

A history of injuries and their relationship to psychological variables in tennis players

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ABSTRACT

This study seeks to establish relationships between injuries in tennis players and psychological variables such as stress control, assessment of performance, motivation, mental ability and team cohesion. It specifically aims at finding out whether the seriousness and type of the injuries suffered by tennis players are related to the psychological variables studied. Sixty-three tennis players aged 16-49 participated in the study ($M = 31.62$; $SD = 8.93$). The findings indicate that those tennis players with fewer moderate injuries showed higher levels of motivation. In addition to this, the tennis players with a lower number of muscular injuries manifested greater self-control which is needed in sports performance. When the incidence of a tendinitis was lower, the tennis players were able to assess their performance better, and when the number of fractures was smaller, they showed greater team cohesion.

Key words: Sports injuries, tennis players, psychological variables

Received: 9 May 2009

Accepted: 17 June 2009

INTRODUCTION

An injury can be regarded as a inherent fact in the practice of sport which, in one way or another, affects a great number of sportspeople. On most occasions, perhaps as a result of the increase of sports demands on high level and performance sportspeople (Bahr and Krosshaug, 2005; Ekstrand, Walden and Häglund, 2004), injuries provoke negative and stressful situations.

An injury can be regarded as “a work accident” (Buceta and Bueno, 1995), since getting injured may give rise to really important negative consequences for professional sportsmen in addition to those related to their health itself, such as interrupting their sports career, losing professional status or a loss of income, etc. Furthermore, anyone practising sport, even if they are not considered high performance sportspeople, may also be affected by the negative consequences of an injury.

Research on the correlation between injuries and psychological factors has increased dramatically over the last few years. One of the most remarkable perspectives of this study has been analysing how psychological factors influence the vulnerability of sportspeople in the face of injuries (Udry and Andersen, 2002).

Whereas the first studies centred on searching for a type of personality prone to injuries (Coddington and Troxel, 1980; Valliant, 1981), the

most recent research has focused on the analysis of specific aspects of the sportsperson's psychology and on how they are related to the risk of injury (Ali, Marivain, Hèas and Boulvais, 2007; Díaz, 2001; Díaz, Buceta and Bueno, 2004; Olmedilla, García-Montalvo and Martínez-Sánchez, 2006; Williams and Andersen, 1998; Williams and Roepke, 1993).

The theoretical models proposed for the study of relationships between psychological aspects and injuries emerged in the 1990s. The model of stress and athletic injury by Andersen and Williams (1988), revised one decade later (Williams and Andersen, 1998), incorporated the study of those psychological factors that might make a sportsperson suffer an injury. This model puts forward the hypothesis that, in face of a stressful situation, a sportsperson gives a response, known as a stress response, which is the product of the cognitive assessment he or she makes of the situation, provoking physiological changes, such as increase of muscular tension, and changes in attention, such as inadequate focusing of attention, which increase the probability of getting injured. In addition to this, other components of the model such as personality, the history of the sportsperson's stress and coping resources, measure the type of response and so increase stress or help to control it.

Starting from the proposal of this model, most of the studies have focused on examining the relationship between stress and injuries (Díaz, 2001; Junge, 2000; Udry and Andersen, 2002) on using this as a theoretical basis. A number of personality aspects have been studied (Currens, 2001; Hanson, McCullagh and Tonymon, 1992; Rogers and Landers, 2002; Smith, 2001), such as self-confidence, anxiety or locus of control. Some studies have found a

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positive correlation between self-control and the risk of getting injured (Petrie, 1993; Wittig and Schurr, 1994), whereas others have found a negative relationship, which means that high levels of self-confidence minimize the risk of injuries (Jackson *et al.*, 1978; Valliant, 1981). More recent studies have found that medium and lower levels of self-confidence are related to a higher probability of injuries (Abenza, Olmedilla, Ortega and Esparza, in press).

