |
| STAI_14 | -0.098 | -0.131 | 0.362 | 0.038 | 0.357 |
| CSAI_S3 | 0.340 | -0.132 | 0.331 | -0.012 | 0.217 |
| CSAI_S1 | 0.183 | -0.088 | 0.217 | -0.107 | 0.490 |
| CSAI_C2 | 0.321 | 0.029 | 0.138 | -0.181 | 0.145 |
| STAI_8 | 0.286 | 0.047 | -0.154 | 0.010 | 0.041 |

| Items | 6 | 7 | 8 | 9 |
|---|---|---|---|---|
| DESSA2 | -0.017 | -0.009 | -0.066 | 0.165 |
| DESSA1 | -0.074 | -0.032 | -0.015 | 0.351 |
| STAI_4 | -0.124 | 0.052 | 0.051 | 0.051 |
| CSAI_C5 | 0.214 | 0.163 | 0.263 | -0.126 |
| DES_EN3 | 0.006 | 0.005 | -0.121 | 0.119 |
| STAI_12 | -0.060 | -0.049 | 0.017 | 0.025 |
| STAI_15 | 0.077 | -0.002 | -0.211 | -0.114 |
| STAI_17 | 0.020 | -0.067 | -0.318 | -0.054 |
| STAI_10 | -0.142 | -0.000 | 0.100 | 0.135 |
| STAI_16 | -0.012 | -0.068 | -0.147 | -0.021 |
| STAI_9 | -0.073 | -0.081 | 0.158 | 0.152 |
| CSAI_S5 | -0.133 | -0.096 | 0.201 | 0.085 |
| STAI_3 | 0.238 | -0.155 | 0.072 | -0.144 |
| STAI_11 | -0.188 | 0.096 | 0.232 | 0.076 |
| STAI_2 | 0.247 | -0.102 | 0.076 | -0.180 |
| DES_EN2 | -0.225 | 0.122 | 0.206 | 0.218 |
| STAI_13 | -0.133 | 0.195 | -0.065 | -0.162 |
| DES_EN1 | -0.094 | 0.096 | 0.324 | 0.031 |
| DES_IN2 | -0.138 | -0.056 | -0.023 | -0.087 |
| DES_IN3 | -0.133 | 0.116 | 0.083 | -0.188 |
| DES_DI1 | 0.012 | -0.030 | -0.038 | 0.144 |
| DES_DI3 | 0.059 | -0.008 | 0.012 | 0.031 |
| DES_DI2 | 0.017 | -0.091 | 0.133 | -0.053 |
| DES_AN3 | -0.030 | -0.007 | -0.011 | 0.134 |
| DES_AN1 | -0.044 | -0.035 | 0.037 | -0.061 |
| DES_CO2 | 0.007 | -0.110 | -0.102 | 0.073 |
| DES_AN2 | 0.034 | 0.063 | 0.127 | 0.134 |
| DES_CO1 | 0.109 | 0.020 | -0.151 | -0.048 |
| DES_FE3 | -0.069 | -0.050 | 0.034 | 0.129 |
| CSAI_S7 | -0.101 | -0.001 | 0.063 | 0.135 |
| CSAI_S6 | 0.103 | 0.009 | 0.046 | -0.119 |
| DES_FE2 | 0.041 | 0.102 | -0.069 | 0.028 |
| CSAI_S9 | -0.031 | 0.406 | -0.129 | -0.009 |
| CSAI_S8 | 0.117 | 0.428 | -0.021 | -0.031 |
| DESSHA1 | 0.779 | 0.082 | 0.135 | 0.067 |
| DESSHA3 | 0.619 | 0.049 | 0.203 | 0.240 |

*(CONTINUED)*

| Items | 6 | 7 | 8 | 9 |
|---|---|---|---|---|
| DESSHA2 | 0.581 | 0.028 | 0.031 | 0.387 |
| CSAI_C1 | -0.299 | 0.636 | 0.033 | 0.098 |
| STAI_7 | 0.090 | 0.601 | 0.036 | -0.120 |
| CSAI_S4 | 0.078 | 0.600 | -0.139 | -0.113 |
| CSAI_C8 | 0.390 | 0.571 | -0.050 | -0.033 |
| CSAI_C7 | 0.203 | 0.516 | -0.047 | 0.219 |
| DES_SU2 | 0.175 | -0.166 | 0.619 | 0.140 |
| DES_SU1 | 0.089 | -0.087 | 0.549 | 0.224 |
| DESSHY3 | 0.255 | -0.010 | -0.052 | 0.710 |
| DES_SA2 | 0.222 | 0.093 | -0.230 | 0.666 |
| DES_SA3 | -0.080 | -0.025 | 0.236 | 0.643 |
| DES_SA1 | -0.031 | -0.034 | 0.213 | 0.601 |
| DES_GU3 | 0.030 | -0.042 | 0.321 | 0.587 |
| DES_GU2 | 0.173 | 0.058 | 0.131 | 0.577 |
| DES_GU1 | 0.218 | 0.205 | 0.103 | 0.527 |
| DESSA3 | -0.059 | -0.122 | 0.301 | 0.423 |
| DESSHY1 | 0.300 | -0.112 | 0.072 | 0.384 |
| DES_SU3 | 0.079 | 0.032 | 0.129 | 0.313 |
| DESSHY2 | 0.239 | 0.063 | 0.380 | 0.258 |
| CSAI_C6 | 0.401 | 0.488 | 0.034 | 0.239 |
| DES_CO3 | -0.185 | 0.438 | 0.053 | -0.238 |
| CSAI_C9 | 0.054 | 0.355 | -0.268 | 0.193 |
| STAI_5 | 0.118 | 0.129 | 0.326 | -0.193 |
| DES_IN1 | -0.057 | -0.045 | 0.072 | -0.150 |
| CSAI_C3 | 0.373 | 0.123 | 0.015 | 0.112 |
| CSAI_C4 | 0.280 | 0.107 | 0.221 | 0.109 |
| STAI_1 | -0.066 | 0.230 | 0.227 | 0.108 |
| CSAI_S2 | 0.064 | 0.177 | -0.139 | -0.101 |
| DES_FE1 | 0.032 | 0.008 | 0.057 | 0.099 |
| STAI_6 | 0.015 | 0.183 | 0.148 | 0.094 |
| STAI_14 | -0.116 | 0.160 | 0.246 | -0.056 |
| CSAI_S3 | 0.279 | -0.010 | 0.012 | -0.054 |
| CSAI_S1 | 0.039 | 0.160 | -0.146 | -0.044 |
| CSAI_C2 | 0.122 | 0.497 | -0.003 | -0.010 |
| STAI_8 | 0.334 | 0.461 | 0.104 | 0.009 |

Legend:
DES - item from the differential emotions scale; STAI - item from the state-trait anxiety inventory; CSAI_C = item from the cognitive subscale of the CSAI-2; CSAI_S = item from the somatic subscale of the CSAI-2. The detailed legend of items' codes is on page 439.

**"Variance" Explained by Rotated Factors**

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 4.197 | 8.603 | 3.161 | 7.531 | 6.585 |

| 6 | 7 | 8 | 9 |
|---|---|---|---|
| 3.929 | 4.499 | 3.216 | 5.710 |

**Percent of Total Variance Explained**

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 5.912 | 12.117 | 4.453 | 10.607 | 9.274 |

| 6 | 7 | 8 | 9 |
|---|---|---|---|
| 5.533 | 6.336 | 4.530 | 8.042 |

**Percent of Common Variance Explained**

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 8.849 | 18.138 | 6.665 | 15.878 | 13.883 |

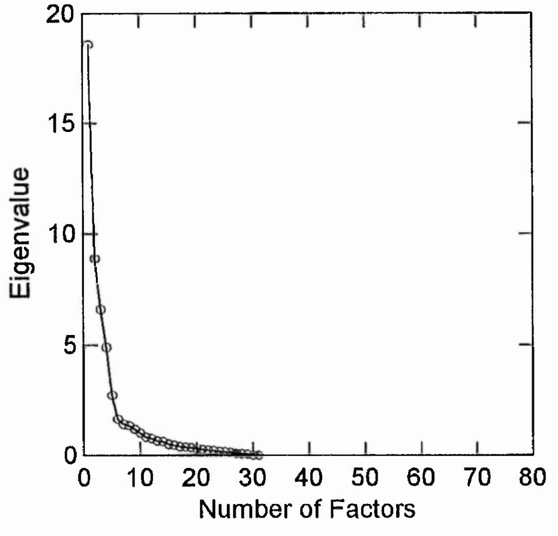
| 6 | 7 | 8 | 9 |
|---|---|---|---|
| 8.283 | 9.485 | 6.781 | 12.039 |

**Correlations among Oblique Factors or Components**

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | 1.000 | | | | |
| 2 | -0.125 | 1.000 | | | |
| 3 | 0.053 | 0.150 | 1.000 | | |
| 4 | 0.288 | -0.068 | 0.057 | 1.000 | |
| 5 | 0.238 | -0.239 | 0.178 | 0.104 | 1.000 |
| 6 | 0.264 | -0.158 | -0.069 | 0.073 | 0.126 |
| 7 | 0.237 | -0.137 | 0.217 | 0.021 | 0.304 |
| 8 | 0.109 | 0.116 | -0.004 | 0.159 | 0.179 |
| 9 | 0.280 | -0.046 | -0.119 | 0.242 | 0.152 |

| | 6 | 7 | 8 | 9 |
|---|---|---|---|---|
| 6 | 1.000 | | | |
| 7 | 0.181 | 1.000 | | |
| 8 | 0.106 | 0.031 | 1.000 | |
| 9 | 0.273 | 0.060 | 0.289 | 1.000 |

Scree Plot



Eigenvalue
Number of Factors
0
5
10
15
20
0
10
20
30
40
50
60
70
80

**Legend for Appendices 37-39: Items of the PESQ**

| Code for item | Item |
|---|---|
| csai_c1 | I am/was concerned about this/that competition |
| stai_1 | I am/was regretful |
| stai_2 | I feel/felt content |
| stai_3 | I feel/felt at ease |
| csai_s1 | I feel/felt my stomach sinking |
| des_co1 | I feel/felt like somebody is/was "good-for-nothing" |
| des_en1 | I feel/felt joyful, like everything is/was going my way, everything is/was rosy |
| dessa1 | I feel/felt sad and gloomy, almost like crying |
| des_in1 | I feel/felt like what I am/was doing or watching is/was interesting |
| csai_s2 | My body feels/felt tight |
| stai_4 | I feel/felt upset |
| dessa2 | I feel/felt unhappy, blue, downhearted |
| stai_5 | I feel/felt over-excited and "rattled" |
| csai_s3 | My hands are/were clammy |
| stai_6 | I am/was tense |
| dessa3 | I fell/felt discouraged, like I can't/couldn't make it, nothing is/was going right |
| stai_7 | I feel/felt anxious |
| csai_s4 | I feel/felt nervous |
| des_co2 | I feel/felt like somebody is/was a low-life, not worth the time of the day |
| stai_8 | I am/was worrying over possible misfortunes |
| csai_c2 | I am/was concerned about losing |
| stai_9 | I feel/felt comfortable |
| des_an1 | I feel/felt mad at someone |
| stai_10 | I feel/felt joyful |
| csai_c3 | I have/had self-doubts |
| des_en2 | I feel/felt glad about something |
| csai_c4 | I am/was concerned I won't/wouldn't be able to concentrate |
| csai_s5 | My body feels/felt relaxed |
| stai_11 | I feel/felt rested |
| dessha1 | I feel/felt like people will/would have looked at me when something goes/went wrong |
| stai_12 | I feel/felt pleasant |
| stai_13 | I feel/felt self-confident |
| csai_c5 | I am/was concerned about choking under pressure |
| des_co3 | I feel/felt like I am/was better than somebody |
| des_di1 | I feel/felt like things are/were so rotten they could/could have made me sick |
| dessha2 | I feel/felt like people will/would laugh at me |
| des_an2 | I feel/felt angry, irritated, annoyed |
| des_fe1 | I feel/felt scared, uneasy, like something may/might have harmed me |

| | |
|---|---|
| des_di2 | I feel/felt like something stinks/stank, puts/put a bad taste in my mouth |
| stai_14 | I feel/felt "high strung" |
| csai_s6 | My heart is/was racing |
| des_fe2 | I feel/felt fearful, like I am/was in danger, very tense |
| stai_15 | I am/was relaxed |
| csai_c6 | I am/was concerned that others will/would be disappointed with my performance |
| des_su1 | I feel/felt surprised, like when something suddenly happens I had no idea would happen |
| des_sa1 | I feel/felt I can't/could not stand myself |
| des_an3 | I feel/felt like screaming at somebody or banging on something |
| desshy1 | I feel/felt bashful, embarrassed |
| des_fe3 | I feel/felt afraid, shaky, and jittery |
| csai_s7 | I feel/felt jittery |
| dessha3 | I feel/felt embarrassed at the thought that someone will/would see me make a mistake |
| des_di3 | I feel/felt disgusted, like something is/was sickening |
| desshy2 | I feel/felt shy, like I want/wanted to hide |
| csai_c7 | I am/was concerned about performing poorly |
| des_in2 | I feel/felt so interested in what I am/was doing, caught up in it |
| des_gu1 | I feel/felt regret, sorry about something I did |
| csai_s8 | I feel/felt tense in my stomach |
| stai_16 | I feel/felt secure |
| des_su2 | I feel/felt like I feel when something unexpected happens |
| des_in3 | I feel/felt alert, curious, kind of excited about something |
| csai_c8 | I am/was concerned I may/might not do as well in this/that competition as I could |
| stai_18 | I am/was worried |
| des_gu2 | I feel/felt like I had done something wrong |
| des_sa2 | I feel/felt sick about myself |
| des_su3 | I feel/felt amazed, like I can't/couldn't believe what is happening/had happened, it is/was so unusual |
| des_en3 | I feel/felt happy |
| csai_c9 | I am/was concerned about reaching my goal |
| des_gu3 | I feel/felt like I have/had to be blamed for something |
| desshy3 | I feel/felt sheepish, like I want/wanted not to be seen |
| des_sa3 | I feel/felt mad at myself |
| csai_s9 | My body feels/felt tense |
| stai_17 | I feel/felt calm |

## APPENDIX 40

## CANONICAL CORRELATION OF MOMENTARY APPRAISAL OF THE COMPETITION AS A SOURCE OF THREAT OR CHALLENGE AND SCORES ON EMOTIONAL SCALES

N = 202

| | | |
|---|---|---|
| RAO F = 10.880 | df = 30.0, 370.0 | p = 0.000 |
| R-Square = 0.718 | Shrunk R-Square = 0.670 | |
| T-Square = 0.458 | Shrunk T-Square = 0.371 | |
| P-Square = 0.458 | Shrunk P-Square = 0.371 | |

