

Psychological vulnerability to injury. Profiles depending on sporting modality

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Summary

In the competitive sports field is necessary to create a profile of "risk to the injury" useful and effective that allows to elaborate specific intervention programs. The purpose of this study was to relate the number of sports injuries (severity of injury) to the different degrees of vulnerability to injury of athletes (high, medium and low vulnerability), based on the sports modality under the differentiation between opposition or individual sport (federated athletes of athletics, swimming and tennis) and contact sport with opposition and cooperation or collective sport (federated athletes of football, basketball and handball). Total sample of this study was 452 individual and collective athletes (284 men and 168 women). For the evaluation of the psychological variables, Resistant Personality Scale, the SCAT and Competitiveness Scale-10 was used. A cluster analysis was carried out and 3 profiles of vulnerability to injury were obtained, establishing a high vulnerability profile that confirmed the hypothesis (increases the vulnerability to injury to a less resistant personality and motivation oriented to success and greater competitive anxiety and oriented motivation to avoid failure).

Key words:
Athletes. Hardiness.
Competitiveness.
Competitive anxiety.

Among the main conclusions is that being an individual or collective athlete influences the relationship between any profile of vulnerability and the number of minor injuries, the number of minor injuries being higher in collective athletes. On the other hand, athletes, in both modalities, who are in a medium vulnerability, have a greater number of mild and moderate injuries, and athletes who are in a high vulnerability have a greater number of serious injuries and very serious.

Vulnerabilidad psicológica a la lesión. Perfiles según la modalidad deportiva

Resumen

En el ámbito deportivo competitivo se hace necesaria la creación de un perfil de "riesgo a la lesión" útil y eficaz que permita elaborar programas específicos de intervención. En este estudio se planteó como objetivo relacionar el número de lesiones deportivas (gravedad de lesión) con los diferentes grados de vulnerabilidad a la lesión de los deportistas (vulnerabilidad alta, media y baja), atendiendo a la modalidad deportiva bajo la diferenciación entre deporte de oposición o individual (deportistas federados de atletismo, natación y tenis) y deporte de oposición-cooperación de contacto o deporte colectivo (deportistas federados de fútbol, baloncesto y balonmano).

La muestra total del estudio fue de 452 deportistas individuales y colectivos (284 hombres y 168 mujeres). Para la evaluación de las variables psicológicas se utilizó la Escala de Personalidad Resistente, el SCAT y la Escala de Competitividad-10. Se realizó un análisis de conglomerados y se obtuvieron 3 perfiles de vulnerabilidad a la lesión, estableciéndose un perfil de vulnerabilidad alta que confirmaba la hipótesis (aumenta la vulnerabilidad a la lesión a menor personalidad resistente y motivación orientada al éxito y a mayor ansiedad competitiva y motivación orientada a evitar el fracaso).

Entre las principales conclusiones se destaca que ser deportista individual o colectivo influye en la relación entre cualquier perfil de vulnerabilidad y el número de lesiones leves, siendo el número de lesiones leves superior en deportistas colectivos. Por otro lado, puede que los deportistas, en ambas modalidades, que se sitúen en una vulnerabilidad media, posean mayor número de lesiones leves y moderadas, y que los deportistas que se sitúen en una vulnerabilidad alta posean un mayor número de lesiones graves y muy graves.

Palabras clave:

Deportistas. Personalidad resistente.
Competitividad. Ansiedad competitiva.

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Introduction

It can be claimed that injury is one of the most important obstacles to the successful performance of an athlete. Perhaps the most frequent and important risk within competition sport, given the physical and psychosocial repercussions, is suffering from an injury. On many occasions the huge demand for effort and the high level of exigence - characteristic of all sporting activity - sometimes result, perhaps in excess, in multiple traumas and injuries that force the athlete to suspend or reorganise his/her activities. In turn, if we take into account the results provided by Antonelli and Salvini¹ from their comparison between the different specialities, upon discovering that there are significant differences between athletes depending on the speed or resistance tests, if the characteristics of the tests are extrapolated to other sports, it could be said that there may be a specific vulnerability profile depending on the speciality.

