PSYCHOLOGICAL PREDICTORS OF SPORT INJURIES AMONG SOCCER PLAYERS

Halmstad University
School of Social and Health Sciences   Author:
Sport Psychology, 91 – 120p, Spring 2008   Andreas Ivarsson
Supervisor: Urban Johnson
Examinator: Urban Johnson

Ivarsson, A. (2008). *Psykologiska faktorer som kan predicera idrottsskada bland fotbollsspelare.* (Magisteruppsats i psykologi inriktning idrott, 91 – 120p). Sektionen för Hälsa och Samhälle: Högskolan i Halmstad.

Mellan 65 – 91 % av fotbollsspelare på elitnivå inrapporterer minst en skada / år (Hägglund, 2007). Ett flertal studier har påvisat att specifika psykologiska faktorer kan predicera uppkomsten av idrottsskador baserat på Rogers och Landers (2005) stress – coping och Williams och Andersens (1998) stress – skademodell. Huvudsyftet med denna studie var att finna några psychologiska prediktorer som kan öka skaderisken bland fotbollsspelare. 152 manliga och kvinnliga fotbollsspelare (m =17,6) studerande vid Svenska fotbollsgymnasier deltog i studien. Fem frågeformulär användes STAI, SAS, LESCA, ACSI – 28 och SSP. Fortlöpande under en sexmånadsperiod inrapporterades skadedata av de ansvariga tränarna vid fotbollsgymnasierna. Resultatet påvisar att det fanns fyra signifikanta prediktorer som tillsammans kan förklara 23 % av skadorna. Dessa faktorer var negativ livstress, somatisk trait anxiety, misstroende och negativ coping. Resultatet är i linje med Williams och Andersens (1998) stress - injurymodell och bör tas i beaktande av tränare som vill förebygga indrottsskador.

Between 65 – 91 % of elite soccer players have at least one injury / year (Hägglund, 2007). Several researches have established models that specify psychological factors that could predict sport injuries. Two examples are Rogers and Landers (2005) stress – coping model and Williams and Andersen´s (1998) stress – injury model. The main purpose of the study was to single out significant psychological factors that could lead to an increased injury risk among soccer players. The participants were 152 male and female soccer players (m = 17, 6) studying at soccer high schools in southwest Sweden. Five questionnaires were used STAI, SAS, LESCA, ACSI – 28 and SSP. Continuously injury record was collected by athletic trainers at the school, during a period of six months. The result suggested that there are four significant predictors that in all could explain 23 % of the injuries. The main factors are life event stress, somatic trait anxiety, mistrust and negative coping. These findings are in unison with for example Williams and Andersen´s (1998) stress – injury model and should be considered by coaches when it comes to preventing sport injuries among their athletes.

Introduction

Participation in competitive sports set high demands on athletes´ physical skills. As a result the injury frequency is rather high among athletes (Pargman, 2007). According to Dishman, Jackson, Hill and Morrow (1999) 17 million athletes in the United States suffers injuries every year. Hägglund (2007) found that between 65 – 95 % of Swedish elite soccer players (male) reported at least one injury every year. Waldén, Hägglund and Ekstrand (2005) report that international soccer players had an injury frequency that was 9, 4 injures / 1000 hours of soccer practice.

During the last years more and more researchers have claimed that two major impact factors could affect the occurrence of sport injuries. External factors (for example, type of sport and weather conditions) and Internal factors (for example, Physiological and Psychological factors) (Johnson, 2008). Weinberg & Gould (2003) states that physiological factors are the biggest risk factor to the occurrence of sport injuries but even psychological factors could contribute.

Sport injury prevention is an interesting area. If it is possible to discover what psychological factors that might lead to increased or decreased risks of injury occurrence among athletes, it would be easier to prevent sport injuries.

Consequently, the main reason of this thesis is to study psychological predictors that could increase the injury risk among soccer players.

Theoretical framework
There are at least a dozen of models that try to establish the connection between psychological antecedents and the occurrence of sport injuries. Two of them are Williams and Andersen's (1998) "stress injury model" and Rogers and Landers (2005) "stress - coping model". These models will be used as the point of departure in the theoretical framework. The reason why these two models will be used is that a large number of previous research are based on them.

According to Williams and Andersen's (1998) model (see Figure 1) there are different psychosocial factors that could increase the injury risk. These risk factors are divided into three main categories, personality, history of stressors and coping resources (Williams & Andersen, 1998).
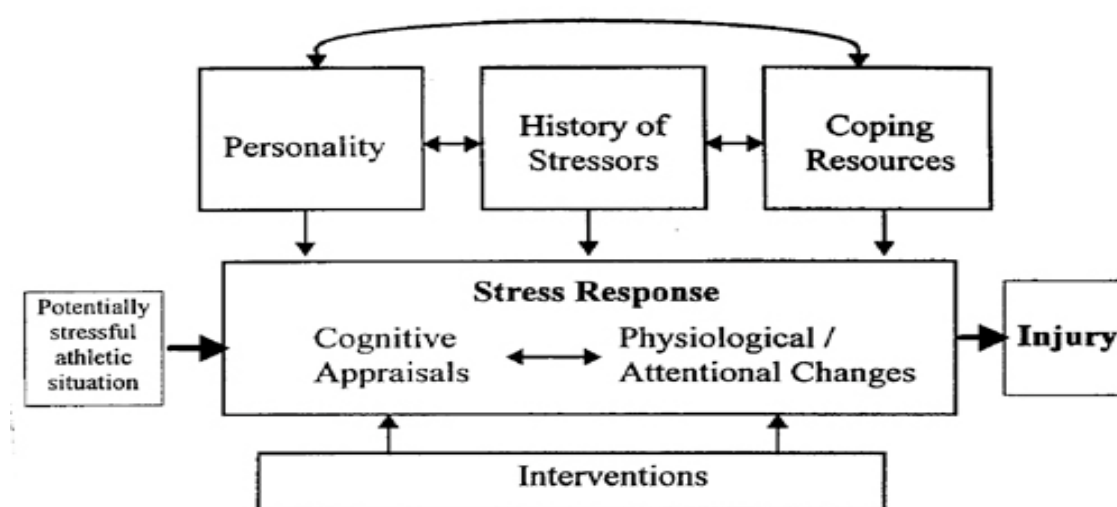

Figure 1. Stress injury model. Williams and Andersen (1998).