**Within basic set "y" correlations**

| | THREAT | CHALLENGE |
|---|---|---|
| THREAT | 1.000 | |
| CHALLENGE | 0.138 | 1.000 |

**Within basic set "x" correlations**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| CSAI_Cognitive (1) | 1.000 | | | | | | | |
| CSAI_Somatic (2) | 0.674 | 1.000 | | | | | | |
| STAI (3) | 0.565 | 0.754 | 1.000 | | | | | |
| DES-Fear (4) | 0.546 | 0.749 | 0.618 | 1.000 | | | | |
| DES-Enjoyment (5) | -0.063 | -0.189 | -0.553 | -0.085 | 1.000 | | | |
| DES-Interest (6) | 0.095 | 0.235 | -0.176 | 0.110 | 0.465 | 1.000 | | |
| DES-Surprise (7) | 0.224 | 0.063 | -0.000 | 0.223 | 0.295 | 0.149 | 1.000 | |
| DES-Guilt (8) | 0.427 | 0.209 | 0.282 | 0.427 | 0.104 | -0.189 | 0.484 | 1.000 |
| DES-Hostility inward (9) | 0.433 | 0.289 | 0.361 | 0.547 | 0.030 | -0.176 | 0.456 | 0.827 |
| DES-Sadness (10) | 0.413 | 0.363 | 0.436 | 0.587 | -0.066 | -0.073 | 0.361 | 0.661 |
| DES-Shame (11) | 0.544 | 0.299 | 0.367 | 0.324 | -0.148 | -0.229 | 0.328 | 0.618 |
| DES-Shyness (12) | 0.413 | 0.254 | 0.331 | 0.460 | 0.037 | -0.241 | 0.457 | 0.806 |
| DES-Disgust (13) | 0.029 | 0.161 | 0.285 | 0.361 | -0.050 | -0.125 | 0.295 | 0.425 |
| DES-Anger (14) | 0.088 | 0.217 | 0.321 | 0.373 | -0.035 | -0.076 | 0.329 | 0.463 |
| DES-Contempt (15) | -0.001 | 0.221 | 0.202 | 0.200 | -0.002 | 0.093 | 0.184 | 0.254 |

| | (9) | (10) | (11) | (12) | (13) | (14) | (15) |
|---|---|---|---|---|---|---|---|
| DES-Hostility Inward (9) | 1.000 | | | | | | |
| DES-Sadness (10) | 0.788 | 1.000 | | | | | |
| DES-Shame (11) | 0.555 | 0.480 | 1.000 | | | | |
| DES-Shyness (12) | 0.805 | 0.668 | 0.722 | 1.000 | | | |
| DES-Disgust (13) | 0.454 | 0.530 | 0.304 | 0.471 | 1.000 | | |
| DES-Anger (14) | 0.494 | 0.547 | 0.279 | 0.452 | 0.932 | 1.000 | |
| DES-Contempt (15) | 0.280 | 0.358 | 0.170 | 0.299 | 0.724 | 0.693 | 1.000 |

**Between basic "y" (column) and basic "x" (row) correlations**

| Scale | THREAT | CHALLENGE |
|---|---|---|
| CSAI_Cognitive | 0.555 | 0.343 |
| CSAI_Somatic | 0.474 | 0.234 |
| STAI | 0.493 | 0.033 |
| DES-Fear | 0.423 | -0.013 |
| DES-Enjoyment | -0.101 | 0.166 |
| DES-Interest | 0.033 | 0.552 |
| DES-Surprise | 0.142 | 0.032 |
| DES-Guilt | 0.247 | -0.129 |
| DES-Hostility inward | 0.322 | -0.170 |
| DES-Sadness | 0.318 | -0.115 |
| DES-Shame | 0.252 | -0.015 |
| DES-Shyness | 0.214 | -0.192 |
| DES-Disgust | 0.058 | -0.254 |
| DES-Anger | 0.044 | -0.214 |
| DES-Contempt | 0.088 | -0.095 |

**Estimated (from x-set) "y" intercorrelations (R-square on diagonal)**

| | THREAT | CHALLENGE |
|---|---|---|
| THREAT | 0.446 | |
| CHALLENGE | 0.164 | 0.499 |

**Significance tests for prediction of each basic "y" variable**

| Variable | F-statistic | Probability |
|---|---|---|
| THREAT | 9.983 | 0.000 |
| CHALLENGE | 12.341 | 0.000 |

**Betas predicting basic "y" (column) from basic "x" (row) variables**

| Scale | THREAT | CHALLENGE |
|---|---|---|
| CSAI_Cognitive | 0.397 | 0.428 |
| CSAI_Somatic | -0.125 | -0.045 |
| STAI | 0.469 | 0.168 |
| DES-Fear | 0.064 | -0.287 |
| DES-Enjoyment | 0.152 | -0.005 |
| DES-Interest | -0.042 | 0.569 |
| DES-Surprise | 0.098 | -0.002 |
| DES-Guilt | -0.011 | 0.052 |
| DES-Hostility inward | 0.274 | -0.052 |
| DES-Sadness | 0.034 | -0.026 |
| DES-Shame | -0.044 | 0.046 |
| DES-Shyness | -0.304 | -0.125 |
| DES-Disgust | 0.338 | 0.085 |
| DES-Anger | -0.613 | -0.136 |
| DES-Contempt | 0.188 | -0.041 |

**Standard errors of betas**

| Scale | THREAT | CHALLENGE |
|---|---|---|
| CSAI_Cognitive | 0.096 | 0.091 |
| CSAI_Somatic | 0.139 | 0.132 |
| STAI | 0.125 | 0.119 |
| DES-Fear | 0.109 | 0.104 |
| DES-Enjoyment | 0.089 | 0.084 |
| DES-Interest | 0.080 | 0.077 |
| DES-Surprise | 0.069 | 0.066 |
| DES-Guilt | 0.114 | 0.109 |
| DES-Hostility inward | 0.130 | 0.124 |
| DES-Sadness | 0.100 | 0.095 |
| DES-Shame | 0.094 | 0.090 |
| DES-Shyness | 0.124 | 0.118 |
| DES-Disgust | 0.181 | 0.172 |
| DES-Anger | 0.167 | 0.159 |
| DES-Contempt | 0.090 | 0.085 |

**T-statistics for betas**

| Scale | THREAT | CHALLENGE |
|---|---|---|
| CSAI_Cognitive | 4.131 | 4.679 |
| CSAI_Somatic | -0.896 | -0.340 |
| STAI | 3.744 | 1.410 |
| DES-Fear | 0.586 | -2.761 |
| DES-Enjoyment | 1.721 | -0.061 |
| DES-Interest | -0.526 | 7.438 |
| DES-Surprise | 1.410 | -0.037 |
| DES-Guilt | -0.100 | 0.477 |
| DES-Hostility inward | 2.101 | -0.416 |
| DES-Sadness | 0.341 | -0.276 |
| DES-Shame | -0.470 | 0.517 |
| DES-Shyness | -2.448 | -1.059 |
| DES-Disgust | 1.870 | 0.493 |
| DES-Anger | -3.673 | -0.857 |
| DES-Contempt | 2.093 | -0.477 |

**Probabilities for betas**

| Scale | THREAT | CHALLENGE |
|---|---|---|
| CSAI_Cognitive | 0.000 | 0.000 |
| CSAI_Somatic | 0.371 | 0.734 |
| STAI | 0.000 | 0.160 |
| DES-Fear | 0.558 | 0.006 |
| DES-Enjoyment | 0.087 | 0.952 |
| DES-Interest | 0.600 | 0.000 |
| DES-Surprise | 0.160 | 0.971 |

*(CONTINUED)*

| Scale | THREAT | CHALLENGE |
|---|---|---|
| DES-Guilt | 0.920 | 0.634 |
| DES-Hostility inward | 0.037 | 0.678 |
| DES-Sadness | 0.734 | 0.783 |
| DES-Shame | 0.639 | 0.606 |
| DES-Shyness | 0.015 | 0.291 |
| DES-Disgust | 0.063 | 0.623 |
| DES-Anger | 0.000 | 0.392 |
| DES-Contempt | 0.038 | 0.634 |

**Stewart-Love canonical redundancy index = 0.472**

**Canonical correlations**

| 1 | 2 |
|---|---|
| 0.750 | 0.595 |

**Bartlett test of residual correlations**

Correlations 1 through 2
Chi-square statistic = 242.849 df = 30 p = 0.000

Correlations 2 through 2
Chi-square statistic = 83.830 df = 14 p = 0.000

**Canonical coefficients for dependent (y) set**

| | 1 | 2 |
|---|---|---|
| THREAT | 0.560 | 0.840 |
| CHALLENGE | 0.755 | -0.670 |

**Canonical loadings (y variable by factor correlations)**

| | 1 | 2 |
|---|---|---|
| THREAT | 0.664 | 0.748 |
| CHALLENGE | 0.832 | -0.554 |

**Canonical redundancies for dependent set**

| 1 | 2 |
|---|---|
| 0.319 | 0.153 |

**Canonical coefficients for independent (x) set**

| Scale | 1 | 2 |
|---|---|---|
| CSAI_Cognitive | 0.727 | 0.079 |
| CSAI_Somatic | -0.138 | -0.125 |
| STAI | 0.519 | 0.473 |
| DES-Fear | -0.241 | 0.414 |
| DES-Enjoyment | 0.109 | 0.221 |
| DES-Interest | 0.541 | -0.701 |
| DES-Surprise | 0.070 | 0.141 |
| DES-Guilt | 0.044 | -0.075 |
| DES-Hostility inward | 0.153 | 0.445 |
| DES-Sadness | -0.001 | 0.077 |
| DES-Shame | 0.014 | -0.115 |
| DES-Shyness | -0.353 | -0.289 |
| DES-Disgust | 0.337 | 0.382 |
| DES-Anger | -0.594 | -0.712 |
| DES-Contempt | 0.099 | 0.311 |

**Canonical loadings (x variable by factor correlations)**

| Scale | 1 | 2 |
|---|---|---|
| CSAI_Cognitive | 0.759 | 0.398 |
| CSAI_Somatic | 0.589 | 0.407 |
| STAI | 0.401 | 0.659 |
| DES-Fear | 0.303 | 0.612 |
| DES-Enjoyment | 0.092 | -0.330 |
| DES-Interest | 0.580 | -0.576 |
| DES-Surprise | 0.139 | 0.164 |
| DES-Guilt | 0.055 | 0.493 |
| DES-Hostility inward | 0.069 | 0.647 |
| DES-Sadness | 0.121 | 0.578 |
| DES-Shame | 0.173 | 0.372 |
| DES-Shyness | -0.034 | 0.518 |
| DES-Disgust | -0.212 | 0.368 |
| DES-Anger | -0.182 | 0.302 |
| DES-Contempt | -0.030 | 0.232 |

**Canonical redundancies for independent set**

| 1 | 2 |
|---|---|
| 0.063 | 0.077 |

## APPENDIX 41

## STEPWISE DISCRIMINANT ANALYSIS WITH THE EMOTIONAL SCALES AS PREDICTORS OF MOMENTARY PRE-COMPETITIVE EMOTIONAL STATES LABELLED BY THE RESPONDENTS AS "ANXIETY" OR "EXCITEMENT"

Forward stepwise with Alpha-to-Enter=0.050 and Alpha-to-Remove=0.100

**Group frequencies**

| Anxiety | Excitement |
|---|---|
| 50 | 51 |

**Group means**

| | Anxiety | Excitement |
|---|---|---|
| CSAI_Cognitive | 24.32 | 20.92 |
| CSAI_Somatic | 26.62 | 22.86 |
| STAI | 64.00 | 55.26 |
| DES-Fear | 6.84 | 4.47 |
| DES-Enjoyment | 5.50 | 7.35 |
| DES-Interest | 8.00 | 10.04 |
| DES-Surprise | 4.18 | 3.92 |
| DES-Guilt | 4.24 | 3.26 |
| DES-Hostility inward | 3.80 | 3.04 |
| DES-Sadness | 3.82 | 3.14 |
| DES-Shame | 5.24 | 3.90 |
| DES-Shyness | 3.84 | 3.10 |
| DES-Disgust | 3.58 | 3.02 |
| DES-Anger | 3.80 | 3.22 |
| DES-Contempt | 2.40 | 2.33 |

| Variable | F-to-remove | \|Variable | F-to-enter | Tolerance |
|---|---|---|---|---|
| | | \|CSAI_Cognitive | 8.05 | 1.000000 |
| | | \|CSAI_Somatic | 7.89 | 1.000000 |
| | | \|STAI | 20.22 | 1.000000 |
| | | \|DES-Fear | 32.68 | 1.000000 |
| | | \|DES-Enjoy | 12.69 | 1.000000 |
| | | \|DES-Interest | 11.42 | 1.000000 |
| | | \|DES-Surprise | 0.58 | 1.000000 |
| | | \|DES-Guilt | 11.96 | 1.000000 |
| | | \|DES-Hostility inward | 10.19 | 1.000000 |
| | | \|DES-Sadness | 6.88 | 1.000000 |
| | | \|DES-Shame | 12.37 | 1.000000 |
| | | \|DES-Shyness | 13.87 | 1.000000 |
| | | \|DES-Disgust | 14.23 | 1.000000 |
| | | \|DES-Anger | 6.43 | 1.000000 |
| | | \|DES-Contempt | 0.12 | 1.000000 |

**Between groups F-matrix -- df = 1, 99**

| | Anxiety | Excitement |
|---|---|---|
| Anxiety | 0.00 | |
| Excitement | 32.68 | 0.00 |

Wilks' lambda
Lambda = 0.7518 df = 1, 1, 99
Approx. F = 32.6774 df = 1, 99 p = 0.0000

| Variable | F-to-remove | Variable | F-to-enter | Tolerance |
|---|---|---|---|---|
| DES-Fear | 32.68 | CSAI_Cognitive | 0.02 | 0.780372 |
| | | CSAI_Somatic | 5.84 | 0.374179 |
| | | STAI | 3.57 | 0.803661 |
| | | DES-Enjoyment | 11.73 | 0.995149 |
| | | DES-Interest | 33.51 | 0.793498 |
| | | DES-Surprise | 0.38 | 0.935278 |
| | | DES-Guilt | 6.40 | 0.991125 |
| | | DES-Hostility inward | 2.98 | 0.953108 |
| | | DES-Sadness | 1.29 | 0.944984 |
| | | DES-Shame | 4.60 | 0.964477 |
| | | DES-Shyness | 4.76 | 0.951700 |
| | | DES-Disgust | 3.80 | 0.921325 |
| | | DES-Anger | 0.29 | 0.884164 |
| | | DES-Contempt | 0.07 | 0.986853 |

**Between groups F-matrix -- df = 2, 98**

| | Anxiety | Excitement |
|---|---|---|
| Anxiety | 0.00 | |
| Excitement | 38.46 | 0.00 |

Wilks' lambda
Lambda = 0.5603 df = 2, 1, 99
Approx. F = 38.4605 df = 2, 98 p = 0.0000

| Variable | F-to-remove | Variable | F-to-enter | Tolerance |
|---|---|---|---|---|
| DES-Fear | 58.83 | CSAI_Cognitive | 1.16 | 0.753332 |
| DES-Interest | 33.51 | CSAI_Somatic | 2.50 | 0.370355 |
| | | STAI | 0.20 | 0.757704 |
| | | DES-Enjoyment | 0.65 | 0.796431 |
| | | DES-Surprise | 0.30 | 0.892583 |
| | | DES-Guilt | 4.56 | 0.991067 |
| | | DES-Hostility inward | 1.21 | 0.947278 |
| | | DES-Sadness | 0.08 | 0.926051 |
| | | DES-Shame | 2.25 | 0.959803 |
| | | DES-Shyness | 0.98 | 0.920597 |
| | | DES-Disgust | 1.56 | 0.914410 |
| | | DES-Anger | 0.47 | 0.882443 |
| | | DES-Contempt | 0.13 | 0.972903 |

**Between groups F-matrix -- df = 3, 97**

| | Anxiety | Excitement |
|---|---|---|
| Anxiety | 0.00 | |
| Excitement | 28.09 | 0.00 |

Wilks' lambda
Lambda = 0.5351 df = 3, 1, 99
Approx. F = 28.0910 df = 3, 97 p = 0.0000

| Variable | F-to-remove | Variable | F-to-enter | Tolerance |
|---|---|---|---|---|
| DES-Fear | 48.60 | CSAI_Cognitive | 0.35 | 0.714809 |
| DES-Interest | 30.93 | CSAI_Somatic | 2.00 | 0.368978 |
| DES-Guilt | 4.56 | STAI | 0.15 | 0.757273 |
| | | DES-Enjoyment | 2.77 | 0.688283 |
| | | DES-Surprise | 0.04 | 0.788608 |
| | | DES-Hostility inward | 0.00 | 0.697968 |
| | | DES-Sadness | 1.00 | 0.660537 |
| | | DES-Shame | 0.64 | 0.849733 |
| | | DES-Shyness | 0.02 | 0.664141 |
| | | DES-Disgust | 0.01 | 0.652143 |
| | | DES-Anger | 0.47 | 0.575955 |
| | | DES-Contempt | 0.27 | 0.817953 |

**Classification matrix (cases in row categories classified into columns)**

| | Anxiety | Excitement | %correct |
|---|---|---|---|
| Anxiety | 43 | 7 | 86 |
| Excitement | 6 | 45 | 88 |
| Total | 49 | 52 | 87 |