Analyses performed for a study in 2018 by Reigal, Delgado, Raimundi and Mendo², revealed that the group of triathletes studied achieved higher scores than the athletes in the negative and positive coping test, attention test, motivational level and attitude test. They also displayed higher scores than footballers in the negative and positive coping test. In terms of the group of golfers, they scored more in all the IPED (Psychological Inventory of Sports Performance), and less in motivational levels. In general, higher scores were shown among triathletes than in the other sports analysed.

As systematised by Antonelli and Salvini¹, there are psychological differences for different disciplines, among which are the skiers (three types are identified: speed, cross-country and jumps). Likewise, there are also different profiles that can leave the athlete more vulnerable to injury, for example, in the study by Coulter, Mallet and Gucciardi³ on American footballers, the results revealed that athletes with less mental strength and with a tendency for risk-taking, were more likely to play with minor injuries that could later become more serious.

On the other hand, the study on resistant personality is interesting, as indicated by Jones⁴, as one of the least-used and applied terms in Sports Psychology. This study follows the approach of resistant personality according to Kobasa⁵ within existing theory, defining it as a construction of 3 factors (control, commitment and challenge): "a person's basic stance towards his or her place in the world that simultaneously expresses commitment, control and readiness to respond to challenge".

In terms of the study of competitive anxiety, the hypothesis that different researchers have in general adopted, is that athletes with high levels of competitive anxiety will have a higher probability of becoming injured in stressful situations⁶⁻¹⁰. On the other hand, the relationship between sporting injuries and competitiveness and motivation for achievement in sport has also been studied^{11,12}.

The starting point is the hypothesis that the sporting modality causes differences in personality traits. However, does practising a certain sport require the athlete to have specific personality characteristics, or at least one factor of predisposition? Moreover, how does one become less vulnerable to injury in certain sports? Within the competitive sporting

field it is necessary to create a useful and effective "injury risk" profile that enables specific injury prevention programmes to be developed. In this study the idea was to explore samples of different sporting modalities within the competitive sphere, using different assessment instruments that included scales focused on different aspects of personality. The objective proposed was to relate the number of sporting injuries (seriousness of injury) with the different degrees of vulnerability to injury of the athletes (high, medium and low vulnerability), adhering to the following criteria: team sport, individual sport. According to the International Bibliography, the hypothesis proposed was that the subjects with the following vulnerability to injury would acquire more injuries (high vulnerability): low resistant personality, high competitive anxiety, low motivation geared towards success and high motivation aimed at avoiding failure.

Material and method

Design

Following Ato, López and Benavente¹³ the strategy used in this study is associative, comparative and cross-cutting. The design used in the research study was cross-cutting, descriptive, correlative and not randomised. The dependent and independent study variables were: a) Frequency or number of injuries depending on the seriousness of the injury (mild, moderate, serious and very serious), b) Sporting modality (individual and team sport) and c) Degree of psychological vulnerability to injury (high, medium and low).

Sample

The total study sample included 452 subjects (46 uninjured), 284 males (39 uninjured) and 168 females (7 uninjured). The average age of the males was 21.77 years (DT=4.81) and the average age of the females was 20.55 years (DT=4.39). The study comprised opposition sport athletes [federated athletics athletes (76), swimming (87) and tennis (91)], 143 males (125 injured) and 111 females (90 injured), and contact opposition-cooperation sport athletes [federated football athletes (92), basketball (43) and handball (63)], 141 males (137 injured) and 57 females (54 injured). Table 1 displays the distribution between injured and uninjured players, depending on the vulnerability profile, the type of sporting modality and sex.

Instruments

To assess resistant personality, an adaptation of the Resistant Personality Scale (RPS) by Jaenes, Godoy and Román¹⁴ was used. The RPS is an instrument comprising 30 items: 10 for each of the dimensions that make up the structure of the resistant personality (commitment, control and challenge), for which the responses are presented in a graduated way in Likert type format. It is based on the Spanish version of the *Personal Views Survey* (PVS, Hardiness Institute). Moreover, the RPS was adapted in terms of content to the sporting context, changing the vocabulary and

Table 1. Recount of injured and uninjured athletes by vulnerability profile and depending on the type of sporting modality and sex.

