

Sport Injury, Psychology and Intervention:

An overview of empirical findings*

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When Emil Jensen, rising star of the Swedish elite soccer team Halmstad BK, in training on September 1, 2006 came down with a severe injury to his cruciate ligament, this was the fifth occurrence in the team during the past eighteen months. When it happened to Jensen, team-mates Björn Anklev and Magnus Andersson were already in rehabilitation training; the latter suffered the same injury a year earlier, as did Martin Friborg. Jensen himself was not too upset, he had proved his mettle and was regularly playing from start, and would again when fit. The HBK coach, Janne Andersson, expressed concern for the rest of the season, but it was the team's physiotherapist Simon Bakkioui who was really worried. To Swedish Radio he observed that one cruciate ligament injury in one soccer team in a five-year period could be considered normal. Five such injuries in a year and a half is unreal – "It can't happen", says Bakkioui, who vows to look carefully at the team's training methods to see if that's where the problem lies.

Most of us have probably learnt to accept injuries as part of the rough game that football is. The expression "in for a penny, in for a pound" probably captures the general reaction to news such as the fate of poor Emil Jensen. It is, however, not that simple. Possibly part of the problem lies in training methods, but, as Urban Johnson shows in his learned overview analysis, there are a number of antecedent psychological and psychosocial risk factors predicting susceptibility for injuries from participation in sport. Personality, stress response, major life events and daily hassles, potentially stressful athletic situation, or low coping resources, sometimes associated with internal or external locus of control, are examples of risk factors. Johnson presents a number of studies of preventive intervention programs, where a variety of psychological strategies and techniques have been utilised in order to reduce injuries in different individual or team sports. Johnson urges coaches and therapists, people close to, and in a unique position to observe and assess, athletes, to take heed to available scientific findings. Perhaps Simon Bakkioui could drive by Halmstad University on his way to the next HBK training – or has he already been there?

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Introduction

Physical activity such as playing football or doing aerobic training involves the risk of injury. Injury rates in U.S. high schools (students aged 15–19) are commonly estimated at 12–30% per year (Nideffer, 1989), while in Australia, sport-related injuries were identified as responsible for 20% of child emergency room visits (Finch, Valuri, & Ozanne-Smith, 1998). Conservative estimates indicate that at least half of the participants in amateur athletics each year suffer injuries that preclude participation (Hardy & Crace, 1990). In the United Kingdom, sport and exercise was the single leading source of injury in a population survey, accounting for about 33% of all injuries (Uitenbroek, 1996). In high-level sport, the risk of suffering an injury is even greater. For instance, in competitive women's gymnastics, injury rates as high as 70–80% per year are reported (Kerr & Minden, 1988). In elite-level football in Sweden (men and women alike) approximately 75% of the participants suffer injury at some time during a season (Engström, Johansson, & Törnkvist, 1991). Moreover, epidemiological studies from Finland and the United Kingdom report that the injury risk for elite football players is between 65% (Lüthje, et al., 1996) and 91% (Lewin, 1989) during one season. Thus, the chances of being injured while engaging in sport are statistically high. In addition, the economic costs of injury are high. In the United States of America, the economic cost was estimated at more than 224 billion U.S. dollars in 1994, including direct medical care, rehabilitation costs, lost wages, and national productivity losses (National Center for Injury Prevention and Control, 1996).

This article presents an overview of empirical findings related to sport injury, intervention and psychosocial risk factors. It also provide suggestions for implication for practice that are relevant to athletic trainers, coaches, leaders and other involved in physical activity.

Psychosocial Antecedents to Sport Injury

Theoretical models of injury risk

While deductively derived models of post-injury responses are frequently documented in the literature (e.g., Brewer, Andersen, & Van Raalte, 2002; Wiese-Bjornstal, Smith, Shaffer, & Morrey, 1998), there are fewer models of pre-injury vulnerability. Thus it is important to examine existing theoretical models that can predict the onset of a sport injury and contribute to the development of preventive interventions and strategies.

