PSYCHOLOGICAL ASPECTS OF SPORTS INJURIES AMONG MALE PROFESSIONAL SOCCER PLAYERS IN CROATIA

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Abstract:

The aim of this study was to assess occurrence of sports injuries among professional male soccer players in relation to their psychological characteristics. This prospective cohort study was conducted during the 2013/2014 sports season among all professional players with the first team contract in the first Croatian soccer league. A stratified sample of 182 male soccer players were selected for the assessment. They were surveyed during their preparation period before the beginning of the season and were under monitoring during the season. Seriousness of injuries was assessed depending on the duration (one day or more) of players' non-participation in sports activities. Psychological characteristics were assessed by the General Anxiety Disorder Scale (GAD-7), Revised Center for Epidemiologic Studies Depression Scale, impulsive behaviour scale from the Zuckerman-Kuhlman Personality Questionnaire Cross-Cultural 50-item version and Psychological Skills Inventory for Sports. Majority of players (62.6%) experienced a kind of injury, with the mean number of 1.28 injuries per player, and 30.7% of them contracted severe injuries. Results of the binary regression model suggest that likelihood of being injured is mostly influenced by higher Impulsive Sensation Seeking and GAD-7 scores (OR=1.26 in both cases). In contrast, adequate mental preparation significantly lowers the chance of being injured (OR=0.89). The study gives an insight into proportions, severity, mechanisms and number of sport injuries in the population of Croatian professional soccer players. We propose several variables as important predictors of future injuries. Some scales, commonly used in this field, have been shown to be less useful for injury prediction.

Key words: psychological characteristics, mental preparation, *sports injuries, professional soccer players*

Introduction

To plan preventive measures against injuries in sport it is important to know why certain situations are injury risky. It is also necessary to clearly define mechanisms by which injuries occur, taking into account specific and typical situations athletes face daily. Only by the determination of (at least some) variables affecting occurrence of a specific sport injury, including their multivariate interactions, the establishment of successful injury prevention model can be created. In order to prevent sports injuries it is important to rigorously consider extrinsic and intrinsic factors that play roles in a certain sporting activity, as well as their interactions in the mecha-

nism of sport injury occurrence. Since most sports injuries occur as a result of the interaction of intrinsic and extrinsic risk factors, they both represent a valid scope of research. However, intrinsic risk factors can be almost completely monitored by having an insight into the musculoskeletal potential of a person, his or her functional status as well as all other available anthropological parameters (Venturelli, Schena, Zanolla, & Bishop, 2011; Volpi & Taioli, 2012; Zuckerman, et al., 2012).

There are two groups of risk factors relevant to the occurrence of any sport injury – intrinsic (internal) and extrinsic (external) ones (Ekstrand, Hagglund, & Walden, 2011). General anthropolog-

ical factors such as athlete's age, sex, body composition, health status, physical fitness, anatomy and sport skill level are considered as intrinsic risk factors. Additional group of intrinsic risk factors are athlete's psychological features such as motivation, aggressiveness, perception of risk situation and willingness to accept risk. Extrinsic risk factors can be associated with a certain sport activity such as type, intensity and frequency of training sessions, warmth, humidity or coldness of weather, special equipment, or type of surface the activity is practised on (van Beijsterveldt, et al., 2011, 2012; Zuckerman, et al., 2012).

Although there is little doubt about positive effects of sport activities on health and wellbeing of an individual, any sporting activity presents also a certain risk of injury. So, for example, professional soccer players are approximately 1000 times more likely to suffer an injury compared to some industrial professions normally considered as high-risky (Drawer & Fuller, 2002). Injuries have additional negative effect on team performance in a way that teams having less injuries are more likely to be ranked higher on the major league charts (Arnason, et al., 2004; Ekstrand & Hilding, 1999). Since injury prevention in sport is of major importance, significance of studies examining their incidence and effect cannot be overestimated (van Mechelen, Hlobil, & Kemper, 1992).