	Individual sport				Team sport			
	Uninjured		Injured		Uninjured		Injured	
	Male	Female	Male	Female	Male	Female	Male	Female
Low vulnerability	15	16	51	43	0	1	22	8
Medium vulnerability	1	3	45	20	2	2	99	42
High vulnerability	2	2	29	27	2	0	16	4

the statements of the items to reflect a content linked to the sporting sphere. Specifically, a factorial analysis was performed from which the following sub-scales were established: control (items 4, 16, 24 and 5), commitment (20, 17 and 10), challenge (9 and 11). A Cronbach alpha coefficient was obtained for the RPS scale of 0.58.

The *Sport Competition Anxiety Test (SCAT)* by Martens¹⁵ was used to assess competitive anxiety. The SCAT is an adding instrument that is useful for assessing the trait of competitive anxiety, characteristic of athletes, and different to a general anxiety trait. Specifically, it assesses the athlete's tendency to perceive the stressful situation of sporting competition as a threat and to react with anxiety. It comprises 15 items on a Likert type scale, with three response options (never, sometimes, almost always). In this research study, a high Cronbach coefficient of 0.73 was obtained.

To assess competitiveness, the Remor Competitiveness-10 Scale was used¹⁶. This self-report questionnaire comprises 10 questions about the respondent's motivation linked to sporting competitiveness, designed to assess motivation to succeed, motivation to avoid failure, and competitiveness in adult individuals that partake in sporting activity. The response format used is the Likert type (1 = Almost Never, 2=Sometimes, 3=Often). Due to reliability problems, items 1 and 10 were removed so that two sub-scales were established: success motivation scale (items 2, 3, 5 and 8), and the motivation scale for avoiding failure (4, 6, 7 and 9). A Cronbach alpha of 0.54 and 0.53 was obtained respectively

To assess sporting injury (history of injuries, frequency and seriousness), a self-report Questionnaire was used *ad hoc* for the study, incorporating suggestions from other authors^{17,18}.

Procedure

Training sessions were attended and before starting the questionnaire administration process the athletes were asked to give their consent, informing them of the confidentiality and anonymous nature of the data, and requesting them to sign the informed content document. The surveys were given out in accordance with the Helsinki Declaration (2013 revision), via informed consent.

To establish the levels of low and high resistant personality, competitive anxiety and motivation geared towards success and motivation aimed at avoiding failure, a frequency analysis was applied, in which subjects with higher levels were defined as high, whilst those with

lower levels were defined as low. The combination of the 4 variables, each of which possess 2 categories (low and high), led to the defining of 16 profiles. Later, an analysis of conglomerates was performed for the 16 profiles, obtaining 4 blocks (of which one block was ruled out for only comprising one subject), finally obtaining 3 blocks or degrees of vulnerability to injury:

- Low vulnerability (more resistant personality, high competitive anxiety, lower motivation geared towards success and greater motivation aimed at avoiding failure). The subjects with this profile should have more mental strength and more tools to face risk situations, but they could acquire injuries as they could also generate unsuitable behaviour.
- Medium vulnerability (less resistant personality, greater competitive anxiety, greater motivation geared towards success and lower motivation aimed at avoiding failure). The subjects with this profile should generate suitable behaviour, but they could acquire injuries given that their motivation geared towards success generates more risky situations.
- High vulnerability (less resistant personality, greater competitive anxiety, lower motivation geared towards success and greater motivation aimed at avoiding failure). The subjects with this profile should generate unsuitable behaviour, will probably have more injuries because being in a state of concern produces more tension and stress, thus increasing the number of injuries.

