EMOTIONAL STATES OF ATHLETES PRIOR TO

PERFORMANCE-INDUCED INJURY

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ABSTRACT
Psychological states experienced by athletes prior to injured, best and worst performances were investigated retrospectively using a mixed methodology. Fifty-nine athletes volunteered to complete an individualized assessment of performance states based on the Individual Zones of Optimal Functioning (IZOF) model. A subsection (n = 30) of participants completed a standardized psychometric scale (Brunel Mood Rating Scale: BRUMS), retrospectively describing how they felt before best, worst, and injured performances. IZOF results showed similar emotion states being identified for injured and best performances. Analysis of BRUMS scores indicated a significant main effect for differences in mood by performance outcome, with post-hoc analyses showing best performance was associated with lower scores on depression and fatigue and higher vigor than injured performance and worst performance. Worst performance was associated with higher fatigue and confusion than injured performance. Results indicate that retrospective emotional profiles before injured performance are closer to successful performance, than unsuccessful, and confirm differences between successful and unsuccessful performance. Qualitative and quantitative approaches used to retrospectively assess pre-performance emotional states before three performance outcomes, produced complimentary findings. Practical implications of the study are discussed.

KEY WORDS: Emotion, mood, success, injury, measurement, performance.

INTRODUCTION

It is estimated that in the U.K. alone there are 29 million sports injuries each year (Sperryn, 1994). Therefore, there is clear need for research to identify the antecedents of sports injury. The identification and control of antecedents in training and competition could enable athletes and those responsible for their welfare to develop strategies to reduce the risk of injury occurring. In reviewing the sports injury literature, it is evident there is little research that considers those pleasant and unpleasant psychological states that may be associated with injury, with the majority of research investigating emotional states following injury (Brewer, 1994; 1998).

As injury may occur during competition, it is logical to explore relationships between psychological states assessed before competition and resulting sport performance (for examples of this method see; Beedie et al., 2000; Jones, 1995; Hanin, 2000). Sport performance is typically assessed through an outcome measure with examples including win / loss, or race time depending on the sport under investigation. Hanin (1997; 2000) urged researchers to consider relationships amongst performance states across a range of situations including best, worst, average performance and more recently injury. Given research that shows psychological states assessed before competition relate significantly with performance, it is logical to

suggest that such states would relate to a performance that led to injury.

Studies that have investigated the association between psychological states that precede injury tend to emphasize life-stress and daily hassles (Andersen and Williams, 1999). The research completed to date tends to suggest that negative states are associated with injury (Kolt and Kirby, 1994; Fawkner et al., 1999). For example, in a study of 115 gymnasts, Kolt and Kirby (1994) found that feeling anxious and tired preceded injury. Kolt and Kirby argued that the mechanism through which affect led to injury could be attributed to its influence on concentration.

Daily hassles are described as minor daily problems, irritations or changed individual encounters (Andersen and Williams, 1988). Athletes exposed to such stressors are thought to be at an increased risk of injury, again suggesting an association with negative psychological states and injury. Researchers have argued that life stress (a major life event e.g. bereavement, marriage) is cumulative in its effects, enhancing the likelihood of injury by disrupting concentration (Andersen and Williams, 1988). A recent study assessed hassles experienced on a weekly basis over the course of a competitive season (Fawkner et al., 1999). Fawkner et al. found that athletes were more likely to incur an injury when they experienced significant increases in daily hassles the week prior to injury. Comparatively, there were no significant changes in daily hassles for the non-injured athletes.

The relationships between psychological states and risk taking behavior could offer an alternative explanation for the antecedents of a performance induced injury. Evidence suggests that psychological states as assessed by the Profile of Mood States (McNair et al., 1971) are associated with risk-taking behavior (Hockey et al., 2000).

In contrast to the notion that negative psychological state profile are associated with injury, Hanin (2000) emphasized that injury might be associated with a range of positive and negative psychological states. This assumption was based on ample empirical research indicating that success related emotions include not only pleasant but also strong unpleasant experiences; similarly poor performance is often accompanied not only by unpleasant experiences but by pleasant emotions. Moreover, success may result in complacency, producing states such as satisfied, content and pleasant. These emotional states could be associated with a reduction in alertness that might in turn lead to diminished motivation. Following success, the illusion of being "too ready" for a task, may prevent the effective recruitment and utilization of all available resources. It is also possible that over-

motivation could result whereby athletes may try harder, ignoring or underestimating ("forgetting") the role of preparation and sound performance routines. Based on anecdotal evidence and numerous observations of athletes, Hanin suggested that the Individual Zones of Optimal Functioning (IZOF) approach could be used to identify those performance states associated with injury, in addition to successful and unsuccessful performance outcomes.

Collectively, there is a great deal of evidence linking emotional states with performance in terms of success/failure, but relatively little research investigating emotional states and performances leading to injuries. Injuries resulting from performances could be associated with negative emotional profiles as suggested by Kolt and Kirby (1994), or associated also with a positive profile as suggested by Hanin (2000).