**Jackknifed classification matrix**

| | Anxiety | Excitement | %correct |
|---|---|---|---|
| Anxiety | 40 | 10 | 80 |
| Excitement | 6 | 45 | 88 |
| Total | 46 | 55 | 84 |

**Classification matrix (cases in row categories classified into columns)**

| | Anxiety | Excitement | %correct |
|---|---|---|---|
| Anxiety | 43 | 7 | 86 |
| Excitement | 6 | 45 | 88 |
| Total | 49 | 52 | 87 |

**Jackknifed classification matrix**

| | Anxiety | Excitement | %correct |
|---|---|---|---|
| Anxiety | 40 | 10 | 80 |
| Excitement | 6 | 45 | 88 |
| Total | 46 | 55 | 84 |

**Eigenvalues**

| |
|---|
| 0.869 |

**Canonical correlations**

| |
|---|
| 0.682 |

**Cumulative proportion of total dispersion**

| |
|---|
| 1.000 |

Wilks' lambda = 0.535
Approx.F = 28.091 df = 3, 97 p-tail = 0.0000

Pillai's trace = 0.465
Approx.F = 28.091 df = 3, 97 p-tail = 0.0000

Lawley-Hotelling trace = 0.869
Approx.F = 28.091 df = 3, 97 p-tail = 0.0000

**Canonical discriminant functions**

| | 1 |
|---|---|
| Constant | -0.992 |

| | |
|---|---|
| CSAI_Cognitive | . |
| CSAI_Somatic | . |
| STAI | . |
| DES-Fear | 0.458 |
| DES-Enjoyment | . |
| DES-Interest | -0.267 |
| DES-Surprise | . |
| DES-Guilt | 0.218 |
| DES-Hostility inward | . |
| DES-Sadness | . |
| DES-Shame | . |
| DES-Shyness | . |
| DES-Disgust | . |
| DES-Anger | . |
| DES-Contempt | . |

**Canonical discriminant functions -- standardized by within variances**

| | 1 |
|---|---|
| CSAI_Cognitive | . |
| CSAI_Somatic | . |
| STAI | . |
| DES-Fear | 0.955 |
| DES-Enjoyment | . |
| DES-Interest | -0.810 |
| DES-Surprise | . |
| DES-Guilt | 0.312 |
| DES-Hostility inward | . |
| DES-Sadness | . |
| DES-Shame | . |
| DES-Shyness | . |
| DES-Disgust | . |
| DES-Anger | . |
| DES-Contempt | . |

**Canonical scores of group means**

| | 1 |
|---|---|
| Anxiety | 0.932 |
| Excitement | -0.914 |

## APPENDIX 42

## DISCRIMINANT ANALYSIS WITH THE STAI AND THE COGNITIVE AND SOMATIC SUBSCALES OF THE CSAI-2 AS PREDICTORS OF MOMENTARY PRE-COMPETITIVE EMOTIONAL STATES LABELLED BY THE RESPONDENTS AS "ANXIETY" OR "EXCITEMENT"

### A) STAI

**Group frequencies**

| Excitement | Anxiety |
|---|---|
| 51 | 50 |

**Group means**

| | Excitement | Anxiety |
|---|---|---|
| STAI | 55.26 | 64.00 |

**Between groups F-matrix -- df = 1, 99**

| | Excitement | Anxiety |
|---|---|---|
| Excitement | 0.00 | |
| Anxiety | 20.22 | 0.00 |

Wilks' lambda
Lambda = 0.8304 df = 1, 1, 99
Approx. F = 20.2158 df = 1, 99 p = 0.000

**Classification functions**

| | Excitement | Anxiety |
|---|---|---|
| CONSTANT | -16.68 | -22.14 |
| STAI | 0.58 | 0.67 |

| Variable | F-to-remove | Tolerance | Variable | F-to-enter | Tolerance |
|---|---|---|---|---|---|
| STAI | 20.22 | 1.000000 | | | |

**Classification matrix (cases in row categories classified into columns)**

| | Excitement | Anxiety | %correct |
|---|---|---|---|
| Excitement | 32 | 19 | 63 |
| Anxiety | 13 | 37 | 74 |
| Total | 45 | 56 | 68 |

**Jackknifed classification matrix**

| | Excitement | Anxiety | %correct |
|---|---|---|---|
| Excitement | 32 | 19 | 63 |
| Anxiety | 13 | 37 | 74 |
| Total | 45 | 56 | 68 |

**Eigenvalues**

| |
|---|
| 0.204 |

**Canonical correlations**

| |
|---|
| 0.412 |

**Cumulative proportion of total dispersion**

| |
|---|
| 1.000 |

Wilks' lambda = 0.830
Approx.F = 20.216 df = 1, 99 p-tail = 0.0000

Pillai's trace = 0.170
Approx.F = 20.216 df = 1, 99 p-tail = 0.0000

Lawley-Hotelling trace = 0.204
Approx.F = 20.216 df = 1, 99 p-tail = 0.0000

**Canonical discriminant functions**

| | 1 |
|---|---|
| Constant | -6.097 |

| | |
|---|---|
| STAI | 0.102 |

**Canonical discriminant functions -- standardized by within variances**

| | 1 |
|---|---|
| STAI | 1.000 |

**Canonical scores of group means**

| | 1 |
|---|---|
| Excitement | -0.443 |
| Anxiety | 0.452 |

## B) CSAI-2 (COGNITIVE AND SOMATIC SUBSCALE)

### Group frequencies

| Excitement | Anxiety |
|---|---|
| 51 | 50 |

### Group means

| | Excitement | Anxiety |
|---|---|---|
| CSAI_Cognitive | 20.92 | 24.32 |
| CSAI_Somatic | 22.86 | 26.62 |

### Total correlation matrix

| | CSAI_Cognitive | CSAI_Somatic |
|---|---|---|
| CSAI_Cognitive | 1.00 | |
| CSAI_Somatic | 0.66 | 1.00 |

### Between groups F-matrix -- df = 2, 98

| | Excitement | Anxiety |
|---|---|---|
| Excitement | 0.00 | |
| Anxiety | 4.84 | 0.00 |

Wilks' lambda
Lambda = 0.9101 df = 2, 1, 99
Approx. F = 4.8409 df = 2, 98 p = 0.0099

### Classification functions

| | Excitement | Anxiety |
|---|---|---|
| CONSTANT | -7.95 | -10.52 |
| CSAI_Cognitive | 0.37 | 0.43 |
| CSAI_Somatic | 0.30 | 0.35 |

| Variable | F-to-remove | Tolerance | \|Variable | F-to-enter | Tolerance |
|---|---|---|---|---|---|
| CSAI_Cognitive | 1.73 | 0.602720 | \| | | |
| CSAI_Somatic | 1.58 | 0.602720 | \| | | |

### Classification matrix (cases in row categories classified into columns)

| | Excitement | Anxiety | %correct |
|---|---|---|---|
| Excitement | 31 | 20 | 61 |
| Anxiety | 17 | 33 | 66 |
| Total | 48 | 53 | 63 |

**Jackknifed classification matrix**

| | Excitement | Anxiety | %correct |
|---|---|---|---|
| Excitement | 31 | 20 | 61 |
| Anxiety | 17 | 33 | 66 |
| Total | 48 | 53 | 63 |

**Eigenvalues**

| |
|---|
| 0.099 |

**Canonical correlations**

| |
|---|
| 0.300 |

**Cumulative proportion of total dispersion**

| |
|---|
| 1.000 |

Wilks' lambda = 0.910
Approx.F = 4.841 df = 2, 98 p-tail = 0.0099

Pillai's trace = 0.090
Approx.F = 4.841 df = 2, 98 p-tail = 0.0099

Lawley-Hotelling trace = 0.099
Approx.F = 4.841 df = 2, 98 p-tail = 0.0099

**Canonical discriminant functions**

| | 1 |
|---|---|
| Constant | -4.118 |

| | |
|---|---|
| CSAI_Cognitve | 0.094 |
| CSAI_Somatic | 0.081 |

**Canonical discriminant functions -- standardized by within variances**

| | 1 |
|---|---|
| CSAI_Cognitive | 0.566 |
| CSAI_Somatic | 0.541 |

**Canonical scores of group means**

| | 1 |
|---|---|
| Excitement | -0.308 |
| Anxiety | 0.314 |

## APPENDIX 43

## SIGNIFICANCE TESTING OF THE DIFFERENCE BETWEEN ATHLETES WHO COMPLETED THE STUDY AND ATHLETES WHO DISCONTINUED PARTICIPATION IN THE STUDY ON DEMOGRAPHIC CHARACTERISTICS AND PERSONALITY TRAITS

T-tests for independent samples were used. Bonferroni adjusted probabilities were computed. T-tests based on separate variances were employed when a significant difference between group variances was detected.

***Variable: Age***

| Group | N | Mean | SD | Separate variance t-value | adf | p | BAP |
|---|---|---|---|---|---|---|---|
| Completed | 39 | 26.77 | 7.75 | 0.96 | 8.1 | 0.365 | 1.000 |
| Drop out | 5 | 24.60 | 4.22 | | | | |

***Variable: Experience (years)***

| Group | N | Mean | SD | Separate variance t-value | adf | p | BAP |
|---|---|---|---|---|---|---|---|
| Completed | 39 | 10.40 | 6.47 | 2.16 | 8.3 | 0.062 | 0.554 |
| Drop out | 5 | 6.40 | 3.44 | | | | |

***Variable: Current performance (5-point scale)***

| Group | N | Mean | SD | Separate variance t-value | adf | p | BAP |
|---|---|---|---|---|---|---|---|
| Completed | 39 | 3.72 | 0.65 | 0.44 | 5.5 | 0.674 | 1.000 |
| Drop out | 5 | 3.60 | 0.55 | | | | |

***Variable: Expected performance (11-point scale)***

| Group | N | Mean | SD | Separate variance t-value | adf | p | BAP |
|---|---|---|---|---|---|---|---|
| Completed | 39 | 6.08 | 1.65 | 0.51 | 4.7 | 0.501 | 1.000 |
| Drop out | 5 | 5.85 | 0.84 | | | | |

***Variable: Neuroticism (NEO PI-R)***

| Group | N | Mean | SD | Separate variance t-value | adf | p | BAP |
|---|---|---|---|---|---|---|---|
| Completed | 39 | 75.39 | 20.15 | -1.12 | 8.4 | 0.293 | 1.000 |
| Drop out | 5 | 81.80 | 10.55 | | | | |

*Variable: Extraversion (NEO PI-R)*

| Group | N | Mean | SD | Separate variance t-value | adf | p | BAP |
|---|---|---|---|---|---|---|---|
| Completed | 39 | 120.10 | 16.22 | 1.84 | 13.5 | 0.088 | 0.791 |
| Drop out | 5 | 113.20 | 6.06 | | | | |

*Variable: Competitive trait anxiety (SCAT)*

| Group | N | Mean | SD | Separate variance t-value | adf | p | BAP |
|---|---|---|---|---|---|---|---|
| Completed | 39 | 22.51 | 3.91 | -2.76 | 8.3 | 0.024 | 0.215 |
| Drop out | 5 | 25.60 | 2.07 | | | | |

Legend: N = number of subjects; SD = standard deviation; Completed = group of athletes who completed the study; Drop out = group of athletes who discontinued participation in the study; p = uncorrected probability; adf = adjusted degrees of freedom related to separate variance t-value; BAP = Bonferroni adjusted probabilities

## APPENDIX 44

## SIGNIFICANCE TESTING OF THE DIFFERENCE BETWEEN TAE KWON DO AND KARATE PRACTITIONERS ON DEMOGRAPHIC CHARACTERISTICS AND PERSONALITY TRAITS

T-tests for independent samples were used. Bonferroni adjusted probabilities were computed. T-tests based on separate variances were employed when a significant difference between group variances was detected.

***Variable: Age***

| Group | N | Mean | SD | t-value | df | p | BAP |
|---|---|---|---|---|---|---|---|
| Karate | 19 | 26.53 | 9.31 | -0.19 | 37 | 0.852 | 1.000 |
| Tae Kwon Do | 20 | 27.00 | 6.16 | | | | |

***Variable: Experience (years)***

| Group | N | Mean | SD | t-value | df | p | BAP |
|---|---|---|---|---|---|---|---|
| Karate | 19 | 12.78 | 6.18 | 2.36 | 37 | 0.023 | 0.211 |
| Tae Kwon Do | 20 | 8.15 | 6.05 | | | | |

***Variable: Current performance (5-point scale)***

| Group | N | Mean | SD | t-value | df | p | BAP |
|---|---|---|---|---|---|---|---|
| Karate | 19 | 3.79 | 0.63 | 0.67 | 37 | 0.508 | 1.000 |
| Tae Kwon Do | 20 | 3.65 | 0.67 | | | | |

***Variable: Expected performance (11-point scale)***

| Group | N | Mean | SD | t-value | df | p | BAP |
|---|---|---|---|---|---|---|---|
| Karate | 19 | 6.06 | 1.65 | 0.01 | 37 | 0.987 | 1.000 |
| Tae Kwon Do | 20 | 6.08 | 1.41 | | | | |

***Variable: Neuroticism (NEO PI-R)***

| Group | N | Mean | SD | t-value | df | p | BAP |
|---|---|---|---|---|---|---|---|
| Karate | 19 | 73.26 | 22.45 | -0.63 | 37 | 0.529 | 1.000 |
| Tae Kwon Do | 20 | 77.40 | 18.05 | | | | |

***Variable: Extraversion (NEO PI-R)***

| Group | N | Mean | SD | t-value | df | p | BAP |
|---|---|---|---|---|---|---|---|
| Karate | 19 | 119.84 | 17.12 | -0.10 | 37 | 0.924 | 1.000 |
| Tae Kwon Do | 20 | 120.35 | 15.76 | | | | |

***Variable: Competitive trait anxiety (SCAT)***

| Group | N | Mean | SD | t-value | df | p | BAP |
|---|---|---|---|---|---|---|---|
| Karate | 19 | 21.21 | 4.42 | -2.10 | 37 | 0.041 | 0.366 |
| Tae Kwon Do | 20 | 23.75 | 2.95 | | | | |

Legend: N = number of subjects; SD = standard deviation; p = uncorrected probability; df = degrees of freedom; BAP = Bonferroni adjusted probabilities

## APPENDIX 45

## INFORMED CONSENT FORM

Ester Mataija, who is a postgraduate researcher at the Department of Life Sciences of the Nottingham Trent University has requested my participation in a research study on the dynamic aspects of competitive emotions.

My participation will involve:
- completion of three questionnaires upon my agreement to participation
- completion of a brief questionnaire five (5) random times a day, between 9.00 a.m. and 9.30 p.m., over a period of one week before a major competition in which I participate
- completion of a brief questionnaire 1 hour before the competition
- completion of a brief questionnaire immediately after the competition
- completion of a brief questionnaire five (5) random times a day, between 9.00 a.m. and 9.30 p.m., over a period of three days after a major competition in which I participate

I understand that there are no foreseeable risks of discomfort related to my participation in this study.
I understand that my participation in this study is confidential.
I understand that the results of this study may be published.
I understand the purpose of this study and I was informed that there is no hidden motives related to my participation.

I have carefully studied the above conditions and understand and agree to participate in this study.

(Please print)

Name: Signature:

_______________________________________________

Date:

______________________________

## APPENDIX 46

### Demographic Questionnaire

THIS INFORMATION WILL BE KEPT STRICTLY CONFIDENTIAL

Name: Surname:

___

Age:

___

Address:

___

Phone:

Day: ______________ Mobile: ______________

Evening: ______________

Best (preferred) time of contact: (days of the week; time of the day):

___

For how long (years, months) have you been training in martial arts regularly?

___

What is your level of sport participation? (Circle the answer that applies to you).
a) recreational
b) competitive - regional level
c) competitive - national level

How would you rate your current performance in martial arts in relation to your ultimate goals?
a) extremely poor
b) poor
c) average
d) good
e) excellent

Using the rating scale below, circle the number representing your expectations in relation to your forthcoming performance.

I think I will perform

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| very much below my usual standard | | | | | at my usual standard | | | | very much above my usual standard | |

Why did you take up martial arts (e.g. enjoyment, health, etc.)?

___

Why do you currently train martial arts?

