

# Psychological Predictors of Injury in Elite Athletes

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## Introduction

The nature of injuries within sport and the psychological factors impacting upon injury rehabilitation are well documented (Brewer, 2003; Johnson, 1997; Van Mechelen, Hlobil, & Kemper, 1992; Weiss, 2003), however existing scientific knowledge that addresses the psychological predictors of injury in elite sport is somewhat contradictory and less comprehensive. Given the cost of injuries, both in terms of time out of sport, the expense of rehabilitation, and adverse social and economic effects (Van Mechelen et al., 1992), further examination of the psychological predictors of injury in elite athletes may prove beneficial for the sports medicine community.

In light of this, the purpose of the present study was to examine the relationship between injuries, specific medical factors (e.g., asthma, back pain) and psychological risk factors including life stress, mood, previous psychological diagnoses and disordered eating behaviour in an elite athlete population – scholarship athletes at the Queensland Academy of Sport (QAS). This investigation was undertaken with a primary focus upon applied research that addresses ‘real life’ challenges facing athletes and sports medicine staff, versus examination of theoretical issues within the area of psychological risk factors and sports injuries. Research was conducted via examination of data obtained through processes and measures already established by the QAS as part of their medical screening policy.

Based upon the results of this investigation, recommendations can be made with regards to implications for practical application within specific elite sporting environments (e.g., QAS), in addition to the sports medicine community at large. Furthermore, through the summary of injury characteristics and the development of population-specific tables of normative data for the mood and life stress measurement scales, an applied contribution to the existing body of knowledge can be made that provides a baseline for future research into screening protocols and interventions aimed at reducing the risk of injury in sport.

## Method

### *Participants*

Data from 845 scholarship athletes (433 females and 412 males) at the Queensland Academy of Sport in Brisbane, Australia, who completed the QAS Health Screening Questionnaire between 2002 and 2004, were used to address the purposes of the present research.

### *Measures*

The QAS Health Screening Questionnaire has been used by the QAS as a screening tool since 2000 as part of its annual processes for scholarship athletes. The questionnaire includes questions related to a number of medical and personal issues, and is divided into sections pertaining to medical history, injury, nutrition and psychological health. The psychology section of the QAS Health Screening Questionnaire, added in 2002, includes questions covering previous history of psychological disorders, identification of disordered eating behaviours, in addition to the inclusion of two standardised measures: the Brunel Mood Scale (BRUMS: Terry, Lane, Lane, & Keohane, 1999; Terry, Lane, & Fogarty, 2003) and the Perceived Stress Scale - 10 (PSS-10: Cohen, Kamarck, & Mermelstein, 1983).

Psychological risk factors examined consist of mood and life stress, as measured by the BRUMS and the PSS-10 respectively, in addition to history of psychological disorders, disturbed eating behaviours. Asthma and back pain were included within the analysis based upon suggested possible relationships with injury (Locke, Mason & O'Rourke, 2004; Locke & O'Rourke, 2003).

*Mood.* The BRUMS is a 24-item self-report inventory with six subscales (anger, confusion, depression, fatigue, tension, vigour) of four items each. The depression subscale is an indicator of depressed mood, not clinical depression. Respondents indicate whether they have felt, for example, *angry, energetic, nervous, or unhappy*, on a 5-point Likert scale (0 = not at all, 1 = a little, 2 = moderately, 3 = quite a bit, 4 = extremely). The standard response timeframe is "How you feel right now" although other timeframes, such as "How you have felt during the past week/month including today" or "How you normally feel" can be used. For the purposes of the QAS screening, the response timeframe used was "How you have felt during the past month including today".

*Life Stress.* The PSS-10 is a 10-item, self-report inventory that assesses the degree to which situations in an individual's life are appraised as stressful. The instrument was designed to evaluate the degree to which respondents found their lives specifically unpredictable, uncontrollable, and overloading. The PSS-10 was designed for those with a minimum Grade 10 education level and takes only one to two minutes to complete. Respondents indicate how often they have felt or thought a certain way on a 5-point Likert scale (0 = never, 1 = almost never, 2 = sometimes, 3 = fairly often, 4 = very often). The standard response timeframe is "In the last month how often have you felt that you were unable to control the important things in your life?" Scores are obtained by reversing responses (e.g., 0 = 4, 1 = 3, 2 = 2, 3 = 1 & 4 = 0) to the four positively stated items (items 4, 5, 7, 8) and then summing across all scale items. Higher scores indicate a higher level of perceived stress across a range of 0-40, with no specific categories or cut-offs suggested by the authors (Cohen & Williamson, 1988).

#### *Procedure*

Arrangements were made for completed Health Screening Questionnaires to be accessible under the supervision of the QAS Coordinator of Psychological Services. The questionnaires used in the present study were completed by QAS scholarship athletes at the beginning of each scholarship year between 2002 and 2004. Questionnaires were distributed to the athletes and collected either by the squad coach or a member of the QAS Sports Medicine department.

#### *Data Analysis*

The aims of this study were (1) to objectively summarise existing injury characteristics to produce population-specific norm tables for elite athletes, thus providing baselines for interventions to assist in either reducing injury incidence or improving the recovery experience; and (2) to investigate relationships between psychological risk factors, asthma, back pain and injury over a three-year period. To address the first aim, specific norms were developed for QAS athletes by creating standardised scores for both the BRUMS and PSS-10. To address the second aim, discriminant function analysis and standard multiple regression were used to determine predictive relationships between mood, life stress, diagnostic psychological history, disturbed eating behaviours and injury. Furthermore, interactions and associations related to gender, type of sport and reported experience of asthma and back pain were examined.

#### Results

To date, preliminary regression analyses have shown that 50% of the variance in PSS-10 scores can be predicted from mood scores, especially for vigour, depression, and tension ( $p < .001$ ). Furthermore, preliminary discriminant function analyses have shown that

mood and stress scores collectively possess significant utility in predicting injury/illness characteristics. Injury status in athletes was correctly classified with 59% accuracy ( $N = 845$ ;  $p = .003$ ), while back pain and asthma were correctly classified with 60% ( $N = 813$ ;  $p = .001$ ) and 58% ( $N = 841$ ;  $p = .03$ ) accuracy respectively. History of anxiety disorder was correctly classified with 81% accuracy ( $N = 822$ ;  $p < .001$ ) with four false negatives and 151 false positives, while history of eating disorder was correctly classified with 95% accuracy ( $N = 824$ ;  $p = .001$ ) with no false negatives and 41 false positives. Given that the role of screening is to signal issues that may warrant follow-up rather than for diagnostic purposes, it is desirable to have few false negatives even at the expense of many false positives. Findings suggest that the BRUMS and PSS-10 may have general utility as screening measures for pathology independently of questions that address such issues directly, where under-reporting is more likely. This finding is consistent with previous research that has shown the BRUMS to have utility as a screening tool (e.g., Terry & Galambos, 2004; Terry, Lane, & Warren, 1999). Results to date suggest that the current measures of psychological variables used within the QAS Health Screening Questionnaire are somewhat effective in predicting injury characteristics and screening for psychological pathology. Ongoing further analyses of completed screenings will help to refine the utility of the measures.

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