Werner, Hagglund, Walden, and Ekstrand (2009) have shown that muscle strains of the upper leg account for 17% of all injuries so that typical team with 25 players can expect to experience 10 strains during each season, with seven strains of posterior muscles and three strains of quadriceps muscles (Werner, et al., 2009). Strains of the upper leg's muscles are also most common among severe injuries. Following are strains and overstrain injuries in the hips and groin, accounting for 14% of all injuries, with approximately seven injuries per team each season. Other more common injuries are ankle sprains (up to 7% of all injuries) and medial collateral ligament injuries (5%), while injuries of the anterior cruciate ligament are less common (<1%) (Walden, Hagglund, & Ekstrand, 2007; Werner, et al., 2009).

Garcia and Aragues (1998) concluded that if soccer players wanted to minimize the risk of sports injuries, an optimum players' anxiety trait score was important. Extreme anxiety trait scores, whether these are high or low, are associated with a greater risk of contracting injuries (Garcia & Aragues, 1998; van Mechelen, et al., 1992). Thus, if this individual characteristic is known, then it is possible to identify those persons who are predisposed to experience sports injuries (Garcia & Aragues, 1998). It cannot be clinically asserted that professional soccer players were more depressive, anxious or more impulsive compared to the general population, but even small changes of these char-

acteristics can result in a considerable decrease of injury rates.

Johnson and Ivarsson (2011) investigated psychological factors that could lead to an increased injury risk among junior soccer players. In addition they constructed an empirical model of injury risk factors for soccer players. The study participants were 108 male and female soccer players of soccer high schools in the southwest Sweden. Injury record was collected by athletic coaches at the schools during a period of eight months. The result suggested four significant predictors that together could explain 23% of injury variance. The main factors were life event stress, somatic trait anxiety, mistrust and ineffective coping (Passer & Seese, 1983). Recommendations are given to sports medicine teams and coaches regarding issues in sport injury prevention (Johnson & Ivarsson, 2011).

The concept of correlation of anxiety with injuries among athletes is already known, although most authors used complex charts like POMS-BI (Kolt & Kirkby, 1994) or CSAI-2 (McKay, Campbell, Meeuwisse, & Emery, 2013). Some authors have found a protective effect of anxiety (but not depression) on injury occurrence in sports: anxious subjects had lower injury rate than less anxious ones (Yang, et al., 2014), whereas Passer et al. (1983) in a somewhat more complex model showed that anxiety does not correlate with the development of sports injury. Williams (1993) described in detail a multi-disciplinary approach to the identification and empowerment of desirable psychological skills of athletes (Williams, 1993).

Hanson, McCullagh, and Tonymon (1993) considered theory of relationship of stress with the development of sports injuries and found a positive correlation between specific psychological skills and injury occurrence.

Since the theoretical and empirical knowledge base on psychological issues related to sports injury has grown considerably more substantive and sophisticated, some other issues, like personality traits, have been raised up. According to the so-called "alternative" theory, personality traits can be explained by the five fundamental factors – aggression, activity, sociability, impulsivity and anxiety. For the purpose of testing and objective assessment of these factors Zuckerman described a model and later developed a questionnaire (Zuckerman, 1992). A recent review article by Keats, Emery, and Finch (2012) presented an integrated model using two prominent theories in social psychology: self-determination theory and the theory of planned behaviour, aimed at explaining and enhancing athletes' adherence to sport injury prevention.

Appreciation of mind-body interactions and how they function regarding stress, sports performance, and injury is fundamental to the acceptance of psychological techniques in the medical

arena. Investigating and teaching these fundamental issues to professionals in both sports and medicine is essential. Furthermore, the psychology of sports injury needs continuous development of base theory, empirical research, and clinical practice sensitive to the needs of an individual athlete (Ahern, 1997). With psychological elements playing undoubtedly important but under-researched part in injury occurrence mechanism, the aim of this paper was to assess mental health of professional soccer players and its effect on injury rates. Our hypothesis was that male professional soccer players with poorer mental health, who scored higher on depressivity, anxiety and impulsivity scales, were more prone to sustain serious sports injury.

Methods

This prospective cohort study was conducted during the 2013/2014 sports season among all professional players with the first team contract in the Croatian soccer league. Croatian soccer league system is made of eight connected series of leagues with relegation and promotion between leagues at the end of the season. For the purpose of this study only teams from the first league have been included (total number of 16 teams).