The aim of the present exploratory study was to explore retrospectively those psychological states experienced by athletes prior injury, and to contrast these experiences with emotional states preceding individually best and worst performance. It should be emphasized that the focus of the present study is pre-injury emotional states evaluated within the framework of individually successful and unsuccessful performances. From a methodological perspective, the strategy was to triangulate the methods used to observe relationships at intra-individual, inter-individual and intra-group levels. Therefore, performance related psychological states were assessed retrospectively using standardized psychometrics and individualized person-oriented methods. Standardized psychometrics focused on scores generated by the POMS that assess anger, confusion, depression, fatigue, tension, and vigor. Research has found this inventory to be an effective predictor of performance (Beedie et al., 2000). The assessment of performance related emotional states using individualized person-oriented methods was accomplished by utilizing five basic dimensions of the IZOF model (Hanin, 1997, 2000). These include:

- *Form* dimension (selective athlete-generated descriptions of situational emotional experiences)
- Emotion *content* (idiosyncratic athlete-generated markers within four global categories based on distinctions between hedonic tone (pleasant-unpleasant) and perceived functionality (optimal-dysfunctional)
- Emotion *intensity*
- *Temporal* dimension (included pre-performance and partly mid-event situations)
- *Context* dimension (consisted of three settings: situations when injury occurred; best ever, worst ever performances).

The present study aimed to examine two alternative explanations of retrospective assessments of performance-induced injury. First, if the assumption that injury is linked to negative psychological states (stress-induced) is correct, then emotional states preceding injury would be negative. Second, if the alternative IZOF-based explanation is true then emotional states prior to injury would include both negative (N+ N-) and positive (P+ P-) aspects with different functional interpretations (sources) of the injury outcome.

I) IZOF STUDY

METHODS

Participants

Volunteer Sport Studies students (N = 59, Age range 18 – 31 years; Male N = 35, Female N = 24) participated in this study. All participants competed at county level and above, with the majority competing in invasion and combat sports.

Narratives. Given the absence of research into emotional states that precede injury and the exploratory nature of this study, it was decided to use narratives (see Hanin, 2003). It was unclear whether the standard retrospective method of assessing psychological states would be produce meaningful data. Therefore, participants were asked to write a description of the circumstances surrounding a performance that resulted in injury, and produced their best and worst performance.

Recall individualized emotion profiling involves a stepwise procedure using a stimulus list of affect words used to identify the idiosyncratic content and intensity of optimal and dysfunctional emotions (see Hanin 1997, 2000, 2004; Hanin and Syrjä 1995a, 1995b, 1996 for more details). This methodology identifies positive and negative emotions that are subjectively meaningful in terms of the individual's past performance history and significant emotional experiences. For example, nervous is a negative emotion, but it may be considered to help achieve successful task completion (optimal), or prevent successful task completion (dysfunctional). Athletes generate individually relevant emotion words that best describe their optimal (helpful, beneficial) and dysfunctional (harmful, detrimental) positive and negative emotions. To help athletes generate individual items, the positive-negative emotion stimulus list is used. This list includes positive and negative emotions typically experienced in performance. Hanin (1993) compiled the English version of the emotion stimulus list through selection and revision of items from the 10 global affect scales described by Watson and Tellegen

(1985). Examples of positive items are "active," and "calm"; negative items include "nervous," and "angry." Hanin and Syrjä (1996), reported reliability of idiosyncratic emotion scales in a sample of high-level soccer players. Mean intraindividual Cronbach alphas of each emotion subscale (P+, N+, P-, and N-) ranged from .54 to .90. Their study also provided evidence of recall and prediction accuracy in athletes. Specifically, significant correspondence between recalled and actual scores, and between predicted and actual scores was found in 76.5% and in 70.6% of the players.

Recall scaling includes several steps. First, optimal emotion patterns are identified. Athletes, using the stimulus list, select 4 or 5 positive and then 4 or 5 negative items that best describe their emotions related to individually successful performances in the past. Following this, dysfunctional emotion patterns are identified by selecting 4 or 5 positive and 4 or 5 negative items that describe their emotions related to individually unsuccessful performances. Finally, athletes use the stimulus list to generate individually relevant positive and negative emotion descriptors related to injured performance. Where it was deemed necessary, athletescould also add emotion words of their own choice. Each athlete generated idiosyncratic emotion descriptors for the four emotion categories: pleasant optimal (P+), unpleasant optimal (N+), pleasant dysfunctional (P-), and (unpleasant dysfunctional (N-).

Emotion intensity. A separate scale assessing intensity was used alongside each of the emotions selected by individual athletes. The intensity scale asked, "Now think about the intensity of your emotion before the (Best, worst or injured performance)". The intensity was measured on the Borg's Category Ratio (CR-10) scale (Borg, 1982) based on the range principle and constructed to avoid the ceiling effect. The CR-10 permits ratio comparisons to be made of intensities as well as determinations of direct intensity levels. Other research (Neely, Ljunggren, Sylven, and Borg, 1992) has shown it to be useful in quantifying stimuli such as exercise capacity and pain. In the present study a standard format of the CR-10 scale (Hanin and Syrjä, 1995a, 1995b) was used with the following verbal anchors: 0 = *nothing at all*, 0.5 = *very, very little*, 1 =*very little*, 2 = *little*, 3 = *moderately*, 5 =*much*, 7 = *very much*, 10 = *very, very much*, ● = *maximal possible* (no verbal anchors were used for 4, 6, 8, and 9).