Personality

The personality could affect what situations an athlete apprehends as stressful (Petrie, 1993). According to Mcgrath´s (1970; Weinberg & Gould, 2003) stress model the apprehension of the situation is important when it comes to the stress response. A couple of risk factors according to an athlete's personality are discovered. Two examples are the relationships between sport injury and psychological risk factors as trait anxiety (Petrie, 1993) and low self confidence (Kolt & Roberts, 1998; Johnson, 2006). Lavallee and Flint (1996) found that there were positive relationships between high competitive anxiety and injury. The authors also established that there was a relationship between high competitive anxiety level and more severe injuries. Examples of personality factors are hardiness, locus of control, sense of coherence, competitive trait anxiety, achievement motivation and sensation seeking (Williams & Andersen, 1998). Locus of control is related to an athlete's perception and describes if the outcome of a situation are within the athletes control. There are two different locus of control, internal locus and external locus. An athlete with for instance high internal locus of control would recognize that the outcome is within their control. Pargman and Lunt (1989) found in their study that the risk of being injured had a positive relationship with external locus of control. In another study Kolt and Kirkby (1996) discovered that a high internal locus of control was correlated with a high number of injuries among elite gymnasts. There are also studies that claim that mood states could be related to injury occurrence. Williams, Hogan and Andersen (1993) stressed that athlete with positive states of mind early in the season experienced less injuries during the season.

History of stressors

There are a great number of studies that indicates a connection between sport injuries and a high stress level (Patterson, Smith & Everett, 1998; Johnson, 2006). Even the connection between changes in life and sport injuries is phenomena that are established in studies (Hardy & Riehl, 1988; Johnson, 2006). These authors stressed that the risk factors, which are presented above, could lead to a decreased concentration level during training. This narrowing in concentration is one factor that could increase the injury risk (Johnson, 2006).
Examples of subgroups in this category are life event stress, daily elements of anxiety and past injury history (Williams & Andersen, 1998). Holmes (1970) discovered in a study that 50 % of the football players who experience a high life stress reported that they became injured and missed at least three days of practice or one game during the research. In the group with moderate life event stress 25 % of the players was reporting the same injury time and among the players with low life event stress the number was only 5 %.

Coping resources

Coping resources may help the athlete to deal with the stressors that he/she will be exposed to, and perhaps help the athlete to perceive fewer situations as stressful (Williams & Andersen, 1998). Williams, Tonymon and Wadsworth (1986; Johnson, 2006) establish that there is a relationship between few coping resources and a high frequency of sport injuries. Hanson (1992; Johnson, 2006) suggest that there is a relationship between a lack of coping resources and the frequency of injuries. Social support is another resource that several studies suggest is connected with the occurrence of injuries. Hardy, Richman and Rosefeld (1991) found that athletes with a high level of social support experienced fewer injuries then athletes with a low level of social support. There are a couple of studies that have found a relationship between negative life events and the occurrence of injuries only among athletes with both low social support and coping skills (Smith, Smoll & Ptacek, 1990; Johnson, 2007a).

Stress and Coping model

Rogers and Landers (2005) carried out a study where the purpose was to investigate how several psychological factors influence the injury risk. The participants in the study were 177 soccer players between 14 and 19 years old. The result showed that different psychological factors might increase the injury risk among soccer players. One promising result was that factors, such as coping resources (for example the ability to control arousal), could prevent the occurrence of sport injuries.

The stress - coping model (see Figure 2) establish that a potentially stressful situation has a positive relationship leading to an increased level of state anxiety and/ or peripheral narrowing. These factors also have a positive relationship with sport injuries. The model also stresses the fact that negative life stress has positive relationships with both sport injuries and peripheral narrowing. One negative relationship that can be observed from the model is the relationship between coping resources and sport injuries. In other words, athletes with a high number of coping resources are exposed to a decreased injury risk in comparison to athletes with few coping resources (Rogers & Landers, 2005).
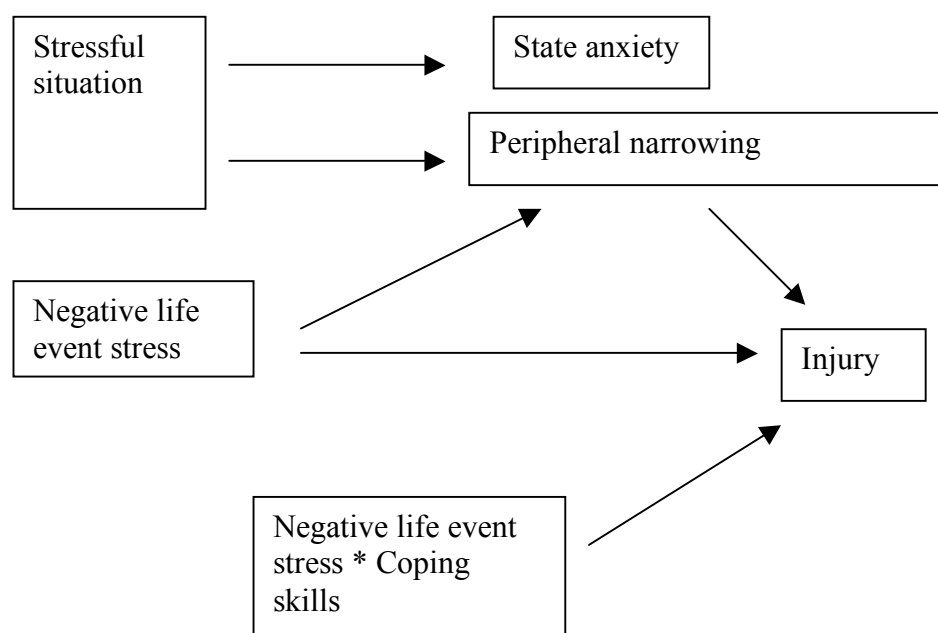

Figure 2. Stress – Coping Model. Rogers and Landers (2005).

Previous Research

Personality

Personality is a factor that has a great influence of a person's behavior (Adams, 1995; Fuller, 2005).

There are few studies that demonstrate that different personality factors (i.e. aggression & anger) may affect an athlete's injury frequency (Williams & Andersen, 1998). For example, Thompson and Morris (1994) found a relationship between anger and an increased injury risk. Moreover, Fuller (2005) showed, in a case study of football players, that there was a relationship between an aggressive behavior and the occurrence of injury.

Also other studies reported relationships between personality factors and injuries. Reuter and Short (2005) discovered that there was a positive relationship between these factors. Dunn (1999) established that worry of becoming injured had a positive relationship to anxiety. The

increased anxiety level could, according to Dunn (1999), be one key factor that increases the injury risk. Dunn and Syrotuik (2003) also found that worry was the strongest predictor of both somatic and cognitive anxiety.

Another personality predictor was discovered by Smith, Ptacek and Smoll (2002). They reported that athletes with a low level of sensation- seeking behavior in general had poorer stress – management coping skills then athletes with high level of sensation – seeking.

Williams and Andersen (1997) discovered that athletes with a high injury risk profile had a delayed response to important stimuli. They also focused on irrelevant cues and additionally they had a narrow perceptual sensitivity.

Kerr and Fowler (1988; Kleinert, 2007) found that athletes with a high level of trait anxiety more frequently reported a more narrow concentration and attention.

Also Andersen and Williams (1999; Kleinert, 2007) found that there was a positive relation between sport injuries and both peripheral narrowing and state anxiety.