___

**APPENDIX 47**

# NEO PI-R

Revised NEO Personality Inventory (NEO PI-R)

## Instructions

Please read all these instructions carefully before beginning.

This questionnaire contains 96 statements. Please read each item carefully and circle the one answer that best corresponds to your agreement or disagreement.

Circle "SD" if the statement is definitely false or if you strongly disagree.
Circle "D" if the statement is mostly false or if you disagree.
Circle "N" if the statement is about equally true or false, if you cannot decide, or if you are neutral on the statement.
Circle "A" if the statement is mostly true or if you agree.
Circle "SA" if the statement is definitely true or if you strongly agree.

There are no right or wrong answers, and you need not be an "expert" to complete this questionnaire. Describe yourself honestly and state your opinions as accurately as possible. Answer every item.

Example

| | | | | | |
|---|---|---|---|---|---|
| 1. I am not a worrier. | SD | D | N | A | SA |
| 2. I really like most people I meet. | SD | D | N | A | SA |
| 3. I often get angry at the people treat me. | SD | D | N | A | SA |
| 4. I shy away from crowds of people. | SD | D | N | A | SA |
| 5. I rarely feel lonely or blue. | SD | D | N | A | SA |
| 6. I am dominant, forceful, and assertive. | SD | D | N | A | SA |
| 7. In dealing with other people, I always dread making a social blunder. | SD | D | N | A | SA |
| 8. I have a leisurely style in work and play. | SD | D | N | A | SA |
| 9. I rarely overindulge in anything. | SD | D | N | A | SA |
| 10. I often crave excitement. | SD | D | N | A | SA |
| 11. I often feel helpless and want someone else to solve my problems. | SD | D | N | A | SA |
| 12. I have never literally jumped of joy. | SD | D | N | A | SA |
| 13. I am easily frightened. | SD | D | N | A | SA |
| 14. I don't get much pleasure from chatting with people. | SD | D | N | A | SA |
| 15. I'm an even-tempered person. | SD | D | N | A | SA |
| 16. I like to have a lot of people around me. | SD | D | N | A | SA |
| 17. Sometimes I feel completely worthless. | SD | D | N | A | SA |
| 18. I sometimes fail to assert myself as much as I should. | SD | D | N | A | SA |

## APPENDIX 48

## BOOKLET FOR THE EXPERIENCE SAMPLING OF PRE- AND POST-COMPETITION EMOTIONS AND SOURCES OF CONCERN

*Page 1*

**Thank you for your participation in this study.**

Ester Mataija

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*Page 2*

**General instructions**

Your participation in the first week of the study will include:

1. Completion of a questionnaire at five random times a day between 9.00 a.m. and 9.30 p.m. upon the reception of a signal from your pager. You should try to complete the questionnaire as soon as possible, but not later than 30 minutes after the pager sounds off.

Your participation on the day of competition will include:

1. Completion of a questionnaire 1 hour before the competition.
2. Completion of a questionnaire immediately after the competition.

Your participation 3 days after the competition will include:

1. Completion of a questionnaire at five random times a day between 9.00 a.m. and 9.30 p.m. upon the reception of a signal from your pager. You should try to complete the questionnaire as soon as possible, but not later than 30 minutes after the pager sounds off.

2. Returning the completed booklet and the pager to the researcher four days after the competition.

## *DETAILED INSTRUCTIONS AND EXAMPLE*

REMEMBER TO CARRY THE PAGER, BOOKLET AND A PEN / PENCIL WITH YOU EVERY DAY FROM 9.00 A.M. TO 9.30 P.M. DURING THE TIME OF THE STUDY.
To ensure that you do not forget the pager and booklet at home, place them with your wrist watch, purse, or any item that you always carry with you.
IN CASE OF PROBLEMS, PLEASE CONTACT IMMEDIATELY THE RESEARCHER
You will receive 5 calls daily except for Wednesday and Saturday when, immediately after 8.00 p.m., there will be one extra call from the National Lottery with the winning lottery numbers. You may also occasionally receive some calls from users who by mistake dial the number of your pager. Hence, make sure that on Wednesday and on Saturday you do not complete the questionnaires upon the signal of the National Lottery, but ONLY upon the calls from the researcher which will be coded in a particular way. Every call from the researcher will be denoted by a numeric message composed of 3 figures (first screen), the message slot number and the time the message was received (second screen). The 3 figures in the message (fist screen) will denote the week (1, 2 or 3), the day of the week (from 1 to 7) and the number of the daily call (1, 2 or 3). Thus, message 123 means first week, second day, 3rd daily call. Message 171 means first week, seventh day, 1st daily call. You will disregard any message not corresponding to the code of the researcher.
When you receive a call from the researcher you will complete the questionnaire, input the time of the call (the time reported on your pager), and the actual time of completion (when you started to complete the questionnaires). If you are not able to answer the questionnaires within 30 minutes after the pager sounded off, you should leave the questionnaire blank and write down in the appropriate space the reason why you could not respond.
At the end of each day, after 9.30 p.m. you will erase the read messages from the pager memory slot.
On the day of the competition you will complete a questionnaire 1 hour before the competition, and immediately after the competition. On the last three days of the study you will, again, receive 5 daily calls from the researcher and will have to complete a questionnaire on each call. Four days after the competition you will return the completed booklet and the pager to the researcher.
If for any reason you do not want to be disturbed by the sound of the pager select “SILENT Mode”. When in Silent Mode, the pager vibrates upon receiving a message instead of emitting a “beep”. In this case MAKE SURE that the pager be in contact with your body (belt, pocket) so that you can detect the vibrations.

**Example:**

Situation: During the second day of the first week of the study you receive your first daily call at 10:32 a.m.

1) Pager sounds or vibrates at 10:32 a.m.
2) Press any button of the pager or wait for 8 seconds
3) Press –. The first screen will display the following message:
   121, meaning week 1, day 2, daily call 1.
4) Press – again or wait for 12 seconds. The second screen will display the following data: 01 10:32A, meaning slot number 01, time of call 10:32 a.m.
5) Open your booklet at the appropriate page, i.e. week 1, day 2, call 1 and fill out the sheet (questions, date, time of call, time of completion, questionnaire) immediately. If you are in a meeting or in an

impossible situation to complete the questionnaire, you may do it a little later, but not later than 30 minutes after your pager call.

6) You continue your normal daily routine and wait for the next call.

*HOW TO USE THE PAGER (Grey model)*

CONTROL BUTTONS

READ / ON Button (–). Used to read messages and to activate pager functions. Also used to scroll through the hour and the minute digits for time setting.

SELECT / MENU Button (Δ). Used to scroll through the pager menus.

SETTING SILENT / AUDIO MODE

To set SILENT Mode press Δ repeatedly until "SILENT ?" appears on display, then press –. The pager will vibrate for 4 seconds and the speaker symbol on the bottom left corner will disappear. To set AUDIO Mode press Δ until "AUDIBLE ?" is displayed then press –. The pager will emit a "beep" tone and the speaker symbol appears on the bottom left corner. When in AUDIO Mode, the pager emits a "beep" tone upon receiving a message. When in SILENT Mode, the pager vibrates upon receiving a message.

RECEIVING AND READING A MESSAGE

When a message is received, the pager emits an alert and the number of unread messages is displayed. The alert automatically stops after 8 seconds or upon pressing any button. To read messages, press –. The first screen of your message is displayed and the backlight is on (example 222 ). To "freeze" the message, hold – while viewing. A continuation symbol (➤) on the right bottom of the message indicates there are additional screens for that message. To advance the display to the next screen, press –. If no buttons are pressed the display will also automatically advance to the next screen after 12 seconds. The screen following the message is the timestamp screen which shows the time the message was received as well as the message slot number (the order that the message was received)
(example 02 13:45P). The pager automatically returns to the STANDBY Mode after 12 seconds if no other buttons are pressed. When an unread message is stored in memory, the pager gives a reminder chirp or vibrates every two minutes.

ERASING MESSAGES

To erase all read press Δ until "ERASE ALL" is displayed, then press –. All unread messages are moved to the first memory slot and carry the new message slot number. You must read a message before it can be erased. Do not erase the message before answering the questionnaires.
In case of problems in handling the pager contact immediately the researchers at the given co-ordinates (see page 1).

 *(Set of questionnaires for first assessment on the first day of the study- 7 days before the competition)*

**Week 1 – Day 1 – Call 1 (111) Date __________ 2000**
**Time of call __________ Time of completion __________**

## DES - IV

Directions: Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel RIGHT NOW. Do not spend too much time on any one statement, but give the answer which seems to describe most accurately your CURRENT feelings.

| You ... | not at all | slightly | moderately so | considerably so | very much so |
|---|---|---|---|---|---|
| Feel regret, sorry for something you did | 1 | 2 | 3 | 4 | 5 |
| Feel sheepish, like you don't want to be seen | 1 | 2 | 3 | 4 | 5 |
| Feel glad about something | 1 | 2 | 3 | 4 | 5 |
| Feel like something stinks, puts a bad taste in your mouth | 1 | 2 | 3 | 4 | 5 |
| Feel you can't stand yourself | 1 | 2 | 3 | 4 | 5 |
| Feel embarrassed, as somebody saw you make a mistake | 1 | 2 | 3 | 4 | 5 |
| Feel unhappy, blue, downhearted | 1 | 2 | 3 | 4 | 5 |
| Feel surprised, like when something suddenly happens, you had no idea would happen | 1 | 2 | 3 | 4 | 5 |
| Feel like someone is a low-life, not worth the time of day | 1 | 2 | 3 | 4 | 5 |
| Feel shy, like you want to hide | 1 | 2 | 3 | 4 | 5 |
| Feel like what you are doing or watching is interesting | 1 | 2 | 3 | 4 | 5 |
| Feel scared, uneasy, like something might harm you | 1 | 2 | 3 | 4 | 5 |
| Feel mad at somebody | 1 | 2 | 3 | 4 | 5 |
| Feel mad at yourself | 1 | 2 | 3 | 4 | 5 |
| Feel happy | 1 | 2 | 3 | 4 | 5 |
| Feel like somebody is "good-for-nothing" | 1 | 2 | 3 | 4 | 5 |
| Feel so interested in what you are doing, caught up with it | 1 | 2 | 3 | 4 | 5 |
| Feel amazed, like you can't believe what's happened, it was so unusual | 1 | 2 | 3 | 4 | 5 |
| Feel fearful, like you are in danger, very tense | 1 | 2 | 3 | 4 | 5 |
| Feel like screaming at somebody or banging on something | 1 | 2 | 3 | 4 | 5 |
| Feel sad and gloomy, almost like crying | 1 | 2 | 3 | 4 | 5 |
| Feel like you did something wrong | 1 | 2 | 3 | 4 | 5 |
| Feel bashful, embarrassed | 1 | 2 | 3 | 4 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| Feel disgusted, like something is sickening | 1 | 2 | 3 | 4 | 5 |
| Feel joyful, like everything is going your way, everything is rosy | 1 | 2 | 3 | 4 | 5 |
| Feel like people laugh at you | 1 | 2 | 3 | 4 | 5 |
| Feel like things are so rotten they could make you sick | 1 | 2 | 3 | 4 | 5 |
| Feel sick about yourself | 1 | 2 | 3 | 4 | 5 |
| Feel like you are better than somebody | 1 | 2 | 3 | 4 | 5 |
| Feel like you ought to be blamed for something | 1 | 2 | 3 | 4 | 5 |
| Feel like you feel when something unexpected happens | 1 | 2 | 3 | 4 | 5 |
| Feel alert, curious, kind of excited about something | 1 | 2 | 3 | 4 | 5 |
| Feel angry, irritated, annoyed | 1 | 2 | 3 | 4 | 5 |
| Feel discouraged, like you can't make it, nothing is going right | 1 | 2 | 3 | 4 | 5 |
| Feel afraid, shaky, and jittery | 1 | 2 | 3 | 4 | 5 |
| Feel like people always look at you when anything goes wrong | 1 | 2 | 3 | 4 | 5 |

Briefly describe any event, situation or thought (if any) that you have experienced in the interval since your last report and that has had a positive or negative impact on the way you feel.

______________________________________________

**The event/situation/thought was** (tick the appropriate box):
- ❑ pleasant
- ❑ unpleasant

**How much control do/did you have over the event/situation/thought?**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Not at all | | | | | | | | Very much |

**How important is/was the event/situation to you?**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Not at all | | | | | | | | Very much |

**Day of competition: immediately after the competition Date __________________2000**
**Time of completion ____________**

## DES - IV

Directions: Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel RIGHT NOW. Do not spend too much time on any one statement, but give the answer which seems to describe most accurately your CURRENT feelings.

| **You ...** | not at all | slightly | moderately so | considerably so | very much so |
|---|---|---|---|---|---|
| Feel regret, sorry for something you did | 1 | 2 | 3 | 4 | 5 |
| Feel sheepish, like you don't want to be seen | 1 | 2 | 3 | 4 | 5 |
| Feel glad about something | 1 | 2 | 3 | 4 | 5 |
| Feel like something stinks, puts a bad taste in your mouth | 1 | 2 | 3 | 4 | 5 |
| Feel you can't stand yourself | 1 | 2 | 3 | 4 | 5 |
| Feel embarrassed, as somebody saw you make a mistake | 1 | 2 | 3 | 4 | 5 |
| Feel unhappy, blue, downhearted | 1 | 2 | 3 | 4 | 5 |
| Feel surprised, like when something suddenly happens, you had no idea would happen | 1 | 2 | 3 | 4 | 5 |
| Feel like someone is a low-life, not worth the time of day | 1 | 2 | 3 | 4 | 5 |
| Feel shy, like you want to hide | 1 | 2 | 3 | 4 | 5 |
| Feel like what you are doing or watching is interesting | 1 | 2 | 3 | 4 | 5 |
| Feel scared, uneasy, like something might harm you | 1 | 2 | 3 | 4 | 5 |
| Feel mad at somebody | 1 | 2 | 3 | 4 | 5 |
| Feel mad at yourself | 1 | 2 | 3 | 4 | 5 |
| Feel happy | 1 | 2 | 3 | 4 | 5 |
| Feel like somebody is "good-for-nothing" | 1 | 2 | 3 | 4 | 5 |
| Feel so interested in what you are doing, caught up with it | 1 | 2 | 3 | 4 | 5 |
| Feel amazed, like you can't believe what's happened, it was so unusual | 1 | 2 | 3 | 4 | 5 |
| Feel fearful, like you are in danger, very tense | 1 | 2 | 3 | 4 | 5 |
| Feel like screaming at somebody or banging on something | 1 | 2 | 3 | 4 | 5 |
| Feel sad and gloomy, almost like crying | 1 | 2 | 3 | 4 | 5 |
| Feel like you did something wrong | 1 | 2 | 3 | 4 | 5 |
| Feel bashful, embarrassed | 1 | 2 | 3 | 4 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| Feel disgusted, like something is sickening | 1 | 2 | 3 | 4 | 5 |
| Feel joyful, like everything is going your way, everything is rosy | 1 | 2 | 3 | 4 | 5 |
| Feel like people laugh at you | 1 | 2 | 3 | 4 | 5 |
| Feel like things are so rotten they could make you sick | 1 | 2 | 3 | 4 | 5 |
| Feel sick about yourself | 1 | 2 | 3 | 4 | 5 |
| Feel like you are better than somebody | 1 | 2 | 3 | 4 | 5 |
| Feel like you ought to be blamed for something | 1 | 2 | 3 | 4 | 5 |
| Feel like you feel when something unexpected happens | 1 | 2 | 3 | 4 | 5 |
| Feel alert, curious, kind of excited about something | 1 | 2 | 3 | 4 | 5 |
| Feel angry, irritated, annoyed | 1 | 2 | 3 | 4 | 5 |
| Feel discouraged, like you can't make it, nothing is going right | 1 | 2 | 3 | 4 | 5 |
| Feel afraid, shaky, and jittery | 1 | 2 | 3 | 4 | 5 |
| Feel like people always look at you when anything goes wrong | 1 | 2 | 3 | 4 | 5 |

Briefly describe any event, situation or thought (if any) that you have experienced in the interval since your last report and that has had a positive or negative impact on the way you feel.

