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Temporal patterning of competitive emotions: A critical review

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An interactional model of stress that integrates current research on competitive affects and emphasizes the temporal dimensions of the stress process is forwarded. The literature reveals that the study of athletes' affective responses to competition has been narrowly focused on pre-competitive anxiety. Equivocal findings on temporal patterning of competitive anxiety suggest that a fundamental change in the empirical approach is needed because the current conceptualization of anxiety and other complex emotions is imprecise. The analysis of secondary emotions as patterns of discrete basic emotions, as suggested by differential emotions theorists, is proposed for consideration in future research. In this view, competitive anxiety is considered as a set of patterns of emotions rather than a unitary affect. The adoption of this approach could result in better operationalization of competitive anxiety as well as other secondary performance-related emotions. We propose that research on competitive affects should follow two parallel lines. The first should focus on the description of complex emotional states that reflect the idiosyncratic emotional experience and vocabulary of the athlete. The second should examine the sets of basic emotions experienced throughout competition, and focus on individual 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 permit the analysis of intra-individual variations in labelling secondary emotions with respect to different competitive contexts and temporal aspects.

Keywords: affect, CSAI-2, differential emotions theory, individual zones of optimal functioning model, review.

Introduction

Athletic competition places many demands on 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. Sanders, 1983; Jones, 1990; Hardy *et al.*, 1996).

Stress is conceptualized as a process of transaction between individuals and their environment (Lazarus and Folkman, 1984; Lazarus, 1999). The current review introduces an interactional model of competitive stress that integrates research on competitive emotions and emphasizes the temporal dimensions of the stress process (Fig. 1). The stress and coping aspects of the model are an adaptation of the interactional models of stress of Hardy *et al.* (1996) and Lazarus (1999). Some of the temporal components of Hanin's (1997) individual zones of optimal functioning model have also been adopted. The interactional model of competitive stress encompasses the relations among the competition, the athlete's 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, 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

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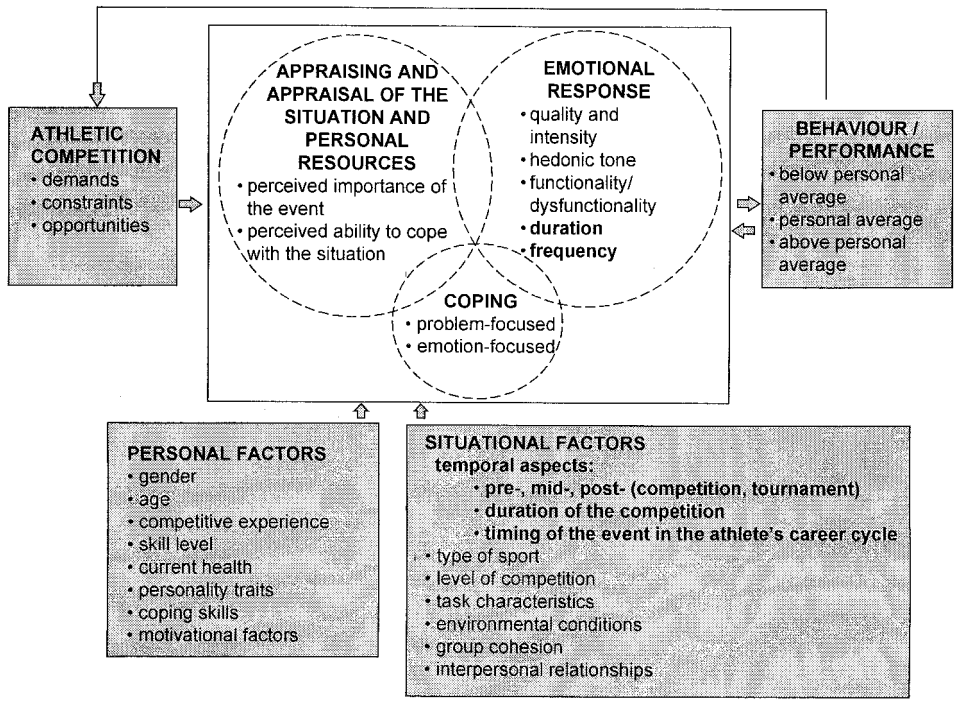

Fig. 1. Interactional model of stress as applied to athletic competition.

allowed to voluntarily inflict harm to their opponents. Opportunities arise from fortunate timing or depend on the individual's ability to recognize an opportunity. These 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 affect the athlete's behaviour and performance (Lazarus and Folkman, 1991; Jones, 1995). Lazarus *et al.* (1980) defined emotions as complex organized 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 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. Coping has two major functions. Problem-focus coping relates to actions aimed at 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 or 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. The athlete may try to avoid thinking about the competition or may try to reappraise its importance.

The model in Fig. 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 *et al.*, 1984; Nordell and Sime, 1993) and perfectionism (Hall *et al.*, 1998), sex (Singh and Brar, 1988; Jones and Cale, 1989; Jones *et al.*, 1991), skill (Huddleston and Gill, 1981; Perkins and Williams, 1994), perceived readiness (Lane *et al.*, 1997) and achievement goals (Hall *et al.*, 1998). Situational factors include the type of sport (Krane and Williams, 1987; Mann *et al.*, 1988), competitive stress (Nordell

and Sime, 1993; Man *et al.*, 1995), environmental conditions (Jones *et al.*, 1990; Lane *et al.*, 1997), personal relationships and group cohesion (Prapavessis and 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 characterized by change. For instance, an individual may initially feel scared and then, after a few moments, angry, then guilty, then distressed (Folkman and Lazarus, 1985). The sequence of feelings experienced reflects both the changing meaning of what is happening as the stressful encounter unfolds and the effectiveness of the coping strategies adopted. To consider just one period or combine together stages of a stressful encounter provides a limited picture of what is happening and would not allow an analysis of why something is happening.