In summary, our study will examine emotional states using five dimensions proposed in the IZOF model. These included *form* dimension (emotional functioning), emotion *content* (idiosyncratic labels within the four emotion categories), emotion

intensity dimension*, time* dimension (pre-event situation), and *context* dimension (best, worst performance in competitions and injured performance).

Procedure

The institution in which the study was conducted granted ethical approval for this study. Participants signed informed consent forms prior to IZOF profiling. Data was then collected simultaneously from volunteer sport studies students at the start of a scheduled lecture. The first author described the IZOF process, with participants, and was present at all times to resolve any uncertainty regarding this process.

RESULTS

Table 1 contains qualitative descriptions provided by athletes when asked to describe the circumstances surrounding performance relative to three performance conditions. Results indicate that participants were able to provide clear descriptions of factors related to best, worst, and injured performance. Using this information, it was possible to identify a number of key themes. Performance that led to injury was described as playing with high aspirations, playing well, performing in an important competition, enjoyment, poor judgment, injury expectations, and bad luck. Best performance was described as playing without excessive pressure, playing in a competition perceived to be important, playing when well prepared, playing well and experiencing facilitative anxiety. Worst performance was associated with overconfidence, low confidence, excessive pressure, fatigue and distractions. Whilst the qualitative data identified some overlap with the circumstances surrounding best and injured performance, worst performance resulted in themes unique to this performance condition.

In order to illustrate the identification of emotions experienced before best, worst and injured performance an individual's qualitative (emotion content) and quantitative (emotion intensity) data are presented within Figure 1. Presenting data in this way offers a triangulation of qualitative and quantitative data.

A county level netball player indicated that confidence (intensity = 8) and determined (intensity = 7) were amongst the helpful positive affects experienced before the best performance, with the items intense (intensity = 3) and anxious (intensity = 2) being helpful unpleasant emotion. For the injured performance, the participant reported similar positive affects as best performance (confidence, intensity = 7; determined, intensity = 6). Injured negative affects included anxious (intensity = 6)

uncertain (intensity = 7) and irritated (intensity = 6), these were seen to be unhelpful, hence different emotional states and functions to those reported to be associated with best performance. For the emotional profiles experienced before worst performance, the participant reported that unhurried (intensity = 5) and exhilarated (intensity = 6) were positive harmful with dissatisfied (intensity = 4) and concerned (intensity = 7) being amongst the harmful negative affects**.**

Support for the quantitative was provided by the participant's qualitative data. When describing their 'best ever' competition they described how the *'team played really well, confidence was high within the team/squad. I felt I played well because we were all on a high from winning as many games as we did and this helped my confidence in my own performance'*. In describing their 'worst ever' performance the participant described how *'we didn't make the final when we all knew we had the potential to win it! I felt my performance wasn't as good as it could have been as my confidence was low'*. In describing a performance in which they 'became injured' it becomes apparent that the description is more akin to a best performance as opposed to a poor performance. The player explains that *'I broke my finger in a friendly match with a local rival team. I was playing well up to the incident even though I was playing in a different position to my usual one'*.

Tables 2 and 3 indicate, that when results of the individual emotional profiles were collated, the most consistent emotional profile was associated with best performance and the least consistent profile was that of worst performance. It should be noted that the top 7 most frequently reported emotional states were selected for analysis. This means that frequency counts for all performance outcomes included emotional states that were identified by less than fifty percent of participants. For example, nervous featured in the top 7 emotional states for all three conditions. Participants identified 'Nervous' prior to best, worst and injured performance. Two other emotional states were identified in all three conditions, anxious and determined. The highest intensity for the emotional states of anxious and nervous was in the worst performance condition, with injured performance being in the middle. The intensity of affect for determined was highest in the best performance condition with injured performance again being in the middle. The intensity of the top 7 emotional states identified was relatively similar (for the same emotions) between best and injured performance outcomes, (ranging from 0 for "anxious" to 0.6 "nervous") with the largest difference being 0.6, see Table 2). Spearman correlation between seven

Table 1. Emergent themes from written description of performance context.

