



ANALYSIS OF THE PREVALENCE OF MUSCULOSKELETAL INJURIES IN PADLE TENNIS PRACTITIONERS

ANÁLISE DA PREVALÊNCIA DE LESÕES MUSCULOESQUELÉTICAS EM PRATICANTES DE PADEL

Marco Aurélio Canaparro Teixeira^{1*}, Patrícia Becker Engers², Tatiane Motta da Costa e Silva³, Simone Lara⁴, Saulo Menna Barreto Dias⁵, Susane Graup⁶

¹Physical Education Teacher by the Federal University of Pampa, Uruguaiana (RS), Brazil; ²PhD in Science Education from the Postgraduate Program in Science Education, Federal University of Pampa, Uruguaiana (RS), Brazil; ³PhD in Science Education from the Postgraduate Program in Science Education, Federal University of Pampa, Uruguaiana (RS), Brazil; ⁴Professor of the Physiotherapy Course at the Federal University of Pampa, Uruguaiana (RS) Brazil; ⁵Master in Physical Education from the Federal University of Pelotas, Pelotas (RS), Brazil; ⁶Professor of the Bachelor's Degree in Physical Education at the Federal University of Pampa, Uruguaiana (RS) Brazil.

***Corresponding author:** Tatiane Motta da Costa e Silva – **Email:** tatianemottaesilva@gmail.com

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ABSTRACT: The objective of this study was to analyze the prevalence of musculoskeletal injuries and associated factors in padel tennis practitioners from Uruguaiana/RS (Brazil). The study included 58 padel tennis players, all of whom answered an online questionnaire consisting of closed and open questions, aiming to collect data related to the research topic. The results revealed an injury rate of 67.2% among participants, with the knee (22.9%), shoulder (17.1%) and ankle (8.6%) being the most affected anatomical sites. Among the reported diagnoses, 42.9% were inflammatory processes, and 33.3% involved tendon and/or ligament ruptures. The shots or playing positions that caused the most discomfort were the displacements (39.6%) and the smash (37.5%). Os resultados reforçam a ideia de que o padel é um esporte com alta taxa de lesão, bem como, as lesões possuem influência durante a prática do esporte. The results reinforce the idea that padel is a sport with a high injury rate and that injuries influence its practice.

KEYWORDS: Musculoskeletal injury. Prevalence. Racquet Sports.

RESUMO: O objetivo deste estudo foi analisar a prevalência de lesões musculoesqueléticas e os fatores associados em praticantes de Padel de Uruguaiana/RS. Participaram 58 praticantes de Padel, sendo que todos responderam um questionário *online* composto por questões fechadas e abertas, visando coletar dados referentes ao tema da pesquisa. Os resultados revelaram uma taxa de lesão de 67,2% entre os participantes, sendo o joelho (22,9%), o ombro (17,1%) e o tornozelo (8,6%) os locais anatômicos mais atingidos. Entre os diagnósticos relatados é possível destacar 42,9% de processos inflamatórios e 33,3% de rompimento de tendões e/ou ligamentos. Os golpes ou posições de jogo que mais causaram desconforto foram os deslocamentos (39,6%) e o smash (37,5%). Os resultados reforçam a ideia de que o padel é um esporte com alta taxa de lesão, bem como, as lesões possuem influência durante a prática do esporte.

PALAVRAS-CHAVE: Lesão musculoesquelética. Esportes com Raquete. Prevalência.

INTRODUCTION

Padel is a racket sport that officially emerged in Mexico in the late 1960s, and in 1990 it began to gain popularity in European countries¹. In the decade from 2000s, padel became global, with the creation of tournaments and professional organizations. Currently, padel is played in more than 60 countries and by thousands of players, including in Brazil, which shows that it is a sport that is gaining more and more fans^{1,2}.

Thanks to its specific characteristics, such as ease of learning, enjoyment, and interaction provided by the sport in the company of other athletes, padel is considered an attractive sport for everyone³. The sport is played exclusively in pairs on a 20 by ten meter court (20 X 10), with walls at the back and part of the sides, with the rest of the court covered by a screen⁴. This sport has a similar scoring system to tennis, but is different from other racket sports due to its interaction with the walls, since athletes are allowed to put the ball back into play, using them after touching the ground of their court just once, which provides more dynamism during the point⁴.