Kleinert (2007) suggests that the psychological state of one person could be related to the injury occurrence. The author suggests there are two main factors that may affect an athlete's risk of being injured. The first is a dysfunctional psycho - physiological process. Some examples are disturbance of attention, too low or too high arousal and bad muscle coordination. One other suggestion that also might increase the injury risk is failures in decision making or risk management. These two factors will lead to an injury related behavior, for instance taking high risks or ignoring prevention measures.

Stress

Woodman and Hardy claimed in their study from 2001 that different stressors might affect an elite athlete and this could be divided into four groups. The authors argue that almost all the stressors that will appear in sport practice are involved in the sub groups below:

       Environmental Issues (Finances and training environment)
       Personal Issues (Injury and goals/expectations)
       Leadership Issues (Coaches and coaching styles)
       Team Issues (Team atmosphere and communication)

Nicholls, Holt, Polman and Bloomfield (2005) found in their research the stressors that are most in common in rugby are fear for injury, mental error and physical errors. Coping strategies used to deal with these stressors were increased concentration, blocking and an increased focus on the task. In another study (Anshel, Porter & Quek, 1998) the authors establish that there are three major stressors during a competition. These are physical/mental errors, worry to get injured and that an opponent does something out of the rules.

Increased stress may be associated with a number of different stress responses. Some examples of stress responses could be:
- Narrowing attention
- Greater distractibility
- Higher level of muscle tension   Williams and Andersen (1998)

Williams and Andersen (1998) suggests that the three categories in the stress – injury model (see Figure 1) will influence an athlete's stress response.

Since the 1970 over 30 studies that have investigated the relationship between life stress and injury have been reported (Williams & Andersen, 1998). The result of a review, including

twenty studies, showed that eighteen of the studies found a relationship between high life stress and injury (Williams & Roepke, 1993; Williams & Andersen, 1998). In the same study the researchers established that athletes with a high life stress level had an increased injury frequency than athletes with a low life stress level.

In a study by Lysens, Vanden Auweele and Osteen (1986) the purpose was to investigate the relationship between life changes and the frequency of injuries. One other purpose was to investigate the relationship between history of stressors and injury frequencies. The participants (n = 99) were asked to fill in a questionnaire where changes in life and history of stressors were measured. During the time of one year the researchers were collecting injury data from all the participants. The result showed that athlete's who had a high level of changes in life were more injured then the athletes with a low change level. One other result was that athletes with few histories of stressors were reporting less injuries then the rest of the group.

Maddison and Prapavessis (2005) also stressed in their first part of a study on rugby players (n = 470) that there is a positive relationship between stress and sport injures. In their second part of the study (n = 48) the participants were in the risk zone of becoming injured. The players were divided into two groups, one experiment- and one control group. The experiment group worked with stress management. The participants in the experiment group reported less injures than the participants in the control group. Other studies have established the positive relationship between a high level of life stress and an increased number of injury occurrences (Morris & Noh, 2007). There are also studies that stressed that negative life stress is associated with an increased risk for injuries among athletes (Morris & Noh, 2007).

In a study by Rozen & Horne (2007) (n = 96) the athletes state- and trait psychological factors were measured. The questionnaires that the researchers used were Visual Analouge Scales (VAS) and SV – Profile of Mood State (POMS). The result showed that pre – season vigour was a significant predictor to injury occurrence in football.

Kleinert (2007) investigated if there was any relationship between psychological states (mood and state of motivation), perceived physical states and injury. The result showed that 28 % of the reported injuries were related to the one or both of the state factors.

Williams and Andersen (1998) establish that athletes who have high anxiety and which affect their performance in a poor way might have an increased risk of being injured.

According to research about anxiety level and gender differences Lewinsohn, Gotlib, Lewinsohn, Seeley and Allen (1998) suggests that females, in general, are two to three times more likely to experience anxiety. Also other studies have established the relationship that males in general have a relatively low anxiety level when it comes to physical activity (Cartoni, Minganti & Zelli, 2005). Kontos (2004) found that male athletes reported higher level of risk taking then female athletes. Johnson (1997) reported that females are more likely to use emotion focused coping then males. Another finding was that females are experience a higher level of cognitive anxiety before sport participation (Jones & Hardy, 1993; Johnson, 1997).

Coping

Coping resources can be divided into three subgroups, general coping, social coping and stress management resources. General coping contains all health aspects such as nutrition and sleep. Social coping contains resources that are intermediary by your social network. Stress management means that people are able to control their anxiety level (Rogers & Landers,

2005).

Holt and Hog (2002) found that female soccer players were using a combination of coping strategies to deal with the stressors that they were exposed to. The coping strategies could be divided into four topics.

> Reappraisal
> Use of social resources
> Performance behaviors
> Blocking

Nicholls, Holt, Polman and Bloomfield (2006) found in their study, including eight elite rugby players, that the most frequently used coping skills were increased concentration, blocking, positive reappraisal and being focused on the task.

The purpose with Johnson, Ekengren and Andersen's (2005) study was to investigate if it was possible to prevent sport injuries by working with psychological skill training. The participants (n = 36) were all elite soccer players that, according to Williams and Andersen's (1998) stress injury model, were in the risk zone of becoming injured. The participants were divided into two groups, experiment - and control group. The brief intervention for the experiment group was relaxation, stress management and coping strategies. The result showed that three athletes in the experiment group reported injuries during the research time while thirteen athletes in the control group did the same.
Also Maddison and Prapavessis (2007) establish that there are some studies that have found it possible to prevent sport injuries by improving the athletes coping skills. To improving the participants coping skills the researches design an intervention program containing for example stress management. In Perna, Antoni, Kumar, Cruess and Schneiderman´s (2003; Maddison & Prapavessis, 2007) study the outcome was that athletes practicing cognitive behavioral stress management reported fewer injury days then athletes in the control group.

Previous research shows that the relationship between a large number of different psychological factors and the occurrence of sport injuries are frequently studied. For example studies that have found positive relationships between injury occurrence and both personality factors and life event stress. Also negative relationships between coping resources and the occurrence of sport injuries have been found. Even if there is a large number of research in the injury prediction area there are just a few models that try to explain the relationship between more then one predictor and the occurrence of sport injuries. Therefore it would be interesting to both investigate single psychological factors effect at the sport injury risk but also to try to design a model with a few variables that could explain a larger number of sport injuries.

Purposes
The purpose of the study is to investigate relationships between psychological stress and the frequency of sport injuries among soccer players. Additional purpose is to investigate the relationship between a specific type of personality and the frequency of sport injuries, but also the relationship between specific coping skills and the frequency of sport injuries. In addition the relationship between the athletes' history of stressors and the frequency of sport injuries will be investigated. One further purpose is to single out some significant psychological factors that could lead to an increased injury risk among soccer players. Finally it is to be investigated if there are any differences in some of the specific psychological factors between the two groups, injured male and injured female soccer players e.g. Life Stress.