Performance	Themes	Examples
Best performance	1. Facilitative anxiety	"I was very nervous and this seemed to have a positive effect. There was a lot at stake. I scored the winning try and beat the best team from around the region".
		"I was extremely pumped up prior the game, it had been on my mind all week, but I play better in pressure situations".
	2. Lack of pressure	"I was the underdog, so was not expected to win, this gave me the increased determination".
		"It was my first time away with an international team, I only knew one other player. No one expected any special performance from me. I was confident and composed throughout".
	3. Playing well	"We were all on a high from winning as many games as we did and this helped my confidence in my own performance"
		"Played quite well, played in goal and made some vital saves"
		"Unexpected to get through this far, played exceptionally well"
	4. Preparation	"I trained my hardest ever losing a lot of weight. I managed to relax as much as possible and after the first bout I felt very confident, inspired and capable of winning".
		"I felt nervous but had put in lots of hard preparation for the event".
	5. Perceived importance	"Trained hard all winter for one race which through winning would go onto county and north of England trials. I was confident and geared to win although a little nervous"
		"We were the host team for a tournament we had never won, winning was an amazing achievement for us"
Injured performance	1. High aspirations	"The high level of the competition made me feel like I needed to prove something, I scored twice in the game but I pushed myself too hard and tore my hamstring".
	2. Playing well	"Was playing well, I got hit in a bad tackle and dislocated my right shoulder".
		"I was playing goal attack. I played really well, I jumped up to catch a ball and landed on the goal defenses' foot and went over on my ankle".
	3. Perceived importance	"It was an important club game with England selectors watching, and I was playing well until my injury. I was stamped on and had a gash that needed stitches".
		"The high level of the competition made me feel like I needed to prove something, I scored twice in the game but I pushed myself too hard and tore my hamstring".
	4. Enjoyment	"It was my first game back after a season off. It was the first 15 minutes of the game and I was happy to be playing again. I sprained my ankle chasing a ball down the line".
		"I was playing well and enjoying the game. I got an elbow in the nose which broke my nose".
	5. Poor judgment	"I was playing very well and just went in for a tackle on the wrong side of the attacker. I fractured my cheekbone and broke my nose".
		"I was injured after 2 minutes, my knee was sore before I played so I should not have played on it".
	6. Injury expectations	"It was an away game that took 2.5 hours to get there. It was my second appearance for the first team. They had a far superior team and we all knew we were going to get a hammering. I injured my ankle".
		"I was very nervous as this was my First National championships. I had an irrational fear that I would get injured during this competition. Then I fractured my elbow and was unable to participate for about 9 months".
	7. Bad luck	"This was full contact so could be expected. I was very determined and focused and was unlucky to get injured".
		"I received a neck injury and was out for one month. I felt fine during the competition I was just unlucky. I was well prepared and not nervous".

Table 1. Continued.

Performance	Themes	Examples
Worst performance	1. Excessive pressure	"My line out jumping was terrible, I put too much pressure on myself".
		"I was expected to get a medal and felt under pressure from parents and coaches before the race".
	2. Poor preparation	"I was nervous about playing abroad and I was not very well prepared".
	3. Overconfidence	"The team had been very fortunate to progress to the final and we were all on a high before the game. We stepped onto the pitch thinking we had already won".
	5. Low self-confidence	"I was provided accommodation in a caravan at the national championships, so I had no sleep. I was alone with no support and I had a lack of confidence. I though I was not worthy of a place".
		"I lost all self belief and was simply going through the motions".
	6. Distractions	"It was an important cup game. I had a poor game because of the crowd and abuse. Therefore, I became uninterested, lost, fatigued and frustrated leading to being penalized by the referee".
		"No one on the team played well which pulled everyone's performance down".
	7. Fatigue	"It was an away game with a long journey. I was very tired and not very focused".

top labels selected for injured and best performance situations was also significant ($r = .86$, $p < 0.05$). Most selected labels for worst performance had only three items similar to injured and best performances.
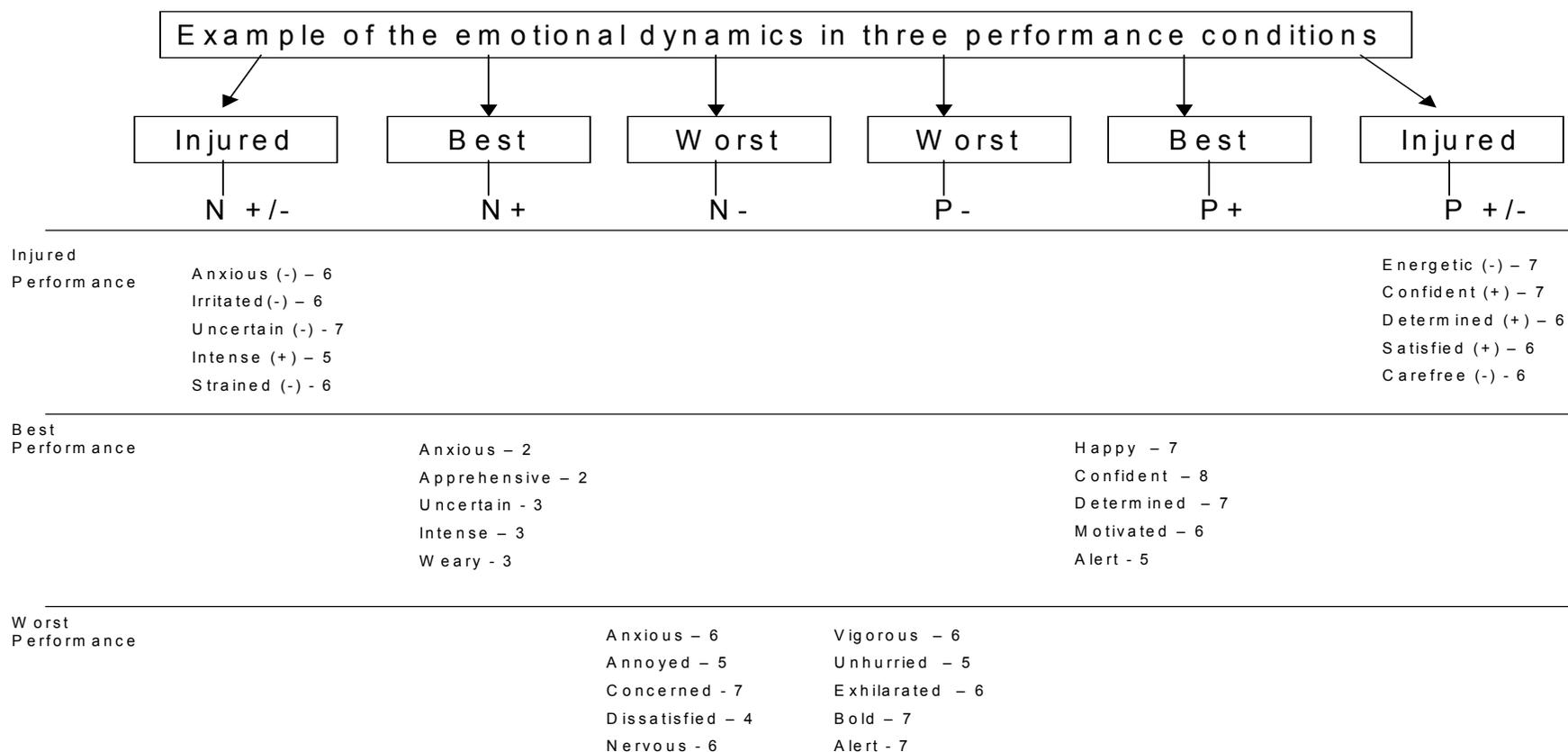
DISCUSION