The relationship between anxiety and injuries has also produced contradictory results. Whereas some studies have not found any relationship whatsoever (Kerr and Minden, 1988; Kerr and Fowler, 1988; Olmedilla *et al.*, 2006), others have positively correlated high rates of anxiety and a higher tendency of getting injured (Lysens, Auweele and Ostyn, 1986; Olmedilla, Andreu, Ortín and Blas, 2009a; Olmedilla, Andreu, Ortín and Blas, 2009b; Pascual and Aragües, 1998; Petrie, 1993).

Research on the correlation between locus of control and injuries has also given unclear findings. Some studies state that sportspeople with an internal locus of control manifest a lower tendency to reporting having suffered from an injury (Labbe, Weish, Coldmith and Hickman, 1991), but others do not find any relationship (Passer and Seese, 1983). The use of instruments not adapted to the field of sports may partly account for these findings, since the research by Dahlhauser and Thomas (1979), on employing a locus of control scale that had been created by themselves, did find a relationship between external locus of control and appearance of injuries. The tendency seems to be that those sportspeople with an internal locus of control may be less vulnerable to injury, as stated in a study by Ortín, Olmedilla, Garcés de los Fayos and Hidalgo (2008). However, it would be desirable to improve the evaluation tools of the locus of control.

In addition to the above, as can be gathered from the model by Andersen and Williams (1988), the cognitive assessment of a given situation made by a sportsperson is a key factor in bringing about physiological and attentional changes. How a sportsperson interprets the assessment of his or her sports performance carried out by other significant people—such as coaches, technicians or fellow athletes, etc—and the way the sportsman interprets his or her own self-assessment are key issues in provoking a stressed response which former studies have related to serious injuries but not to minor or moderate ones (Abenza *et al.*, en prensa; Olmedilla, Ortega and Abenza, 2005; Olmedilla *et al.*, 2006). Another important aspect of the model refers to the sportsperson's attention ability and to the cognitive assessment he or she makes in some stressful situations. These issues may affect some attention processes and bring about responses inappropriate to the original stress and which also increase the risk of injury.

Some studies have found significant relationships between the ability to concentrate and lower risk of injury (Kerr and Minden, 1988) and between better management of attention ability during training and competitions and lower risk of injuries (Olmedilla *et al.*, 2006).

One of the components of the model

(Williams and Andersen, 1998), namely the history of the sportsperson's stress factors, includes, among other aspects, the injuries he or she has suffered from, which turn into a history of injuries and, therefore, into potential stress which might affect psychological variables that could also increase stress rates. This means we are referring to a circle with no solution to its continuation. In other words, a history of injuries characterized by many injuries with some degree of seriousness might negatively affect some psychological aspects such as the ability to control stress, motivation or the management of coping strategies, which might also determine the sportsperson's responses to stress and, therefore, increase the probability of getting injured. All in all, we are in face of a most interesting theoretical framework, which, still needs more empirical research to provide data confirming the bidirectionality between personal variables—such as different aspects of personality, specific stress factors, coping abilities—and the response to stress. In addition to this, as stated by Udry and Andersen (2002), research has found and seems to suggest that some methodological limitations need to be overcome. These limitations have been collected in the works by Williams and Roepke (1993) and by Petrie and Falkestein (1998), who indicate that the sometimes contradictory findings of research are due to some methodological problems such as lack of rigorous design, generic instruments which are not specifically applicable to the sports field, small or overheterogeneous samples, and complexity of the different sports.

This study seeks to overcome some of the limitations which have been observed by previous research and suggested by a number of authors (Díaz *et al.*, 2004; Petrie and Falkstein, 1998; Williams and Roepke, 1993; Weiss, 2003), and extend the empirical research as regards the relationship between one element of the model, the history of stress and some of the most relevant psychological variables in the sports world. It has specifically tried to make the sample homogeneous by choosing one sport, tennis, one gender, male, and one instrument for evaluating psychological variables adapted to the sports field, the CPRD questionnaire—*Cuestionario de Características Psicológicas relacionadas con el Rendimiento Deportivo*—on psychological characteristics related to sports performance.

The aim of this study was to establish the relationship between the injuries of male tennis players and the psychological variables of stress control, influence of performance assessment, motivation, mental ability and team cohesion, and, specifically, to find out whether the seriousness of the injuries were related to the psychological variables under study.