As illustrated in Fig. 1, besides 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 characterize 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 competition. Thirdly, athletes' emotional states and coping depend on the timing of the assessment with respect to the competitive event (pre-, mid- or post-competition). Fourthly, personal variables such as age, skill 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). The above emphasizes 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 patterning 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 review discusses conceptual and methodological issues related to this specific emotion. Because, until recently, researchers have neglected other competition-related emotions, not much relevant empirical evidence could be analysed. This lack of information can be informative. By comparing the interactional model of stress (Figs 1 and 2) with the empirical findings presented here, issues needing further investigation can be identified.

Temporal patterning of competitive anxiety

Unidimensional approach

Among the various affects experienced by athletes facing a competition, most research has focused on anxiety, defined as an emotional state characterized 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 need to distinguish between anxiety as a trait or disposition and anxiety as a transient state.

Table 1 summarizes the results of studies that examined the temporal patterning of anxiety from a unidimensional perspective. Most of these studies used Spielberger's State–Trait Anxiety Inventory or the Competitive State Anxiety Inventory (Martens *et al.*, 1990). The latter is a version of the State–Trait Anxiety Inventory adapted to sport settings. Table 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 patterning 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 optimizing individual performance and well-being.

To illustrate, the time × locus of control and time × success–failure interaction effects observed by Hall (1980) (see Table 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

Table 1. Summary of studies on the temporal patterning of a unidimensional concept of competitive anxiety (means)

Authors	*n*	Sport	Instrument	Pre-competition					During competition	Post-competition		Moderators
				1 week	1 day	12 h	1 h	i.b.		i.a.	1 day	
Donzelli *et al.* (1990)[a]	233 M, F	Running	7-point one-item scale	2.12	3.27	3.57	4.42	4.87	3.61			Sex,[b,c] A-trait,[b,c] experience,[b,c] success[b,c]
Durtschi and Weiss (1984)	66 M, F	Running	DRQ	[d]	↑		↑	[e]	↓			Skill[b]
Gal-or *et al.* (1986)	59 M, F	Orienteering	10-point one-item scale	1.59	3.02↑		4.90↑	4.43				Skill[b]
Hall (1980)[f]	64 M, F	Motor task	STAI					39.22		41.31		Locus of control,[c] A-trait,[b] success[b,c]
Huband and McKelvie (1986)	42 M, F	Basketball, hockey	CSAI		16.12			21.36↑		18.32↓	13.29↓	A-trait[b,c]
Huddleston and Gill (1981)	19 F	Track and field	CSAI	18.87				29.4↑				Training *vs* competition[b]
Sanderson and Reilly (1983)	64 M, F	Running	STAI					47.96		36.84↓		A-trait,[b] race result (position)[b,c]
Vura *et al.* (1985)[f]	17 M	Wrestling	STAI-H CSAI					43.52 22.35	43.35 23.11	40.14 20.12		Success *vs* failure,[b,c] favourable *vs* unfavourable judging[b,c]

Abbreviations: STAI = Spielberger's State–Trait Anxiety Inventory; CSAI = Competitive State Anxiety Inventory; i.b. = immediately before; i.a. = immediately after.
[a] Significant main effect of time of assessment, but significance of inter-assessment change not reported. [b] Moderator significantly affected anxiety. [c] Interaction between moderator and time of assessment. [d] Initial time of assessment with no mean available. [e] No significant change. [f] Time main effect not tested. ↑ = significant increment; ↓ = significant reduction.

do not perceive their life outcomes to be related to personal effort or skill). This means that, in general, externals may benefit more than internals from anxiety-reduction techniques pre-competition. However, the opposite tendency was observed post-competition for individuals who experienced failure. Internals scored significantly higher on post-competitive anxiety after failure than externals. Additionally, externals showed no significant differences whether succeeding or failing. Consequently, in 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 patterning of unidimensional competitive anxiety shows that, over a one-week pre-competitive period, state anxiety increased as competition neared (Huddleston and Gill, 1981; Durtschi and Weiss, 1984; Gal-or *et al.*, 1986; Huband and McKelvie, 1986; Donzelli *et al.*, 1990) (see Table 1). Gal-or *et al.* (1986) reported a significant increase in anxiety from 1 week to 1 day before the competition. Further increments were seen 1 h and immediately before the start of the event. Also, Durtschi and Weiss (1984) found that athletes' anxiety declined once the competition started. Interestingly, significant temporal changes were detected on the Distance Runner Questionnaire, but not on the Competitive State Anxiety Inventory. However, no data on the validity of the Distance Runner Questionnaire were reported. With regard to post-competition, a reduction in anxiety has been reported immediately (Sanderson and Reilly, 1983; Huband and McKelvie, 1986) and 1 day (Huband and McKelvie, 1986) after the event. Personal variables (e.g. sex, experience, trait anxiety and skill), situational variables (e.g. competitive stress) and favourable versus unfavourable judging moderated the intensity of competitive anxiety. Performance outcome affected post-competitive anxiety and its temporal patterning. 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 patterning 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.

Multidimensional approach

In the 1990s, investigations of competitive anxiety shifted from a unidimensional to a multidimensional conceptualization 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 shows the findings of studies on the temporal patterns of the three subscales of the CSAI-2. When available, we report mean 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 patterning of the three dimensions of competitive anxiety.