Based on the studies presented in the theoretical framework research and purpose following

hypotheses was drawn.

1. There are relationships between a number of specific personality variables and an increased risk of becoming injured.
2. There is a positive relationship between negative life event stress and injury occurrence among soccer players.
3. There is a relationship between a low number of coping skills and an increased risk of becoming injured.
4. There is a positive relationship between anxiety level and the injury occurrence.
5. There are specific psychological factors that might increase the injury risk among soccer players.
6. Injured female athletes have a higher psychological stress level then injured male athletes.

<div align="center">Method</div>

Participants
The participants were 120 male and 32 female (n = 152) soccer players studying at soccer high schools in Sweden. The participants came from three different schools all located in the south western part of Sweden. Their ages were between 17 and 19 years old. Athletes below 18 years of age got parental approval to take part in the study. The selection of the high schools was made strategically and in cooperation with the Swedish Soccer Association. All participation was voluntary. The research design was authorized and approved by Halmstad University ethical board.

Measurements

State Trait Anxiety Inventory (STAI)
STAI (Spielberg, Gorsush, Luschene, Vagg & Jacobs, 1983) is used to measure current state anxiety. The test consists of 40 affirmations (20 state and 20 trait). The state affirmations describe how the athletes feel just at the specific moment when the questionnaire is completed. On the other hand the trait affirmations describe the athletes' general anxiety level. Questions were answered on a 4 graded Likert scale, ranging from 1 ("not at all") to 4 ("very much so").

Sport Anxiety Scale (SAS)
SAS (Smith, Smoll & Schutz, 1990) is used to measure an athlete's anxiety level. The test consists of 20 affirmations, classified in 3 categories. The categories are somatic anxiety (9 items), worry (7 items) and concentration disrupters (5 items). Questions were answered on a 4 graded Likert scale, ranging from 1 ("not at all") to 4 ("very much so").

Athletic Coping Skills Inventory - 28 (ACSI-28)
ACSI – 28 (Smith, Shutz, Smoll & Ptacek, 1995) is used to measure an athletes general coping skills. The test consists of 28 affirmations, classified in 7 categories. The categories are, coping with adversity, peaking under pressure, goal setting, mental preparation, concentration, freedom of worry, confidence and achievement against coachability. Questions were answered on a 4 graded Likert scale, ranging from 0 ("not at all") to 3 ("very much so"). The five variables coping with adversity, peaking under pressure, goal setting, mental preparation, concentration are combined to form an effective coping skills category and the two variables freedom of worry and confidence and achievement against coach ability are

combined to form an ineffective coping skills category. The reason why the author chose to divide the coping factors into two subgroups is that the five variables in positive coping category have a positive relationship with the occurrence while the two variables in the negative coping category have a negative relationship with the injury factor (Johnson, 2007b). ACSI – 28 has a "test – retest" reability of .87.

Life Events Survey for Collegiate Athletes (LESCA)

LESCA (Petrie, 1992) is used to measure an athlete's life history stressors. The test consist of 69 affirmations. Athletes are asked to indicate which events have occurred in the last 12 month, and then for each event, to rate the life event impact that they have experienced on a 8 point Likert scale, with the anchoring -4 ("extremely negative") to + 4 (extremely positive). The outcome of the test will be divided into three categories, Negative Life Event Stress, Positive Life Event Stress and Total Life Event Stress.

Swedish universities Scales of Personality (SSP)

SSP (Gustavsson, Bergman, Edman, Ekselius, von Knorring & Linder, 2000) is used to measure personality factors and is developed by Karolinska Institutet in Sweden. SSP has been used in a several studies (Magnusson, Göransson & Heilig, 2007 and Kuppers, 2004). The test consists of 91 affirmations, classified in 13 categories. The categories are; somatic trait anxiety, cognitive trait anxiety, mistrust ,stress sensitivity, submission, impulsiveness, adventure-loving, interpersonal distance, social conformity, bitterness, annoyance tendency, disbelieves verbal trait aggression and physical trait aggression. Questions were answered on a 4 graded Likert scale, ranging from 1 ("not at all") to 4 ("very much so"). Gustavsson et al., (2000) stressed that the current questioner has been found to be easy to understand for the participants.

Procedure

The sampling of the data took place from 1st October 2007 to 1st May 2008. Contact with the coaches was established by phone. One informational letter was also sent. Two occasions, located just before soccer practice, visiting the high schools were decided. During the first occasion, students were informed about the purposes of the research, that they could stop their participation at any time and that all data would be confidential. Students also got an approval letter handed out from the researcher. This letters were later collected by the coaches and sent to the researcher. During this first test occasion (1/10) the students completed the STAI, SAS and ACSI -28. During the next test occasion taking place in the end of the research period LESCA and SSP were completed by the students. Continuously injury record was collected by athletic trainers at the schools, during a six month period. Injury was defined as "all types of injuries that occur in connection with sport participation" (Lysens, de Weerdt & Nieuwboer, 1991; Johnson, 1997, pp. 2). The completed questionnaires were transcribed by the researcher.

Drop – out

The total number of participants was 152 soccer players. Of these participants, 108 took part in the both test occasions. That gives a drop - out rate of 29 %. Of the remaining 108 participants 82 completed all the questionnaires correct. That gives an internal drop – out rate of 24 %.

Statistical analysis

One way Analysis of Variance (ANOVA) was used for comparing the data between injured and non injured groups of athletes. This analyze method was chosen in order to find

differences between the injured and non - injured athletes. The hypotheses 1-5 were tested using Linier Regression analysis, backward method, with the dependent variable injury. The reason for using Linier Regression was to find injury predictors. The models (one for each hypothesis 1-3) that occurred in the Linier Regression analysis were later tested using logistic regression analysis. Logistic Regression allows multivariate analysis of dichotomous dependent variable into a probability statement, the so-called logic transformation .The logistic regression was used to show how large group of athletes that could be successfully predicted as injured or non - injured according to the results from the Linear Regression. Hypothesis 6 was testing psychological factors using one way Analysis of Variance (ANOVA) comparing injured male and injured female athletes. Moreover ANOVA was used to find differences between injured males and injured females.

Results

Of the 152 participating athletes, 69 (45 %) athletes missed at least one day of sport practice due to an injury. In this group of 69 injured athletes reported 99 injuries were reported.

Hypothesis 1
The result showed significant results of ANOVA analysis in somatic trait anxiety between the injury and non injury groups of athletes ($F(1, 99) = 4, 79$, p = 0,031). The result showed that injured athletes have a higher level of somatic trait anxiety the non – injury athletes. No other significant relationship was found

The regression analysis of the personality variables showed that the two predictors somatic trait anxiety and mistrust could explain 11 % of the total variance of injury occurrence R^2 Adj 0, 11, F (2, 91) = 6, 613, p = 0,002. Both factors were significant, somatic trait anxiety (beta 0, 32) and mistrust (-0, 29).