The IZOF approach was used to identify and assess participant generated emotion profiles (Hanin, 2000) associated with best, worst and injured performance. Out of the ninety-six emotional states available for selection, participants commonly identified the same 7 emotional states as being experienced prior to best and injured performance. As Table 2 indicates, the frequency with which the top seven emotional states were identified demonstrates a greater degree of consistency for best performance as compared to injured and worst performance. Injured performance provided a more consistent profile than worst performance. The emotion states retrospectively identified prior to worst performance varied considerably.

At the group level, three emotional states were reported across all performance conditions and reflected qualitatively different interaction patterns. Specifically, nervous demonstrated an increase in intensity from best to worst performance, with injured being in the middle (Best < Injured < Worst). The intensity of the item 'anxious' had a similar intensity for best and injured performance, but was scored higher for worst performance (Best = Injured <

Worst). Determined was associated with best performance, moderately associated with injured with low determination linked with worst performance (Best > Injured > Worst). Notably absent before worst performance were motivated (Best = Injured > Worst), confident (Best = Injured > Worst), energetic (Best > Injured > Worst) and aggressive (Best < Injured > Worst).

A key aspect of Hanin's work has been the identification of unpleasant states that facilitate performance and pleasant states that are harmful for performance. Findings of the present study indicate that anxious, aggressive and nervous were unpleasant states that were perceived to facilitate good performance. All seven emotional states associated with a best performance describe states of high activation (high intensity and effort). It is notable that the same emotional states in terms of emotional content, but slightly different in intensity, are associated with performances that led to injury. Of the seven emotional states identified prior to best and injured conditions, four were pleasant and three were unpleasant, a finding that lends support to the notion that researchers should assess an equal balance of positive and negative emotional states.

The findings for worst performance show that the balance of pleasant and unpleasant affect was unequal. There were five unpleasant states and two pleasant states. Calmness might be associated with poor performance due to its link with complacency (Hanin, 2000), whereas feeling excited might lead to poor performance due to excessive activation (caused by trying too hard). Qualitative data (see Table 1) illustrates the possible mechanisms responsible for injury such as

Example of the emotional dynamics in three performance conditions

Injured	Best	Worst	Worst	Best	Injured
N +/-	N +	N -	P -	P +	P +/-

	Injured Performance					
	Anxious (-) – 6					Energetic (-) – 7
	Irritated (-) – 6					Confident (+) – 7
	Uncertain (-) - 7					Determined (+) – 6
	Intense (+) – 5					Satisfied (+) – 6
	Strained (-) - 6					Carefree (-) - 6

	Best Performance					
		Anxious – 2			Happy – 7	
		Apprehensive – 2			Confident – 8	
		Uncertain - 3			Determined – 7	
		Intense – 3			Motivated – 6	
		Weary - 3			Alert - 5	

	Worst Performance					
		Anxious – 6	Vigorous – 6			
		Annoyed – 5	Unhurried – 5			
		Concerned - 7	Exhilarated – 6			
		Dissatisfied – 4	Bold – 7			
		Nervous - 6	Alert - 7			

19 year old female county level Netball player

Figure 1. Emotional dynamics in three performance conditions.

disrupted focus, more risk taking and unsustainable effort leading to fatigue, thus indicating poor control of those psychological factors regulating performance. The qualitative data produced by this study indicated that the perception of emotional states could influence its functional impact. In the best performance condition, athletes clearly described the potentially facilitative nature of anxiety. In most attributions, there is a strong meta-emotional component – knowledge and preference or rejection of a particular state based on past experiences. One participant described how they were *"extremely pumped up prior to the game, it had been on my mind all week, but (usually) I play better in pressure situations"* whilst another described how they *"felt nervous but had put in lots of hard preparation for the event"*. The quality of preparation again appeared to be influential prior to worst performances, in this instance participants described poor

Table 2. Emotional states experienced before best, worst, and injured performance among 59 athletes.