METHOD

Participants

A total number of 63 tennis players aged 16-49 ($M = 31.62$, $SD = 8.93$) participated in the study. Of them, 50.8% were injured at the time of the study, versus 49.2%, who were not injured. All of them belonged to tennis clubs of the Bajo Vinalopó region in the province of Alicante, Spain, and were

registered in intraclub and interclub tournaments. Most of the players were very experienced in terms of practising tennis; 30.16% had played it for over 12 years, 25.40% for between 8 and 12 years, 28.57% for between 4 and 8 years, 12.70% for between 1 and 4 years, and only 3.17% had experience of less than one year. As for how long they used to practise it, most of them, 52.38%, would play between 1 and 3 hours per week, 22.2% for less than one hour, 14.29% between 3 and 5 hours, 7.94% between 5 and 8 hours, and only 3.17% used to play for more than 8 hours a week.

Instruments

Two instruments were used to explore the following variables: a history of the injuries suffered by the tennis players and psychological variables related to sports performance.

-Self report questionnaire for data collection on injuries. In order to assess the histories of injuries of the tennis players, a self report questionnaire was used. It was the same as the one utilised in former studies (Díaz *et al.*, 2004; Olmedilla, Ortega and Abenza, 2007; Ortín, 2009). It registered the number, seriousness, types of injuries suffered from, during the previous sports season—approximately one year—and the sportsman's situation of being injured or non-injured at the time of the study.

In order to assess the seriousness of the injuries, a functional criterion was used (Díaz *et al.*, 2004; Olmedilla *et al.*, 2006; Pascual and Aragües, 1998; Van Mechelen *et al.*, 1996) which differentiated among mild injuries, which interrupt training for at least one day and require treatment; moderate injuries, which oblige the tennis player to interrupt his training and competitions for at least one week; serious injuries, which imply one or two months of not playing at all, sometimes hospitalization and even surgical operation, and very serious injuries, which bring about a permanent drop in the player's performance, needing constant rehabilitation to avoid a worsening of the condition.

In order to assess the type of injury, the lesions were classified into muscular injuries, fractures, tendinitis, bruises, sprains and others.

-The CPRD questionnaire: A questionnaire of psychological characteristics related to sports performance—“Cuestionario de Características Psicológicas relacionadas con el Rendimiento Deportivo” (Gimeno, Buceta and Pérez-Llantada, 1999). The CPRD questionnaire is one adapted from the PSIS (*Psychological Skills Inventory for Sport*) by Mahoney (1989). The Spanish version (Gimeno *et al.*, 1999) consists of 55 reagents in a five choice Likert-type scale; 1 meaning 'in complete disagreement' and 5 'in complete agreement', with saturation higher than 0.30, with a Chronbach's alpha coefficient of 0.85 and it accounts for a variance of 63%. To be specific, the CPRD questionnaire assesses five psychological variables:

1. Stress control (SC). This factor, consisting of 20 reagents, refers to potentially stressful situations during which control is necessary, and to the sportsman's responses in relation to training and competition demands. A high rate indicates that the sportsman has psychological resources to control the stress related to the practice of his

sport.

2. Index of performance assessment (IPA). This factor, consisting of 12 reagents, refers to the characteristics of the sportsman's responses in face of situations during which either he assesses his own performance or he thinks how other people significant to him are assessing him. Furthermore, it includes the evaluation of previous assessments which may give rise to an appraisal of his sports performance. A high score indicates that the sportsman shows high control of the impact from a negative assessment of his performance.
3. Motivation (MO). This factor, consisting of 8 reagents, refers to the sportsman's motivation and interest in all that is related to the practice of his sport, such as training, competitions and the effort to better himself day by day. A high score indicates that he shows a high level of motivation to practise his sport.
4. Mental ability (MA). This factor, which consists of 9 reagents, includes psychological abilities that may favour sports performance. A high rate indicates that the sportsman has abilities or psychological strategies that help his performance.
5. Team cohesion (TC). This factor, which consists of 6 reagents, refers to the sportsman's integration into his team or sports group. A high rate indicates that the sportsman shows adequate integration. This has less importance in the tennis player's sports activity, since the competitions are usually individual. However, it has been included in the study due to its potential importance in relation to those players with whom he shares activity (in training with other players of the same club and in tournaments with his partner when playing doubles).