A logistic regression analysis was performed using somatic trait anxiety and mistrust as predictors. A total of 101 cases was analyzed (chi – square = 8, 57, df = 2, p = 0,014). In this sample 77, 2 % of the no injured was successfully predicted while only 36, 4 % for the injury group were accurate. Totally 59, 4 % of predictions were accurate.

Hypothesis 2
The result showed significant results of ANOVA analysis in negative life event stress (N - LES) between the injury and non injury groups of athletes ($F(1, 142) = 5, 203$, p = 0,024). The result showed that injured athletes have a higher level of N – LES then the non – injured athletes. No other significant relationship was found.

The regression analysis of the life stress variables showed the predictor negative life event stress could explain 3, 7 % of the total variance on the dependent variable injury R^2 Adj 0, 037, F (2, 141) = 6,567, p = 0,011. The predictor negative life stress was significant (beta 0, 21).

A Logistic Regression analysis was performed using the predictor negative life event stress and the dependent variable injury. A total of 144 cases was analyzed (chi – square = 5, 14, df = 1, p = 0,023). In this sample 83, 5 % was successfully predicted no injured whilst only 36, 9 % of the injury predictions were accurate. Totally 62, 5 % of predictors were accurate.

Hypothesis 3

The results of the one way ANOVA showed no significant differences in positive or negative coping between the injured and non injured groups.
The result from a linear regression analysis showed no significant relationships between the predictors negative coping, positive coping and the dependent variable injury.

Hypothesis 4
The results of the one way ANOVA showed no significant differences in state or trait anxiety between the injured and non – injured groups.
The result from a linear regression analysis showed no significant relationships between the predictors state - and trait Anxiety and the dependent variable injury.

Hypothesis 5
The regression analysis of measured predictors showed that the predictors negative life event stress, somatic trait anxiety, negative coping, mistrust and stress susceptibility could explain 23 % of the total variance R^2 Adj 0, 23, $F_{(5, 76)}$ = 5, 73, p = <0,001. Significant predictors (p< 0, 05) were negative life event stress (beta 0, 24), somatic trait anxiety (beta 0, 32), negative coping (beta 0, 24) and mistrust (beta – 0, 32).

A logistic regression analysis was performed with the predictors somatic trait anxiety, mistrust, negative life event stress and negative coping. The dependent variable was injury. A total of 86 cases was analyzed (chi - square = 12,182, df = 4, p = 0,016). 78, 3 % of the non - injured was successfully predicted while 55 % of the injury predictions were accurate. Totally 67, 4 % of predictions were accurate.

Hypothesis 6
The result showed significant results of ANOVA analysis in trait anxiety (TA)(p = 0,005), negative life event stress (N –LES)(p = 0,002) and physical trait aggression (PhTA) (p = 0,028) between the injury male and injured female groups of athletes. Moreover, the result showed that injured female athletes both have a higher N – LES level and a higher Trait Anxiety level then injured male (see Table 1) On the other hand injured male had a higher level of PhTA then injured female. No other significant relationship was found.

Table 1. Differences in ANOVA between males and females.

Variable	Group	N	M	SD	F	p
TA	Injured Male	44	31, 84	7, 03	4, 17	0,005
	Injured Female	18	39, 17	8, 90		
N –LES	Injured Male	46	17, 47	12, 08	6, 83	0,002
	Injured Female	19	30, 26	15, 94		
PhTA	Injured Male	31	2, 51	0, 62	5, 03	0, 028
	Injured Female	13	1, 92	0, 55		

Discussion

The main purpose of this research was to study psychological predictors that could increase the injury risk among soccer players. The result showed that there are several psychological factors that might predict sport injuries. Significant factors are somatic trait anxiety, mistrust, negative life event stress and negative coping. These factors will be discussed in the following discussion.

Hypothesis 1
Williams and Andersen (1998) stress in their stress – injury model that different personality variables could increase the risk for an athlete to become injured. Examples of personality factors are hardiness and locus of control (Williams & Andersen, 1998). One of the hypotheses in the study was that there would be personal factors that could increase the injury risk among soccer players. The results showed that injured athletes had a significant higher level of somatic trait anxiety than no – injured athletes, much like Williams and Andersen (1998) that established a positive relationship between competitive trait anxiety and sport injuries. According to Kerr and Fowler (1988; Kleinert, 2007) athletes with a high level of trait anxiety more often reported narrowing in concentration and attention than other athletes. Williams and Andersen (1997) discovered in their study that narrowing in attention could lead to an increased injury risk. Rogers and Landers (2005) stressed that peripheral narrowing could be one predictor of sport injuries. These findings could be one explanation of why somatic trait anxiety could be one predictor for sport injuries because if the high anxiety level leads to peripheral narrowing the athlete will have more injuries.
The result from the regression analysis regarding personality factors showed that a high level of somatic trait anxiety and a low level of mistrust could explain 11 % of the total variance of injury occurrence in the study. This means that an athlete experiencing a high level of somatic trait anxiety and a low level of mistrust are more exposed to injuries. The finding that a low level of mistrust could be one predictor to sport injury is new in the injury area. One athlete that is not apprehensive could be more likely to throw himself/herself into things that could be beyond his/her capacity. In a case like that the athlete could be exposed to a high risk of becoming injured.
Finally the logistic regression showed that 59, 4 % of the participants were successfully predicted into injured or no injured, using above mentioned personality factors as predictors.

Hypothesis 2
The positive relationship between life event stress is a well established result. For example Lysens, Vanden Auweele and Osten (1986) found that stressful changes in life could predict sport injuries. Rogers and Landers (2005) suggest that it is negative life event stress that is the strongest stress predictor, something that the result in the current study supports. The reason why negative life event stress could be an important injury predictor could be the fact that athletes with high stress levels probably have problem focusing on important cues during sport participation. However, negative life event stress is a strong predictor of sport injuries but the result showed that it could only explain 3, 7 % of the injuries in the study. One possible explanation why negative life event stress could be a significant predictor even if it only explains 3, 7 % of the injuries, could be that it might affect other predictors. For example life event stress could be one strong predictor for athletes that have a low number of coping skills or that have a stress sensitive personality. One conclusion is that the athletes in a great number of cases must have the negative life event stress predictor but it is the other predictors that decide if he/she will be in the risk population. According to life event stressors it could be

important to consider the fact that athlete, depending on their age, are exposed to different stressors. That is, stressors such as leaving home, pressure from their parents to perform well in school could potentially be different from those of an average collegian athlete, whom stressors such as relationships and career are more permanent. Wylleman & Lavellee (2004; Alferman & Stambulova, 2007) stressed that athletes are going trough developmental stages in for example their psychosocial development. This standpoint might lead to the fact that athletes at different age intervals activate partially different coping strategies dealing with age – related stressors. Therefore it could be iffy to generalize all the findings in this study to athletes in other ages.