Best performance			Injured Performance			Worst performance		
Affect	Freq %	Intensity M	Affect	Freq %	Intensity M	Affect	Freq %	Intensity M
Motivated	63	8.3	Motivated	58	8.0	Nervous	37	6.8
Confident	59	7.1	Confident	49	6.9	Anxious	31	6.6
Determined	51	8.4	Aggressive	39	6.8	Determined	25	7.0
Anxious	51	5.7	Determined	37	7.9	Tense	24	5.8
Aggressive	49	6.5	Anxious	36	5.7	Calm	24	4.5
Energetic	46	8.3	Nervous	34	6.4	Excited	22	6.3
Nervous	44	5.8	Energetic	27	8.8	Annoyed	22	5.9

Freq = frequency.

preparation *"I was very nervous about playing abroad and I was not very well prepared"(I need to prepare well not to feel nervous)*. Participants attributed poor performance to a variety of factors including fatigue, overconfidence, poor confidence, distractions and excessive pressure. Prior to performances in which participants were injured, many described how they were playing well up until the point of the injury *"I was playing well and enjoying the game. I got an elbow to the nose which broke my nose"*, and "*It was an important club game with England selectors watching and I was playing well until my injury"*. However, other factors were identified in describing the circumstances leading up to the injury including poor judgment, high aspirations, enjoyment/ enthusiasm, injury expectations and bad luck.

A number of emotional states were identified in the qualitative data provided by participants prior to best, worst and injured conditions. Prior to best and injured performances these predominantly included pleasant states such as enjoyment, happy, focused, determined, inspired and pumped. However negative states were also identified as being helpful and included aggressive, nervous, and anxious. Conversely when describing worst performance, only unpleasant states were identified within participants qualitative data. These included terms such as lost, fatigued, frustrated, pressured and nervous. The qualitative findings support the quantitative data and offer further support to the notion that researchers should assess an equal balance of positive and negative emotional states when profiling performance.

When viewed collectively, findings of the present study illustrate that using an ideographic approach in the assessment of affect can produce data enriched by the self-generated descriptions of the circumstances surrounding best, worst and injured performance, an aspect of profiling not assessed in standardized scales. Additionally, it was possible to distinguish between perceived (or experienced) states, relatively stable emotion patterns and meta-experiences reflected in athlete's attributions.

Table 3. Emotion content and intensity in three performance conditions.

Pleasant emotions	Injured	Best	Worst	Unpleasant emotions	Injured	Best	Worst
Energetic	7	-		Anxious	6	2	6
Confident	7	8		Irritated	6		
Determined	6	7		Uncertain	7	3	
Satisfied	6			Intense	5	3	
Carefree	6			Strained	6		
Happy		7		Apprehensive		2	
Motivated		6		Weary		3	
Alert		5	7	Annoyed			5
Vigorous			6	Concerned			7
Unhurried			5	Dissatisfied			4
Exhilarated			6	Nervous			6
Bold			7				
Mean intensity	*6.4*	*6.4*	*6.2*		*6.0*	*2.0*	*5.6*

II) PROFILE OF MOOD STATES BASED STUDY

METHOD
Participants
Participants (Age: M = 23.41 years, SD = 4.52) were 30 volunteer Sport Studies students. All participants completed at county level and above. As the sample two comprised a subsection of participants from sample one, the sporting characteristics of participants were matched in that all participants participated in invasion and combat sports.

Profile of Mood States
A short version of the POMS was used in the present study, namely the Brunel Mood Rating Scale (BRUMS: Terry et al., 1999, Terry et al., 2003) (previously called the Profile of Mood States-Adolescents). The BRUMS is a 24-item scale that assesses Anger, Confusion, Depression, Fatigue, Tension and Vigor. Terry et al. (1999, 2003) reported a rigorous validation procedure for use in sport in which single sample confirmatory factor analysis and multisample confirmatory factor analysis results has show factor loadings and relationships between factors are invariant between different samples. An important feature of the BRUMS is that it was developed initially for use with adolescents. Thus the BRUMS comprises items that should be understood by university-educated students. Here as in most normative standardized scales, an emphasis is made on reading ability and understanding of item content rather than on their person- and task-relevancy that is reflected in a special meaning of descriptors for individual performers. This is to recognize a limitation of even psychometrically good standardized scales.

Procedure
All participants were volunteers and no incentives were offered for their involvement in this study. Participants were given a questionnaire pack containing four different BRUMS Questionnaires. First, BRUMS assessed ambient mood, hence participants completed the BRUMS using the response timeframe 'how do you feel right now?' A second BRUMS asked participants to report how they felt before their best performance, with a third BRUMS asking participants to report how they felt before their worst performance. The fourth BRUMS asked participants to report how they felt before a performance in which they were injured (pre-event focus). The order in which participants completed the measures was randomized to prevent an order effect.