Procedure

This is a descriptive correlational study with a cross-sectional research design in which all the variables were assessed at the same time (Hernández, Fernández and Baptista, 2003). At first, the tennis club managers were contacted by phone in order to ask for their permission and support in the data collection process. They were briefly informed about the objectives of the study. Appointments in the tennis club facilities were arranged in order to inform them personally about any information they might be interested in and in order to establish first contact with the tennis players. After having arranged appointments with the tennis players in the facilities of their own clubs, the objective of the research was briefly explained to them and, then, the dynamics of the questionnaires to fill in. Under the supervision of an expert in sports psychology, a graduate in Science of Physical Activities and Sport directed the data collection sessions, explained how to complete each questionnaire and solved any doubts that arose individually. It took the players about 60 minutes to fill in the two questionnaires. All the participants showed the voluntary nature of their collaboration by signing their consent before beginning.

Statistical analysis

This study has made use of a correlational methodology. The statistical techniques applied have been Pearson’s correlation analysis and Student’s “t” statistic for measures coming from independent samples. The analyses have been carried out with the SPSS 15.0 program for Windows.

FINDINGS

Table 1 shows the distribution of the sample in relation to injuries; to be specific, about whether the tennis player is currently injured or not and, if so, about the seriousness of his injury and the history of the injuries suffered while playing tennis. Almost half of the sample population was not injured at the time of the study and almost a third (30.2%) had never been injured. It is important to point out that over 20% were suffering from a moderate or serious injury.

| Current injury | Frequency | | No. of injuries received | | Frequency | |
|-----------------|-----------|------|--------------------------|----|-----------|---|
| | Frequency | % | Frequency | % | Frequency | % |
| Non injured | 31 | 49,2 | None | 19 | 30,2 | |
| Mild injury | 19 | 30,2 | One | 25 | 39,7 | |
| Moderate injury | 11 | 17,5 | Two | 10 | 15,9 | |
| Serious injury | 2 | 3,2 | Three | 8 | 12,7 | |
| | | | Four | 1 | 1,6 | |
| Total | 63 | 100 | Total | 63 | 100 | |

Table 1. Current situation of the tennis player as to whether or not he is injured and number of injuries suffered throughout his practice of tennis

Table 2 shows the frequency and percentages of the types of injury suffered by the tennis players. It is worth pointing out that the great majority of the injuries are muscular and tendinitis (81.94%), that there is only one fracture (1.39%) and not one contusion.

| Type of injury | Frequency | Percentage |
|----------------|-----------|------------|
| Muscular | 33 | 45,83 |
| Tendinitis | 26 | 36,11 |
| Sprains | 8 | 11,11 |
| Fractures | 1 | 1,39 |
| Bruises | 0 | 0 |
| Other | 4 | 5,56 |
| Total | 72 | 100,00 |

Table 2. Frequency and percentage of the types of injury suffered from by the tennis players

As can be seen in Table 3, significant relationships have only been found between moderate injuries and the motivation factor when analyzing the seriousness of the injuries. A negative correlation ($r = -0.348$; $\alpha \leq 0.01$) can be seen, that is to say, the lower the number of moderate injuries the higher the score in the motivation factor.