Hypothesis 3
The third hypothesis was that injured athletes should have a lower number of coping resources then no injured athletes. For example Hanson (1992; Johnson, 2006) stressed that there are a relationship between a lack of coping resources and the frequency of sport injuries. The result of the current study showed no differences in coping resources between injured and no injured athletes. The reason why the study didn't found the same relationship could be that the specific questioner was not sensitive enough. One other possible explanation is that the participating athletes were younger then the participating athletes in most of the other studies, and therefore have not developed a pronounced coping activity. There are just a few studies that supporting the result the occurred in this study. For example Wiechman, Smith, Smoll & Ptacek (2000) found no evidence that a few coping resources would increase the injury risk.

Hypothesis 4
One of the hypotheses in the current study was that injured athletes would have a higher anxiety level. Anxiety factors such as state anxiety (Kleinert, 2007) and trait anxiety (Petrie, 1993) have both shown a positive relationship in regards to sport injuries. Except for the somatic trait anxiety no other significant relationships were found in the study. One explanation could be that an athlete's state anxiety is changing over time. Therefore it could be hazardous to measure an athlete's state level because of it flexible nature.

Hypothesis 5
The main purpose of the current study was to find psychological factors that together could predict sport injuries. Williams and Andersen (1998) claimed that there are three main blocks that could predict sport injuries. The three blocks are personality, history of stressors and coping (see Figure 1). Rogers and Landers (2005) stressed in their stress – coping model that there are a several injury predictors (e.g. negative life event stress and state anxiety, see Figure 2). In the current study the result showed that that there are predictors that together could explain 23 % of the total variance of injury occurrence. 23 % might sound small but there are a several factors that must be considered exploring the result. Johnson (2008) writes that there are two major fields, internal (e.g. psychological and physiological) and external (e.g. type of sport, weather conditions), that could affect the injury occurrence. Also Weinberg and Gould (2003) establish that there are different factors that could predict sport injuries which go beyond warily psychological factors. If an explanation value of 23 % is considered in this context it is a significant predictor that could be one important factor predicting sport injuries.
The result showed that there are five predictors in the model. The significant predictors could be divided into the same main blocks as Williams and Andersen (1998) suggests. In the current study the personality predictors are somatic trait anxiety and mistrust, the history of stressors predictor is negative life event stress and the coping predictor is ineffective coping skills. All significant predictors except mistrust have a positive relationship with sport

injuries. The two personality predictors that occurred in the current study are sparsely discussed in the literature. One reason could be that the personality test (SSP) is used in a few studies before and consequently partly new psychological factors, e.g. mistrust, have not been tested before. In line with Rogers and Landers (2005) stress – coping model one of the strongest predictors to sport injury is negative life event stress. Rogers and Landers (2005) established in their study that it is negative life event stress that is the strongest predictor for injury. Even the relationship between few coping resources and an increased injury risk is something that are well established (Williams, Tonyman and Wadsworth (1986; Rogers & Landers, 2005). One interesting aspect that could be considered is that it would be possible to prevent sport injuries by improving athletes coping resources. For example both Johnson, Ekengren and Andersen (2005) and Maddison and Prapavessis (2007) found that athletes who worked with psychological skill training, for example stress management, had less injuries then other athletes.

The five significant predictors that are present in the text above could together predict 67, 4 % of the cases successfully. That means that approximately two of three athletes were sorted corrected into either the injury – or the no injury group. Consequently it is possible to create a conceptual model of injury risk factors (see Figure 3).
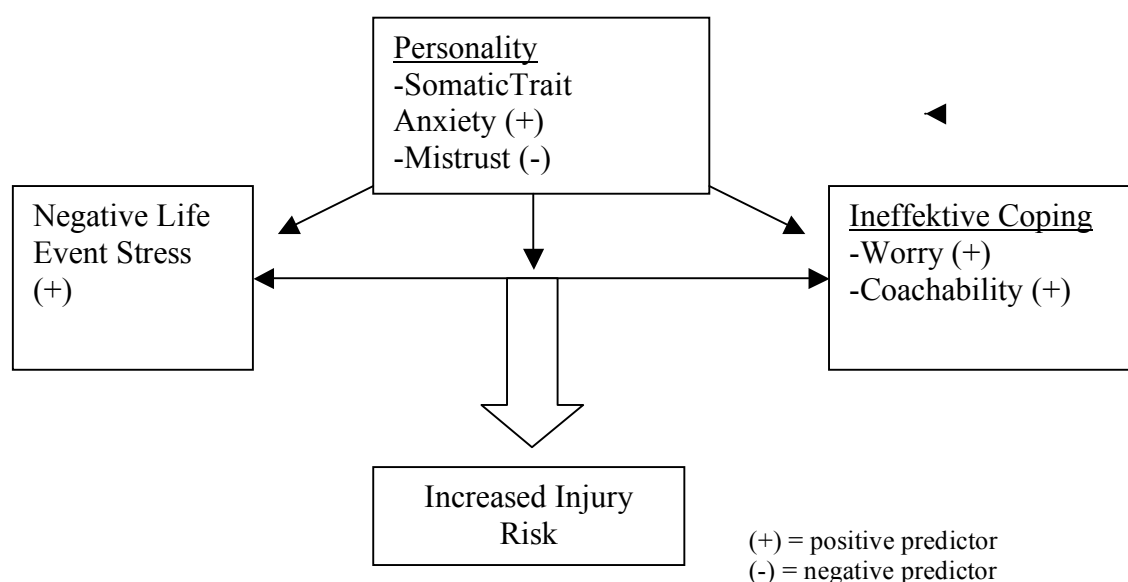

Figure 3. Conceptual Model of Injury Risk Factors.

The conceptual model of injury risk factors (see Figure 3) supports significant parts of both Williams and Andersen´s (1998) stress – injury model and Rogers and Landers (2005) stress – coping model. For example both Life Stress and Coping skills are discussed in all three models. There are, however some differences between the conceptual model of injury risk factors and the two other. One distinct difference is that the stress – injury model contains much more predictors in each block (personality, history of stressors & coping) while the conceptual injury prediction model only have one or two in each block. One other difference between these two models is that the conceptual model of injury risk factors doesn't highlight the stress response. Also between the conceptual model of injury risk factors and the stress – coping model there are some differences. The most distinct one might be that the stress – coping model has both peripheral narrowing and state anxiety as predictors. These two predictors are not discussed in the conceptual model of injury risk factors. Instead the

conceptual model of injury risk factors is highlighting two personality factors.