Data analysis
Data were analyzed using repeated measures multivariate analysis of covariance. Ambient mood was used as a covariate as previous research has suggested that mood influences memory processes (Bower, 1981). For example, Bower (1981) proposed, "a person in a depressed mood will tend to recall only unpleasant events and to project a bleak interpretation onto the common events of life, and these depressing memories and interpretations feedback to intensify and prolong the depressed mood" (p. 145). Further, the notion of mood-congruent recall (see Blaney, 1986 for a review) infers that memories are more accessible when mood is similar to when the memories were originally encoded, although some studies (e.g. Parrott and Sabini, 1990) have shown mood-incongruent effects, for example, individuals experiencing negative moods recall positive experiences to prevent mood from worsening, or to enhance mood.

RESULTS

Repeated measures MANCOVA indicated a significant main effect for differences in mood by performance condition (Pillai's Trace $_{12,17}$ = .75, p < .01, Eta^2 = .75). There was no significant covariate effect for the influence of current mood (Pillai's Trace $_{12,23}$ = .10, p > .05, Eta^2 = .10) and no significant interaction effect (Pillai's Trace $_{12,17}$ = .40, p > .05, Eta^2 = .40). Univariate results in Table 4 show that there were significant mood differences for Depression, Vigor, Confusion, and Fatigue. Results are displayed graphically in Figure 2.

Table 4. POMS-based scores before best, injured and worst performance (n = 30). Data are means (±SD).

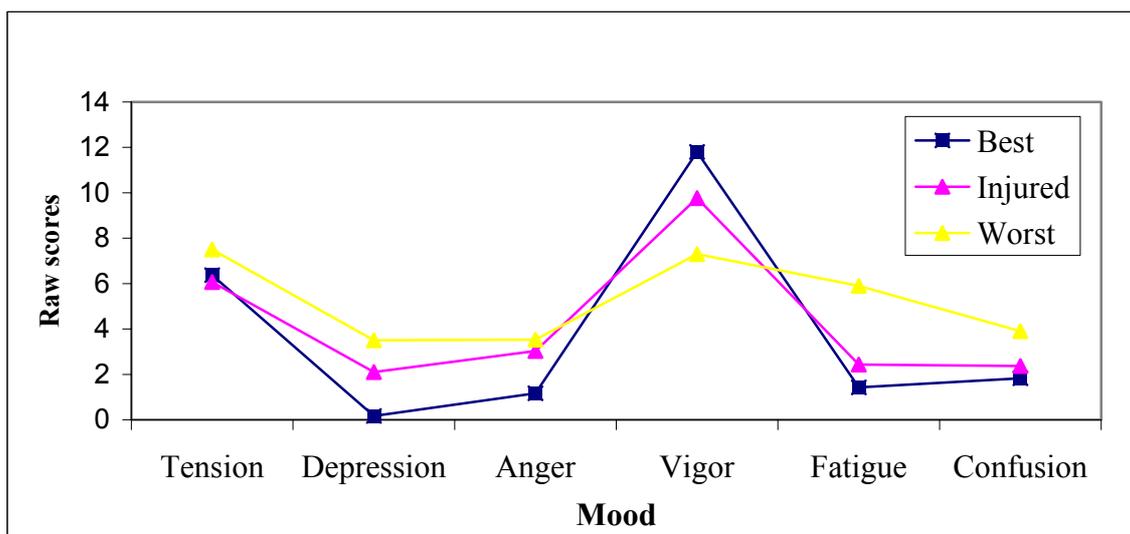| Mood variable	Best	Injured	Worst	F $_{1,22}$	Eta^2
Anger	1.17 (1.42)	3.03 (3.57)	3.53 (3.61)	2.53	.08
Confusion	1.83 (2.20)	2.37 (2.70)	3.90 (3.30)	10.63*	.28
Depression	.17 (.38)	2.10 (2.99)	3.50 (3.49)	11.30*	.29
Fatigue	1.43 (2.19)	2.43 (2.81)	5.90 (4.39)	14.20*	.34
Tension	6.37 (4.03)	6.07 (3.86)	7.50 (4.07)	1.75	.06
Vigor	11.80 (3.51)	9.77 (3.96)	7.30 (4.33)	6.64*	.19

* p < 0.05

Figure 2. Mood profile for best, worst, and injured performance.

Post-hoc analyses indicated that injured performance was associated with significantly lower fatigue ($t = -3.67$, $p < .01$) and confusion ($t = -2.61$, $p < .014$) than worst performance. Further, injured performance was associated with significantly higher scores on depression ($t = -3.78$, $p < .01$) and fatigue ($t = 2.09$, $p < .05$) and lower vigor ($t = 3.41$, $p < .01$) than best performance. Best performance was associated with higher vigor ($t = 4.05$, $p < .001$) and lower depression ($t = -5.18$, $p < .01$), fatigue ($t = -5.34$, $p < .001$), and confusion ($t = -3.45$, $p < .01$) scores than worst performance. As Figure 2 indicates, mood profiles for best performance and injured performance represent iceberg profiles, whilst poor performance represents a flattish profile.

DISCUSSION

Findings from the present study showed significant differences between psychological state profiles taken retrospectively before injured, best and worst performance. An issue when considering psychological states before best, worst and injured performance is where an injured performance sits in relation to best and worst performance, which are used as individualized reference points. Injury (after its occurrence - but not necessarily prior to injury!) represents an unpleasant and unexpected experience and thus from a stress-induced perspective it could be argued that emotional states before injured performance should be closer to worst performance.