When analyzing the correlation between the type of injury and the psychological variables,

| Injuries | | SC | IPA | MO | MA | TC |
|-------------------|--------------------------|----------|---------|-----------|-------|-------|
| Moderate injuries | Pearson's correlation | -.009 | ,067 | -.348(**) | ,176 | ,086 |
| | Significance (bilateral) | ,942 | ,600 | ,005 | ,168 | ,503 |
| | N | 63 | 63 | 63 | 63 | 63 |
| Muscular injuries | Pearson's correlation | -.271(*) | -.129 | -.033 | -.066 | -.202 |
| | Significance (bilateral) | ,031 | ,313 | ,798 | ,608 | ,112 |
| | N | 63 | 63 | 63 | 63 | 63 |
| Tendinitis | Pearson's correlation | ,223 | ,292(*) | ,067 | ,227 | -.035 |
| | Significance (bilateral) | ,080 | ,020 | ,604 | ,074 | ,784 |
| | N | 63 | 63 | 63 | 63 | 63 |

Table 3. Correlations between CPRD factors and sports injuries

** The correlation is significant at 0,01 level (bilateral)

* The correlation is significant at 0,05 level (bilateral).

a Cannot be calculated as at least one constant is variable

significantly statistical relationships are found between muscular injuries, tendinitis and the psychological variables. To be specific, a negative correlation can be seen between muscular injuries and stress control ($r = -0.271$; $\alpha \leq 0.05$), that is to say, when the incidence of muscular injuries is lower, the sportsman’s stress control is higher. In the same way, a negative relationship is to be seen between tendinitis and the influence of performance assessment ($r = -0.292$; $\alpha \leq 0.05$). In other words, when the incidence of tendinitis is lower, the sportsman has a higher score in this factor.

DISCUSSION

The aim of this study was to find out the relationship between the injuries of tennis players and some psychological variables—stress control, influence of the assessment of performance, motivation, mental abilities and team cohesion. To be specific, the objective was to analyse whether the seriousness and type of injuries were related to the psychological variables under study.

When analysing the seriousness of the injuries, the findings indicate that significant relationships have only been found between moderate injuries and motivation, in the sense that the tennis players with a higher number of moderate injuries showed a lower score in the motivation factor. That is to say, a history of moderate injuries might be affecting the tennis players’ motivation and interest in training and competitions. Other studies, though, have not found relationships between the seriousness of the injuries and the psychological variables studied in those cases when the lesions were mild or moderate (Abenza, Olmedilla, Ortega and Esparza, 2008; Abenza *et al.*, in press; Olmedilla *et al.*, 2006).

It is interesting to verify, that in these studies, the sample was made up of football players, who are team sportspeople, whereas this study has focused on tennis players. In this respect, the low sample population may be preventing a better statistical analysis, since the number of serious or very serious injuries is low. However, the specificity of the sport may bias these findings. Therefore, a moderate injury might not be really important for a football player, since he can recover within a week

and miss, at most, one match, but it could be significant for a tennis player, who might miss a number of competitions within a week. In this sense, it would be most interesting to study the impact of the seriousness of the injuries on the psychological variables of the sportsperson by comparing team players and individual players and, even within individual sportspeople to see if this relationship behaves in the same way or is different for each kind of sport.

In addition to this, the instrument used in the evaluation of the psychological characteristics is also likely to be affecting the findings. The research carried out with football players applied the *CPRD* version for football players; however, this study has used the general version of the *CPRD* by Gimeno *et al* (1999). This fact might indicate that the assessment of psychological variables should be carried out bearing in mind the type of sport practised, which would increase the reliability of the instrument.

In any case, after having analysed the findings of this study and those of the research by Abenza *et al* (2008), it can be stated that a history of moderate lesions might negatively affect a tennis player's motivation to practise his sport, whereas a history of serious or very serious injuries might affect a football player by increasing his anxiety level, by diminishing his self-confidence and by causing a worse handling of situations generated by the assessment of his sports performance.

When the relationship between the type of injury and the psychological variables is analysed, the findings indicate that psychological variables show statistically significant relationships with muscular injuries and tendinitis. Specifically, the results show that when tennis players have more muscular injuries, their ability to control sports stress is lower. Furthermore, when tennis players suffer from a greater incidence of tendinitis, they show worse management of the pressure brought about by the assessment of their performance. No significant relationships have been found with the rest of types of injuries, maybe because there were very few cases of them.