Hypothesis 6
One interesting topic to discuss is gender differences. According to Lewinsohn, Gotlib, Lewinsohn, Seeley and Allen (1998) females have a higher anxiety level then males. Other studies establish that male athletes in general have a low anxiety level (Cartoni, Minganti & Zelli, 2005). Also Jones & Hardy (1993; Johnson, 1997) reported that females are more likely to experience a high level of anxiety right before sport participation. Therefore one of the purposes of the current study was to investigate if there are some differences between injured males/females and psychological stress level. The result showed that there are significant differences between gender and three psychological factors in the study. Injured females had both a higher level of negative life event stress and trait anxiety than injured males, while males had a higher level of physical trait aggression. The fact that females experience both higher stress level and trait anxiety level support the literature present above. One possible explanation could be that females in general activate more pressure on themselves outside the sports. This might lead to the high experience of the two factors. Kontos (2004) found that male athletes are more risktaking than female athletes. A high risk taking behavior could perhaps explain a higher level of Aggression behavior. The finding that males in the injury group experienced higher physical trait aggression is not surprising. It is rather logical that male athletes more frequently tend to show an aggressive behavior on the field as they might do it even in other context.

Methodological Discussion
The rationale of using two test occasions for each participant was because of administrative reasons such as a big sample of participants and the large number of questionnaires. The problem with the two - occasion design was that were some participants that were not able to take part in both test occasions. Consequently, some participants drop out of the study. This is also the reason why there are some differences in the (n) value between different parts in the result. The participation drop out is a limitation in the study but the author's opinion is that there is adequate (n) value for each result. One other limitation in the study is the fact that it is hard to measure state levels, just using two occasions during six months. State levels are changing over time and therefore it could be hazardous to receive a general rate for this level. This fact could be one of the reasons why the results in the current study didn't found relationships between different state levels and sport injuries. Another limitation is that some of the questionnaires might have poorer sensitiveness then the other. One other thing that could be important to consider is that SSP is not tested at a sport related population before. To divide the ACSI – 28 variables into two categories is also one thing that is important to consider. The reason was to gather the variables that had the same relationship with sport injuries into the same category. However, this procedure is used successfully in other studies. Finally the participants' age is something that also could affect the result. According to age it could be some differences between the participants and senior soccer players in some results. Fore example a soccer player might experience different situations as stressful depending to his/her age.

Conclusion
The result showed that there are distinct personality factors that could predict the occurrence of sport injuries. The significant factors are somatic trait anxiety, mistrust, negative life event stress and ineffective coping skills (worry and coachability). These factors together with stress susceptibility (no significant) could together explain 23 % of the injuries that occurred in the

current study. These findings support partly Williams and Andersen's (1998) stress - injury model, but also parts of Rogers and Landers (2005) stress – coping model. Another conclusion that can be drawn was that injured female athletes had a higher level of both trait anxiety and negative life event stress while males had a higher level of physical trait aggression.

Implications

Following the results, there are distinct psychological factors that affect the injury risk among soccer players. Especially the predictor negative life event stress is important for both players and coaches to consider in order to preventing sport injuries. It is problematic for an athlete with high negative life event stress to focus on important cues of a soccer game. Therefore it is important for coaches to be aware of this and perhaps let the athlete skip some practice if he/she has problems to stay focus in practice. One other implication is that it could be important to prevent sport injuries by developing the athletes coping skills. One example is to decrease the athletes' level of worry through increasing the self confidence of the athlete. Moreover, install a feeling that that the athlete feels that he/she could talk to the coach about things outside the sport area.

Further Research

The majority of research in the pre – injury area today has focused on investigations concerning relationships between just one or few specific psychological predictor and the occurrence of sport injuries. In the current study one conceptual model (see Figure 3) was developed with the aim of explain the injury occurrence. This model was supported by two existing models in the sport injury area (see Figure 1 & 2). Therefore it would be interesting to investigate if this new conceptual model could be used to divide soccer players into a risk group and a no risk group and then follow their injury reporting during one year in order to study if the players in the risk group incur a larger number of injuries.

One other interesting area for future research would be to investigate if there are any differences in injury predictors between minor and major injuries. Most of the researches today, including this research, make no difference between these two types of injuries. Rogers and Landers (2005) found a positive relationship between peripheral narrowing and the occurrence of sport injuries. Therefore it would be an interesting research design to investigate that relationship.

References

Alferman, D., & Stambulova, N. (2007). Career Transitions and Career Termination. In G. Tenenbaum & R. C. Eklund (Eds.) *Handbook of Sport Psychology* (pp. 712 – 733). New York: John Wiley & Sons.

Anshel, M. H., Porter, A., & Quek, J. J. (1998). Coping with acute stress in sport as a function of gender: an exploratory study. *Journal of Sport Behaviour*, *21*, 363-376.

Cartoni, A. C., Minganti, C., & Zelli, A. (2005). Gender, age and professional-level differences in the psychological correlates of fear of injury in Italian gymnasts. *Journal of sport behavior, 28*, 3 – 17.

Dishman, R., K., Jackson, A. W., Hill, D. W., & Morrow, J. R. (1999). *Physical activity for health and fitness.* Champaign: Human Kinetics.

Dunn, G. H. (1999). A theoretical framework for structuring the content of competitive worry in ice hockey. *Journal of Sport and Exercise Psychology, 21,* 259-279.

Dunn, G. H., & Syrotuik, D. G. (2003). An investigation of multidimensional worry dispositions in a high contact sport. *Psychology of Sport and Exercise, 4,* 265 – 282.

Fuller, C. W. (2005). An assessment of the relationship between behaviour and injury in the workplace: A case study in professional football. *Saftey Science, 43,* 213 – 224.

Gustavsson, J. P., Bergman, H., Edman, G., Ekselius, L., von Knorring, L., & Linder, J. (2000). Swedish universities Scales of Personality (SSP): construction, internal consistency and normative data. *Acta Psychiat. Scand, 102,* 217 - 225

Hardy, C. J., Richman, J. M., & Rosenfeld, L. B. (1991). The role of social support in the life stress/injury relationship. *The Sport Psychologist, 5,* 128 – 139.

Holmes, T. H. (1970). Psychological screening. In *Football injuries* (pp. 211 -214). Paper presented at a workshop sponsored by Subcommittee on Athletic Injuries., Committee on Skeletal System, Devision of Medical Science, National Research Council, February 1969. Washington DC: National Academy of Science.

Holt, N. L., & Hog, J. M. (2002). Perceptions of Stress and Coping During Preparation for the 1999 Women's Soccer World Cup Final. *The Sport Psychologist, 16,* 251 – 271.

Hägglund, M. (2007). *Epidemiology and prevention of football injuries.* Linköping: Linköping University Medical Dissertation No. 989.

Johnson, U. (1997). *The Long- Term Injured Competitive Athelte- A study of psychosocial risk factors.* Stockholm: Almqvist & Wiksell.

Johnson, U., Ekengren, J., & Andersen, M. B. (2005). Injury Prevention in Sweden. Helping Soccer Players at Risk. *Journal of Sport and Exercise Psychology, 1,* 32-38.

Johnson, U. (2006). Sport Injury, Psychology and Intervention: An overview of empirical findings.from.http.*www.idrottsforum.org*

Johnson, U. (2007a). Psychosocial Antecedents of Sport Injury, Prevention, and Intervention: An Overview of Theoretical Approaches and Empirical Findings. *International Journal of Sport and Exercise Psychology, 5*, 352 – 369.