Participants

Participants were interviewed at baseline and monitored during the preparatory period before the start of the season and during the season. Sports injuries were assessed in coordination with sports medicine specialists (M.D.), coaches and physical therapists of individual soccer clubs according to the unified and standardized forms. A stratified sample of 182 male soccer players was selected for the assessment, taking individual clubs as strata. Eleven to 12 players from the first team have been randomly sampled from each club (stratum). Data were collected following the UEFA guidelines and a consensus document for the study of sports injuries (all discussed in detail in Walden, 2007) enabling standardization of forms and the risk of injury. Seriousness of experienced injuries was assessed depending on the absence (in days) from sports activities. All collected personal information were considered to be confidential since after the data had been entered into the appropriate computer database, the only link with the personal information of respondents was personal identification number in the database, known only to the authors of the paper. The study was approved by the Ethics Committee of the University of Zagreb School of Medicine. The individual informed consent was collected from each player before completing the questionnaire. The continuation of the study involved coaches, physiotherapists and doctors of individual sports clubs who were the contact persons for the follow-up of individual athletes.

Instruments

Psychological characteristics were assessed using the General Anxiety Disorder Scale (GAD-7), Center for Epidemiologic Studies Depression Scale (CESD Scale), impulsive behaviour scale from the Zuckerman-Kuhlman Personality Questionnaire Cross-Cultural 50-item version (ZKPQ-50-CC) and Psychological Skills Inventory for Sports (PSIS–Youth).

GAD-7 is a self-reported questionnaire for screening and severity measuring of generalized anxiety disorder (Spitzer, Kroenke, Williams, & Lowe, 2006). GAD-7 has seven items, which measure severity of various signs of generalized anxiety disorder according to the reported response categories of "not at all", "several days", "more than half the days", and "nearly every day". Assessment is indicated by the total score, which is made up by adding the scores of all the seven items' scale (Swinson, 2006). High internal consistency (α=.89) on the general population was recently reported for this scale (Lowe, et. al., 2008).

CESD scale was created in 1977 by Laurie Radloff (Radloff, 1977) and revised in 2004 by Eaton and others (Eaton, Muntaner, Smith, Tien, & Ybarra, 2004). The CESD is a screening test for depression and depressive disorder. The CESD measures symptoms defined by the American Psychiatric Association's Diagnostic and Statistical Manual (DSM-IV) for a major depressive episode. The 20-item scale remains as one of the most widely used instruments in the field of psychiatric epidemiology. Very high Cronbach alpha values were found in a variety of populations, ranging from 0.88 in hepatitis-C patients (Clark, Mahoney, Clark, & Eriksen, 2002), to as high as 0.95 in Greek translation of the scale (Fountoulakis, et al., 2001).

ZKPQ-50-CC is a shortened version of ZKPQ adapted simultaneously to the English, French, German and Spanish languages. ZKPQ-50-CC has 50 items and measures the Zuckerman's five personality factors: Impulsive Sensation Seeking, Neuroticism-Anxiety, Aggression-Hostility, Activity, and Sociability (Aluja, Kuhlman, & Zuckerman, 2010). In our study only Impulsive Sensation Seeking personality factor has been used. Validity of all personal factors was proven to be acceptable (i.e. α>0.70 in all cases) in a recent study (Poó & Ledesma, 2013).

The listed questionnaires were translated and linguistically validated by translating them to Croatian and then back to English. Cronbach α coefficients were calculated to assess internal consistency.

Psychological Skills Inventory for Sports PSIS–Youth inventory consists of 5-point Likert type items, which are distributed over 6 scales (Mahoney, Gabriel, & Perkins, 1987). The Croatian Youth Version of the PSIS–Youth is based upon the Dutch

version of the PSIS-R-5, but the formulation of questions is simpler. It contains 44 five-point Likert type items, distributed over the same 6 scales/domains as the PSIS-R-5: Motivation (8 items), Confidence (8 items), Anxiety Control (8 items), Mental Preparation (6 items), Team Emphasis (7 items) and Concentration (7 items). PSIS-Youth was created by the input from leading sports psychologists who answered inventory questions as they thought the "ideal" athlete would. All items showed acceptable internal consistency with Cronbach α ranging from 0.68 for Team Emphasis to 0.81 for Confidence (Sindik, Novokmet, & Havaš-Auguštin, 2013).

