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Injury Prevalence in Portuguese and French Judo Athletes

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Abstract

Context: Judo is mainly an individual sport which requires great explosiveness and speed of movement, being considered as a combat sport with high risk of injury.

Objective To quantify the prevalence of musculoskeletal injuries in judo practitioners. The intention was also to evaluate the intensity of pain in different body locations of the judo practitioners.

Design cross-sectional and observational study

Patient or other participants: The sample used in this study consisted of 30 French judo practitioners and 30 Portuguese judo practitioners. All athletes completed an individual characterization questionnaire regarding the training conditions followed by the Nordic Musculoskeletal Questionnaire.

Results: The regions of shoulder, knee, lumbar spine and fingers were regions where athletes reported more pain. The French athletes presented relatively more pain in relation to the Portuguese athletes. It was also observed that the athletes devalued the pain, since it was observed alighting for the medians of the pain scale by different body regions that was 0 or 0.5.

Conclusions: We can conclude that in the present sample the prevalence of lesions is very high, especially in the shoulder, knee, fingers and lumbar spine. It was also concluded that injuries do not oblige the athletes to stop activities. To end, athletes have a higher pain threshold or devalue injuries.

Keywords: Judo; Injury; Prevalence

Introduction

Judo is mainly an individual sport which requires great explosiveness and speed of movement, being considered as a combat sport with high risk of injury [1]. Structurally the most frequent injuries occur in shoulder complex, cervical spine and knee. Most frequent injuries are traumatic ones in head, ankle, wrist and hands. Several studies [2-5] also found that injuries occur more frequently during competitions when compared to training periods.

Concerning the risk factors, these may be intrinsic such as being male [5], age, athlete's weight, and fat mass index [2]. Also, anatomical changes such as ligament hyperlaxity, lower limb dysmetria, previous injuries [6], genetics, hormonal and psychological disorders [7]. As extrinsic factors, we found such as diet (due to pre-test weighing), poor physical preparation and poor atmospheric conditions, and higher training frequency, with no resting periods [8,9]. For the sports physiotherapist the preventive role seems to be one of the most important in order to avoid the risk of injury recurrence or the appearance of new ones [10]. To improve this role the sports physiotherapist should also have a detailed knowledge of the most frequent injuries to be able to prevent them. Thus, the main goal of this study was the quantification of the number/prevalence of lesions and the prevalence by body zone in two groups of athletes from two distinct countries. Thus, this study will allow the Physiotherapist the preparation to establish a treatment plan and/or a prevention plan for judo practitioners and, if necessary, constitute a multidisciplinary team for the athlete (Nutritionist, Psychologist, Physician, Trainer, and Physiotherapist).

Methods

Participants

The non-probabilistic sample consisted of 30 French judo practitioners and 30 Portuguese from regional to international level and both genders. Inclusion criteria were defined as: Judoka with a minimum of 5 years of practice, active in competition, being integrated in the junior and / or senior rank (15-35 years). The following exclusion criteria were defined: not having signed the declaration of informed consent, incomplete questionnaire. The study was approved by the local ethics committee and was implemented according to the Declaration of Helsinki. All individuals gave their written consent.

Instruments

Participants self-completed a questionnaire including characterization (involving parameters such as age, gender, weight, height, marital status, competition level, weekly training frequency, weight category and whether or not a diet was required), and completed the Nordic Musculoskeletal Questionnaire, validated by Mesquita et al. [11] for the Portuguese population, and the French version of the same questionnaire, validated by Descatha et al. [12].

Statistical Analysis

Statistical analysis of the data was performed using IBM © SPSS © Statistics software 23.0 and in all inference analyses a significant difference or significant association was considered whenever $p < 0.05$ (95% confidence).Comparison of the distribution of quantitative variables by country or by gender was performed using Mann-Whitney tests (after a non-normal distribution of the continuous variables by the

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Shapiro-Wilks test). The comparison of the distribution of qualitative variables by country or by gender was performed using the Chi-square test, or Fisher's test when necessary. The comparison of sex categories by country was evaluated using the Binomial test.The 95% confidence interval for the prevalence of lesions in the last 6 months was calculated using the adjusted Wald method.