Somatic anxiety

Empirical results for the temporal patterning 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 and Gill, 1987; Slaughter *et al.*, 1994). However, Caruso *et al.* (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 s cycling at maximal speed) might have produced a sustained increase in 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,

Table 2. Summary of studies on the temporal patterning of a multidimensional concept of competitive anxiety (means)

Authors	*n*	Sport	A.C.	Pre-competition							During competition	Immediately post-competition	Moderators
				2 weeks	1 week	2 days	1 day	2 h	1 h	i.b.			
Campbell and Jones (1995)	103 ?	Various	C		[d]			↑		[e]			Skill, wheelchair sport participants [b,c]
			S		[d]			[e]		[e]			
			SC		[d]			[e]		[e]			
Campbell and 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 *et al.* (1990)	24 M	Various	C							11.83	12.42	12.17	Non-competition *vs* competition, [b,c] success *vs* failure [b,c]
			S							12.6	15.17↑	15.82	
			SC							24.65	20.85↓	20.75	
Davis and Gill (1995)	22 M	Hockey	C [a]			15.5		16.9		18.0			Competitive stress [b,c]
			S [a]			10.4		13.7		15.1			
			SC [a]			29.6		28.1		27.3			
Diez and 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 *et al.* (1984, study 2)	63 F	Volleyball	C		[d]	[e]	[e]	[e]		[e]			Experience
			S		15.09	15.02	14.49↓	16.24↑		18.32↑			
			SC		[d]	[e]	[e]	[e]		[e]			
Hall *et al.* (1998)	119 M, F	Cross-country running	C [a]		17.68	17.72	19.08			20.36			Perfectionism [b,c]
			S [a]		14.88	14.98	17.78			19.54			
			SC [a]		24.52	25.77	22.83			21.91			
Jones and Cale (1989)	40 M, F	Various	C [a]	14.78	15.6	16.28	17.23	17.73		18.53			Sex [b,c]
			S [a]	10.63	10.43	10.88	11.6	13.75		16.2			
			SC [a]	30.35	30.18	30.4	29.78	28.65		27.55			
Jones and Cale (1997) [f]	44 M, F	Perceptual speed task	C							11.28	13.6	12.93	Goal setting, [b,c] subjective goal difficulty [b]
			S							11.16	11.75	11.12	
			SC							28.33	26.77	28.05	

Jones *et al.* (1988)	12 M	Cricket	C			[d]	[e]		[e]	[e]			None
			S			10.92	12.00		14.58↑	18.33↑			
			SC			26.58	25.25		25.17	22.42↓			
Jones *et al.* (1991)	56 M, F	Various	C[a]		19.27	19.13	19.07	20.25		21.15			Sex,[b,c] readiness,[b]
			S		12.16	11.48	12.24	15.52↑		18.29↑			importance of match,[b]
			SC[a]		27.68	27.97	27.52	25.81		24.82			winning possibility[b]
Karteroliotis and Gill (1987)	41 M	Motor task	C		[d]					13.14	14.8↑	13.39↓	None
			S		[d]					12.51	13.68↑	10.97↓	
			SC		[d]					[e]	26.65↓	28.53↑	
Krane and Williams (1987)	80 F	Gymnastics, Golf	C				[d]		[e]	[e]			Type of sport[b,c]
			S				[d]		↑	[e]			
			SC				[d]		[e]	[e]			
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↑			
			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			
			SC			24.35	25.75	24.25		24.83			
Masters *et al.* (1995)	22 M, F	Various	C	17.52			19.4↑						None
			S	12.97			14.75↑						
			SC	27.75			23.6↓						
Nordell and Sime (1993)	20 F	Swimmers	C				16.25		17.58↑				Competitive stress[b]
			S				-		-				
			SC				-		-				
Perkins and Williams (1994)	18 ?	Abseiling	C		[d]		↑		[e]	[e]			Novices *vs* experienced[b,c]
			S		[d]		↓		[e]	[e]			
			SC		[d]		↓		[e]	[e]			
Slaughter *et al.* (1994)	110 M, F	Basketball	C			[d]	↓	↑	↑		↓	↓	Sex[b,c]
			S			[d]	↓	↑	↑		↓	↓	
			SC			[d]	↑	↓	↓		↑	↑	
Swain and Jones (1990, study 1)	60 M	Track and field	C		[d]	[e]	[e]	[e]		↑			None
			S		[d]	[e]	[e]	↑		↑			
			SC		[d]	[e]	[e]	↓		↓			

Table 2.- *continued*

Authors	*n*	Sport	A.C.	Pre-competition: 2 weeks	1 week	2 days	1 day	2 h	1 h	i.b.	During competition	Immediately post-competition	Moderators
Swain and Jones (1990, study 2)	49 ?	Track and field	C			[d]	[e]	[e]		↑			None
			S			[d]	↑	↑		↑			
			SC			[d]	[e]	[e]		[e]			
Swain and Jones (1993)	49 M, F	Track and field	C			16.53	16.88	17.37		17.65↑			Sex[b]
			S			10.44	11.44↑	15.33↑		18.59↑			
			SC			25.78	25.41	25.07		25.07			
Swain and Jones (1991)	97 M, F	Track and field	C[a]		16.97	17.76	18.17	19.01		19.72			Gender endorsement[b,c]
			S[a]		10.32	10.88	12.14	16.08		19.27			
			SC[a]		26.76	26.62	26.06	24.27		23.17			
Wiggins (1998)	91 M, F	Various	C				18.66	18.60	18.97				Sex[c]
			S[a]				13.64	15.32	16.47				
			SC				25.54	25.08	24.79				

Abbreviations: A.C. = anxiety components; C = cognitive anxiety; S = somatic anxiety; SC = self-confidence; i.b. = immediately before.