Coefficients for the used questionnaires were assessed ranging from the lowest 0.776 (ZKPQ-50-CC Impulsive Sensation Seeking) to 0.928 (CESD) as shown in Table 2. Some scales from PSIS-Youth (Team Emphasis and Concentration) were not used due to their poor internal consistency (possibly because the presumed subscales in the Croatian version of questionnaire were not congruent with the original version factor structure: Cronbach α for Team Emphasis was 0.517 and for Concentration 0.676).

Statistical methods

Data are shown in tables. Smirnov-Kolmogorov test was used to assess normality of data distribution and appropriate parametric tests were used in all statistical procedures. Independent *t*-test was used for the comparison of psychological scores between the players who experienced and those who did not experience injuries. Multivariate binary logistic regression model of injury prediction was made to assess the effect of the selected psychological scores on the likelihood of being injured. All the predictor variables were tested in one block to assess their predictive power, while controlling for the effects of other predictors in the model. Collinearity statistics for all the predictor variables was made and the predictor variables with high correlations with other variables (i.e. those above 0.70) were removed from the model. Cronbach α coefficients were calculated to assess internal consistency of each questionnaire used. All p values below 0.05 were considered significant.

Results

Socio-demographic data of players who experienced injuries are shown in Table 1. Out of 182 players 114 (62.6%) players encountered injuries among whom 35 (30.7%) experienced severe injuries. The total number of 146 injuries was recorded per 114 players indicating injury to player ratio of 1.28. Majority of players sustained injuries to the lower extremities: 101 (69.2%). The upper extremities were injured on 20 (13.7%) occasions, while injuries to the other locations (head, thorax,

Table 1. Socio-demographic characteristics of players who experienced injuries (N=114)

Total number of 114 injured players / 146 injuries		N	%
Assessment of injury severity	Minor injury (1-7 days out of play)	31	27.2%
	Moderate injury (8-28 days out of play)	48	42.1%
	Serious injury (>28 days out of play)	35	30.7%
Injury location	Head	12	8.2%
	Arms	20	13.7%
	Thorax	3	2.0%
	Abdomen	1	0.7%
	Spine	9	6.2%
	Legs	101	69.2%
Education level	Without or only elementary school	2	1.8%
	High school	80	70.2%
	College or university	18	15.8%
	Ph.D.	1	0.9%
	No data	13	11.4%
Marriage	No	94	82.5%
	Yes	19	16.7%
	No data	1	0.9%
Main position in the team	Goalkeeper	8	7.0%
	Defender	44	38.6%
	Midfielder	39	34.2%
	Attacker	17	14.9%
	Left or right wing	6	5.3%
First team member	No	28	24.6%
	Yes	86	75.4%
Dominant leg	Left	19	16.7%
	Right	77	67.5%
	Both	18	15.8%
Age (years): mean±SD		23.6±3.8	
Height (cm): mean±SD		183.5±6.6	
Weight (kg): mean±SD		78.5±7.1	
Duration of professional soccer playing (years): mean±SD		8.0±5.0	
Number of matches in the last 12 months: mean±SD		28.9±14.3	

Note. N=number of observations; Ph.D.=doctorate degree; SD=standard deviation

abdomen and spine) occurred in 17.1% of injury cases.

Average age of injured players was 23.6±3.8 years whose professional soccer playing experience was 8.0±5.0 years and they on average played 28.9±14.3 matches in the last 12 months. Majority of players preferred the right leg (77 or 67.5%) and 86 (75.4%) were members of the starting line-up.

Table 2. Comparison of psychological scores between the players who experienced and did not experience injuries; independent t-test

Scores	Injury	N	Mean	SD	t	p	Cronbach α coefficient*
Impulsive Sensation Seeking	No	68	4.86	2.21	-1.25	0.212	0.776
	Yes	114	5.47	2.65			
CESD	No	68	12.31	17.51	0.50	0.621	0.928
	Yes	114	11.09	10.86			
GAD-7	No	68	4.24	6.14	-0.15	0.882	0.908
	Yes	114	4.38	4.86			
PSIS: Motivation	No	68	36.53	3.21	0.72	0.473	0.841
	Yes	114	36.06	3.56			
PSIS: Confidence	No	68	31.95	6.46	0.67	0.573	0.824
	Yes	114	31.24	5.41			
PSIS: Anxiety Control	No	68	20.17	7.55	0.89	0.377	0.823
	Yes	114	19.16	5.67			
PSIS: Mental Preparation	No	68	18.27	4.91	2.06	0.042	0.814
	Yes	114	16.45	4.82			

Note: N=number of observations; SD=standard deviation; t, p=results of the statistical testing (independent *t*-test); for instruments description (CESD, GAD-7, PSIS) please, see the text.