____________________________________________________

**The event/situation/thought was** (tick the appropriate box):

- ☐ pleasant
- ☐ unpleasant

**How much control do/did you have over the event/situation/thought?**

1 2 3 4 5 6 7

Not at all ... Very much

**How important is/was the event/situation to you?**

1 2 3 4 5 6 7

Not at all ... Very much

Using the rating scale below, circle the number representing how you performed in this competition.

**I think I performed**

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| very much below my usual standard | | | | | at my usual standard | | | | | very much above my usual standard |

# APPENDIX 49

## QBASIC PROGRAM FOR OBTAINING A LIST OF RANDOM PAGER CALL TIMES AND SCHEDULE OF RANDOM PAGER CALLS

### *QBASIC PROGRAM FOR OBTAINING A LIST OF RANDOM PAGER CALL TIMES*

```
FOR X = 1 TO 10: PRINT “Day”; X; “ “
FOR Y = 0 TO 4
C = 2.5 * Y
h% = INT ( RND * 2.5 ) + 9 + C
m% = INT ( RND * 60 )
PRINT h%; “+: “; m%; “ “;
NEXT Y
NEXT X
```

### *SCHEDULE OF RANDOM PAGER CALLS OBTAINED BY RUNNING THE QBASIC PROGRAM*

A) First competition (25 March - 4 April 2000): National Tae Kwon Do Championship held on the 1st of April 2000 (Bristol, UK)

| 25 March | 26 March | 27 March | 28 March | 29 March | 30 March | 31 March |
|---|---|---|---|---|---|---|
| 10:30 | 09:48 | 10:50 | 09:06 | 11:00 | 09:30 | 09:28 |
| 12:08 | 11:35 | 13:10 | 11:32 | 13:21 | 13:38 | 11:32 |
| 14:20 | 15:02 | 14:51 | 14:31 | 15:02 | 15:00 | 15:27 |
| 17:14 | 16:51 | 18:05 | 17:58 | 17:42 | 16:45 | 16:34 |
| 19:11 | 19:32 | 20:48 | 21:00 | 20:11 | 19:22 | 19:42 |
| **2 April** | **3 April** | **4 April** | | | | |
| 10:05 | 11:02 | 09:58 | | | | |
| 13:08 | 11:50 | 11:48 | | | | |
| 14:58 | 15:32 | 16:02 | | | | |
| 17:01 | 18:33 | 18:17 | | | | |
| 19:05 | 20:42 | 20:09 | | | | |

B) Second competition (30 April - 10 May 2000): National Shotokan Karate Championship held on the 7h of May 2000 (Birmingham, UK)

| 30 April | 1 May | 2 May | 3 May | 4 May | 5 May | 6 May |
|---|---|---|---|---|---|---|
| 10:25 | 10:47 | 09:45 | 11:00 | 09:30 | 10:30 | 09:28 |
| 12:03 | 12:25 | 11:38 | 12:13 | 13:38 | 12:08 | 13:08 |
| 14:15 | 15:40 | 14:30 | 15:21 | 15:00 | 14:20 | 14:20 |
| 17:03 | 18:34 | 17:30 | 18:21 | 16:45 | 17:14 | 18:05 |
| 19:20 | 19:27 | 20:45 | 19:47 | 19:15 | 19:15 | 19:05 |
| **8 May** | **9 May** | **10 May** | | | | |
| 11:15 | 09:15 | 10:03 | | | | |
| 13:15 | 11:45 | 13:01 | | | | |
| 14:27 | 16:00 | 14:05 | | | | |
| 18:44 | 16:49 | 17:33 | | | | |
| 20:58 | 19:22 | 19:57 | | | | |

## APPENDIX 50

## DESCRIPTION AND CLASSIFICATION OF SOURCES OF CONCERN REPORTED BY ATHLETES

| Sources of concern | Non competition | Competition |
|---|---|---|
| 1. Competition (talking or thinking about ~) | | ✓ |
| 2. Don't feel ready for competition. | | ✓ |
| 3. Somebody let me down. | ✓ | |
| 4. Not seeing my son. | ✓ | |
| 5. Not done coursework for college. | ✓ | |
| 6. More coursework. | ✓ | |
| 7. Picked up slight injury (training). | ✓ | |
| 8. I owe money, not enough to pay back. | ✓ | |
| 9. Not quick enough (sparring) (training before competition). | | ✓ |
| 10. Bought new computer, not happy with it. | ✓ | |
| 11. Putting pressure on myself, not to lose, thinking about competition. | | ✓ |
| 12. Lost in final. | | ✓ |
| 13. Time running out for coursework. | ✓ | |
| 14. Argument with my son's mother / sister / daughter / etc. | ✓ | |
| 15. Conflict / tension with mum. | ✓ | |
| 16. Bad relationship with parents. | ✓ | |
| 17. Made silly mistake at college. | ✓ | |
| 18. Have big problem with maths. | ✓ | |
| 19. Board meeting - discussion on staff dismissal. | ✓ | |
| 20. Had to fire somebody. | ✓ | |
| 21. Other staff members aren't happy about dismissal of other staff. | ✓ | |
| 22. Sacked staff member has sabotaged the computer system even though they had been caught stealing. | ✓ | |
| 23. Still trying to fix computers. | ✓ | |
| 24. My family taking the Mickey out of me. | ✓ | |
| 25. A lot to do / too much work. | ✓ | |
| 26. Something at work that should have been sorted wasn't. | ✓ | |
| 27. Can't find solution for homework. | ✓ | |
| 28. Almost accident with motorbike. | ✓ | |
| 29. Test too difficult (college). | ✓ | |
| 30. Had to help dad and couldn't go out. | ✓ | |
| 31. Problems at work where police had to be called. | ✓ | |
| 32. Not winning (competition). | | ✓ |
| 33. Heavy traffic - driving home. | ✓ | |
| 34. Too much extra work to do. | ✓ | |
| 35. Made silly mistakes (competition). | | ✓ |

*(continued)*

| Sources of concern | Non competition | Competition |
|---|---|---|
| 36. Took a knock on the head at work. | ✓ | |
| 37. Done something wrong at work. | ✓ | |
| 38. Radio broke in the car. | ✓ | |
| 39. Tire and have to go to work. | ✓ | |
| 40. Broken gearbox on car. | ✓ | |
| 41. Next day delivery not here. | ✓ | |
| 42. Had a hard day at work. | ✓ | |
| 43. Breakdown in work. | ✓ | |
| 44. Slept in (work). | ✓ | |
| 45. Got seen leaving work early. | ✓ | |
| 46. Missed bin men. | ✓ | |
| 47. Missed last report. | ✓ | |
| 50. Woke up late. | ✓ | |
| 51. Got called into work (problem). | ✓ | |
| 52. Nowhere to warm up (before competition) | | ✓ |
| 53. Broken ribs (result of competition). | | ✓ |
| 54. Someone pulled across me on the motorway. | ✓ | |
| 55. Flat tyre on lorry I drive. | ✓ | |
| 56. Ate to much. | ✓ | |
| 57. Late for tae-kwon do training. | ✓ | |
| 58. Children fighting. | ✓ | |
| 59. Delayed at work - might not be able to get home. | ✓ | |
| 60. Cut up by black van. | ✓ | |
| 61. Delayed at work again - might not get home tonight - problem for tomorrow's competition? | | ✓ |
| 62. Waiting 5 hours before sparring (day of competition), | | ✓ |
| 63. Could not get into a rhythm in gym - warming up before competition. | | ✓ |
| 64. Fed up! (seems to be related to work). | ✓ | |
| 65. Could have done better. Maybe next time. (after competition). | | ✓ |
| 66. Being irritated by a friend. | ✓ | |
| 67. Being informed of bad news. | ✓ | |
| 68. Car mirror smashed in car park. | ✓ | |
| 69. Complaint. | ✓ | |
| 70. Conversation with ill sister. | ✓ | |
| 71. Disturbed by neighbours. | ✓ | |
| 72. Talked/thought about ill colleague. | ✓ | |
| 73. Major car breakdown on the motorway. | ✓ | |
| 74. Found out car trouble expensive. | ✓ | |
| 75. Vomiting due to hangover - ate curry - bad idea. | ✓ | |
| 76. Felt guilty. I could not go training today because of hangover. | ✓ | |

*(continued)*

| Sources of concern | Non competition | Competition |
|---|---|---|
| 77. Late for dinner and got a hard time about it. | ✓ | |
| 78. Important e-mail had to be sent in short space of time. | ✓ | |
| 79. Bosses wife's mum is dying in hospital. | ✓ | |
| 80. In the gym on my own and felt like I could not be bothered. | ✓ | |
| 81. Sparring in Tae Kwon Do and fell over - embarrassed but rather amused (training) | ✓ | |
| 82. Got kicked in the chin and was seeing stars (competition). | | ✓ |
| 83. Got up late to meet the bus - fortunately bus was late too (going to competition). | | ✓ |
| 84. Getting a head cold - getting worse as day goes on (day before competition). | | ✓ |
| 85. My assistant didn't do an assignment and deadline has passed. | ✓ | |
| 86. Yoga class was full because I didn't put my name early enough. | ✓ | |
| 87. In the gym and I can't seem to get motivated. | ✓ | |
| 88. Nobody else in work can do e-mails so my work load gets much busier plus everything seems to want to get done immediately. | ✓ | |
| 89. Work is very monotonous today but looking forward to yoga tonight. | ✓ | |
| 90. Disturbed while doing assignment. | ✓ | |
| 91. Waiting to be assessed. | ✓ | |
| 92. Waiting for the results (job interview). | ✓ | |
| 93. My mother-in-law ruined my jacket. | ✓ | |
| 94. Unwanted guests. | ✓ | |
| 95. Met boss while late. | ✓ | |
| 96. Awful behaviour of colleague. | ✓ | |
| 97. Problems with son. | ✓ | |
| 98. Waiting for my McMuffin!!!! | ✓ | |
| 99. Banged my leg. | ✓ | |
| 100. Flat tyre on bike. | ✓ | |
| 101. Too tense before competition. | | ✓ |
| 102. Didn't do well - very nervous (competition) | | ✓ |
| 103. Thought: did not do well in competition. | | ✓ |
| 104. Talk about bad performance in competition. | | ✓ |
| 105. Our lecturer is disgusting. | ✓ | |
| 106. Waking up early for morning lecture. | ✓ | |
| 107. Got a bad grade for an assignment. | ✓ | |
| 108. Suffered injuries at competition. | | ✓ |
| 109. Had to load two 20 tone trucks in work. | ✓ | |
| 110. Too many people coming into work. | ✓ | |
| 111. Confrontation with work colleague. | ✓ | |
| 112. Work on a report against the clock. | ✓ | |
| 113. Nearly had car accident. | ✓ | |
| 114. Woken up very early. | ✓ | |
| 115. Tension throughout whole day (competition). | | ✓ |

*(continued)*

| Sources of concern | Non competition | Competition |
|---|---|---|
| 116. Absolutely knackered. | ✓ | |
| 117. Long distance drive. | ✓ | |
| 118. Late for a course. | ✓ | |
| 119. Disappointed by a friend. | ✓ | |
| 120. Forgot something related to work. | ✓ | |
| 121. Can't solve problem at work. | ✓ | |
| 122. Was lying to friend. | ✓ | |
| 123. Video recorder chewed up important tape. | ✓ | |
| 124. Watching very poor film. | ✓ | |
| 125. Saw a hostile neighbour. | ✓ | |
| 126. Filling in official complicated forms. | ✓ | |
| 127. Having to stick to a schedule when I was tired. | ✓ | |
| 128. Had to clean up dog's excretia. | ✓ | |
| 129. Feeling sick. | ✓ | |
| 130. Treating badly a friend of mine. | ✓ | |
| 131. Staff not working as they should. | ✓ | |
| 132. Injured during semi-final of individual fighting. Not able to fight in final or team final. | | ✓ |
| 133. Thinking about the fact I should have won. | | ✓ |
| 134. Getting up to take my rabbit to the vet after only 4 hours sleep | ✓ | |
| 135. Worrying about my income for next month - I am self employed. | ✓ | |
| 136. I client did not make a payment he promised. | ✓ | |
| 137. Some companies have failed to pay their invoices to me. | ✓ | |
| 138. Fighting in the team event. | | ✓ |
| 139. Problems with a mortgage case which I rectified. | ✓ | |
| 140. I cut my stomach (just before competition) | | ✓ |
| 141. Working with impatient customers. | ✓ | |
| 142. Trying to fix my phone. | ✓ | |
| 143. Trying to catch bus. | ✓ | |
| 144. Doing paper work. | ✓ | |
| 145. Discman not working.. | ✓ | |
| 146. ICT exam.. | ✓ | |
| 147. Clay head exploding. | ✓ | |
| 148. Work overnight / driving home half asleep. | ✓ | |
| 149. Attending memorial service for dead babies, | ✓ | |
| 150. Exhaustion. | ✓ | |
| 151. Trying to find a missing patient. | ✓ | |
| 152. Did not sleep well night before (1 hour precomp.) | | ✓ |
| 153. Felt physically very heavy, comparing to how I felt before competition. | | ✓ |
| 154. My son would not stop crying for 10 minutes. | ✓ | |

*(continued)*

| Sources of concern | Non competition | Competition |
|---|---|---|
| 155. Debt collectors threatened to take me to court or repossess my property. | ✓ | |
| 156. Embarrassing situation. | ✓ | |
| 157. Can't meet girlfriend. | ✓ | |
| 158. Mad at result (competition). | | ✓ |
| 159. Pressures at work. | ✓ | |
| 160. Driver cutting me up at traffic lights. | ✓ | |
| 161. One of the kids has broken the lawn-mower. | ✓ | |
| 162. Daughter playing up and not going to bed. | ✓ | |
| 163. Sorting out problems with customers. | ✓ | |
| 164. Being messed about by contract manager. | ✓ | |
| 165. Awaiting phone call about work. | ✓ | |
| 166. Problems with bricklayers on site. | ✓ | |
| 167. Run out of petrol. Being late for training (before competition) | | ✓ |
| 168. Getting stressed because training and bleeper going off. | ✓ | |
| 169. Forgetting some movement (training). | ✓ | |
| 170. People not turning up for training. | ✓ | |
| 171. Cannot drink or eat before the weighing-in. | | ✓ |
| 172. Too much beer and food last night. | ✓ | |
| 173. Making my black eye better. | ✓ | |
| 174. Bad stomach pain - still due to hangover - hate my lack of self-control | ✓ | |

## APPENDIX 51

## RELATIONSHIP BETWEEN COMPLIANCE RATE, PERSONAL VARIABLES AND DAY OF THE STUDY

### A) Correlations between personal variables and compliance rate

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Number of missing ES (1) | 1.000 | | | | | |
| Age (2) | 0.148 | 1.000 | | | | |
| Sport experience (3) | 0.155 | **0.636 | 1.000 | | | |
| Neuroticism (4) | -0.321 | -0.183 | -0.111 | 1.000 | | |
| Extraversion (5) | 0.047 | -0.009 | 0.094 | -0.366 | 1.000 | |
| Competitive trait anxiety (6) | -0.076 | -0.112 | -0.286 | **0.598 | -0.149 | 1.000 |

* = p <0.05; ** = p<0.01 (Bonferroni adjusted probabilities); ES = experience sampling

### B) Correlation between compliance rate and day of the study

| Day of study | Observed number of missing ES | Expected number of missing ES | Residual |
|---|---|---|---|
| 1 | 15 | 13.1 | 1.9 |
| 2 | 11 | 13.1 | -2.1 |
| 3 | 10 | 13.1 | -3.1 |
| 4 | 6 | 13.1 | -7.1 |
| 5 | 11 | 13.1 | -2.1 |
| 6 | 18 | 13.1 | 4.9 |
| 7 | 11 | 13.1 | -2.1 |
| 9 | 15 | 13.1 | 1.9 |
| 10 | 21 | 13.1 | 7.9 |
| 11 | 13 | 13.1 | -0.1 |
| Total | 131 | | |

**Chi-Square (9) = 12.74**
**Contingency coefficient = 0.30**
**p = 0.175**

## APPENDIX 52

## INTERNAL CONSISTENCY (CRONBACH ALPHA) OF THE DES-IV SUBSCALES DERIVED FROM DATA COLLECTED ON THE DAY OF THE COMPETITION

| DES scale | Assessment: one hour before the competition | Assessment: immediately after the competiton |
|---|---|---|
| Guilt | 0.85 | 0.89 |
| Shyness | 0.88 | 0.94 |
| Enjoyment | 0.89 | 0.94 |
| Disgust | 0.89 | 0.96 |
| Hostility inward | 0.83 | 0.77 |
| Shame | 0.83 | 0.74 |
| Sadness | 0.76 | 0.83 |
| Surprise | 0.88 | 0.89 |
| Interest | 0.78 | 0.88 |
| Contempt* | 0.41 | 0.49 |
| Fear | 0.78 | 0.78 |
| Anger | 0.73 | 0.76 |

* Exclusion of the item "I felt/feel like I was/am better than somebody" improved the internal consistency of the scale to Alpha values 0.52 for the first assessment and 0.55 for the second assessment.