Thus, the history of injuries, when muscular, tendinitis or moderate, seem to affect some psychological variables of tennis players, such as stress control, managing the pressure of having their performance assessed and motivation. In this sense and in the line of what Williams and Andersen (1998) suggested in their revised model of stress and injuries, in which the personal variables (personality, history of stress factors and coping resources), show a bidirectional relationship, injuries can be said to bring about really stressful factors negatively affecting some psychological variables, such as motivation and coping resources such as stress control and worse handling of assessment. This relationship might increase stressed responses in tennis players and increase the probability of suffering an injury.

In the line with other studies carried out with football players (Abenza *et al.*, 2008), the data found permit the consideration of the sense of reciprocity between the different elements in Andersen's and Williams's (1988) stress and injury model. If an important history of stress and few or

inadequate coping resources bring about stressed responses, increasing the sportsman's vulnerability to the injury, the injuries suffered, when they are moderate affect the whole process as true stress factors. The relationship between psychological factors and vulnerability to injury is complemented by the correlation between the history of injuries and psychological factors. The scientific literature shows empirical evidence of this as regards the first level of relationship, but very little as regards the second.

The study of the history of injuries is limited to analysing their relationship to the possibility of getting injured again. In this sense, in a study with young football players, Kucera, Marshall, Kirkendall, Marchak and Garrett (2005) indicate that the previous history of injuries is a relevant factor in the possibility of getting a new injury. Those football players who had already been injured were 2.6 times more likely to get injured than the ones without a previous history of injury. However, in general terms, the studies have centred on the relationship between psychological factors and vulnerability to injury. Most of them have used cross and correlation methodological approaches, so although the cause and effect relationship cannot be established, it can however, be observed that some psychological variables are related to the number of injuries received, to their seriousness and, to a lesser extent, to the type of injury.

All in all, the findings of this research provide some new and interesting data. First of all, they confirm some of the premises of the Williams and Andersen (1998) stress and injury model, since the history of the injuries is related to psychological variables, to be precise, to the tennis players' motivation and coping abilities, such as their capacity to control stress and their adequate handling of the assessment of their performance. In one way or another, these findings can help to better understand the reciprocal relationship between stress-injuries-stress. On the other hand, the greater number of injuries dealt with in this study have been muscular and tendinitis, with only one fracture, as opposed to that of Pluim, Staal and Windler (2006) who found in their research that most of the tennis players' injuries came from stress fractures or were tendinitis, although the authors themselves mention the great variability in the of the type of injuries in tennis.

Limitations of the study and suggestions for future research

Even though we think that it could be important to continue this line of research, we are aware of some of the limitations of this study:

1. The size of the sample is small. This makes the number of injuries taken into consideration for our study to be small too, which may have affected the statistical analyses carried out, meaning that some associations have not been detected, as well as in the differences of the means of response. It is worth noting that in other sports, such as football, injuries have actually shown relationships to psychological variables, when they have been serious and very serious (Abenza *et al.*, in press), and we believe that the same thing would happen if the size of the tennis player sample were increased, but this

- is still a task to be carried out.
2. It would be interesting to carry out a longitudinal study about the effect of the history of injuries on some psychological variables, and about the effect of such variables on the sportsperson's responses to stress and on the number, type and seriousness of the injuries received. In this sense, in the line of what some authors (Petrie and Falkstein, 1998) suggest, it would be useful to make the sample population more homogeneous. Although this has partly been achieved by this work, the fact is that the range of SD in the age of the tennis players should be reduced, as it is excessively wide in this study, and above all players should be analysed at the same competition level.
 3. The influence of some socio-demographic variables likely to be relevant, such as educational level, occupation or marital status, should be examined in further studies. If the use of instruments as *CPRD-f* is advisable for assessing psychological variables in football, applying instruments specifically adapted to tennis might be recommendable too. Besides, it would be great help to count on other types of instruments to register injuries, such as register forms completed by physiotherapists and by other sport professionals, and not only on the information provided by the tennis players' self reports.
 4. Finally, it would be interesting to engage in multivariate design research which can study the mediation of some personality factors such as self esteem or extroversion versus introversion, etc.

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