Because it is an aerobic-demanding sport that requires not only eye-hand coordination but also speed, agility, reflexes, and strength and power in both upper and lower limbs, padel demands a high level of physical conditioning from its practitioners, whether beginners or advanced players⁵. Therefore, the need for a series of movements, such as sprints, jumps, and rotations, which involve successive efforts, leads to a higher risk of injury for its players⁶.

The study by Thacker *et al.*⁷ which investigated injuries in different sports have pointed out that such occurrences may be directly related to intrinsic predisposing factors (biological, biomechanical, psychological, history of injuries, physical conditioning, diet, fatigue, overtraining, risk behaviors, among others) and extrinsic factors (environment in which the athlete is inserted, type and condition of sports floors, temperature of the environment, etc.). However, there are few studies that specifically analyze the epidemiology of injuries associated with padel practice^{8,9}.

According to Pradas *et al.*, (2012), padel is a sport characterized by a type of mostly aerobic effort. Furthermore, it is associated with short efforts of moderate to high intensity (variable intensity) due to the high number of movements and blows performed close to the ground, that is, it is characterized as a sport with intermittent intensity¹⁰.

Studies carried out in Spain indicate that the personal incidence of injuries (number of players injured per hundred athletes) varies between 49.8% and 86.7%, with an injury rate of 2.75 injuries per thousand hours of exposure to risk^{9,11}. Furthermore, that padel injuries occur more frequently in the lower limbs, the most affected joint is the elbow joint complex and muscle tendon injuries are the most common.¹¹ In amateur athletes, the most common injuries occur in the shoulder joint¹². However, in a study carried out in the Brazilian context, it was identified that the most affected anatomical site was the upper limb, with mild severity and symptomatic return, and that padel players have a high injury rate per athlete, as well as a high injury rate per injured athlete⁶.

The same authors mentioned above found in their study that the most prevalent injury mechanism in padel is non-contact and occurs more frequently at the end of matches, and may be related to overload or lack of technique. Therefore, the incidence of certain injuries resulting from the practice of physical and/or sports activities can vary as a result of a series of factors, such as the type of sport practiced, the length of time the sport has been practiced and the athlete's level of competition.¹³.

Thus, there are several factors that can trigger injuries in athletes and, therefore, early assessment of the risk factors that lead to these dysfunctions becomes essential from a prevention perspective. So, the present study aimed to analyze the prevalence of musculoskeletal injuries and

associated factors in padel tennis players from Uruguaiiana/RS (Brazil), providing data and information that allow the identification of elements that may assist preventive strategies during practice, preserving the physical integrity of its participants.

METHODOLOGY

This is a quantitative study, characterized as descriptive cross-sectional one¹⁴.

This study is part of a macroproject that aims to evaluate the muscular strength, flexibility and postural balance of athletes, in order to identify criteria that serve as subsidies for the creation of strategies to prevent musculoskeletal injuries among practitioners. The research was approved by the Ethics Committee of the researchers' institution under opinion number 3,623,044, being part of a macroproject entitled "Analysis of muscular strength, flexibility and stability of lower limbs in athletes".

The study population consisted of padel tennis players, aged between 13 and 65 years, of both sexes, from Uruguaiiana/RS. The municipality has five places where this sport is practiced, and according to information from those responsible, approximately 500 people practice padel systematically every week. That way, the sample was composed of practitioners who met the following inclusion criteria: a) Study age range; b) Playing padel in Uruguaiiana/RS. Practitioners who did not answer all the questions in the questionnaire or who were diagnosed with any physical and/or cognitive disability were excluded from the study.

To collect the data, contact was initially made with the padel practice locations in the municipality, with the aim of scheduling a meeting to present the project and request authorization to carry out the research. After this procedure, padel tennis players were invited to participate in the study and the Free and Informed Consent Form (FICF) was sent, as well as the data collection instrument through an electronic Google Forms form, through contact on the Whatsapp messaging application, which can be answered at the place and time of their preference. It is worth noting that only those who indicated acceptance by signing the FICF were part of the sample. Data collection was carried out between September and October 2022.