The most influential stress–injury model aimed at predicting the occurrence of sport injury was developed by Andersen and Williams, 1988, and modified by Williams and Andersen, 1998. It posits that individuals with personality characteristics that tend to exacerbate the stress response, with a history of many stressors, and with few coping resources will be more likely, when placed in a stressful situation, to appraise the situation as stressful and thus exhibit greater physiological activation and attentional disruption. The muscle tension, distractibility, and perceptual narrowing that occur during the stress response appear to be the mechanisms behind increased injury risk (Andersen & Williams, 1999).

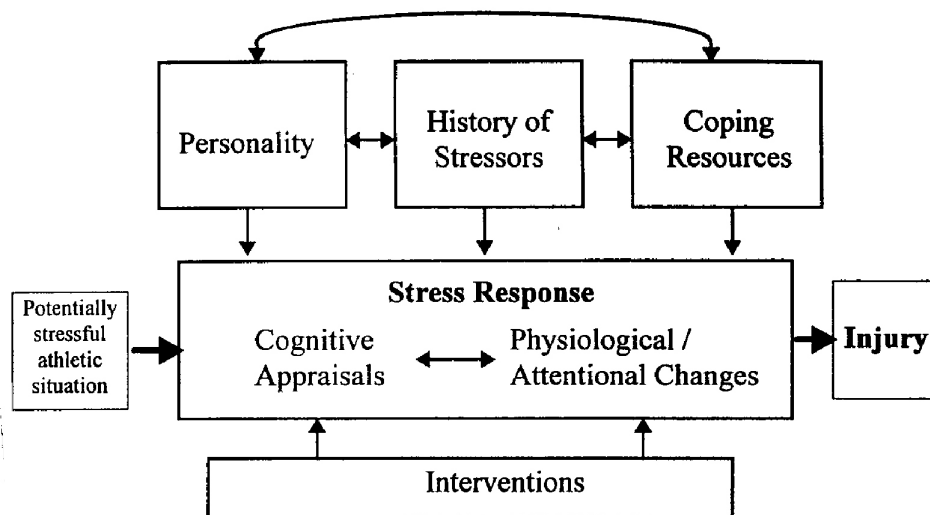


Figure 1. *The stress and injury model (From Psychosocial antecedents of sport injury: Review and critique of the stress and injury model by J. M. Williams and M. B. Andersen, 1998. Copyright 1998. Reproduced by permission of Taylor & Francis, Inc., <http://www.routledge-ny.com>).*

Summary

There is a lack of theoretical models and frameworks explaining what psychosocial factors are associated with sport injury. Current models generally have vague descriptions of potential antecedent factors and psychological intervention techniques. However, Williams and Andersen's model from 1998 has received empirical support. Consequently, this theoretical framework will be examined more closely.

Empirical findings

Researchers have examined several of the psychosocial risk factors suggested in William and Andersen's model from 1998.

Personality

Several personality variables have been identified as moderators in the stress–illness relationship. Personality characteristics may dispose individuals to perceive fewer situations and events as stressful, or they may dispose individuals to be more susceptible to the effects of stressors such as major life events and daily hassles. Relationships are often found between injury outcome and risk factors such as internal or external locus of control (Pargman & Lunt, 1989; Kolt & Kirkby, 1996), competitive trait anxiety (Lavalley & Flint, 1996; Petrie, 1993), low self-esteem (Kolt & Roberts, 1998), and low mood state early in the season (Williams, Hogan, & Andersen, 1993). Most of this research was conducted on male, elite, or competitive athletes.

History of stressors

Since Holmes study in 1970, many others have examined the relationship of life stress to athletic injury. The vast majority of these studies have found a positive relationship between injury and high life stress (Patterson, Smith, & Everett, 1998), daily hassles (Fawk-

ner, McMurray, & Summer, 1999), and life changes (Hardy & Riehl, 1988). These findings suggest that preoccupation with life change may affect concentration on training and competition and increase the likelihood of injury. In addition, there is now clear evidence that stress has negative effects on the functioning of the immune system (O'Leary, 1990). However, researchers have also found contrasting results showing no relation between previous injury and frequency or severity of injury (Hanson, McCullagh, & Tonymon, 1992) and that even positive life events can be related to injury outcome (Petrie, 1993).