[a] Significant main effect of time of assessment, but significance of inter-assessment change not reported. [b] Moderator significantly affected anxiety. [c] Interaction between moderator and time of assessment. [d] Initial time of assessment with no mean available. [e] No significant change. [f] Time main effect not tested. * Second assessment was 12 h before competition. ↑ = significant increment; ↓ = significant reduction.

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 cognitive anxiety 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, although 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 the autonomic nervous system is unlikely to show much evidence of emotion-specific patterning, especially for complex emotional states such as anxiety (e.g. Davidson, 1994; LeDoux, 1994).

Accordingly, we suggest that the assessment of 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 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. 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, our findings (Table 2) indicate that athletes tend to experience a rapid increase in autonomic arousal close to competition, which dissipates once the competition is over. However, no conclusion can be drawn about the emotions that underlie the increase in arousal. The same arousal might be provoked by fear, anxiety, anger, positive excitement, shame–embarrassment or a combination of two or more emotions.

Cognitive anxiety

Although theory predicts a rapid increase in the intensity of physiological symptoms as athletes approach 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 has led to different findings. In some cases, the intensity of cognitive anxiety remained stable over time (Gould *et al.*, 1984; Caruso *et al.*, 1990; Wiggins, 1998), whereas in others it increased with approach of the evaluative event (Swain and Jones, 1993; Slaughter *et al.*, 1994; Davis and Gill, 1995; Diez and Rosa, 1996; Hall *et al.*, 1998). Moreover, when present, the changes on the cognitive sub-scale were far less pronounced than those on the somatic sub-scale (Table 2). These results apparently support the contention of Martens *et al.* that cognitive anxiety is more stable over time than somatic anxiety. These 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 analysed directly the temporal changes in expectancy of success together with changes on the CSAI-2 sub-scales (Table 2). Jones *et al.* (1991) showed that male athletes did not exhibit significant changes in cognitive anxiety during the week before competition, whereas 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 shows that the moderators analysed in the reported studies do not account for the differences 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. Lane *et al.* (1999) evaluated the factor structure of the inventory using confirmatory factor analysis and observed that the three-factor model hypothesized 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 mobilize resources to cope with it. In light of these findings, Lane *et al.* 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,

several studies have revealed that not all athletes consider the experiences listed in the CSAI-2 to be negative. Jones and Swain (1992) found that athletes sometimes 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 *et al.* (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 spectrum of states ranging from panic and immobilization 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 (e.g. challenge). Therefore, the common and differential components defining emotional states of threat and challenge should be identified.

In our view, there is a solution to this problem. 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 hypothesized that individuals differ in 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 and 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 and Izard, 1980). Factor analytic studies have shown that terms used to describe anxiety, as well as items from clinical anxiety scales such as the State–Trait Anxiety Inventory, consistently correlate most highly with fear and share the next largest amount of variance with a combined sadness–guilt factor (Izard and 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 variations in the pattern of anxiety (Izard and Youngstrom, 1996). That 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 assumptions of the theory of differential emotions 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 hypothesized that different patterns of anxiety may affect performance in different ways. 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 could be hypothesized that fear accompanied by interest or anger might lead to proactive behaviour or be a sign of acceptance of, and confrontation with, the competitive challenge (Fig. 2). Conversely, fear accompanied by guilt, shame or sadness might 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 (Fig. 1), which in turn determine the appraisal of the importance of the situation and the individual's ability to cope. Note that Fig. 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.

Because of the current confusion and lack of satisfactory operational definitions of competitive anxiety, we suggest that future research should examine various forms of anxiety patterns that result from combinations of fear with other discrete basic emotions (Izard and Buechler, 1980). Discrete basic, primary or fundamental emotions are thought to be characterized by distinctive universal signs (emotional expression) and

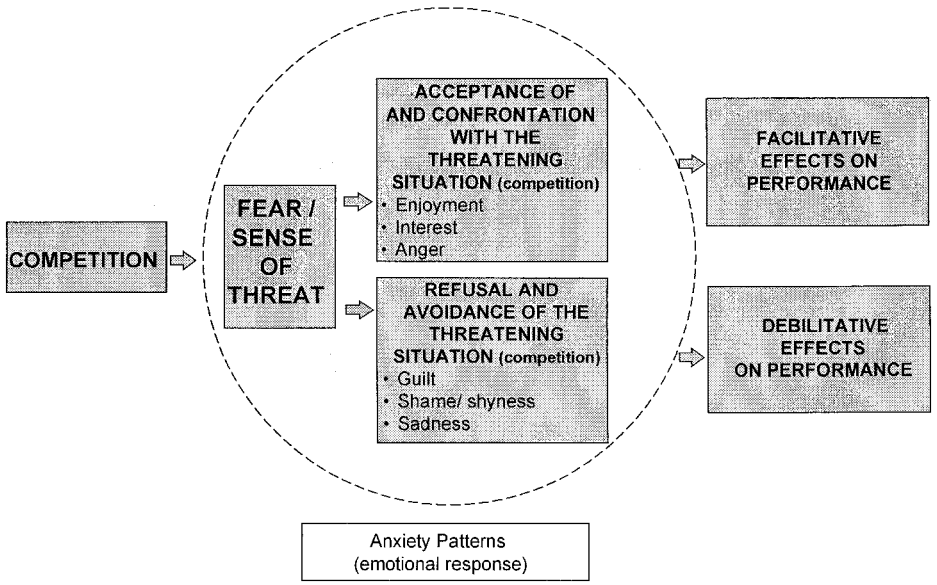

Fig. 2. Patterns of competitive anxiety and their effect on sport performance. This diagram represents the emotional-response component of the interactional model of stress. It illustrates only two of the many possible patterns of emotions that athletes experience during, before or after competition.