To verify the prevalence of musculoskeletal injuries, a questionnaire composed of closed and open questions was used, aiming to collect data regarding the history of physical activity practice, personal data (sex and age), anthropometric data (body mass and height), data on padel practice (volume of classes, weekly games and time of practice) and data on musculoskeletal injuries (type of injury suffered (and if suffered) during practice, which body segment was affected and what was the mechanism of injury).

The data were analyzed using descriptive statistics procedures, supported by measures of mean, standard deviation, absolute and relative frequencies. The normality of the data was analyzed using the Kolmogorov-Smirnov test, which indicated a normal distribution. To analyze differences in numerical variables between sexes, the "t" test for independent samples was used. The association of categorical variables was tested using the Chi-square test. A significance level of 5% ($p < 0.05$) was considered for all tests. Statistical analysis was conducted using SPSS (Statistical Package for the Social Science) for Windows version 16.0.

RESULTS

Fifty-eight padle tennis players participated in the study, of which 62.1% were male. Table 1 presents the descriptive values of the anthropometric variables and characteristics of the practice, considering the general group and separated by sex, with the male group presenting significantly higher values of Body Mass Index - BMI ($p=0.001$).

Table 1. Descriptive values of the variables analyzed in padel players from Uruguaiana/RS.

VARIABLE	GENERAL (n=58)	MALE (n=36)	FEMALE (n=22)	p
	Average $\pm$ SD	Average $\pm$ SD	Average $\pm$ SD	
Age (years)	38,9 $\pm$ 10,43	37,3 $\pm$ 9,43	41,6 $\pm$ 11,62	0,130
Body mass (Kg)	80,3 $\pm$ 15,97	88,25 $\pm$ 12,97	67,3 $\pm$ 11,28	<0,001*
Stature (m)	1,71 $\pm$ 0,078	1,76 $\pm$ 0,055	1,64 $\pm$ 0,049	<0,001*
BMI (Kg/m ²)	27,1 $\pm$ 4,23	28,4 $\pm$ 4,20	24,8 $\pm$ 3,25	0,001*
Practice time (months)	76,8 $\pm$ 91,45	85,2 $\pm$ 95,78	63,3 $\pm$ 84,21	0,381
Weekly practice time (hours)	4,4 $\pm$ 3,93	4,8 $\pm$ 4,79	3,82 $\pm$ 1,79	0,386
Weekly frequency of practice (days)	2,6 $\pm$ 1,15	2,6 $\pm$ 1,31	2,5 $\pm$ 0,86	0,661
Weekly working time (hours)	37,1 $\pm$ 16,37	37,2 $\pm$ 17,05	36,8 $\pm$ 15,57	0,928
Daily time in sitting position during work (minutes)	271,5 $\pm$ 162,52	286,7 $\pm$ 150,50	246,8 $\pm$ 41	0,370
Daily sleep time (hours)	6,76 $\pm$ 0,885	6,75 $\pm$ 0,81	6,77 $\pm$ 1,02	0,925

n= sample number; SD= Standard Deviation; * significant value.

Source: By the authors (2024).

The data also indicate that there are no significant differences in the characteristics of the practice between the sexes, as well as no differences in relation to weekly working time, time spent in the sitting position and daily sleeping time ($p>0.05$) (Table 1).

The frequency distribution of sociodemographic variables is presented in Table 2, in which it is possible to observe that 91.4% work and 44.8% have a family income above ten minimum wages. When asked about their professions, 25.9% said they were civil servants, 22.4% were commercial workers, 15% were liberal professionals, 6.9% were rural workers and 29.8% were in other professions.

Table 2. Frequency distribution of sociodemographic variables of padel players from Uruguaiana/RS.