** Calculated for each scale, PSIS Team Efforts and PSIS Concentration domains were not shown due to the Cronbach α coefficient lower than 0.700.

Table 3. Binary logistic regression model of injury prediction regarding the selected psychological scores

	OR	95% CI		p
		Lower	Upper	
Impulsive Sensation Seeking	1.26	1.02	1.57	0.035
CESD	0.97	0.90	1.05	0.428
GAD-7	1.26	1.01	1.57	0.038
PSIS: Motivation	0.94	0.79	1.11	0.455
PSIS: Confidence	0.97	0.86	1.10	0.681
PSIS: Anxiety Control	1.02	0.92	1.12	0.735
PSIS: Mental Preparation	0.89	0.80	0.99	0.035

Note: OR=odds ratio; CI=confidence interval; for instruments description (CESD, GAD-7, PSIS) please, see the text.

Regarding the positions in the team there were 44 (38.6%) defenders, 39 (34.2%) midfielders, 17 (14.9%) attackers, 8 (7.0%) goalkeepers and 6 (5.3%) left or right wing players. More than 70% of the investigated players finished only high school and 94 (82.5%) were not married.

Differences in GAD-7, CESD scale and impulsive behaviour scores were not significant between the players who sustained injuries and those who did not. The findings regarding depression and anxiety levels, impulsive sensation seeking, motivation and confidence were within the recommended ranges. The significant difference was noted only in Mental Preparation scores: athletes who sustained injuries scored significantly lower on mental preparation (Table 2). The significant positive correlations between the impulsive behaviour and CESD Scale (r=0.446; p=0.009) and GAD-7 (r=0.382; p=0.028) were found only among the players who sustained serious injury. This indicates relevance of impulsive behaviour among professional athletes. Regression model was statistically significant (p=.028), correctly classifying 75% of subjects and predicting 21% of injury rate. Several predictor variables from the binary regression model significantly influenced the likelihood of being injured: the players who had higher Impulsive Sensation Seeking and GAD-7 scores had 1.26 times more chance of being injured (OR: 1.26, 95% CI: 1.02-1.57 and OR: 1.26, 95% CI: 1.01-1.57 respectively). In contrast, adequate mental preparation lowers the chance of being injured for 1.12 times (OR: 0.89, 95% CI: 0.80-0.99).

Discussion and conclusions

Compared to studies describing injuries in professional soccerers, our results indicate that this is indeed a genuine problem. Since most of the soccerers in our study have experienced injury of the lower limbs, it is necessary to further discuss these injuries. Both the epidemiology and method of injury reporting in professional soccer is well documented, although studies examining psychological predictors of the injury occurrence are scarce. In 2001, UEFA initiated a research project aiming to decrease number and severity of injuries in soccer thus improving players' safety (Walden, Hagglund, & Ekstrand, 2005). Following the extensive discussion with UEFA in 1999 and 2000, focusing chiefly on the exact study organization and definitions to

be used, the research project was mainly a result of effort by the UEFA's Medical Committee. The project covered ten seasons of the UEFA league, including players from 25 European soccer clubs from ten countries. The results showed that a professional soccer team could expect on average 50 injuries per season, resulting in loss of playing time. This amounts to approximately 2 injuries per player (Ekstrand & Hilding, 1999). Although half of these injuries are relatively light, meaning that player can continue with normal training and return to games in a week, there is a significant proportion of more serious injuries. Thirty-seven percent of injuries are thus of medium severity, resulting in more than one but less than four weeks of absence, while 16% are serious injuries requiring more than four weeks of absence. With approximately 12% of team absent from the field at any given time, injuries are a major factor affecting team's performance. In this context, it is interesting to notice that, judging from a Swedish study of the first-league soccerers, incidence and severity of injuries remained fairly constant between years of 1980 and 2000 (Hagglund, Walden, & Ekstrand, 2003). A more recent study came to the similar conclusions, i.e. that the risk of injury remained stable over the subsequent seasons (Ekstrand & Torstveit, 2012), although the nature of injuries had somewhat changed with a smaller proportion of sprains in the first-league soccer. Most common injuries in soccer remain to be muscle strains, usually of posterior muscles of the upper-leg (Ekstrand, et al., 2011).