Results

The sample consisted of 60 athletes, 30 French and 30 Portuguese. No statistically significant differences were found either in sociodemographic variables or in anthropometric variables between the two groups (p>0.05), although medians of age, height and weight were slightly higher in the French sample (Table 1). For data on training conditions and preparation for athletes' tests, i.e. in parameters such as diet, consult with a Nutritionist and/or a Psychologist, if they underwent physical preparation (weight training/anaerobic training), training frequency or level of competition, no statistically significant differences were found (p>0.05) for both groupsTable 1.

In judo, athletes are divided into several weight categories (weight that must be met for the weighting day allowing or not the athlete's entry into the competition). Regarding this,the most frequent weight categories in the Portuguese group were -73kg (29.4%), -60kg (23.5%) and 66kg (23.5%) in the Male and -57kg (30.8%), -52kg (30.8%) and -48kg (23.1%) in female athletes. However, it was found that on a regular basis 66.7% of the athletes had a real weight above the weight of their category, imposing the necessity of reduction close to the competition events, but only 16.7% of the athletes consulted a nutritionist. Regarding the training and level of athletes, 66.7% of athletes train daily, 76.6% of athletes report having hours of training due to bodybuilding and/or general physical preparation and 66.7% of athletes compete at the international level. Moreover, 16.7% of the athletes consult a psychologist for mental preparation. The most frequent weight categories in the French group were -73kg (25.0%), -60kg (25.0%) and the categories -66kg and -81kg with 16.7%. In the female, the most frequent categories in this sample were -57kg (27.8%), -63kg (22.2%) and -78kg (16.7%). Similar to the Portuguese group, 66.6% of the French athletes had a real weight above their weight category and therefore are obliged to practice a specific diet, but only in 26.7% of these athletes that diet is prescribed by a nutritionist. In the French group, 53.3% of the athletes practice international competition, 90% do general physical training and/or bodybuilding, and 13.3% of the athletes consulted a psychologist for mental preparation.

It can be seen (Table 2) that there is no significant difference in the distribution of female or male athletes by country. Regarding the anthropometric characteristics of the athletes, in both countries male athletes are significantly taller (p <0.05), and the male Portuguese athletes are significantly heavier than the female ones. Regarding the quantification of athlete´s previous injuries (Table 3), 40% of French athletes did not suffer injuries in either the upper limb or the lower limb, 43.3% had injuries either in the lower limb or in the upper limb and 16.7% had injuries in the upper and lower limb. In the Portuguese athlete's group, 36.7% did not mention having suffered any injury, 50% suffered injury to the lower limb or upper limb and 13.3% had injury to the upper limb and lower limb. No statistically significant differences were found in the prevalence of injuries (p>0.05) in the French and the Portuguese athletesTables 2 and 3.The most frequent injured joints (Table 4) in French athletes were shoulder (63.3%), fingers (60%), knee (56.7%) and lower spine (50%). In Portuguese athletes, the joint

		Country		
Variable		**Portugal**	**France**	**p***
Gender	Female	13 (43.3%)	18 (60%)	0.196
	Male	17 (56.3%)	12 (40%)	
Age (years)	Median (Q1-Q3)	19 (18-22.5)	22 (20-26)	0.064
	Mean ± DP	21.1 ± 5.3	23.4 ± 4.1	
	Min-Max	16-35	18-33	
Height (cm)	Median (Q1-Q3)	167.5 (159-175)	170 (165-176.5)	0.18
	Mean ± DP	167.7 ± 8.8	170.63 ± 8.0	
	Min-Max	154-185	150-187	
Weight (kg)	Median (Q1-Q3)	63 (56.8-71.5)	68 (60-78.3))	0.086
	Mean ± DP	64.6 ± 10.9	70.1 ± 13.5	
	Min-Max	50-97	47-103	
Diet	Yes	20 (66.7%)	21 (66.7%)	1
	No	10 (33.3%)	11 (33.3%)	
Nutritionist	Yes	5 (16.7%)	9 (26.7%)	0.347
	No	25 (83.3%)	23 (73.3%)	
Physical Preparation	Yes	23 (76.7%)	28 (90%)	0.166
	No	7 (23.3%)	4 (10%)	
Psychologist	Yes	5 (16.7%)	4 (13.3%)	1
	No	25 (83.3%)	26 (86.7%)	
Competition level	International	20 (66.7%)	16 (53.3%)	0.174
	Nacional	10 (33.3%)	12 (36.7%)	
	Regional	0 (0%)	4 (10%)	
Training frequency	Daily	21 (70%)	20 (66.7%)	0.7
	2x/Week	2 (6.7%)	1 (3.3%)	
	3x/ Week	8 (26.7%)	7 (23.3%)	
	1x/ Week	0 (0%)	1 (3.3%)	
*Mann-Whitney test for quantitative variables and Qui-Square test for qualitative variables				