VARIABLE	GENERAL	MALE	FEMALE	p
	n(%)	n(%)	n(%)	
Sex				
Male	36(62,1)	-	-	
Female	22(37,9)	-	-	
Age range				

VARIABLE	GENERAL	MALE	FEMALE	p
	n(%)	n(%)	n(%)	
Up to 37 years old	21(36,2)	12(33,3)	9(40,9)	0,010*
From 38 to 43 years old	21(36,2)	18(50,0)	3(13,6)	
Over 43 years old	16(27,6)	6(16,7)	10(45,5)	
BMI				
Normal	20(34,5)	7(19,4)	13(59,1)	0,008*
Overweight	23(39,7)	17(47,2)	6(27,3)	
Obesity	15(25,9)	12(33,3)	3(13,6)	
Do you work?				
Yes	53(91,4)	32(88,9)	21(95,5)	0,387
No	5(8,6)	4(11,1)	1(4,5)	
Individual income				
No income	3(5,2)	2(5,6)	1(4,5)	0,348
Up to 2 minimum wages	8(13,8)	4(11,1)	4(18,2)	
From 3 to 5 minimum wages	18(31,0)	9(25,0)	9(40,9)	
From 6 to 10 minimum wages	20(34,5)	13(36,1)	7(31,8)	
Above 10 minimum wages	9(15,5)	8(22,2)	1(4,5)	
Renda familiar				
No income	1(1,7)	1(2,8)	0(0,0)	0,224
Up to 2 minimum wages	2(3,4)	0(0,0)	2(9,1)	
From 3 to 5 minimum wages	14(24,1)	7(19,4)	7(31,8)	
From 6 to 10 minimum wages	15(25,9)	10(27,8)	5(22,7)	
Above 10 minimum wages	26(44,8)	18(50,0)	8(36,4)	

n= number of participants; % percentage

Source: By the authors (2024).

Most of the research participants (87.9%) reported that they had already taken classes with a padel teacher, with 37.9% taking these classes with teachers trained in Physical Education (Table 3). Furthermore, 24.1% use medication continuously and 91.4% consider themselves to be healthy people. The medications used are varied, consisting of hormonal supplements (7%), beta-blockers (9%), antidepressants (3%), analgesics/muscle relaxants (3%), among others.

The analysis by sex showed significant differences in age group ($p=0.010$) and in taking classes with a padel teacher ($p=0.027$), in which the female group was associated with the age group “over 43 years old”, constituting an older group, as well as, all of them (100%) took padel classes with a teacher. Regarding the BMI classification, significant differences were evident between the groups ($p=0.008$), in which the female group was associated with the “normal” nutritional status.

Table 3. Frequency distribution of variables related to sport analyzed in padel players from Uruguiana/RS.

VARIABLE	GENERAL	MALE	FEMALE	p
	n(%)	n(%)	n(%)	
Participate in tournaments				
Yes	41(70,7)	27(75,0)	14(63,6)	0,356
No	17(29,3)	9(25,0)	8(36,4)	
Lateral dominance				
Right-handed	54(93,1)	32(88,9)	22(100,0)	0,269
Left-handed	3(5,2)	3(8,3)	0(0,0)	
Ambidextrous	1(1,7)	1(2,8)	0(0,0)	
Side of the playing court				
Right	19(32,8)	12(33,3)	7(31,8)	0,483
Left	24(41,4)	13(36,1)	11(50,0)	
Both	15(25,9)	11(30,6)	4(18,2)	
Have you ever taken classes with a padel teacher?				
Yes	51(87,9)	29(80,6)	22(100,0)	0,027*
No	7(12,1)	7(19,4)	0(0,0)	
The Professor had a degree in Physical Education				
Sim	22(37,9)	14(38,9)	8(36,4)	0,778
Não	26(44,8)	15(41,7)	11(50,0)	
Não sei	10(17,2)	7(19,4)	3(13,6)	
Faz uso contínuo de medicamento				
Yes	14(24,1)	7(19,4)	7(31,8)	0,285
No	44(75,9)	29(80,6)	15(68,2)	
Exercise practice beyond padel				
Yes	45(77,6)	25(69,4)	20(90,9)	0,057
No	13(22,4)	11(30,6)	2(9,1)	
Do you consider yourself a healthy person?				
Yes	53(91,4)	32(88,9)	21(95,5)	0,387
No	5(8,6)	4(11,1)	1(4,5)	

n= number of participants; % percentage

Source: By the authors (2024).