In our research we used four different instruments (questionnaires) which effectively assessed psychological status of professional soccer players. Based on our results it was possible to construct a predictive model during the investigated period.

The first considered scale was the CESD, the scale that assessed the level of depressive symptoms during the past seven days. We did not find any association of this scale with other injury parameters in our study. Leddy, Lambert and Ogles (1994) described the occurrence of depression immediately after the injury, but also during the follow-up period in ten different sports (although the results should be interpreted with caution due to sample size). Appaneal et al. (Appaneal, Levine, Perna, & Roh, 2009) used the CESD scale in monitoring patients with sports injuries. Similar to our results, they did not found statistically significant differences in the level of depressive symptoms between the injured and non-injured respondents. However, using a different scale (SIGH-D), the authors failed to find statistically significant differences among the groups monitored a week, month and three months after the injury. In the context of our results and discussed studies, the conclusion is that scale CESD is not suitable for monitoring the levels of depressive symptoms after sports injury.

GAD-7 scale was used to assess the level of anxiety among the general population. Anxiety measure was included in this study for the reasons that became obvious after reviewing available literature. The existing tools (scales) are well established but relatively large in scope and number of questions so it is ungrateful to use the multifactorial studies where participants must complete several questionnaires. Therefore we decided to use well-documented questionnaire GAD-7 which has only seven questions and is easily applicable in such a research. Contradictory data from other studies were further motivation for testing the impact of this variable on the existence of injury in athletes. We found that athletes had 1.26 times more chance of being injured for each GAD-7 score elevated.

Psychological skills are an important element in every profession as well as in sports. Although, judging by the available literature, these factors are discussed primarily in the context of increasing athletic performance in competitions (Mahoney, 1989), there are also research on their impact on the incidence and severity of injuries. The PSIS scale was the result of efforts to systematize psychological skills specific to sports activities (Chartrand, Jowdy, & Danish, 1992). The scale has been used to study different sports aspects such as national differences or differences by gender (Cox & Liu 1993). Our results indicate a statistically significant difference in one out of four factors of the scale – the mental preparation.

The main emphasis in our study was on impulsive behaviour that, like anxiety, significantly predicted injury occurrence. Also, we have found significant positive correlations between impulsive behaviour and CESD scale that indicates importance of controlling impulsive behaviour.

To our knowledge, this is the first study which attempted to connect occurrence of injuries in sport with psychological characteristics assessed in this way. As applied sport psychology continues to grow, a variety of professionals may attempt to teach athletes certain mental skills; however, there is little research to suggest which skills professionals may be qualified to use with their clients. Some researchers have established models that specify psychological factors that could predict sport injuries. One example is Williams and Andersen's (1998) stress-injury model emphasizing factors such as anxiety, negative life stress and few coping resources. Adequate prevention and training techniques to lower players' impulsivity could be performed to promote adequate mental health after possible injury. Keats, Emery and Finch (2012) showed that despite the minimal application of behavioural theory within the field of sport injury prevention in youth, behavioural science had the potential to make a significant impact on the understanding and prevention of youth sport injury. Appropriate evaluation of adherence and mainte-

nance components based on models of behavioural change should be a critical component of future injury prevention research and practice.

Our study has demonstrated that certain psychological characteristics of professional soccer players are associated with higher probability of the injury occurrence. Although there were no statistically significant differences between soccer players with and without injuries regarding their psychological characteristics (with the exception of mental preparedness), a multivariate regression model showed that impulsiveness and anxiety could lead to increased risk of injury, while mental preparedness lowered this risk.

Although importance of sport psychology has globally been accepted and well documented, its importance in Croatia is still not adequately recognized. An important step to introducing psychology in the professional sport in Croatia is education of athletes and sport officials on importance of psychological preparation and future research in this field should be recommended. With its deep relationship to all levels of training, both mental and physical, psychological preparation might be the proverbial "weakest link", strongly affecting all other elements and influencing final outcome of a game or even season.

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