Table 1: Sample characterization by country.

referred as the most painful were shoulders (53.3%) followed by lower spine and knee with both 50%. However, significant differences were found only for the neck region (p=0.005) and upper spine (p=0.001), and in both situations with higher prevalence for French athletesTable 4. As for the comparison of stopping frequency (12 months) for pain in several locations (Table 5), it was only possible to compare in the Portuguese group, as this question does not integrate the French questionnaire. It was verified that few athletes interrupted their activity due to injury. However, injuries that led to inability to train or compete were the ones of the ankle (80%) and of the shoulder (37%). Thirteen percent discontinued workouts due to injury at the lumbar spine, hip or knee, 10% because of a wrist or hand injury, 7% because of an injury at the elbow, and 3% due to a neck injury. However, it was verified that training needed to be stopped (stopped) significantly more often only in the case of an ankle / foot injury (p <0.05). Lesions in the remaining locations did not imply a significantly higher training stop.

Concerning pain prevalence in the 7 days prior to the application of the questionnaire (Table 6), the French athlete's pain complaints at the shoulder were the most frequent (50%), similar to what happened 12 months in advance. Neck and knee were the following regions with a prevalence of 43.3% and the lower spine with a prevalence of 33.3%. For the Portuguese athletes, the prevalence of higher pain was observed for the shoulder region (30%), in agreement with the mentioned for the previous 12 months. In this populations significant differences were found for pain prevalence in the last 7 days for the neck, shoulder, elbow, upper spine and hip (p<0.05), being more frequent for the French athletesTables 5 and 6.

Regarding the pain intensity (Table 7), measured through the pain scale, no significant differences were detected in the median pain intensity reported by the French or Portuguese athletes (p>0.05). However, the results show that in all body regions, except the lumbar spine, in the Portuguese group, all medians on the pain scale have a score of 0 (half of the athletes with lower pain intensity report zero pain intensity). This value indicates or can indicate two things: either