Table 3 also shows that 77.6% of the study participants practice other exercises in addition to padel, reaching 90.9% in the female group. Among the exercises reported, 66% practice resistance exercises, 21% practice team sports (soccer and volleyball), 16% individual sports (swimming, cycling and tennis), 10% practice running/walking and 3% practice pilates.

Figure 1 shows the frequency distribution of injuries during padel practice, and it is possible to see that 75% of the male group has already suffered an injury. No significant differences were found between the sexes ($p=0.107$).

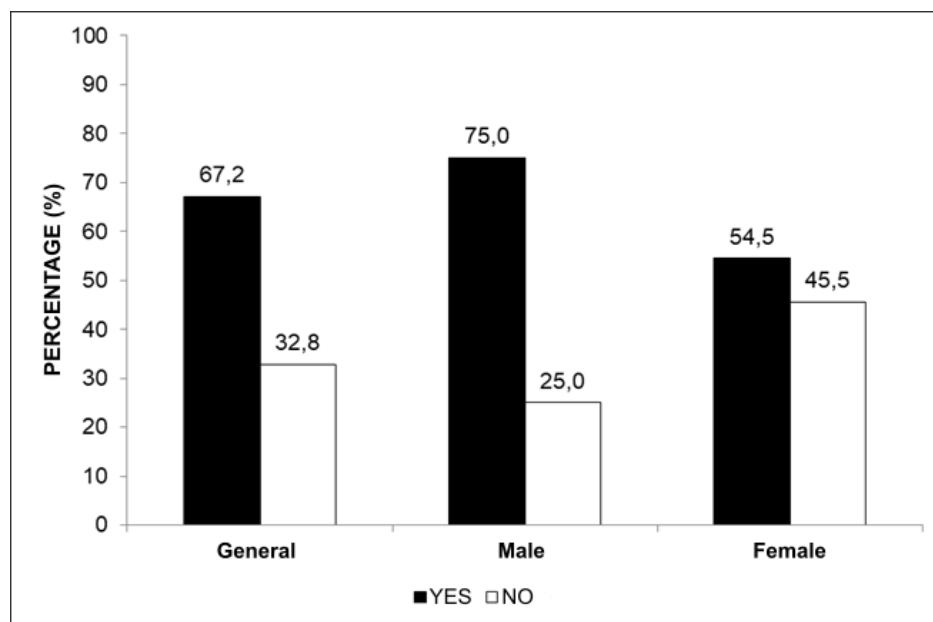


Figure 1. Frequency distribution of injuries during padel sports practice.

Source: By the authors (2024).

Regarding the frequency distribution of variables related to injuries analyzed in padel players, it is worth highlighting that none of the variables related to injuries and musculoskeletal problems presented significant differences between the sexes (Table 4). However, 77.6% of players reported that the injury influenced their level of play and 79.3% stated that it impacted their performance in sets. When asked about how injuries influence the practice of sports, 43.6% felt limitations in movement, 41% reported pain, 33.3% reported performing movements incorrectly due to insecurity.

Regarding the reason for the padel injury, 36.6% reported having suffered ligament injuries, 36.6% musculoskeletal injuries and 9.8% training overload. In this sense, the most affected body parts were the knee (22.9%), shoulder (17.1%) and ankle (8.6%). Considering the fact that they had to stop playing padel due to musculoskeletal problems, 60.3% responded positively, of which 42.9% felt pain when performing the smash, 40% when moving laterally, 25% when squatting and 37.1% reported feeling pain in the injured areas in different positions.

Furthermore, 36.2% stated that they had been diagnosed with a musculoskeletal problem, and 60.3% had already stopped playing padel due to these problems. Among the reported diagnoses, it is possible to highlight inflammatory processes (42.9%), rupture of tendons and/or ligaments (33.3%), problems in the menisci (19%), among others. Among the inflammatory processes, epicondylitis was reported by three practitioners, as well as, three practitioners also reported having tendonitis in the shoulders.