## APPENDIX 53

## ANOVAS AND COMPARISON OF ADJACENT ASSESSMENTS ACCOMPANYING TABLE 5.2

*2 (GROUP OF ATHLETES) X 11 (TIME TO OR FROM COMPETITION) ANOVAs WITH REPEATED MEASURES ON THE 2ND FACTOR*

Levene's test of homogeneity of variance was not significant in any ANOVA.

**Variable: GUILT**

MAUCHLY'S TEST OF SPHERICITY

| Effect | Mauchly's W | Chi-Square | df | Sign. | G-G | H-F |
|---|---|---|---|---|---|---|
| Time | 0.000 | 449.352 | 65 | 0.000 | 0.190 | 0.207 |

TESTS OF WITHIN-SUBJECTS EFFECTS (Greenhouse-Geisser correction)

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Time | 155.099 | 2.088 | 74.282 | 15.322 | 0.000 |
| Time*Group | 6.007 | 2.088 | 2.877 | 0.593 | 0.838 |
| Error (Time) | 374.540 | 77.255 | 4.848 | | |

TESTS OF BETWEEN-SUBJECTS EFFECTS

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Group | 0.148 | 1 | 0.148 | 0.029 | 0.867 |
| Error | 191.936 | 37 | 5.187 | | |

COMPARISON OF ADJACENT ASSESSMENTS:

| Assessments | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1-2 | 0.107 | 0.092 | 0.254 | 1.000 |
| 2-3 | 0.213 | 0.093 | 0.028 | 0.308 |
| 3-4 | -0.137 | 0.083 | 0.107 | 1.000 |
| 4-5 | -0.024 | 0.106 | 0.825 | 1.000 |
| 5-6 | 0.137 | 0.107 | 0.210 | 1.000 |
| 6-7 | -0.097 | 0.104 | 0.356 | 1.000 |
| 7-8 | -0.117 | 0.150 | 0.440 | 1.000 |
| 8-9 | -1.949 | 0.398 | 0.000 | 0.000 |
| 9-10 | 1.543 | 0.331 | 0.000 | 0.000 |
| 10-11 | 0.575 | 0.230 | 0.017 | 0.187 |
| 11-12 | -0.062 | 0.103 | 0.552 | 1.000 |

**Variable: SHYNESS**

MAUCHLY'S TEST OF SPHERICITY

| Effect | Mauchly's W | Chi-Square | df | Sign. | G-G | H-F |
|---|---|---|---|---|---|---|
| Time | 0.000 | 455.586 | 65 | 0.000 | 0.275 | 0.310 |

TESTS OF WITHIN-SUBJECTS EFFECTS (Greenhouse-Geisser correction)

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Time | 23.386 | 3.026 | 7.727 | 4.883 | 0.003 |
| Time*Group | 4.847 | 3.026 | 1.601 | 1.012 | 0.391 |
| Error (Time) | 177.197 | 111.977 | 1.582 | | |

TESTS OF BETWEEN-SUBJECTS EFFECTS

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Group | 0.191 | 1 | 0.191 | 0.061 | 0.807 |
| Error | 116.711 | 37 | 3.154 | | |

COMPARISON OF ADJACENT ASSESSMENTS:

| Assessments | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1-2 | 0.052 | 0.058 | 0.378 | 1.000 |
| 2-3 | 0.060 | 0.073 | 0.413 | 1.000 |
| 3-4 | -0.133 | 0.071 | 0.069 | 0.759 |
| 4-5 | -0.024 | 0.056 | 0.689 | 1.000 |
| 5-6 | 0.086 | 0.049 | 0.088 | 0.968 |
| 6-7 | 0.018 | 0.034 | 0.615 | 1.000 |
| 7-8 | -0.546 | 0.200 | 0.010 | 0.110 |
| 8-9 | -0.193 | 0.266 | 0.472 | 1.000 |
| 9-10 | 0.487 | 0.246 | 0.055 | 0.605 |
| 10-11 | 0.157 | 0.126 | 0.219 | 1.000 |
| 11-12 | 0.057 | 0.070 | 0.512 | 1.000 |

**Variable: DISGUST**

MAUCHLY'S TEST OF SPHERICITY

| Effect | Mauchly's W | Chi-Square | df | Sign. | G-G | H-F |
|---|---|---|---|---|---|---|
| Time | 0.000 | 691.582 | 65 | 0.000 | 0.173 | 0.188 |

TESTS OF WITHIN-SUBJECTS EFFECTS (Greenhouse-Geisser correction)

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Time | 18.853 | 1.908 | 9.879 | 2.421 | 0.099 |
| Time*Group | 0.646 | 1.908 | 0.339 | 0.083 | 0.913 |
| Error (Time) | 288.083 | 70.606 | 4.080 | | |

TESTS OF BETWEEN-SUBJECTS EFFECTS

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Group | 0.076 | 1 | 0.076 | 0.051 | 0.823 |
| Error | 55.542 | 37 | 1.501 | | |

## Variable: HOSTILITY INWARD

MAUCHLY'S TEST OF SPHERICITY

| Effect | Mauchly's W | Chi-Square | df | Sign. | G-G | H-F |
|---|---|---|---|---|---|---|
| Time | 0.000 | 638.002 | 65 | 0.000 | 0.213 | 0.235 |

TESTS OF WITHIN-SUBJECTS EFFECTS (Greenhouse-Geisser correction)

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Time | 138.279 | 2.345 | 58.975 | 16.443 | 0.000 |
| Time*Group | 30.647 | 2.345 | 13.071 | 3.644 | 0.024 |
| Error (Time) | 311.156 | 86.754 | 3.587 | | |

TESTS OF BETWEEN-SUBJECTS EFFECTS

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Group | 7.630 | 1 | 7.630 | 2.674 | 0.110 |
| Error | 105.555 | 37 | 2.853 | | |

COMPARISON OF ADJACENT ASSESSMENTS:

| Assessments | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1-2 | 0.093 | 0.082 | 0.262 | 1.000 |
| 2-3 | 0.108 | 0.047 | 0.027 | 0.297 |
| 3-4 | -0.072 | 0.042 | 0.089 | 0.979 |
| 4-5 | -0.109 | 0.078 | 0.171 | 1.000 |
| 5-6 | 0.142 | 0.076 | 0.071 | 0.781 |

| | | | | |
|---|---|---|---|---|
| 6-7 | -0.085 | 0.068 | 0.220 | 1.000 |
| 7-8 | -0.494 | 0.244 | 0.050 | 0.550 |
| 8-9 | -1.417 | 0.321 | 0.000 | 0.000 |
| 9-10 | 1.600 | 0.345 | 0.000 | 0.000 |
| 10-11 | 0.408 | 0.182 | 0.031 | 0.341 |
| 11-12 | -0.054 | 0.063 | 0.398 | 1.000 |

**Variable: SHAME**

MAUCHLY'S TEST OF SPHERICITY

| Effect | Mauchly's W | Chi-Square | df | Sign. | G-G | H-F |
|---|---|---|---|---|---|---|
| Time | 0.000 | 535.574 | 65 | 0.000 | 0.266 | 0.300 |

TESTS OF WITHIN-SUBJECTS EFFECTS (Greenhouse-Geisser correction)

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Time | 20.195 | 2.930 | 6.893 | 6.170 | 0.001 |
| Time*Group | 5.303 | 2.930 | 1.810 | 1.620 | 0.190 |
| Error (Time) | 121.098 | 108.402 | 1.117 | | |

TESTS OF BETWEEN-SUBJECTS EFFECTS

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Group | 0.012 | 1 | 0.012 | 0.003 | 0.956 |
| Error | 141.607 | 37 | 3.827 | | |

COMPARISON OF ADJACENT ASSESSMENTS:

| Assessments | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1-2 | -0.042 | 0.092 | 0.649 | 1.000 |
| 2-3 | 0.066 | 0.079 | 0.407 | 1.000 |
| 3-4 | 0.000 | 0.053 | 0.997 | 1.000 |
| 4-5 | -0.003 | 0.034 | 0.937 | 1.000 |
| 5-6 | 0.009 | 0.032 | 0.769 | 1.000 |
| 6-7 | 0.047 | 0.036 | 0.202 | 1.000 |
| 7-8 | -0.493 | 0.189 | 0.013 | 0.143 |
| 8-9 | -0.193 | 0.242 | 0.429 | 1.000 |
| 9-10 | 0.515 | 0.170 | 0.004 | 0.044 |
| 10-11 | 0.149 | 0.094 | 0.120 | 1.000 |
| 11-12 | 0.043 | 0.038 | 0.260 | 1.000 |

## Variable: SADNESS

MAUCHLY'S TEST OF SPHERICITY

| Effect | Mauchly's W | Chi-Square | df | Sign. | G-G | H-F |
|---|---|---|---|---|---|---|
| Time | 0.000 | 476.809 | 65 | 0.000 | 0.236 | 0.262 |

TESTS OF WITHIN-SUBJECTS EFFECTS (Greenhouse-Geisser correction)

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Time | 113.625 | 2.598 | 43.741 | 9.957 | 0.000 |
| Time*Group | 16.893 | 2.598 | 6.503 | 1.480 | 0.229 |
| Error (Time) | 422.221 | 96.115 | 4.393 | | |

TESTS OF BETWEEN-SUBJECTS EFFECTS

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Group | 4.826 | 1 | 4.826 | 0.838 | 0.366 |
| Error | 213.181 | 37 | 5.762 | | |

COMPARISON OF ADJACENT ASSESSMENTS:

| Assessments | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1-2 | 0.137 | 0.101 | 0.183 | 1.000 |
| 2-3 | 0.063 | 0.123 | 0.608 | 1.000 |
| 3-4 | -0.008 | 0.106 | 0.943 | 1.000 |
| 4-5 | -0.119 | 0.162 | 0.468 | 1.000 |
| 5-6 | 0.053 | 0.132 | 0.689 | 1.000 |
| 6-7 | 0.035 | 0.054 | 0.527 | 1.000 |
| 7-8 | -0.263 | 0.139 | 0.067 | 0.737 |
| 8-9 | -1.497 | 0.411 | 0.001 | 0.011 |
| 9-10 | 1.111 | 0.423 | 0.013 | 0.143 |
| 10-11 | 0.514 | 0.240 | 0.039 | 0.429 |
| 11-12 | 0.211 | 0.095 | 0.032 | 0.359 |

## Variable: FEAR

MAUCHLY'S TEST OF SPHERICITY

| Effect | Mauchly's W | Chi-Square | df | Sign. | G-G | H-F |
|---|---|---|---|---|---|---|
| Time | 0.000 | 550.776 | 65 | 0.000 | 0.200 | 0.218 |

TESTS OF WITHIN-SUBJECTS EFFECTS (Greenhouse-Geisser correction)

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Time | 447.672 | 2.195 | 203.923 | 50.283 | 0.000 |
| Time*Group | 14.023 | 2.195 | 6.388 | 1.575 | 0.211 |
| Error (Time) | 329.409 | 81.226 | 4.055 | | |

TESTS OF BETWEEN-SUBJECTS EFFECTS

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Group | 0.222 | 1 | 0.222 | 0.057 | 0.812 |
| Error | 143.282 | 37 | 3.872 | | |

COMPARISON OF ADJACENT ASSESSMENTS:

| Assessments | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1-2 | -0.005 | 0.074 | 0.947 | 1.000 |
| 2-3 | 0.085 | 0.084 | 0.314 | 1.000 |
| 3-4 | -0.098 | 0.064 | 0.135 | 1.000 |
| 4-5 | 0.015 | 0.081 | 0.858 | 1.000 |
| 5-6 | 0.027 | 0.054 | 0.961 | 1.000 |
| 6-7 | -0.471 | 0.172 | 0.010 | 0.110 |
| 7-8 | -3.045 | 0.355 | 0.000 | 0.000 |
| 8-9 | 3.080 | 0.416 | 0.000 | 0.000 |
| 9-10 | 0.426 | 0.181 | 0.024 | 0.264 |
| 10-11 | 0.178 | 0.103 | 0.090 | 0.990 |
| 11-12 | 0.007 | 0.039 | 0.864 | 1.000 |

## Variable: ANGER

MAUCHLY'S TEST OF SPHERICITY

| Effect | Mauchly's W | Chi-Square | df | Sign. | G-G | H-F |
|---|---|---|---|---|---|---|
| Time | 0.000 | 318.441 | 65 | 0.000 | 0.256 | 0.287 |

TESTS OF WITHIN-SUBJECTS EFFECTS (Greenhouse-Geisser correction)

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Time | 157.235 | 2.815 | 55.856 | 9.582 | 0.000 |
| Time*Group | 12.462 | 2.815 | 4.427 | 0.759 | 0.512 |
| Error (Time) | 607.172 | 104.155 | 5.829 | | |

TESTS OF BETWEEN-SUBJECTS EFFECTS

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Group | 0.068 | 1 | 0.068 | 0.012 | 0.913 |
| Error | 204.846 | 37 | 5.536 | | |

COMPARISON OF ADJACENT ASSESSMENTS:

| Assessments | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1-2 | 0.122 | 0.136 | 0.377 | 1.000 |
| 2-3 | -0.021 | 0.124 | 0.864 | 1.000 |
| 3-4 | -0.097 | 0.142 | 0.499 | 1.000 |
| 4-5 | 0.065 | 0.129 | 0.618 | 1.000 |
| 5-6 | -0.164 | 0.129 | 0.212 | 1.000 |
| 6-7 | 0.111 | 0.233 | 0.637 | 1.000 |
| 7-8 | -0.326 | 0.336 | 0.338 | 1.000 |
| 8-9 | -1.667 | 0.380 | 0.000 | 0.000 |
| 9-10 | 1.874 | 0.460 | 0.000 | 0.000 |
| 10-11 | 0.265 | 0.132 | 0.052 | 0.572 |
| 11-12 | 0.248 | 0.185 | 0.189 | 1.000 |

**Variable: ENJOYMENT**

MAUCHLY'S TEST OF SPHERICITY

| Effect | Mauchly's W | Chi-Square | df | Sign. | G-G | H-F |
|---|---|---|---|---|---|---|
| Time | 0.002 | 211.304 | 65 | 0.000 | 0.404 | 0.479 |

TESTS OF WITHIN-SUBJECTS EFFECTS (Greenhouse-Geisser correction)

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Time | 42.004 | 4.449 | 9.441 | 1.118 | 0.318 |
| Time*Group | 40.615 | 4.449 | 9.129 | 1.149 | 0.336 |
| Error (Time) | 1307.663 | 164.612 | 7.944 | | |

TESTS OF BETWEEN-SUBJECTS EFFECTS

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Group | 0.050 | 1 | 0.050 | 0.001 | 0.974 |
| Error | 1655.115 | 37 | 44.733 | | |

**Variable: SURPRISE**

MAUCHLY'S TEST OF SPHERICITY

| Effect | Mauchly's W | Chi-Square | df | Sign. | G-G | H-F |
|---|---|---|---|---|---|---|
| Time | 0.000 | 283.811 | 65 | 0.000 | 0.405 | 0.480 |

TESTS OF WITHIN-SUBJECTS EFFECTS (Greenhouse-Geisser correction)