Statistical analysis

A descriptive study was carried out of the different study variables. To perform the statistical calculations the IBM SPSS Statistics version 23.0 package was used. To assess the standard nature of the scale variables, the Chi-square test was used, as well as the Kolmogorov-Smirnov statistics test for the categorical variables. In order to compare the number of injuries among athletes that fulfilled the psychological vulnerability to injury profile with those that did not, the Student t test was used for independent samples. Next, in order to verify that the sporting modality variable influenced the relationship between the "number of injuries and vulnerability" variables, an analysis of variance was applied of the two factors (2x3), using the Bonferroni test to analyse the comparisons *post-hoc*. In all cases, a significance level of $p < 0.005$ was used.

Results

After applying the statistical Chi-square test to determine the normality of the categorical variabilities, the distribution of the data is considered normal ($p>0.05$), therefore, the tests performed with these variables are parametric. In turn, to assess the normality of the scale variables, and after applying the Kolmogorov-Smirnov statistical test for a sample, normality was also determined ($p<0.05$).

Table 2 displays the number of injuries by seriousness and vulnerability to injury, differentiated by sporting modality.

Upon analysing the values obtained in the "number of mild injuries" variable, the effect of the interaction of the sporting modality factor by Type of Vulnerability (2x3) can be seen as statistically significant ($F_{2,446}=6.125, p=0.002$). Therefore, it can be indicated that being an individual or team sport influences the relationship between the vulnerability profile and the number of mild injuries. Specifically, for athletes that practice team sports there are statistically significant differences in the number of mild injuries depending on the vulnerability group ($F_{2,446}=5.754, p=0.003$), with differences apparent between the high vulnerability group and the medium vulnerability group ($p=0.003$) and between the high vulnerability group and the low vulnerability group ($p=0.012$). On the contrary, for individual athletes no statistically significant differences can be seen in the number of mild injuries by vulnerability group ($F_{2,446}=1.650, p=0.193$). In any case, the average number of mild injuries is higher in team sports than in individual sports, regardless of the type of vulnerability, with statistically significant differences appearing in high vulnerability ($F_{1,446}=29.983, p=0.000$), in medium vulnerability ($F_{1,446}=5.911, p=0.015$) and in low vulnerability ($F_{1,446}=7.769, p=0.006$).

Moreover, upon analysing the values obtained in the number of moderate injuries variable, the effect of the interaction of the sporting modality factor by Type of Vulnerability (2x3) was not considered to be statistically significant ($F_{2,446}=1.289, p=0.276$). Therefore, it can be indicated that being an individual or team sport does not influence the relationship between the vulnerability profile and the number of moderate injuries. Specifically, for athletes that practice individual sports there

are differences tending towards significant in the number of moderate injuries depending on the vulnerability group ($F_{2,446}=2.861, p=0.058$), with differences appearing between the high vulnerability group and the low vulnerability group ($p=0.054$). On the contrary, for team sport athletes no statistically significant differences can be seen in the number of moderate injuries by vulnerability group ($F_{2,446}=0.965, p=0.382$). In any case, the average number of moderate injuries is higher in team sports than in individual sports, regardless of the type of vulnerability, with statistically significant differences appearing in high vulnerability ($F_{1,446}=19.436, p=0.000$), in medium vulnerability ($F_{1,446}=69.521, p=0.000$) and in low vulnerability ($F_{1,446}=60.143, p=0.000$).

Moreover, upon analysing the values obtained in the number of serious injuries variable, the effect of the interaction of the sporting modality factor by Type of Vulnerability (2x3) was not considered to be statistically significant ($F_{2,446}=0.673, p=0.511$). Therefore, it can be indicated that being an individual or team sport does not influence the relationship between the vulnerability profile and the number of serious injuries. Specifically, for athletes that practice individual sports there are statistically significant differences in the number of serious injuries depending on the vulnerability group ($F_{2,446}=10.575, p=0.000$), with differences appearing between the high vulnerability group and the low vulnerability group ($p=0.000$). On the contrary, for team sport athletes no statistically significant differences can be seen in the number of serious injuries by vulnerability group ($F_{2,446}=0.938, p=0.392$). In any case, the average number of serious injuries is higher in team sports than in individual sports (apart from high vulnerability, for which individual sports reveals a higher average) regardless of the vulnerability type, with no statistically significant differences apparent or tendencies towards significance.