Coping resources

Several studies have supported the link between general coping resources and athletic injury. Williams, Tonymon, and Wadsworth (1986) report a relationship between athletes low in coping resources and prediction of injury. Hanson et al. (1992) found that coping resources were the best discriminator for both severity and number of injuries. Moreover, Madison and Prapavessis (2005) found that an increase in coping resources followed after an intervention program for a group of at-risk players. Research about the effect of social support on injury occurrence has not provided consistent findings. Some studies have shown a direct effect, with athletes low in social support exhibiting more injuries (e.g., Hardy, Richman, & Rosenfeld, 1991). Other studies have found a relationship between negative life events and injury outcome only for athletes low in both social support and coping skills (Smith, Smoll, & Ptacek, 1990).

Summary

Several psychosocial factors seem to be related to the occurrence of sport injury. The most cited factors are high competitive trait anxiety, low self-esteem and positive or negative mood state, high life stress and life changes, and low coping skills and social support. However, other studies using non-specific sport instruments have yielded inconclusive results as well as a lack of relationship between previous injury and injury occurrence. Moreover, research about the effect of social support on injury occurrence has not provided consistent findings.

Psychological Prevention Intervention Studies

Empirical studies

While empirical support exists for the relation between psychosocial antecedents (whether alone or in combination) and injury outcome, the implementation and assessment of controlled intervention that might lessen the stress response and reduce injury vulnerability is sparsely documented.

Two reports offer partial support for the usefulness of a preventive intervention programme, although they are not explicitly focused on injury prevention (Table 1). In 1980 DeWitt found that basketball and football players detected a noticeable decrease in minor injuries after participation in a cognitive and physiological (biofeedback) training programme. However, DeWitt gathered no objective data regarding physical injuries. At the 1987 Olympic Sports Festival, Murphy (1988) conducted relaxation sessions with members of a team,

Table 1. *Injury prevention intervention studies.*

Study	N	Population	Gender	Intervention	Control group(s)	Method	Intervention effects	Statistical comparisons
DeWitt, 1980	18	Basketball, football players	Male	Biofeedback	No	Quantitative	Reduced injuries	No
Murphy, 1988	12	Team athletes	n/a	Relaxation/pain control	No	Qualitative	Reduced injuries	No
May and Brown, 1989	18	Olympic alpine skiers	n/a	Relaxation/imagery	No	Qualitative	Reduced injuries increased self-confidence	No
Schomer, 1990	10	Marathon runners	Male-female	Attentional strategies	No	Qualitative	Facilitated heavy training without injury	No
Davis, 1991	21	Collegiate swimmers and football players	n/a	Stress management	No	Quantitative	52% reduction in swimming injuries 33% reduction in football injuries	No
Kerr and Goss, 1996	24	Elite gymnasts	Male-female	Stress management	Yes	Qualitative/Quantitative	Reduced injuries and stress levels	Yes
Perna, Antonio, and Schneiderman, 1998	34	Collegiate rowers	Male-female	Cognitive behavioural Stress management	Yes	Quantitative	Reduce injury and illness	Yes
Johnson, Ekengren, and Andersen, 2005	32	Competitive soccer-players	Male-female	Stress, management,	Yes	Qualitative/quantitative	Reduced injuries and stress levels critical incidence	Yes
Maddison and Prapavessis, 2005	38	Competitive rugby players	Male	Stress management CMSM	Yes	Quantitative	Reduced injuries and stress levels	Yes

five of whom had minor injuries and two serious injuries. Practising relaxation training after every workout until competition resulted in all 12 athletes being able to compete.

To date, at least seven intervention strategies are primarily focused on reducing injury risk in sport settings. May and Brown (1989) used attention control, imagery, mental skills training, team building, communication, relationship orientations, and crisis interventions for individuals, pairs, and groups of U.S. alpine skiers in the 1988 Olympics in Calgary. The authors reported that their interventions led to reduced injuries, increased self-confidence, and enhanced self-control. Schomer (1990) examined the effects of associative versus dissociative thought patterns with ten marathon runners. According to Schomer, consistent body monitoring (associative thinking) was responsible for the elimination or minimization of overuse injuries. In contrast, Davis (1991) focused on prevention treatment (stress management) using imagery with collegiate swimmers and football players to reduce injuries. The programme involved progressive relaxation combined with imagined rehearsal of swimming and football skills and related content during the competitive season. Davis reported an impressive 52% reduction in swimming injuries and a 33% reduction in football injuries.