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Time | 145.162 | 4.459 | 32.555 | 9.092 | 0.000 |
| Time*Group | 16.263 | 4.459 | 3.647 | 1.019 | 0.404 |
| Error (Time) | 590.733 | 164.982 | 3.581 | | |

TESTS OF BETWEEN-SUBJECTS EFFECTS

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Group | 1.430 | 1 | 1.430 | 0.077 | 0.783 |
| Error | 686.992 | 37 | 18.567 | | |

COMPARISON OF ADJACENT ASSESSMENTS:

| Assessments | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1-2 | 0.525 | 0.175 | 0.005 | 0.055 |
| 2-3 | -0.196 | 0.143 | 0.178 | 1.000 |
| 3-4 | 0.183 | 0.143 | 0.203 | 1.000 |
| 4-5 | -0.028 | 0.105 | 0.790 | 1.000 |
| 5-6 | -0.357 | 0.128 | 0.008 | 0.088 |
| 6-7 | -0.079 | 0.214 | 0.714 | 1.000 |
| 7-8 | -1.282 | 0.246 | 0.000 | 0.000 |
| 8-9 | 0.282 | 0.390 | 0.475 | 1.000 |
| 9-10 | 1.480 | 0.346 | 0.000 | 0.000 |
| 10-11 | -0.114 | 0.140 | 0.423 | 1.000 |
| 11-12 | -0.332 | 0.215 | 0.130 | 1.000 |

**Variable: INTEREST**

MAUCHLY'S TEST OF SPHERICITY

| Effect | Mauchly's W | Chi-Square | df | Sign. | G-G | H-F |
|---|---|---|---|---|---|---|
| Time | 0.006 | 171.329 | 65 | 0.000 | 0.469 | 0.569 |

TESTS OF WITHIN-SUBJECTS EFFECTS (Greenhouse-Geisser correction)

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Time | 424.420 | 5.161 | 82.231 | 13.890 | 0.000 |
| Time*Group | 34.979 | 5.161 | 6.777 | 1.145 | 0.338 |
| Error (Time) | 1130.541 | 190.970 | 5.920 | | |

TESTS OF BETWEEN-SUBJECTS EFFECTS

| Source | Type III SS | df | MS | F | Sign. |
|---|---|---|---|---|---|
| Group | 1.361 | 1 | 1.361 | 0.044 | 0.835 |
| Error | 1150.010 | 37 | 31.081 | | |

COMPARISON OF ADJACENT ASSESSMENTS:

| Assessments | Mean difference | SE | Sign. | Sign. (Bonferroni) |
|---|---|---|---|---|
| 1-2 | 0.686 | 0.221 | 0.004 | 0.044 |
| 2-3 | 0.060 | 0.259 | 0.819 | 1.000 |
| 3-4 | -0.041 | 0.250 | 0.872 | 1.000 |
| 4-5 | 0.222 | 0.226 | 0.333 | 1.000 |
| 5-6 | -0.230 | 0.252 | 0.366 | 1.000 |
| 6-7 | -0.393 | 0.299 | 0.197 | 1.000 |
| 7-8 | -2.753 | 0.390 | 0.000 | 0.000 |
| 8-9 | -1.553 | 0.542 | 0.007 | 0.077 |
| 9-10 | 1.903 | 0.492 | 0.000 | 0.000 |
| 10-11 | -0.169 | 0.249 | 0.501 | 1.000 |
| 11-12 | -0.487 | 0.296 | 0.108 | 1.000 |

## APPENDIX 54

## F-TESTS FOR COUNTED RESULTS (FREQUENCIES) TESTING THE SIGNIFICANCE OF THE DIFFERENCE IN FREQUENCY OF REPORTED SOURCES OF CONCERN BETWEEN ADJACENT DAYS OR ASSESSMENTS

Due to multiple testing, Bonferroni adjusted probabilities were applied.

Significance of the difference between two temporally adjacent frequencies was computed via the following test statistic:

$$F = \frac{\frac{1}{t_1}(N_1 + 0.5)}{\frac{1}{t_2}(N_2 + 0.5)}$$

which follows the F-distribution with ($2N_2$+1, $2N_1$+1) degrees of freedom (Kanji, 1999).

**a) Significance testing of temporally adjacent frequencies of pleasant competition-related sources of concern**

| Pair of days/assessments | F | ($df_1$, $df_2$) | p | Bonferroni adjusted probability |
|---|---|---|---|---|
| Day 1 - Day 2 | 1.47 | (33, 23) | 0.171 | 1.000 |
| Day 2 - Day 3 | 1.86 | (43, 23) | 0.056 | 0.620 |
| Day 3 - Day 4 | 1.42 | (43, 31) | 0.157 | 1.000 |
| Day 4 - Day 5 | 1.03 | (31, 31) | 0.470 | 1.000 |
| Day 5 - Day 6 | 1.51 | (45, 31) | 0.115 | 1.000 |
| Day 6 - Day 7 | 1.95 | (91, 45) | 0.008 | 0.083 |
| Day 7 - Day 8 (BC) | 3.47 | (67, 91) | 0.000 | 0.000 |
| Day 8 (BC) - Day 8 (AC) | 1.56 | (67, 43) | 0.061 | 0.671 |
| Day 8 (AC) - Day 9 | 15.27 | (43, 13) | 0.000 | 0.000 |
| Day 9 - Day 10 | 2.51 | (13, 5) | 0.158 | 1.000 |
| Day 10 - Day 11 | 5.23 | (5, 1) | 0.320 | 1.000 |

**b) Significance testing of temporally adjacent frequencies of unpleasant competition-related sources of concern**

| Pair of days/assessments | F | ($df_1$, $df_2$) | p | Bonferroni adjusted probability |
|---|---|---|---|---|
| Day 1 - Day 2 | 3.07 | (9, 3) | 0.193 | 1.000 |
| Day 2 - Day 3 | 3.02 | (3, 1) | 0.395 | 1.000 |
| Day 3 - Day 4 | 2.94 | (3, 1) | 0.400 | 1.000 |
| Day 4 - Day 5 | 1.03 | (3, 3) | 0.491 | 1.000 |
| Day 5 - Day 6 | 1.04 | (3, 3) | 0.489 | 1.000 |
| Day 6 - Day 7 | 8.66 | (27, 3) | 0.050 | 0.547 |
| Day 7 - Day 8 (BC) | 2.27 | (13, 27) | 0.035 | 0.384 |
| Day 8 (BC) - Day 8 (AC) | 2.85 | (37, 13) | 0.023 | 0.254 |
| Day 8 (AC) - Day 9 | 5.17 | (37, 33) | 0.000 | 0.000 |
| Day 9 - Day 10 | 3.54 | (33, 9) | 0.025 | 0.274 |
| Day 10 - Day 11 | 9.41 | (9, 1) | 0.248 | 1.000 |

**c) Significance testing of temporally adjacent frequencies of pleasant competition-extraneous sources of concern**

| Pair of days/assessments | F | $(df_1, df_2)$ | p | Bonferroni adjusted probability |
|---|---|---|---|---|
| Day 1 - Day 2 | 1.26 | (45, 35) | 0.243 | 1.000 |
| Day 2 - Day 3 | 1.53 | (69, 45) | 0.067 | 0.730 |
| Day 3 - Day 4 | 1.91 | (37, 69) | 0.010 | 0.115 |
| Day 4 - Day 5 | 1.53 | (55, 37) | 0.088 | 0.962 |
| Day 5 - Day 6 | 1.08 | (55, 49) | 0.410 | 1.000 |
| Day 6 - Day 7 | 1.76 | (49, 29) | 0.053 | 0.589 |
| Day 7 - Day 8 (BC) | 6.15 | (29, 1) | 0.310 | 1.000 |
| Day 8 (BC) - Day 8 (AC) | 1.00 | (1, 1) | 0.500 | 1.000 |
| Day 8 (AC) - Day 9 | 9.32 | (41, 1) | 0.255 | 1.000 |
| Day 9 - Day 10 | 1.71 | (71, 43) | 0.030 | 0.333 |
| Day 10 - Day 11 | 1.22 | (71, 61) | 0.216 | 1.000 |

**d) Significance testing of temporally adjacent frequencies of unpleasant competition-extraneous sources of concern**

| Pair of days/assessments | F | $(df_1, df_2)$ | p | Bonferroni adjusted probability |
|---|---|---|---|---|
| Day 1 - Day 2 | 1.23 | (65, 59) | 0.323 | 1.000 |
| Day 2 - Day 3 | 1.04 | (59, 57) | 0.440 | 1.000 |
| Day 3 - Day 4 | 1.53 | (89, 57) | 0.043 | 0.478 |
| Day 4 - Day 5 | 1.29 | (89, 67) | 0.135 | 1.000 |
| Day 5 - Day 6 | 1.57 | (67, 41) | 0.061 | 0.668 |
| Day 6 - Day 7 | 2.03 | (41, 21) | 0.042 | 0.464 |
| Day 7 - Day 8 (BC) | 4.45 | (21, 1) | 0.360 | 1.000 |
| Day 8 (BC) - Day 8 (AC) | 1.00 | (1, 1) | 0.500 | 1.000 |
| Day 8 (AC) - Day 9 | 6.71 | (31, 1) | 0.298 | 1.000 |
| Day 9 - Day 10 | 1.10 | (33, 31) | 0.395 | 1.000 |
| Day 10 - Day 11 | 1.13 | (39, 33) | 0.362 | 1.000 |

## APPENDIX 55

## PRINCIPAL COMPONENT ANALYSIS WITH OBLIQUE (OBLIMIN) ROTATION OF MEAN SCORES ON THE DES-IV

### Communalities

| Scale | Communalities |
|---|---|
| Guilt | 0.691 |
| Shyness | 0.660 |
| Disgust | 0.765 |
| Hostility Inward | 0.668 |
| Shame | 0.605 |
| Sadness | 0.680 |
| Fear | 0.444 |
| Anger | 0.686 |
| Enjoyment | 0.711 |
| Surprise | 0.741 |
| Interest | 0.796 |

### Total variance explained

| Component | Initial eigenvalues | % of variance | After rotation |
|---|---|---|---|
| 1 | 4.169 | 37.901 | 3.864 |
| 2 | 2.268 | 20.616 | 2.393 |
| 3 | 1.009 | 9.175 | 2.399 |

### Rotated pattern matrix

| Scale | 1 | 2 | 3 |
|---|---|---|---|
| Guilt | 0.788 | -0.151 | 0.047 |
| Shyness | 0.834 | 0.041 | -0.054 |
| Disgust | -0.085 | 0.058 | 0.914 |
| Hostility Inward | 0.732 | -0.164 | 0.119 |
| Shame | 0.761 | 0.111 | 0.033 |
| Sadness | 0.644 | -0.215 | 0.241 |
| Fear | 0.690 | 0.142 | -0.096 |
| Anger | 0.132 | 0.011 | 0.765 |
| Enjoyment | -0.112 | 0.817 | -0.056 |
| Surprise | 0.093 | 0.864 | 0.136 |
| Interest | 0.029 | 0.890 | -0.019 |

### Structure matrix

| Scale | 1 | 2 | 3 |
|---|---|---|---|
| Guilt | 0.815 | -0.198 | 0.403 |
| Shyness | 0.810 | 0.007 | 0.294 |

| | | | |
|---|---|---|---|
| Disgust | 0.300 | -0.075 | 0.870 |
| Hostility Inward | 0.791 | -0.218 | 0.454 |
| Shame | 0.770 | -0.068 | 0.339 |
| Sadness | 0.757 | -0.284 | 0.546 |
| Fear | 0.642 | 0.121 | 0.175 |
| Anger | 0.456 | -0.109 | 0.819 |
| Enjoyment | -0.177 | 0.831 | -0.225 |
| Surprise | 0.108 | 0.839 | 0.047 |
| Interest | -0.024 | 0.892 | -0.139 |

**Component correlation matrix**

| | 1 | 2 | 3 |
|---|---|---|---|
| 1 | 1.000 | | |
| 2 | -0.050 | 1.000 | |
| 3 | 0.424 | -0.149 | 1.000 |

## PRINCIPAL COMPONENT ANALYSIS WITH OBLIQUE (OBLIMIN) ROTATION OF WITHIN-SUBJECT Z SCORES ON THE DES-IV

### Communalities

| Scale | Communalities |
|---|---|
| Guilt | 0.604 |
| Shyness | 0.712 |
| Disgust | 0.584 |
| Hostility Inward | 0.631 |
| Shame | 0.622 |
| Sadness | 0.708 |
| Fear | 0.346 |
| Anger | 0.722 |
| Enjoyment | 0.610 |
| Surprise | 0.759 |
| Interest | 0.800 |

### Total variance explained

| Component | Initial eigenvalues | % of variance | After rotation |
|---|---|---|---|
| 1 | 4.017 | 36.516 | 3.272 |
| 2 | 2.075 | 18.867 | 2.215 |
| 3 | 1.007 | 9.153 | 2.971 |

### Rotated pattern matrix

| Scale | 1 | 2 | 3 |
|---|---|---|---|
| Guilt | 0.594 | -0.086 | 0.293 |
| Shyness | 0.890 | -0.069 | -0.134 |
| Disgust | -0.016 | 0.034 | 0.776 |
| Hostility Inward | 0.539 | -0.094 | 0.379 |
| Shame | 0.816 | -0.011 | -0.071 |
| Sadness | 0.410 | -0.160 | 0.543 |
| Fear | 0.510 | 0.268 | 0.046 |
| Anger | -0.061 | 0.012 | 0.876 |
| Enjoyment | -0.089 | 0.654 | -0.296 |
| Surprise | 0.031 | 0.878 | 0.191 |
| Interest | 0.029 | 0.891 | -0.020 |

### Structure matrix

| Scale | 1 | 2 | 3 |
|---|---|---|---|
| Guilt | 0.720 | -0.142 | 0.560 |
| Shyness | 0.834 | -0.060 | 0.257 |
| Disgust | 0.315 | -0.090 | 0.763 |
| Hostility Inward | 0.702 | -0.163 | 0.624 |

| | | | |
|---|---|---|---|
| Shame | 0.786 | -0.011 | 0.279 |
| Sadness | 0.644 | -0.253 | 0.744 |
| Fear | 0.525 | 0.254 | 0.220 |
| Anger | 0.312 | -0.128 | 0.848 |
| Enjoyment | -0.224 | 0.703 | -0.439 |
| Surprise | 0.100 | 0.847 | 0.063 |
| Interest | 0.008 | 0.894 | -0.151 |

**Component correlation matrix**

| | 1 | 2 | 3 |
|---|---|---|---|
| 1 | 1.000 | | |
| 2 | -0.014 | 1.000 | |
| 3 | 0.426 | -0.161 | 1.000 |

## APPENDIX 56

## EMPTY MODEL OF PRE-COMPETITION HOSTILITY (ANGER AND DISGUST), COMPUTATION OF PROPORTIONAL REDUCTION OF ERROR ($R^2$) AND CORRELATION BETWEEN RESPONSE VARIABLES ACCOMPANYING TABLE 5.5

**Model 1: Estimates for empty model of pre-competition hostility**

| Effect | Coefficient and variance components (SE) | |
|---|---|---|
| | Disgust | Anger |
| Intercept | 3.16 (0.04) | 3.62 (0.09) |
| Person-level variance | 0.04 (0.01) | 0.24 (0.08) |
| Day-level variance | 0.05 (0.02) | 0.22 (0.05) |
| Beep-level variance | 0.47 (0.02) | 1.64 (0.07) |

Deviance: 7303.54 (2644 cases)

**Model 2: Variance components for multilevel regression model with fixed slopes**

| Random effect | Variance components (SE) | |
|---|---|---|
| | Disgust | Anger |
| Person-level variance | 0.03 (0.01) | 0.15 (0.05) |
| Day-level variance | 0.05 (0.01) | 0.15 (0.04) |
| Beep-level variance | 0.46 (0.02) | 1.25 (0.06) |

Deviance: 6910.24 (2644 cases)
Chi-square (26) = 393.30 $p < 0.001$

Proportional reduction of error at beep-level = 1-(total unexplained variance in model 2 / total unexplained variance in model 1)