With regards to the values obtained in the number of very serious injuries variable, the effect of the interaction of the sporting modality factor by Type of Vulnerability (2x3) was not considered to be statistically significant ($F_{2,446}=0.649, p=0.523$). Therefore, it can be indicated that being an individual or team sport does not influence the relationship between the vulnerability profile and the number of very serious injuries. Specifically, for athletes that practice individual sports there

Table 2. Relationship between frequency and seriousness of injury and the vulnerability profile depending on sporting modality.

No. injuries	Individual			Team		
	Low V. (n=88)	Medium V. (n=147)	High V. (n=49)	Low V. (n=68)	Medium V. (n=67)	High V. (n=33)
Mild	0.98 ± 1.31	1.53 ± 1.48	0.98 ± 1.21	2.19 ± 1.72	2.31 ± 2.61	3.95 ± 5.31
Moderate	0.50 ± 0.78	0.62 ± 0.92	1.03 ± 1.11	2.70 ± 1.34	2.35 ± 1.69	2.59 ± 3.21
Serious	0.24 ± 0.65	0.52 ± 0.81	0.81 ± 0.87	0.45 ± 0.62	0.64 ± 0.83	0.72 ± 1.16
Very serious	0.04 ± 0.30	0.05 ± 0.23	0.26 ± 0.48	0.09 ± 0.30	0.14 ± 0.45	0.22 ± 0.42
Total	1.77 ± 1.67	2.73 ± 1.69	3.10 ± 1.70	5.45 ± 2.09	5.44 ± 3.88	7.50 ± 9.00
Injury rate	0.54 ± 0.53	0.61 ± 0.38	0.87 ± 0.46	1.68 ± 0.96	1.60 ± 1.19	1.77 ± 1.83

are statistically significant differences in the number of very serious injuries depending on the vulnerability group ($F_{2,446}=7.208, p=0.001$), with differences apparent between the high vulnerability group and the low vulnerability group ($p=0.001$) and between the high vulnerability group and the medium vulnerability group ($p=0.007$). On the contrary, for team sport athletes no statistically significant differences were seen in the number of very serious injuries by vulnerability group ($F_{2,446}=0.748, p=0.474$).

The average number of very serious injuries is higher in team sports than in individual sports (apart from high vulnerability, for which individual sports reveals a higher average) regardless of the vulnerability type, with no statistically significant differences apparent or tendencies towards significance.

In summary, the average number of mild, moderate, serious and very serious injuries is higher among team athletes than among individual athletes, but being an individual or team athlete does not influence the relationship between the vulnerability profile and number of moderate, serious and very serious injuries. On the other hand, being an individual or team sport does influence the relationship between any vulnerability profile and the number of mild injuries. In team sports differences can be seen between the high and medium vulnerability groups and between the high vulnerability and low vulnerability groups for mild injuries. In turn, among individual athletes differences can be seen between the high and low vulnerability groups for moderate, serious and very serious injuries, and between the high and medium vulnerability groups for very serious injuries.

Discussion

Junge¹⁹ indicates the existence of an "injury prone" personality profile, though he acknowledges that there are subjects with a greater tendency to take high-risk decisions. In turn, Thomson and Morris²⁰ indicate that athletes that outwardly display a high degree of anger, increase their risk of acquiring an injury, opposed to those that direct their anger inwardly. On the other hand, according to the Global Psychological Model of Sporting Injuries (GPMSI) by Olmedilla and Garcia-Mas (2009, quoted in Garcia-Mas, Pujals, Fuster-Parra, Nuñez and Rubio, 2014²¹) the consequent variables of a sporting injury are: the use of confrontation strategies, the causal attributions of the injury for the athlete, the perception of risky behaviour and the tendency to carry it out.

For this study it was considered necessary to create a useful and effective "risk of injury" profile, so as to design specific intervention programmes and to give the athlete an idea of his/her psychological vulnerability to injury profile. The results show that the vulnerability profile proposed in this study (subjects with low resistant personality and motivation geared towards success, high competitive anxiety and motivation aimed at avoiding failure would acquire more injuries), apart from team athletes with vulnerability to serious injury profiles, it appears that no case has been confirmed regardless of the nature of the injury.