Variable		Country					
		Portugal			France		
		Female	Male	p*	Female	Male	p*
	n (%)	13 (43.3%)	17 (56.3%)	0.465	18 (60%)	12 (40%)	0.273
Age (years)	Me (Q1-Q3)	19 (18-21.5)	18 (17-24)	0.583	22.5 (21-26.5)	20.5 (19-26)	0.187
	Mean ± SD	21.0 ± 4.8	21.24 ± 5.8		24.0 ± 3.7	22.6 ± 4.6	
	Min-Max	17-34	16-35		19-33	18-31	
Height (cm)	Me (Q1-Q3)	159 (157.5-165)	170 (168-180)	<0.001	167 (161.8-171.3)	175 (171.3-179.8)	0.006
	Mean ± SD	160.7 ± 5.5	173.1 ± 6.8		167.5 ± 7.8	175.3 ± 5.7	
	Min-Max	154-175	162-185		150-183	167-187	
Weight (kg)	Me (Q1-Q3)	56 (51.5-59)	68 (63-75)	<0.001	64 (59-79.8)	70.5 (64.3-77.3)	0.158
	Mean ± SD	57.2 ± 7.9	70.2 ± 9.6		68.0 ± 14.1	73.3 ± 12.4	
	Min-Max	50-79	59-97		47-100	60-103	
Diet	Yes	11 (84.6%)	9 (52.9%)	0.119	14 (77.8%)	6 (50.0%)	0.139
	No	2 (15.4%)	8 (47.1%)		4 (22.2%)	6 (50.0%)	
Nutritionist	Yes	4 (30.8%)	1 (5.9%)	0.138	7 (38.9%)	1 (8.3%)	0.099
	No	9 (69.2%)	16 (94.1%)		11 (61.1%)	11 (91.7%)	
Physical Preparation	Yes	12 (92.3%)	11 (64.7%)	0.104	18 (100%)	9 (75%)	0.054
	No	1 (7.7%)	6 (35.3%)		0	3 (25%)	
Psychologist	Yes	3 (23.1%)	2 (11.8%)	0.628	4 (22.2%)	0	0.13
	No	10 (76.9%)	15 (88.2%)		14 (77.8%)	12 (100%)	
Competition level	International	11 (84.6%)	9 (52.9%)	0.119	16 (88.9%)	0	<0.001
	Nacional	2 (15.4%)	8 (57.1%)		2 (11.1%)	9 (75.0%)	
	Regional	0	0		0	3 (25.0%)	
Training Frequency	Diary	12 (92.3%)	9 (52.9%)	0.135	17 (94.4%)	3 (25%)	<0.001
	2x/week	0	1 (5.9%)		0	2 (16.7%)	
	3x/week	1 (7.7%)	6 (35.3%)		1 (5.6%)	7 (58.3%)	
	1x/week	0	1 (5.9%)		0	1 (5.9%)	
*Mann-Whitney test for quantitative variables and Fisher test for qualitative variables and binomial for gender							

Table 2: Sample characterization by country and gender.

Injuries	Country		p	Overall
	France	Portugal		
No injury	12 (40.0%)	11 (36.7%)	0.862	23 (38.3%)
	CI95%: 24.6%-57.7%	CI95%: 21.8%-54.6%		CI95%:27.1%-51%
IL or SLa	13 (43.3%)	15 (50.0%)		28 (46.7%)
	CI95%: 27.4%-60.8	CI95%: 33.2%-66.9%		CI95%: 34.6%-59.1%
IL and SL	5 (16.7%)	4 (13.3%)		9 (15.0%)
	CI95%: 6.9%-34.0%	CI95%: 4.7%-30.3%		CI95%: 7.9%-26.3%
a IL: inferior limb; SL: superior limb.				

Table 3: Prevalence (n (%) and confidence interval 95%) of injuries in the last 6 months.

Body region	France	Portugal	p
Neck	14 (46.7%)	4 (13.3%)	0.005
Shoulder	19 (63.3%)	16 (53.3%)	0.432
Elbow	13 (43.3%)	9 (30.0%)	0.284
Wrist/Hand	12 (40.0%)	11 (36.7%)	0.791
Fingers	18 (60%)	n.a**	0.584*
Superior Spine	11 (36.7%)	1 (3.3%)	0.001
Inferior Spine	15 (50.0%)	15 (50.0%)	1
Hip	15 (50.0%)	8 (26.7%)	0.063
Knee	17 (56.7%)	15 (50.0%)	0.605
Ankle/Foot	11 (36.7%)	9 (30.0%)	0.584
*Binomial Test to compare answer frequency in France; ** n.a: Not applicable			

Table 4: Pain prevalence (n (%)) in the last 12 months.

Body region	Yes, Stop	No	p
Neck	1 (3%)	29 (97%)	<0.001
Shoulder	11 (37%)	19 (63%)	0.2
Elbow	2 (7%)	28 (93%)	<0.001
Wrist/Hand	3 (10%)	27 (90%)	<0.001
Superior Spine	0 (0%)	30 (100%)	<0.001
Inferior Spine	4 (13%)	26 (87%)	<0.001
Hip	4 (13%)	26 (87%)	<0.001
knee	4 (13%)	26 (87%)	<0.001
Ankle/foot	24 (80%)	6 (20%)	0.001

Table 5: Comparison of training stop response frequency due to the presence of pain, by body location, in Portugal in the last 12 months (n (%)).