Table 4. Frequency distribution of variables related to injuries analyzed in padel players from Uruguiana/RS.

VARIABLE	GENERAL	MALE	FEMALE	p
	n(%)	n(%)	n(%)	
Do injuries affect your level of play?				
Yes	45 (77,6)	27(75,0)	18(81,8)	0,546
No	13 (22,4)	9(25,0)	4(18,2)	
Do these injuries impact the use of sets won?				
Yes	46(79,3)	28(77,8)	18(81,8)	0,712
No	12(20,7)	8(22,2)	4(18,2)	
Diagnosis of musculoskeletal problem				
Yes	21(36,2)	14(38,9)	7(31,8)	0,587
No	37(63,8)	22(61,1)	15(68,2)	
Have you ever stopped playing padel due to musculoskeletal problems?				
Yes	35(60,3)	25(69,4)	10(45,5)	0,070
No	23(39,7)	11(30,6)	12(54,5)	
Have you ever had to miss work or worked with discomfort due to an injury caused by playing padel?				
Yes	21(36,2)	15(41,7)	6(27,3)	0,268
No	37(63,8)	21(58,3)	16(72,7)	
Do musculoskeletal symptoms influence the practice of padel?				
Yes	46(79,3)	29(80,6)	17(77,3)	0,756
No	12(20,7)	7(19,4)	5(22,7)	
Do these symptoms interfere with the game's strokes and movements?				
Yes	43(74,1)	29(80,6)	14(63,6)	0,153
No	15(25,9)	7(19,4)	8(36,4)	
Have you ever sought out a professional to treat these symptoms?				
Yes	38(65,5)	22(61,1)	16(72,7)	0,366
No	20(34,5)	14(38,9)	6(27,3)	

n= number of participants; % percentage

Source: By the authors (2024).

As shown in Table 4, 74.1% of those evaluated reported that musculoskeletal symptoms interfere with strokes and game movements and 65.5% have already sought a professional to treat the

symptoms. It is worth noting that although there is no significant difference, the percentage of injuries was higher in males (75%), interfering with blows and movement during the practice of the sport for 80.6%, and only 61.1% of them sought professional help. When asked about which shots or game positions cause the most discomfort, 60.4% highlighted movement (frontal, lateral, posterior displacement, running and crouching), 37.5% the smash and 16.7% pointed out the backhand.

The analysis of the association of variables showed that, in the general group, only the time of practice was associated with having suffered an injury while playing padel ($p=0.043$), in which practitioners with the longest time of practice (60 months or more) had a higher frequency of injuries. In the female group, a significant association was observed with the number of hours of weekly work ($p=0.030$), in which 90% of the group that did not have injuries while practicing padel had the lowest workload (up to 40 hours per week).

An association was observed between padel injuries and absence due to musculoskeletal problems ($p<0.001$), absence from work activities due to sports injuries ($p=0.024$), seeking specialized care ($p=0.042$), symptoms influencing the practice of sports ($p=0.005$) and the injury hindering strokes and movement during a match ($p=0.049$). In this sense, 79.5% of those who reported injuries while playing the sport had to take time off due to musculoskeletal problems, with 46.2% having to take time off work, 74.4% seeking specific professional assistance, 89.7% reporting that musculoskeletal symptoms influence their practice and 82.1% reporting that the symptoms hinder their strokes and movement on the court.

DISCUSSION

This study aimed to analyze the prevalence of musculoskeletal injuries and associated factors in padle tennis players in the city of Uruguiana/RS. In this perspective, the data showed a high prevalence of injuries, in which the majority of players (67.2%) reported having suffered injuries while playing padle tennis, with the male group presenting a higher frequency (75%), but not significant.

This result is in line with what is presented in the literature, indicating that padel is a highly harmful sport.^{6,11} A Brazilian study carried out with 62 volunteer padel players who competed in the 4th Stage of the Brazilian Padel Circuit in 2017 in Porto Alegre/RS, found a prevalence of 67.7% of injuries⁶. Just as a study with 478 federated padel players from Madrid, Spain, found that 65.6% of those evaluated had a history of injuries¹¹.