Kolt and Kirby (1994) provide evidence showing negative emotional profiles before performances that resulted in injury. Findings from the present study suggest that this is only one option. There were smaller differences between emotional states identified prior to best and injured performance than the size of differences in emotional states before poor and injured performances. Thus the probability of injury is higher when BRUMS scores are closer to the best performance, whereby it is argued that athletes who feel vigorous in the absence of unpleasant states such as confusion and fatigue expect to perform to expectation.

A limitation of standardized psychometric measures such as the BRUMS is that unpleasant emotional states were not functionally distinguished (N + and N-). However, it should be noted that findings show no significant relationships between tension and anger with injured, best, and worst performance. Previous research has argued that these states could serve a motivational function when experienced without depressive symptoms (Lane and Terry, 2000). Lane and Terry (2000) argued that anger-performance and tension-performance relationships are best examined by accounting for whether individuals experienced depressed mood or reported no-depressive symptoms. Therefore, Lane and Terry (2000) argued that the functional impact of anger/tension on performance is determined by the relationship with a third variable (depressed mood). Studies that do not consider the proposed moderating effect of depression are likely to produce no significant findings for anger and tension, an explanation that could be applied to findings from the present study, and one that is consistent with meta-analysis results (Beedie et al., 2000).

Results of the POMS-based study also suggest that psychological states as assessed by the BRUMS that precede injury are more similar to high readiness states experienced prior to best performances than to worse-performance states. In other words, when things go too well for an athlete there is even a more danger in injury occurrence than prior to stress-related conditions when nearly all goes wrong and athlete is more alert and concerned about forthcoming performance.

GENERAL DISCUSSION

Findings of the present study show that the assessment of retrospective emotional states using fixed item and idiographic approaches produced almost similar findings. The psychological state profiles of successful and injured performances demonstrated a closer relationship with each other than with worst performance. This was apparent with quantitative results taken from the BRUMS and IZOF methods and further supported by information gleaned using open-ended questions and narratives. Interestingly, qualitative data indicated that most participants were playing well prior to injury.

We proposed alternative explanations for the results obtained and recommend that further research is necessary to test these alternative explanations. It is suggested that those performance states common to best and injured performance might be attributed to increased risk taking behavior, partly as a function of feeling in a state associated with superior performance. It is speculated that the perception of a superior performance when playing well, could lead to an increase in risk taking behavior as participants strive to maintain their performance level. Risk taking behaviors identified within the qualitative data included athletes committing to difficult challenges, reporting more physical involvement in competition and greater determination.

A second explanation is an increase in effort expended (trying too hard) by athletes. Trying too hard is a common response of many athletes as a reaction to performance barriers. This can result from cultural and subcultural (specific sports) influences and norms (Hanin, 2003). Trying too hard and ignoring existing or potential risks may come from external pressures (selectors, coach, parents) or can be self-generated (desire to do well). In technical sports excessive effort often destroys technique and skilful performance. The predominant response when seeking to improve performance is to increase effort; arguably reflected by more intensive, stronger and quicker movements. Should an increase in effort result in technical underperformance this may also contribute to an increased risk of injury.

The third explanation offered concerns overconfidence and complacency. Overconfidence, especially after repeated successes, can result in a shift of performance focus from the performance process (doing) to performance outcomes (even better results). Additionally, an athlete may begin to underestimate task demands and changing conditions. This results in an "easy" focus, with athletes being less alert in pre-event and mid-event situations. Thus optimal performance states may have a detrimental effects leading to injuries if an athlete underestimates task demands or does not make adjustments to specific conditions of competition.

An acknowledged limitation of the present exploratory study was that the type of injury was not accounted for. When assessing injury, it is important to distinguish injuries that result from external factors (i.e., from opponents) and self-generated injuries (i.e., poor judgment leading to injury). However, it is suggested that applied sport psychologists acknowledge that those psychological states associated with best performance could also be associated with injured performance. This notion is in contrast to existing practice that focuses mainly on stress-related issues accompanying athletic performance (Kolt and Kirby, 1994). Evidently, there is a need for further research to investigate emotional antecedents of injury to capture the dynamics of any shift from a potentially best performance to a performance resulting in an injury. In order to achieve this it is necessary to develop measures grounded in the experiences of the athlete (Hanin, 2003). This could be achieved using qualitative methodologies such as in-depth interviews, narratives and metaphor self-generation.

CONCLUSION

In conclusion, the present study explored relationships between emotional states and a range of different performance outcomes using IZOF and POMS based methods. It is suggested that future research should further examine the emotional antecedents of injury and that applied sport psychologists recognize the potential risk of injury associated with emotional profiles typically linked with best performance.

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KEY POINTS

- Psychological states experienced by athletes prior to injured, best and worst performances were investigated retrospectively using a mixed methodology.

- Results indicate that retrospective emotional profiles before injured performance are closer to successful performance, than unsuccessful, and confirm differences between successful and unsuccessful performance, a finding that occurred using both methods.

- Future research should further examine the emotional antecedents of injury and that applied sport psychologists recognize the potential risk of injury associated with emotional profiles typically linked with best performance.

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