Body region	France	Portugal	p
Neck	13 (43.3%)	1 (3.3%)	<0.001
Shoulder	15 (50.0%)	6 (20.0%)	0.015
Elbow	9 (30.0%)	2 (6.7%)	0.02
Wrist/Hand	7 (23.3%)	4 (13.3%)	0.317
Superior Spine	13 (43.3%)	n.a**	0.585*
Inferior Spine	8 (26.7%)	0 (0.0%)	0.005
Hip	10 (33.3%)	9 (30.0%)	0.781
knee	10 (33.3%)	1(3.3%)	0.003
Ankle/foot	13 (43.3%)	6 (20.0%)	0.052
Wrist/Hand	8 (26.7%)	1(3.3%)	0.26
*Binomial test to compare answer frequency in France; ** n.a: Not applicable			

Table 6: Pain prevalence in the last 7 days (n (%)).

Body region	France	Portugal	p
	Me (P25-P75)		
Neck	0 (0-2)	0 (0-0)	0.127
Shoulder	0 (0-2.25)	0 (0-6)	0.794
Elbow	0 (0-0.25)	0 (0-0)	1
Wrist/Hand	0 (0-2)	0 (0-3.25)	0.784
Fingers	0.5 (0-4)	-	n.a*
Upper Spine	0 (0-0.75)	0 (0-0)	0.148
Inferior Spine	0 (0-2)	1.5 (1-4)	0.116
Hip	0 (0-3.25)	0 (0-3)	1
Knee	0 (0-6)	0 (0-3)	0.794
Ankle/Foot	0 (0-0.75)	0 (0-3)	1
*n.a: Not applicable			

Table 7: Comparison of the median of the pain scale reported by athletes of the two groups, per body region.

the athletes devalue the pain and continue to train with pain or athletes have a higher pain threshold. Still, looking at the 75thpain percentile, relatively lower values were observed, except for the shoulder region for the Portuguese group, which presents a quite high value (of 6)Table 7.

Discussion

The main goal of this study was to quantify the prevalence of musculoskeletal injuries in judo practitioners, and to find out, which is the most damaged area while comparing the Portuguese and French realities. For this, a sample of judo practitioners of the two above-mentioned countries was used. All were junior and senior athletes, practicing at the highest level with more than 50% being international athletes. The whole sample showed to be concerned mainly with healthy habits: an adequate diet (66.7% of the athletes), a daily training frequency (70% of the athletes) and the practice of general physical preparation (76.7%-90%).

It is important to stress that some limitations were found during this study, and while the sample size may be a considered small for an epidemiological context, a more significant issue was found regarding the used scale. Even though they have the same designation, both scales have been validated differently, thus including different parameters, making comparisons difficult. As well, we can add the fact of having a different sample from two different countries and with different levels of competition and with different training load or intensity and level. Albeit the aforementioned facts, interesting and important findings were found that may be extrapolated to both populations. The competitive levels to which these athletes were exposed as well as the volume and intensity of training in their sports' career led to a significant incidence of injuries in Judo [12].

Carvalho et al. [13]reported, for Portugal, that 83% of athletes had at least one injury in both, lower and upper limb due to training load. The value found in the present study was considerably lower, about 46.7%. It should be noted that judo is a combat sport with a lot of physical contact, which may induce a higher number of injuries. The contact between athletes, the opposing forces between them and the athlete's strength, even to avoid falling, will require a greater muscular explosive capacity. This potentiates the risk of muscular injuries especially in situations of poor physical preparation, but it will also increase the forces at joint level, increasing tension and the risk of ligament injury [14].