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 (Frijda, 1986; Davidson, 1992). Thus, for instance, fear and anger have distinctive universal facial expressions that can easily be recognized by members of literate and pre-literate cultures throughout 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 stimulus 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 characterized 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 interpreted differently 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, interest. Given the above, we suggest 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 (discussed in detail below). The second would examine the profile of basic emotions experienced throughout competition, and would focus on individual and situational differences and the factors determining those differences. We suggest that 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 intra-individual variations in labelling secondary emotions with respect to different competitive contexts and temporal aspects (e.g. anticipatory anxiety *vs* performance anxiety, and post-performance anxiety).

To illustrate the value of the second line of research, we report the findings of a study on unidimensional pre- and post-competitive anxiety and then suggest how to analyse differences in patterns of pre- and post-competitive anxiety as sets of basic emotions. Vura *et al.* (1985) determined the anxiety of wrestlers 2 days before and after a competition. They analysed the effects of winning or losing, favourable versus unfavourable draws and judging on the athletes' anxiety. 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, post-competitive anxiety showed a relative increase when successful performance was accompanied by unfavourable judging. The highest post-competitive anxiety was observed when favourable judging was accompanied by unsuccessful performance. In our view, the results of this study are not particularly informative. Given the different circumstances, it is justifiable to hypothesize 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. Although 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, we can also hypothesize 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-competitive anxiety as measured by the State–Trait Anxiety Inventory and profiles of primary emotions as measured by the Differential Emotions Scale-IV 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.

Temporal patterning of other competitive affects

Recent research has acknowledged the need 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 (Lazarus, 1993; Gill, 1994; Jones, 1995; Hanin, 1997; Robazza *et al.*, 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. Currently, two approaches have been used – nomothetic and idiographic. The first involves the use of nomothetic standardized scales, is based on group averages and focuses on inter-individual and inter-group comparisons. The latter, promoted by Hanin (1995, 1997), uses individualized 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 have supported the utility of this latter line of investigation (Cockerill *et al.*, 1991; Prapavessis and Grove, 1991; Hanin and Syrjä, 1995; Terry, 1995; Hanin, 1997; Robazza *et al.*, 1998). However, the predictive validity of pre-performance affective states seems to depend on the type of sport, the use of self-referenced performance criteria and the homogeneity of the participants in terms of ability and fitness (Terry, 1995). Indeed, we hypothesize that individual differences in skill and fitness will contribute more to sport performance than variations in emotional states. Accordingly, in circumstances in which differences in physical characteristics are great, the athletes' profiles of pre-competitive emotional states cannot represent a good predictor of performance outcome. Therefore, the interactional model of stress (Fig. 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 1 day before competition. They are then categorized as having 'performed to expectations' if they finish in their expected position or higher, or as having 'under-performed' if they do not. Using this method, Terry (1993) correctly classified 70.9% of performances at World and Olympic standard on the basis of mood profiles in the sports of rowing and bobsledding. In later studies, replications of this strategy led to 100% (Hall and Terry, 1995) and 64.7% (Terry, 1995) discriminatory success.

However, the efficiency of this research strategy seems to depend on the sport examined. Pre-game mood pattern showed no discriminatory capability among the England cricket team during three matches against

Australia (Terry, 1994). Similarly, pre-performance scores on the Profile of Mood States were not helpful in predicting performance of a soccer team that played in the women's premier league in Sweden (Hassmen and Blomstrand, 1995). According to Terry (1995) and Hanin (1995), the conflicting results obtained when examining different sports are attributable to the duration of the competition. Rowing, wrestling and bobsledding last less than 10 min, whereas soccer lasts 90 min and a cricket Test match lasts for 5 days. Since the probability of mood fluctuations during performance increases with performance duration, the predictive ability of pre-competition emotional states will decrease accordingly.

In contrast to the negative reports, Cockerill *et al.* (1991) used the Profile of Mood States to predict successfully 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. Although these findings may be specific to cross-country running, they nonetheless prove the utility of examining the quality, intensity and development of pre-competitive emotional states for the prediction of athletes' behaviour and performance.

Indeed, substantial variation between sports in the desirability of specific affective states for performance is to be expected. Running, a task of low cognitive complexity in which no fine motor control is involved, requires relatively high arousal (Schmidt, 1991). Other sports of greater cognitive complexity, such as tennis, archery and fencing, might benefit from emotional states accompanied by less 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 such research indicates a need for further investigations on the differences in desirability of specific emotional states in various sports.

The nomothetic approach

Few nomothetic studies have addressed the temporal patterning of pre-competitive affect. The first study to examine changes of mood before a competition compared pre-competitive mood states with basal mood responses in 115 college rodeo athletes (Meyers *et al.*, 1990). The difference between pre-competitive and baseline mood 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. Similarly, Szabo and Bak (1999) showed that collegiate soccer players exhibited higher positive engagement and revitalization before competitive matches than before training sessions.