$\mathbf{R^2_{(disgust)}}$ $= 1 - (v_{2i} + v_{2jt} + \varepsilon_{2ijt})/(v_{1i} + v_{1jt} + \varepsilon_{1ijt})$ $= \mathbf{0.04}$
$\mathbf{R^2_{(angert)}}$ $= 1 - (v_{2i} + v_{2jt} + \varepsilon_{2ijt})/(v_{1i} + v_{1jt} + \varepsilon_{1ijt})$ $= \mathbf{0.26}$

**Correlations between response variables**

| Level | Disgust - Anger |
|---|---|
| Person | 0.72 ** |
| Day | 0.41 |
| Beep | 0.35 ** |

Legend : * = p<0.05; ** = p<0.01

# APPENDIX 57

## EMPTY MODEL OF PRE-COMPETITION NEGATIVE EMOTIONS, COMPUTATION OF PROPORTIONAL REDUCTION OF ERROR ($R^2$) AND CORRELATION BETWEEN RESPONSE VARIABLES ACCOMPANYING TABLE 5.6

### Model 1: Estimates for empty model of pre-competition negative emotions

| Effect | Coefficient and variance components (SE) | | |
|---|---|---|---|
| | Guilt | Shyness | Self-hostility |
| Intercept | 3.28 (0.07) | 3.23 (0.06) | 3.21 (0.05) |
| Person-level variance | 0.17 (0.03) | 0.14 (0.04) | 0.08 (0.02) |
| Day-level variance | 0.13 (0.02) | 0.05 (0.01) | 0.06 (0.01) |
| Beep-level variance | 0.48 (0.02) | 0.33 (0.01) | 0.41 (0.02) |
| Effect | Coefficient and variance components (SE) | | |
| | Shame | Sadness | Fear |
| Intercept | 3.22 (0.08) | 3.34 (0.09) | 3.68 (0.09) |
| Person-level variance | 0.25 (0.06) | 0.24 (0.06) | 0.12 (0.08) |
| Day-level variance | 0.00 (0.00) | 0.17 (0.03) | 1.52 (0.14) |
| Beep-level variance | 0.32 (0.01) | 0.51 (0.02) | 0.55 (0.24) |

Deviance: 15794.09 (7932 cases)

### Model 2: Variance components for multilevel regression model with fixed slopes

| Effect | Variance components (SE) | | |
|---|---|---|---|
| | Guilt | Shyness | Self-hostility |
| Person-level variance | 0.14 (0.04) | 0.11 (0.03) | 0.05 (0.02) |
| Day-level variance | 0.11 (0.02) | 0.07 (0.01) | 0.05 (0.01) |
| Beep-level variance | 0.45 (0.02) | 0.31 (0.01) | 0.37 (0.02) |
| Effect | Variance components (SE) | | |
| | Shame | Sadness | Fear |
| Person-level variance | 0.21 (0.05) | 0.17 (0.05) | 0.12 (0.05) |
| Day-level variance | 0.02 (0.01) | 0.13 (0.02) | 0.59 (0.06) |
| Beep-level variance | 0.30 (0.01) | 0.47 (0.02) | 0.52 (0.02) |

Deviance: 15250.42 (7932)
Chi-square (84) = 543.67 $p < 0.001$

Proportional reduction of error at beep-level = 1-(total unexplained variance in model 2 / total unexplained variance in model 1)

$\mathbf{R^2_{(guilt)}} = \mathbf{0.10}$
$\mathbf{R^2_{(shyness)}} = \mathbf{0.04}$
$\mathbf{R^2_{(self\text{-}hostility)}} = \mathbf{0.13}$
$\mathbf{R^2_{(shame)}} = \mathbf{0.06}$
$\mathbf{R^2_{(sadness)}} = \mathbf{0.17}$
$\mathbf{R^2_{(fear)}} = \mathbf{0.44}$

**Correlations between response variables**

| Level | Guilt - Shyness | Guilt - Self-hostility | Guilt - Shame | Guilt - Sadness | Guilt - Fear |
|---|---|---|---|---|---|
| Person | 0.30 ** | 0.23 ** | 0.33 ** | 0.36 ** | 0.34 ** |
| Day | 0.14 | 0.25 ** | 0.11 | 0.30 ** | 0.18 |
| Beep | 0.37 ** | 0.44 ** | 0.28 ** | 0.42 ** | 0.40 ** |
| **Level** | **Shyness - Self-hostility** | **Shyness - Shame** | **Shyness - Sadness** | **Shyness - Fear** | **Self-hostility - Shame** |
| Person | 0.19 * | 0.39 ** | 0.33 ** | 0.32 ** | 0.24 ** |
| Day | 0.17 | 0.18 | 0.04 | 0.28 ** | 0.14 |
| Beep | 0.33 ** | 0.33 ** | 0.31 ** | 0.36 ** | 0.30 ** |
| **Level** | **Self-hostility - Sadness** | **Self-hostility - Fear** | **Shame - Sadness** | **Shame - Fear** | **Sadness - Fear** |
| Person | 0.28 ** | 0.23 ** | 0.36 ** | 0.37 ** | 0.39 ** |
| Day | 0.25 ** | 0.37 ** | 0.09 | 0.33 ** | 0.28 ** |
| Beep | 0.39 ** | 0.36 ** | 0.27 ** | 0.24 ** | 0.31 ** |

Legend : * = p<0.05; ** = p<0.01

## APPENDIX 58

## EMPTY MODEL OF PRE-COMPETITION POSITIVE EMOTIONS, COMPUTATION OF PROPORTIONAL REDUCTION OF ERROR ($R^2$) AND CORRELATION BETWEEN RESPONSE VARIABLES ACCOMPANYING TABLE 5.7

**Model 1: Estimates for empty model of pre-competition positive emotions**

| Effect | Coefficient and variance components (SE) | | |
|---|---|---|---|
| | Enjoyment | Surprise | Interest |
| Intercept | 7.43 (0.31) | 4.60 (0.18) | 6.44 (0.05) |
| Person-level variance | 3.52 (0.85) | 1.15 (0.28) | 1.94 (0.50) |
| Day-level variance | 1.03 (0.16) | 0.38 (0.07) | 1.09 (0.19) |
| Beep-level variance | 3.39 (0.15) | 1.80 (0.08) | 4.20 (0.19) |

Deviance: 15421.55 (3966 cases)

**Model 2: Variance components for multilevel regression model with fixed slopes**

| Effect | Variance components (SE) | | |
|---|---|---|---|
| | Enjoyment | Surprise | Interest |
| Person-level variance | 2.50 (0.61) | 0.92 (0.23) | 1.45 (0.38) |
| Day-level variance | 0.83 (0.13) | 0.29 (0.06) | 0.82 (0.15) |
| Beep-level variance | 2.72 (0.12) | 1.61 (0.07) | 3.36 (0.15) |

Deviance: 14863.93 (3966)
Chi-square (42) = 557.62 $p < 0.001$

Proportional reduction of error at beep-level = 1-(total unexplained variance in model 2 / total unexplained variance in model 1)

$\mathbf{R^2_{(enjoyment)}} = \mathbf{0.24}$
$\mathbf{R^2_{(surprise)}} = \mathbf{0.15}$
$\mathbf{R^2_{(interest)}} = \mathbf{0.22}$

**Correlations between response variables**

| Level | Enjoyment - Surprise | | Enjoyment - Interest | | Surprise - Interest | |
|---|---|---|---|---|---|---|
| Person | 0.64 | ** | 0.75 | ** | 0.66 | ** |
| Day | 0.53 | ** | 0.65 | ** | 0.70 | ** |
| Beep | 0.34 | ** | 0.45 | ** | 0.54 | ** |

Legend : * = p<0.05; ** = p<0.01

## APPENDIX 59

## EMPTY MODEL OF POST-COMPETITION HOSTILITY (ANGER AND DISGUST), COMPUTATION OF PROPORTIONAL REDUCTION OF ERROR ($R^2$) AND CORRELATION BETWEEN RESPONSE VARIABLES ACCOMPANYING TABLE 5.8

**Model 1: Estimates for empty model of post-competition hostility**

| Effect | Coefficient and variance components (SE) | |
|---|---|---|
| | Disgust | Anger |
| Intercept | 3.29 (0.09) | 3.86 (0.16) |
| Person-level variance | 0.08 (0.07) | 0.33 (0.23) |
| Day-level variance | 0.66 (0.11) | 2.22 (0.33) |
| Beep-level variance | 0.44 (0.03) | 1.35 (0.09) |

Deviance: 3303.94 (1150 cases)

**Model 2: Variance components for multilevel regression model with fixed slopes**

| Random effect | Variance components (SE) | |
|---|---|---|
| | Disgust | Anger |
| Person-level variance | 0.09 (0.07) | 0.15 (0.11) |
| Day-level variance | 0.59 (0.09) | 0.90 (0.16) |
| Beep-level variance | 0.35 (0.03) | 0.90 (0.06) |

Deviance: 2986.16 (1150 cases)
Chi-square (32) = 317.78 $p < 0.001$

Proportional reduction of error at beep-level = 1-(total unexplained variance in model 2 / total unexplained variance in model 1)

$\mathbf{R^2_{(disgust)}}$ **= 0.13**
$\mathbf{R^2_{(angert)}}$ **= 0.47**

**Correlations between response variables**

| Level | Disgust - Anger |
|---|---|
| Person | 0.71 ** |
| Day | 0.78 ** |
| Beep | 0.38 ** |

Legend : * = p<0.05; ** = p<0.01

## APPENDIX 60

## EMPTY MODEL OF POST-COMPETITION NEGATIVE EMOTIONS, COMPUTATION OF PROPORTIONAL REDUCTION OF ERROR ($R^2$) AND CORRELATION BETWEEN RESPONSE VARIABLES ACCOMPANYING TABLE 5.9

**Model 1: Estimates for empty model of post-competition negative emotions**

| Effect | Coefficient and variance components (SE) | | |
|---|---|---|---|
| | Guilt | Shyness | Self-hostility |
| Intercept | 3.84 (0.17) | 3.48 (0.11) | 3.65 (0.12) |
| Person-level variance | 0.50 (0.27) | 0.28 (0.11) | 0.06 (0.15) |
| Day-level variance | 2.24 (0.32) | 0.53 (0.10) | 1.97 (0.28) |
| Beep-level variance | 0.65 (0.05) | 0.61 (0.04) | 0.48 (0.03) |
| Effect | Coefficient and variance components (SE) | | |
| | Shame | Sadness | Fear |
| Intercept | 3.38 (0.09) | 3.92 (0.18) | 3.30 (0.08) |
| Person-level variance | 0.66 (0.31) | 0.11 (0.05) | 0.20 (0.07) |
| Day-level variance | 2.40 (0.35) | 0.39 (0.06) | 0.35 (0.06) |
| Beep-level variance | 0.81 (0.06) | 0.20 (0.01) | 0.30 (0.02) |

Deviance: 7069.47 (3450 cases)

**Model 2: Variance components for multilevel regression model with fixed slopes**

| Effect | Variance components (SE) | | |
|---|---|---|---|
| | Guilt | Shyness | Self-hostility |
| Person-level variance | 0.11 (0.06) | 0.09 (0.03) | 0.00 (0.00) |
| Day-level variance | 0.95 (0.14) | 0.28 (0.05) | 0.77 (0.11) |
| Beep-level variance | 0.53 (0.04) | 0.57 (0.04) | 0.43 (0.03) |
| Effect | Variance components (SE) | | |
| | Shame | Sadness | Fear |
| Person-level variance | 0.06 (0.04) | 0.06 (0.03) | 0.08 (0.02) |
| Day-level variance | 1.07 (0.15) | 0.28 (0.04) | 0.15 (0.03) |
| Beep-level variance | 0.59 (0.04) | 0.17 (0.01) | 0.27 (0.02) |

Deviance: 6625.91 (3450)
Chi-square (90) = 443.56 $p < 0.001$

Proportional reduction of error at beep-level = 1-(total unexplained variance in model 2 / total unexplained variance in model 1)

$\mathbf{R^2_{(guilt)}} = \mathbf{0.53}$ $\mathbf{R^2_{(sadness)}} = \mathbf{0.27}$
$\mathbf{R^2_{(shyness)}} = \mathbf{0.34}$ $\mathbf{R^2_{(fear)}} = \mathbf{0.40}$
$\mathbf{R^2_{(self\text{-}hostility)}} = \mathbf{0.52}$
$\mathbf{R^2_{(shame)}} = \mathbf{0.56}$

**Correlations between response variables**

| Level | Guilt - Shyness | Guilt - Self-hostility | Guilt - Shame | Guilt - Sadness | Guilt - Fear |
|---|---|---|---|---|---|
| Person | 0.50 ** | 0.00 | 0.66 ** | 0.63 ** | 0.41 ** |
| Day | 0.90 ** | 0.77 | 0.88 ** | 0.86 ** | 0.30 |
| Beep | 0.38 ** | 0.58 ** | 0.35 ** | 0.19 ** | 0.35 ** |
| **Level** | **Shyness - Self-hostility** | **Shyness - Shame** | **Shyness - Sadness** | **Shyness - Fear** | **Self-hostility - Shame** |
| Person | 0.00 | 0.96 ** | 0.88 ** | 0.86 ** | 0.00 |
| Day | 1.00 ** | 1.00 ** | 1.00 ** | 0.18 | 1.00 ** |
| Beep | 0.23 ** | 0.62 ** | 0.21 ** | 0.51 ** | 0.30 ** |
| **Level** | **Self-hostility - Sadness** | **Self-hostility - Fear** | **Shame - Sadness** | **Shame - Fear** | **Sadness - Fear** |
| Person | 0.00 | 0.00 | 1.00 ** | 0.96 ** | 0.97 ** |
| Day | 0.90 ** | 0.32 | 0.94 ** | 0.38 | 0.25 |
| Beep | 0.26 ** | 0.28 ** | 0.04 | 0.49 ** | 0.13 ** |

Legend : * = p<0.05; ** = p<0.01

## APPENDIX 61

## EMPTY MODEL OF POST-COMPETITION POSITIVE EMOTIONS, COMPUTATION OF PROPORTIONAL REDUCTION OF ERROR ($R^2$) AND CORRELATION BETWEEN RESPONSE VARIABLES ACCOMPANYING TABLE 5.10

### Model 1: Estimates for empty model of post-competition positive emotions

| Effect | Coefficient and variance components (SE) | | |
|---|---|---|---|
| | Enjoyment | Surprise | Interest |
| Intercept | 7.33 (0.34) | 4.65 (0.24) | 6.32 (0.30) |
| Person-level variance | 3.81 (1.04) | 1.80 (0.50) | 2.81 (0.79) |
| Day-level variance | 2.09 (0.41) | 0.95 (0.20) | 1.41 (0.35) |
| Beep-level variance | 2.98 (0.20) | 1.69 (0.11) | 3.95 (0.27) |

Deviance: 6629.29 (1725 cases)

### Model 2: Variance components for multilevel regression model with fixed slopes

| Effect | Variance components (SE) | | |
|---|---|---|---|
| | Enjoyment | Surprise | Interest |
| Person-level variance | 2.21 (0.61) | 1.21 (0.33) | 1.86 (0.52) |
| Day-level variance | 1.09 (0.24) | 0.46 (0.12) | 0.76 (0.22) |
| Beep-level variance | 2.17 (0.15) | 1.43 (0.10) | 2.99 (0.20) |

Deviance: 6261.22 (1725)
Chi-square (48) = 368.07 $p < 0.001$

Proportional reduction of error at beep-level = 1-(total unexplained variance in model 2 / total unexplained variance in model 1)

$\mathbf{R^2_{(enjoyment)}}$ **= 0.39**
$\mathbf{R^2_{(surprise)}}$ **= 0.30**
$\mathbf{R^2_{(interest)}}$ **= 0.31**

### Correlations between response variables

| Level | Enjoyment - Surprise | | Enjoyment - Interest | | Surprise - Interest | |
|---|---|---|---|---|---|---|
| Person | 0.61 | ** | 0.80 | ** | 0.67 | ** |
| Day | 0.68 | | 0.84 | ** | 0.60 | |
| Beep | 0.45 | ** | 0.46 | ** | 0.54 | ** |

Legend : * = p<0.05; ** = p<0.01