Regarding anthropometric characteristics, it was possible to notice a significant difference between the BMI values, indicating that the male group is more overweight with an average of 28.4 (± 4.20) kg/m². The significantly higher BMI values in the male group diverge when compared to data from the 2019 National Health Survey, which shows a higher prevalence of overweight in Brazilian women¹⁵. It is worth noting that there is a direct relationship between BMI and the worsening of osteoarthritis injuries in the knee¹⁶. Corroborating this hypothesis, Cardoso¹⁷ points out that people with a BMI greater than 27 kg/m² are more likely to develop osteoarthritis in their knees.

In this study, a considerable portion of the participants (44.8%) have a family income of more than ten minimum wages, which leads us to believe that padel is still considered an elitist sport due to its characteristics. Therefore, in the municipality where this research was conducted, there are no public courts, which means that a relatively high investment is required for the practice of padel to take place.

Corroborating the fact that it is considered an elitist modality, a significant portion of participants (87.9%) took classes with private teachers. With a significant difference between the sexes ($p=0.027$), in

which 100% of women reported that they take classes with the supervision of teachers. This result may be associated with the fact that the male group has a higher prevalence of injuries, as inadequate and inefficient learning of the strokes and movements required by padel may have resulted in poor execution, injuring the desired main segment or also overloading the secondary areas of the body that need to compensate for the lack of movement technique and/or ineffectiveness of the stroke, increasing the chance of injuries¹².

Sports biomechanical factors are essential for sports performance. Specifically considering padel, the motor skills of sports technique related to causes and effects motivate the structuring of motor patterns that give rise to the game of the sport, determining the technical quality of the players, who aim to hit the ball with the greatest possible speed and precision¹⁸. According to Espino *et al.*¹⁸ it is essential to correctly perform the different phases and sub-phases of the blows.

Another factor that may have influenced the high prevalence of injuries in the group evaluated is the fact that only 37.9% of those evaluated took these classes with teachers trained in Physical Education. Although there are regulations that guarantee that people with sports experience can work with training in sports¹⁹, it is undeniable that training in a specialized area leads to a broader and more appropriate understanding of aspects of exercise physiology and movement biomechanics, which will interfere with the execution of movement during the game and, if performed incorrectly and/or with muscular imbalances, increase the risk of injuries.

Collaborating with our findings on injury occurrence (knee 22.9%, shoulder 17.1% and ankle 8.6%) the study by Tagliafico, Torri e Righetto²⁰, carried out with 800 padel players, which showed that most injuries occurred in the lower limbs, especially in the knee joint. However, Garcia-Fernandez *et al.*¹¹ presents the lower limbs as the most harmful (41%), however when analyzing the exact locations of the injuries, the prevalence is higher in the elbows (20.5%), followed by the knee and foot (11.4%). In contrast, the study by Valério *et al.*⁶ and the one by Muñoz *et al.*²¹, show that the site with the highest incidence of injuries was the upper limb, mainly in the shoulder joint.

One hypothesis that may explain this variability between the lower and upper limbs as being more affected by injuries in padel is the high demand for movement required, combined with the successive repetitive movements with the dominant arm of the racket. Considering that the playing field in padel is a maximum of ten meters away when one of the pairs goes up to the net, this requires the padel players to move quickly and prepare in short spaces of time.²².

It is important to highlight that most of the participants practice other physical exercises besides padle tennis, and that this high frequency of practice by some participants, combined with other practices, can lead to muscle and joint overload. Since many of the exercises practiced require similar musculoskeletal structures, such as the shoulder joint, which is widely used in volleyball, tennis and swimming. Likewise, the knee joint was indicated as the most affected site by 22.9%, and is widely used in soccer, running/walking and also in volleyball. This result can be reinforced by the responses regarding the reasons for the injuries, which mention, among other factors, musculoskeletal injuries and training overload. However, poor training technique combined with several risk factors such as exercise overload predispose athletes to stress responses, which can be interpreted as precursors of stress fractures²³.