Prapavessis and Grove (1994) administered the abbreviated version of the Profile of Mood States (Grove and Prapavessis, 1992) to 75 male and 31 female competitive rifle shooters 48 h, 24 h, 12 h and 15 min before a competition. Significant time-to-competition effects were noted 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 min before the competition started. Finally, confusion and anger remained relatively stable as competition approached, but 15 min before competition anger increased while confusion declined. Since this study was one of only a few to try to determine the temporal patterning 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 specific research (Gill, 1994; Jones, 1995), little progress has been made over the last 5 years.

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 pre-competitive anxiety. The model states that the optimal anxiety bandwidth is specific to the individual and that there is great inter-individual variability in the bandwidth among the athletes. Hence, pre-competition anxiety has to be individually examined. Recently, the individual zones of optimal functioning model has been extended to pre-competitive emotions other than anxiety.

In the last 5 years, research using the individual zones of optimal functioning model has focused on positive and negative affective patterns that facilitate or impair athletic performance. A framework of five basic dimensions has been proposed to describe what Hanin calls 'psychobiosocial performance states' and 'emotion–performance relationships'. Since the detailed description of this model is beyond the scope of this review, only a brief account of its fundamental ideas and concepts will be given (for further clarification, readers are referred to Hanin, 1999).

In Hanin's (1999) model, emotions are viewed as the affective modality (also termed 'form' or 'substrate') of the athlete's psychobiosocial state. They can be correlated with other modalities (forms or substrates) such as motivational, cognitive and bodily-somatic. Modality, form or substrate is one of the five fundamental dimensions of the model. The other dimensions are intensity (energy), time, context (space) and content (information). Intensity typically includes the amount, rate, frequency, range, zones and profile of positive–negative affect. Positive–negative affect comprises situational, intra-personal, intra–inter group, organizational and cross-cultural sub-components that help to relate it to the setting and environmental aspects of the activity. The time dimension pertains to the dynamics of emotions across different circumstances before, during and after the performance of a single or several short- or long-duration tasks (Hanin, 1994). Furthermore, emotions can refer to past and current experiences or pertain to future expectations. The content of emotions is determined by two closely related but independent factors: the hedonic tone (positivity–negativity or pleasure–displeasure) and the effect of emotion on performance. Both positive and negative emotions can have facilitating, detrimental or both effects on performance, depending on their idiosyncratic meaning. Therefore, four emotion-content categories derive from the interaction of the two factors: positive, pleasant, facilitating emotions; negative, unpleasant, facilitating emotions; positive, pleasant, debilitating emotions; negative, unpleasant, debilitating emotions (Hanin, 1997).

The individual zones of optimal functioning approach advocates the use of individualized scales with athlete-generated items. It has been suggested that the use of standardized inventories and self-report scales is not as pertinent and sensitive to the individual emotional experience as individualized assessments (Hanin, 1997). Thus, an emotional profile is determined by retrospective recall of past performances giving the athlete a list of emotional states. Then she or he selects from the list four or five positive emotions and four or five negative emotions that are associated with successful and unsuccessful past performance. Importantly, the participants can generate personal items when they feel that the listed items do not describe their experience.

Research in hockey, soccer, squash and badminton has shown that athletes report idiosyncratic positive and negative affect patterns and self-define their intensity (Hanin and Syrjä, 1995; Hanin, 1997). These studies also revealed that positive and negative emotions may be facilitating, debilitating or both, depending on the individual's attributed meaning and intensity.

Hanin (1997) also examined the content of the most selected emotions in each of the four categories. The results obtained on 138 athletes, representing seven sports (badminton, squash, swimming, cross-country skiing, soccer, orienteering, ice-hockey), showed that, for positive affect, the top nine functionally optimal emotions were energetic, charged, motivated, certain, confident, purposeful, willing, resolute and alert. Pleasant emotional states such as easy-going, excited, composed, relaxed, over-joyed, fearless, satisfied, exalted and pleasant were most often considered dysfunctional. Unpleasant functionally optimal emotions included tense, charged, dissatisfied, attacking, vehement, intense, nervous, irritated, provoked, angry and furious. Finally, negative dysfunctional emotions included tired, unwilling, uncertain, sluggish, depressed, lazy, distressed, sorrowful, afraid and exhausted.

Because researchers applying the individual zones of optimal functioning approach have in the main been interested in the relationship between sport performance and emotions experienced immediately before competition, examination of the temporal patterning of idiosyncratic pre-competitive emotional states has only recently been undertaken. Hanin and Syrjä (1996) assessed 17 soccer players and observed that their positive–negative affect scores 1 day before and 30 min after a competition were significantly different from pre-match ratings obtained 40 min before the competition. Robazza *et al.* (in press) monitored anxiety components, self-confidence and idiosyncratic emotions in 13 Italian archers at the 1995 World Championship, 15 min before practice sessions and competition. Current affect scores were collected across seven assessments and contrasted with recalled optimal and poor performances. The first assessment was performed 2 days before the competition, before a practice session. The second assessment was performed the following day, before the official practice. Other assessments were carried out before a competitive event throughout the Championship. 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 most frequently chosen as facilitating emotions, whereas 'fatigued', 'concerned', 'discouraged' and 'insecure' were identified as inhibiting emotions. Notably, 'aggressive', 'calm' and 'satisfied' were reported by different archers as having both facilitating and debilitating effects on performance. The study also revealed a consistent pattern of high correlation on difference scores from the recalled optimal performance between self-confidence and facilitating emotions across assessments. Another consistent pattern of correlations was observed between the raw scores on worry and tension. However, when the

absolute difference scores from the recalled optimal performance were considered, they exhibited different temporal patternings. Worry reached its peak in the final round, whereas tension was slightly below or above optimum across assessments. Finally, self-confidence and positive emotions revealed a similar, relatively stable, temporal patterning when raw and difference scores were compared.