According to the results of this study, being an individual athlete (opposition sports) or a team athlete (opposition-cooperation contact

sports) does influence the relationship between any vulnerability profile, high (0.98/3.95), medium (1.53/2.31) and low (0.98/2.19) vulnerability and the number of mild injuries, with team sports being more vulnerable to suffering from mild injuries, aligned with some research studies that indicate that team sports - particularly in which there is contact - entails a higher risk of injury^{22,23}. On the other hand, it could be that team athletes are more prone to suffering from mild injuries, regardless of their vulnerability profile (high, medium or low).

In a study that analysed the role of personality on injuries among elite athletes using the 16PF-5 and an injury register, the results indicated significant correlations between the number of injuries and the Tension and Boldness scales²⁴. Moreover, in the study by Berengüí, López, Garcés de los Fayos and Almarcha²⁵, the personalities of 48 athletes from Olympic wrestling, Canoeing and Taekwondo were measured, using the EPQ-R, the Revised Eysenck and Eysenck Personality Questionnaire. This instrument is based on the Eysenck theory, and identifies three fundamental dimensions of personality: Extraversion, Neuroticism (emotionality), and Psychoticism (tough-mindedness). The verification is interesting of how the Neuroticism dimension correlated to the number of injuries acquired, with the individuals scoring the highest in this dimension described as anxious, very emotive, unstable and insecure²⁴. Along the same lines, Appaneal and Perna²⁶ indicate that athletes with a pessimistic profile, and athletes with a high degree of daily stress experience more illness/injury symptoms than those with a low score. A fair explanation could be that athletes that have specific traits could be more prone to become injured²⁴ given that in Table 2 team athletes were more prone to suffering mild injuries regardless of their vulnerability profile (high, medium or low).

Finally, it is worth highlighting the influence of other variables that could modify the seriousness of the injury, the typology of the injury, the time within the season, sex, age, the phase of the season or the different competitive levels²⁷. In the study about profiles of vulnerability to sporting injury, the seriousness of it could be key to determining a low or high risk of suffering from some kind of sporting injury in a specific sport, in a study about resilience levels based on sporting modality, it was clearly revealed that resilience capacity depends on individual factors²⁸. More research is required in this line of study: discovering the aspects that make a player more vulnerable is vital, and not just for the health of the player, as it could also lead to a significant breakdown of the team structure.

In this study the objective proposed was to relate the number of sporting injuries (frequency and seriousness) with the different degrees of vulnerability to injury of the athletes (high, medium and low vulnerability), adhering to the following criteria: team sport, individual sport. Fulfilling the hypothesis proposed in this study implies having more injuries.

The following conclusions can be established:

- It is perhaps probable that athletes that fulfil the hypothesis and that possess these traits (lower resistant personality, greater competitive anxiety, lower motivation geared towards success and greater motivation aimed at avoiding failure), may be more prone to acquiring a serious injury (team athletes).
- Being individual or team athletes influences the relationship between any vulnerability profile and the number of mild injuries, with

the number of mild injuries being higher among team athletes than among individual athletes, with differences appearing in team athletes between the high and medium vulnerability group and between the high and low vulnerability group. Perhaps, differently to individual athletes, team athletes that are positioned in any vulnerability profile could be more vulnerable to acquire a mild injury.

- The results are probably linked to the nature of the seriousness of the injury, i.e. athletes in both modalities that are positioned in a medium vulnerability profile, and athletes that are positioned in a high vulnerability profile, may suffer from a greater number of serious and very serious injuries.

The results of this study could provide an approximation to the psychological vulnerability to injury profile of the athlete, and could also be used to identify individuals with a high degree of risk to injury. They could also identify the factors that lead to a greater degree of vulnerability to injury of the athlete, and consequently, be used to design intervention programmes that reduce the risk of suffering from sporting injuries.

Conflict of interest

The authors claim to have absolutely no conflict of interest.

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