Johnson, U. (2007b). Psychological Antecidents to Sport Injury Prevention.In D. Pargman (Ed.) *Psychological bases of Sport Injuries* (pp 39-52) Morgantown: Fitness Information Technology.

Johnson, U. (2008). Mental återhämtning och rehabilitering efter idrottsskada. *Svensk Idrottsforskning, 1,* 36 – 39.

Kleinert, J. (2007). Mood States and Percived Physical States as Short Term Predictors of Sport Injuries: Two Prospective Studies. *International Journal of Sport and Exercise Psychology, 5*, 340 – 351.

Kolt, G. S., & Kirkby, R. J. (1996). Injury in Australian female competitive gymnasts: A psychological perspective. *Australian Journal of Physiotherapy, 42,* 121 – 126.

Kontos, A. P. (2004). Perceived Risk, Risk Taking, Estimation of Ability and Injury among Adolescent Sport Participants. *Journal of Pediatric Psychology, 29,* 447 – 455.

Kuppens, P. (2004). Interpersonal determinants of trait anger: low agreeableness, perceived low social esteem, and the amplifing role of the importance attached to social relationships. *Personality and Individual Differences, 38,* 13 -23.

Lavaellee, L., & Flint, F. (1996). The relationship of stress, competitive anxiety, mood state, and social support to athletic injury. *Journal of Athletic Training,* 31, 296-299.

Lewinsohn, P.M., Gotlib, I. H., Lewinsohn, M., Seeley, J. R., & Allen, N. B. (1998). Gender differences in anxiety disorders and anxiety symptoms in adolescents. *Journal of Abnormal Psychology, 107*, 109-117.

Lysens, R., Vanden Auweele, Y., & Ostyn, M. (1986). The relationship between psychosocial factors and sports injuries. *Journal of Sports Medicine and Physical Fitness, 26,* 77-84.

Maddison, R., & Prapavessis, H. (2005). A psychological approach to the prediction and prevention of athletic injury. *Journal of Sport and Exercise Psychology, 27,* 289-310.

Maddison, R., & Prapavessis, H. (2007). Preventing Sport Injuries: A Case for Psychology Intervention. In D. Pargman (Ed.) *Psychological bases of Sport Injuries* (pp 25-38) Morgantown: Fitness Information Technology.

Magnusson, Å., Göransson, M., & Heilig, M. (2007). Hazardous alcohol users during pregnancy: Psychiatric health and personality traits. *Drug and Alcohol Dependence, 89,* 275 – 281.

Morris, T., & Noh, Y. E. (2007). Research – based Injury Prevention Interventions on Sport and Dance. In D. Pargman (Ed.) *Psychological bases of Sport Injuries* (pp 3-24) Morgantown: Fitness Information Technology.

Nicholls, A. R., Holt, N. L., Polman, R.C. J., & Bloomfield, J. (2006). Stressors, Coping and Coping effectivness Among Professional Rugby Union Players. *The Sport Psychologist, 20*, 314-329.

Pargman, D., & Lunt, S. D. (1989). The relationship of self – concept and locus of control to the severity in freshman collegiate football players. *Sports Medicine, Training and Rehabilitation, 1,* 201 – 208.

Pargman, D. (2007). Sport Injury: An Introduction and Overview of Related Psychological Issues. In D. Pargman (Ed.) *Psychological bases of Sport Injuries* (xvii - xxvii) Morgantown: Fitness Information Technology.

Petrie. T. A. (1993). Coping skills, competitive trait anxiety and playing status: Moderation effects on the life stress – injury relationship. *Journal of Sport and Exercise Psychology, 5*, 1-16.

Reuter, J. M., & Short, S. E. (2005). The Relationship Among Three Components of Perceived Risk of Injury, Previous Injuries and Gender in Non- Contact/Limited Contact Sport Athletes. *Athletic Insight,* 7.

Rogers, T. M., & Landers, D. M. (2005). Mediating Effects of Pheripheral Vision in the life event Stress/Athletic Injury Relationship. *Journal of Sport and Exercise Psychology, 27,* 271-288.

Rozen, W. M., & Horne, D. J. L. (2007). The association of Psychological Factors with Injury Incidence and Outcome on the Australian Football League. *Individual Differences Research, 5*, 73 – 80.

Smith, R. E., Smoll, F. L., & Schutz, R. W. (1990) Measurement and correlates of sport-specific cognitive and somatic trait anxiety: the sport anxiety scale. *Anxiety Research, 2*, 263– 280.

Smith, R. E., Schutz, R. W., Smoll, F. L., & Ptacek, J. T. (1995). Development and validation of a multidimensional measure of sport – specific psychological skills: The Athletic Coping Skills Inventory – 28. *Journal of Sport and Exercise Psychology, 17,* 379 – 398.

Simth, R. E., Ptacek, J. T., & Smoll, F. L. (2002). Sensation Seeking, Stress and Adolecent Injuries: A test of Stress – Buffering, Risk – taking and Coping Skills Hypotheses. *Journal of Personality and Social Psychology , 62*, 1016-1024.

Spielberger, C. D., Gorsuch, R. L., Luschene, R., Vagg, P. R., & Jacobs, G. A. (1983). *Manual for the State – Trait Anxiety Inventory*. Palo Alto, Ca : Consulting Psychologists.

Thompson, N. J., & Morris, R. D. (1994). Predicting injury risks in adolecent football players: The importance of psychological variables. *Journal of Pediatric Psychology, 19,* 415 – 429.

Waldén, M., Hägglund. M., & Ekstrand, J. (2005). UEFA Champions League Study: a prospective study of injuries in professional football during the 2001-2002 season. *British Journal of Sports Medicine, 39*, 542-546.

Weinberg, R. S., & Gould, D. (2003). *Foundations of Sport & Exercise Psychology*. Champaign: Human Kinetics.

Wiechman, S. A., Smith, R. E., Smoll, F. L., & Ptacek, J. T. (2000). Masking effects of Social Desirability Response Set on Relations Between Psychosocial Factors and Sport Injuries: A Methodological Note. *Journal of Science and Medicine in Sport, 3,* 194 – 202.

Williams, J. M., Hogan, T. D., & Andersen, M. B. (1993). Positive states of mind and athletic injury risk. *Psychosomatic Medicine, 55*, 468 – 472.

Williams, J. M., & Andersen, M. B. (1997). Psychosocial influences on central and peripheral vision and reaction time during demanding tasks. *Behavioural Medicine, 26,* 160 – 167.

Williams, J. M., & Andersen, M. B. (1998). Psykosocial antecedents of sport injury: Review and critique of the stress and injury model. *Journal of Applied Sport Psychology, 10*, 5-25.

Woodman, T., & Hardy, L. (2001). A case Study of Organizational Stress in Elit Sport. *Journal of Applied Sport Psychology, 13,* 207-238.