The same authors (Robazza *et al.*, 1999, 2000), using a similar research paradigm, reported two case studies on two female elite archers. Both athletes chose 'determined' and 'focused' as facilitating emotions. However, while one also included the item 'satisfied', the other chose 'confident' and 'concerned'. 'Dissatisfied', 'tense', 'worried' and 'cheerful' were identified as inhibiting emotions by one of the athletes; the other instead chose 'discouraged' and 'aggressive'. Both, however, agreed that 'insecure' represented a negative inhibiting emotional state. For one of the archers, facilitating emotion scores were always inside the optimal zone across the assessments (Robazza *et al.*, 1999). Only one score for inhibiting emotion intensity was inside the ineffective bandwidth on different days, and two of five scores for inhibiting emotion intensity were within the ineffective bandwidth before the official practice. Because, across the five assessments, only five scores for inhibiting emotion intensity were inside the ranges of recalled ineffective performance, a good performance was expected. Indeed, the results confirmed the researchers' expectations and the archer performed well in the competition. In the other case study (Robazza *et al.*, 2000), the archer exhibited a gradual worsening of her psychological conditions across the competition. On the days after official practice, six emotional states were consistently close to recalled poor performance and were actually followed by below-average performance. The results presented by Robazza *et al.* (1999, 2000, in press) provide compelling evidence of the practical utility of the idiographic approach advocated by Hanin (1995, 1997) for predicting athletes' self-referenced performance.

However, the reasons why different athletes, even within the same sport, disagree on the functionality or dysfunctionality of specific emotional states and their optimal intensity have yet to be explored. We suggest 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 (personality, skill) variables 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 (Larsen *et al.*, 1986) tended to be less physiologically aroused, more sociable, more impulsive and more extravert. Larsen and Diener (1987) tried to explain these findings using Modulation-of-Arousal Theory. This theory postulates a common objective optimal arousal for all individuals. However, because individuals differ in their base arousal, they constantly try to modulate their own arousal to keep it close to the optimum. According to this theory, affect intensity, extraversion and sensation-seeking originate from individual differences in base arousal and exemplify various adjustment mechanisms designed to modulate arousal in different ways. Therefore, individuals with a low 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 that the apparent differences are a reflection of different individual bandwidths of arousal and individual needs. Additionally, recent research has shown that emotion intensity is a complex construct involving independent or partially independent components (Frijda *et al.*, 1992). Consequently, because we cannot be sure that 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 (Fig. 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 values of specific affects, it has been suggested that they combine with each other in an additive manner (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 (Swain and Jones, 1993; Campbell and Jones, 1997). Since researchers have in the main been concerned with emotion intensity, we suggest that future investigations should 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.

Moderators and antecedents of competition-related emotional states

As stated earlier, the interactional stress model (Fig. 1) proposes that the way in which an 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 patterning of anxiety or its sub-components as measured with the CSAI-2 (Table 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 be examined in detail (for such a discussion, the reader is referred to 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 recent studies. Since researchers have been concerned primarily with competitive anxiety, the discussion will in the main be limited to the moderators of this specific performance-related emotional state.

Sex and gender role endorsement

Sex has been identified as a moderator variable of the temporal patterning of anxiety in several studies (e.g. Jones and Cale, 1989; Donzelli *et al.*, 1990; Jones *et al.*, 1991; Swain and Jones, 1993) (Table 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 female athletes. They suggested that the findings could be related to differences between the sexes in the willingness to report feelings of an unpleasant nature and to socialization 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 replication of the study of Jones and Cale (1989), 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 included participants from team sports. Indeed, Krane and Williams (1987) demonstrated that the temporal patterning of anxiety could be a function of the sport. The authors observed that, with the approach of 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 patterning between males and females on all sub-scales of the CSAI-2. It would appear that differences in state competitive anxiety between the sexes is one of the most consistent findings in such research.

Some researchers have recently shifted their attention to the relationship between gender role endorsement and competitive anxiety (Swain and Jones, 1991). They suggest that a biological distinction between males and females may not have the same predictive validity as a distinction based on individuals' psychological traits of masculinity and femininity. This standpoint derives from the cognitive orientation of contemporary stress models that emphasize the role of personal characteristics in the cognitive appraisal of the person–environment relationship (Lazarus and 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 patterning 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 elevated cognitive anxiety 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). These differences suggest that gender role orientation, as a personality variable, might 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 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.

Skill

Skill has been suggested to help determine the development of competitive state anxiety. Gal-or *et al.* (1986) examined the temporal patterning of anxiety in 59 orienteers of different ability. Significant differences among three ability groups were observed immediately before the competition, with the less skilled orienteers exhibiting more state anxiety than their counterparts (Table 1). It was also observed that better orienteers exhibited an early increase in anxiety followed by a decline to a more moderate level before 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 find 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 among the participants.

Sport experience

Although sport experience is probably correlated with skill, from a scientific standpoint it is important to make a clear distinction between the two. The definition of skill is based on objective individual ability and performance, which in turn affect self-confidence and self-efficacy (Martens *et al.*, 1990). Thus, the relationship between skill 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 familiarity or unfamiliarity with the sporting environment. Perkins and Williams (1994) conducted a study of the effects of a complete lack of specific sport experience on state anxiety. The CSAI-2 was repeatedly administered to experienced and novice abseilers before three consecutive descents. Although no difference between the two groups was observed 1 week before the first descent, an increase in the cognitive and somatic aspects of anxiety in novice abseilers was apparent 24 h before the event. The differences disappeared in the subsequent trials. In this case, the unfamiliarity with the sport and the risks involved in abseiling exerted a substantial effect on the athletes' 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' 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.