De Carvalho et al. [15], in high performance Brazilian Olympic judo athletes, stated that the most injured body region was the shoulder with 28.9% followed by the knee with 22.7% and 23.7% at the ankle. In another study by Frey for French athletes, the most injured segment was also the shoulder with 27.8% followed by the elbow with 12.7% and the knee with 11.8%. In the present study, within the last 12 months, the shoulder was the joint that showed higher levels of pain, both in the French sample (63.3%) and in the Portuguese sample (53.3%). This high prevalence is in accordance with other studies [15,16] with a prevalence of 56.7% for French athletes and 50% for Portuguese athletes. According to Ribeiroet al. [17,18]there is greater ligament laxity in overhead athletes and this same laxity is more evident in the dominant limb. It is important to remark that the shoulder is the most mobile joint of the human body. This fact associated with marked ligament laxity athletes may develop severe instability. In judo, the goal is to project the opponent with his back on the ground; while the opponent tries to avoid totally falling on his back in a way that increases the risk of shoulder injury [14]. This is a possible justification for a higher prevalence of injuries in shoulder complex.The same issue was questioned but relative to the last 7 days and again the highest prevalence of injuries was in the shoulder and knee regions. In the present study, the prevalence of finger lesions was also very high with 60% for the French group, and according to [19] these seem to be the most at risk structures due to judo movements.

However, the presence of injury may not mean that athletes are not able to perform their activities. Regarding this parameter, it was only possible conclude with respect to the Portuguese athletes since the scale used for the French language does not include this item. Thus, 80% of athletes stopped sports activity due to ankle or foot injury and 37% due to shoulder injuries. In what refers to other body regions, athletes did not report injuries that would justify stopping training or avoid competition. Most competitive athletes train with pain or devalue injuries [20]. This devaluation of injuries can be explained by the fact that athletes may present a higher pain threshold and a higher pressure to obtain results (medals). In the present study, the median values concerning pain scale ranged from 0 or 0.5 for all body regions. It is important to point out that this parameter can have serious consequences for both athlete and physiotherapist. If athletes devalue pain or if they practice with pain [20], micro-injuries may occur, and ignoring will increase the risk to transform an acute into a chronic injury. Thus, the role of the sports physical therapist is crucial to prevent those situations. These health professionals must have a deep knowledge of the athletes in order to prevent or treat possible injuries.

While comparing groups, there were significant differences in the level of injuries. The French group was the one with the highest pain values. This difference can be explained by the competitive level of the athletes which is higher in French athletes. Although the Portuguese sample is made up of 66.7% of international athletes and the French sample by 53.3% of international athletes, 70% of Portuguese train daily against 66.7% French, the French sample was also composed of several athletes from the 2016 Olympic team. In addition, these athletes completed the questionnaires during the preparation for the 2016 Olympic Games in Rio de Janeiro. This is a very intensive internship with twice a day high intensity training between competitions. Concerning the Portuguese sample, the international athletes are mainly from the junior national team or young seniors.

Regarding the Nordic Musculoskeletal Scale, developed by Kuorinka et al. [21] and the scale validated for the Portuguese population by Mesquita et al.[10], we found several differences when compared with the scale validated to the French language by Descatha et al. [11]. On the French scale there was a question concerning finger injuries, which was considered very interesting for data interpretation regarding judo, due to the specific technical gesture that implies a lot of finger activity. In opposition, the Portuguese version of the scale does not include this body zone, and the same occurs in the original Musculoskeletal Nordic Scale [21]. These differences may be due because the scale validation by Descathaet al. was developed mainly for the upper limb; on the other hand, the scale for the Portuguese population [10]was developed for the whole body. Also, in the scale developed by Mesquita, the question "during the last 12 months, had to avoid its normal activities because of problems in the following regions", is also not present in the scale validated for French Population. However, this parameter appears on the initial scale. A higher incidence of injuries was found in the joint complex of the shoulder, so this study may allow Physiotherapists, to perform a better and more effective prevention of injuries in this joint complex.

Conclusion

We can conclude that there is a high prevalence of injuries in judo athletes from both samples, and the most affected regions are identical

for Portuguese and French athletes. Thus, the most frequently injured structures are the shoulder, the lumbar spine and the knee. Fingers, although present only in the French sample scale, showed a very high prevalence as well. However, in the Portuguese sample, ankle injuries, despite their low prevalence triggered a stop of the sport and/or professional activity. Moreover, we concluded that athletes seem to devalue pain or may present a high pain threshold.

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