The smash was indicated by 42.9% of players as causing pain, leading to people stopping playing padel. This movement consists of an offensive blow, without jumping, performed with the upper limb and executed on the player's dominant side over the head. In this movement, the athlete hits the ball with great power at the highest possible point, and can be a flat hit (without spin) or with a topspin effect, so that after bouncing on the opposite side, the ball goes over one of the side walls or returns to the other side after bouncing against the back wall²⁴.

As the smash is a very important and decisive shot, performed close to the net, it significantly increases the number of points won²⁴. Thus, the power given for this stroke overloads the joints of the upper limbs, considering that the speed of the ball in a smash by a semi-professional padel player reaches 120.72 ± 9.8 km/h, therefore, the high rate of pain in the shoulder joint due to the smash may be related to the main objective and importance of the stroke, winning the point.²⁵

According to the study by Escudero-Tena *et al.*²⁶, based on the analysis of World Padel Tour matches, the world's main padel tournament, from the quarterfinals to the final, winning athletes have a higher rate of point-winning smashes than losing athletes. In other words, the athlete gives everything he has due to the importance of winning the point, with variables such as joint overload, muscle fatigue and central nervous system fatigue that can influence²⁶.

Although a considerable portion of participants had suffered injuries while playing padel tennis, only 36.2% had been diagnosed with musculoskeletal problems, even though 60.3% had stopped playing due to these problems. In this perspective, the majority of participants (74.1%) reported that the symptoms interfered with their practice of padel tennis and 65.5% had already sought professional treatment for the symptoms. This result shows that many people neglect musculoskeletal pain and discomfort and do not seek specialized care to treat the problem, reinforcing the hypothesis that they do not wait for the appropriate time to recover from the injury before returning to sports.

Among those who had a diagnosis, inflammatory processes such as tendonitis and epicondylitis stood out, as well as tendon and/or ligament injuries and meniscus problems. Results from other studies point in the same direction, showing a high incidence of tendon injuries (40.4%) in padel players¹¹. Inflammatory processes appear to be directly linked to the strokes and playing positions that were highlighted as causing pain, since dislocations and squats require the knee joint, while smashes and backhands require the shoulder and elbow joints.

The length of practice was associated with the frequency of sports injuries, showing that those who have been practicing for longer have more injuries. This may be related to the longer time athletes are exposed to variables that can cause injuries. However, Valério *et al.*⁶ did not find statistically significant differences between the length of time athletes have been practicing sports and the presence or absence of injuries. Muñoz *et al.*²¹ found that the development of injuries in padel is reduced when players have been practicing this sport for more than five years.

From this perspective, the technical level may be more related to the occurrence of injuries than the time spent playing, since high-level players have fewer injuries¹² (Sánchez-Alcaraz 2019). In order to reduce the chances of injuries, it is important to correctly execute the technical gesture of the movement. It is necessary for players to dedicate time to technical work in the execution of the gestures, improving the quality of the sports motor gesture. To this end, it is considered that taking classes with specialized professionals is essential for learning technical gestures. As highlighted in the study carried out by Llamas, García and Pérez²⁷ in Spain, after six months of classes with a specialized teacher, the level of execution of the smash showed significant improvement.

CONCLUSION

This study showed a high prevalence of injuries during padel practice. The most affected areas were the knee, followed by the shoulder and ankle. Ligament injuries, musculoskeletal injuries and training overload were the main causes of injuries. The main diagnoses reported were inflammatory

processes, including tendonitis, tendon and/or ligament rupture and meniscus problems. Practitioners with longer practice time had a higher frequency of injuries.

Among the factors associated with the high prevalence of injuries found in the present study, it is worth noting that a large proportion of participants performed other exercises in addition to padel and the fact that the minority of practitioners took classes with a teacher trained in Physical Education.

Finally, it is suggested that new studies be conducted with practitioners who practice padel exclusively, in order to be able to analyze more reliably the relationship between the sport and the frequency of injuries.

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