It is important to emphasize 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 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.

Success vs failure

Performance outcome undoubtedly affects an athlete's emotional experience (Martens and 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 conditions of failure, but a decrease in conditions of success. Notably, somatic anxiety increased in both conditions. Self-confidence decreased in the failure condition, but remained stable among participants experiencing success. As noted earlier, Vura *et al.* (1985) also noted an increase in state anxiety in elite wrestlers after a 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 greatest post-competition anxiety occurred when a bad performance was accompanied by favourable judging. We can assume 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 an athlete's 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.

Type of sport

An athlete's affective response to competition is thought to depend also on the characteristics and requirements

of their sport (Krane and Williams, 1987; Martens *et al.*, 1990; Jones *et al.*, 1991; Hassmen and Blomstrand, 1995). Research has indicated that individual-based sports tend to produce more competitive anxiety than team sports, as do subjectively scored and non-contact sports (Martens *et al.*, 1990). Moreover, different sports appear to require different patterns of desirable pre-competitive affective states (Friend and LeUnes, 1990; Cockerill *et al.*, 1991; Prapavessis and 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 individual sports.

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 and Jones, 1991), competitive trait anxiety (Huband and McKelvie, 1986; Donzelli *et al.*, 1990), perfectionism (Hall *et al.*, 1998) and locus of control (Hall, 1980). Donzelli *et al.* (1990) reported similar state anxiety in high and low trait-anxious athletes 1 week before competition, but more intense anxiety in the high trait-anxious group on the post-competition assessments. In examining team sports athletes, Huband and McKelvie (1986) noted that the anxiety of low trait-anxious athletes did not change 1 day before, just before and 1 day after the event, whereas that of highly anxious athletes peaked just before the competition. The anxiety decreased in both groups just after and 1 day after the competition.

Hall *et al.* (1998) examined the links between perfectionism, achievement goals and the temporal patterning 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 on 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 (see Table 2).

Several other personality characteristics have been examined for their effect on the magnitude of competitive state anxiety (e.g. Jones and Swain, 1992; Yang and Pargman, 1993), but not for 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 or empirically linked with emotionality and could moderate an athlete's pre-competitive mood 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 field of research suggests a need for further investigation.

Cognitive factors

Cognitive appraisal is postulated to determine the athlete's emotional response to competition (Fig. 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 hypothesized to be related to perceived importance (Marchant *et al.*, 1998) and uncertainty of outcome. The latter would include perceptions of one's own and one's opponent's ability and the external competitive environment. However, recent research has indicated that threat of defeat is more important for state anxiety, not uncertainty about the outcome (Cooley, 1987; Jones *et al.*, 1991; Prapavessis *et al.*, 1996; Marchant *et al.*, 1997). For example, Marchant *et al.* (1997) reported higher concern among golfers who were certain to lose than among those who were less certain. Notably, the somatic aspect of anxiety, as measured by 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 to 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. Slaughter *et al.*, 1994; Marchant *et al.*, 1997), no evidence has been found for the hypothesized antecedents (Jones *et al.*, 1991; Lox, 1992; Hanton and Jones, 1995; Lane *et al.*, 1997). 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 and Jones, 1995) and skill (cf. Jones, 1995). For example, antecedents in females are related more to personal goals and standards, whereas males tend to react to interpersonal comparison (Jones *et al.*, 1991). Moreover, the different sub-scales sometimes do and sometimes don't share similar antecedents (Lox, 1992; Lane *et al.*, 1997), indicating that the multidimensional theory of anxiety may not constitute the best approach for explaining and exploring athletes' responses to competition.

The equivocal findings of the relationship between competitive state anxiety and other variables are an

indication of the complexity of the relationship. Obviously, many interacting moderators and mediators determine the magnitude and time-course of competitive affects, making accurate prediction difficult (Fig. 1). Another probable reason why this appears to be so intricate is the lack of precision in defining and measuring anxiety.

Conclusions

Stress is a complex process that unfolds over time and is characterized by continuous change. An interactional model of competitive stress that integrates current research on competitive affects and emphasizes the temporal aspects of the stress process has been proposed (Fig. 1). Close inspection of the literature reveals that there has been little research on the temporal aspects and moderators of nomothetic and idiographic performance-related emotions other than anxiety. Investigation has focused mainly on emotion intensity, neglecting temporal dimensions such as frequency and duration of emotions. Researchers have in the main been concerned with the athlete's emotional experience before a single competition, neglecting the temporal changes in affectivity related to longer periods, such as seasons, tournaments and phases of an athlete's career, and post-competition.

Equivocal findings on temporal patterning and interpretation of competitive anxiety 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 interpreted differently, the analysis of competitive anxiety and other complex emotions as a set of patterns of basic emotions has been proposed.

We propose that, for the sake of a thorough and deeper understanding of athletes' experience and behaviour, research on competitive affects should be based on the integration of two approaches. The first, the idiographic approach, 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 approach, is centred on the analysis of basic emotions throughout the stress process and deals with inter-individual comparison, but also permits the analysis of intra-individual variations in labelling secondary emotions in different phases of competition. We hope 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.

Athletes' emotional response to competitive stress is determined by their subjective interpretation or appraisal, which, in turn, is influenced by various situational (e.g. type of sport, standard of competition, interpersonal relationships) and personal factors (e.g. sex, age, skill, motivation). To date, research has focused primarily on the moderators 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 (Fig. 1) is meant to provide some ideas for future research.

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