In a well-organized study, Kerr and Goss (1996) used a stress-management intervention based on Meichenbaum's (1985) stress inoculation training programme with 24 elite gymnasts over an eight-month period. The gymnasts were matched in pairs according to sex, age, and performance level. Results showed that there were substantially fewer injuries in the intervention group than in the control group (while the results were not statistically significant, they were clinically meaningful, see Andersen & Stoové, 1998). Furthermore, stress levels were significantly lower for the intervention group than for members of the control group. Perna, Antonio, and Schneiderman (1998) found that a 4-week cognitive behavioural stress management intervention was effective in reducing injury and illness in collegiate rowers.

Maddison and Prapavessis (2005) identified 48 competitive rugby players with an at-risk psychological profile for injury and randomly assigned them to either a CBSM intervention or a non-control condition. Results showed that those in the intervention condition reported missing less time due to injury compared to their non-intervention counterparts. The intervention group also had an increase on coping resources and a decrease in worry following the program.

Finally, a study by Johnson, Ekengren, and Andersen (2005) identified 32 at-risk athletes (soccer players) on the basis of the stress-injury model (Williams & Andersen, 1998). The instruments used were the Sport Anxiety Scale (Smith, Smoll, Schutz, 1990), The Life Event Survey for Collegiate Athletes (Petrie, 1992), and the Athletic Coping Skills Inventory (Smith, Smoll, & Ptacek, 1990). The researcher were interested in investigating whether psychologically based intervention programmes, organized in a pre-post test treatment-control group design would result in a lower incidence of injuries for competitive soccer players who had a risk profile than for a matched control group. Four intervention techniques were used 6 to 8 times over a 5-month period. The techniques were somatic and cognitive relaxation, stress management, goal-setting training, attribution, and self-confidence training. A critical incident diary was used to monitor progress. The experimental group reported a significantly lower number of injuries during the intervention period.

Implications for Practice

The research surveyed has some practical implications. First, major life event stress and daily hassles seem to have a direct or indirect effect on injury resiliency and vulnerability. Practitioners should thus understand the effect these factors have on injury outcome. Because of their close relationships with athletes, coaches and therapists are in a unique position to recognize athletes at-risk and to help them. They are in a position to teach athletes how to expand their range of coping skills and thus to meet troublesome life events and daily hassles.

The second implication is that it is important to recognize the effect that some personality variables seem to have on injury outcome. People with high competitive trait anxiety, an external locus of control, pessimistic lifestyles, chronically low moods, and aggressive behaviour seem to be at greatest risk of injury. It might thus be advisable to include a psychosocial risk assessment as part of the general physical examination at the start of the athletic season in order to identify at-risk athletes so as to provide the needed interventions.

The third practical implication relates to prevention techniques and skills. Relaxation techniques, including somatic relaxation techniques focusing on breathing and/or progressive muscle relaxation show promise. So does the practice of having athletes keep daily or weekly notes during the season, for instance in the form of a critical incident diary. This practice is likely to alert athletes to the potential effects of negative events related to sport and everyday life, and enhance their mental preparation for practice or upcoming games, or enable them to take steps to avoid stressful situations at work or at school (see Johnson, 2004). Coaches and sport psychologists should consider implementing intervention programmes for athletes with a high injury-risk profile. Such programmes should combine physiological and psychological skills and techniques as well as quantitative and qualitative techniques.

Summary

This review provides an overview of theoretical approaches and empirical findings as regards the psychosocial antecedents of sport injuries. It also provides an overview of intervention studies that have taken place within the last 15 years. During this period, different models for detecting injury outcome have been developed. It appears that psychosocial variables such as high competitive anxiety, low or high emotional state, high levels of life changes, low coping resources, and low levels of social support are directly or indirectly related to injury outcome. Moreover, empirical prevention studies demonstrate positive results in terms of a reduction in the number of injuries and, in most cases, improvements in mood and reduced stress levels. These advances have allowed us to take a more structured approach to the study of psychosocial antecedents to sport injury and to preventive measures to avoid injuries. This in turn allows us to take a more informed view of the existing literature on prevention and intervention in the sport injury domain.

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