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ORIGINAL RESEARCH

Injuries in competitive sports: an analysis of Brazilian padel athletes

Lesões no esporte de rendimento: uma análise em atletas brasileiros de pádel

Lesiones en el deporte de rendimiento: un análisis en los atletas de pádel brasileños

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ABSTRACT | This study aimed to analyze the prevalence of injuries in Brazilian padel athletes. In total, 62 padel players (40 men) participated, with an average age of 31.03±7.32 years who periodically trained for at least eight months. All individuals responded to the Referred Morbidity Survey in a stage of the national circuit of the sport, which contained questions on the athletes' identification, anatomical site, mechanism, nature, time, and severity of the injury and return to normal activities and injury recurrence. Results showed an injury rate of 1.39 per athlete and 2.05 per injured athlete, with the most prevalent injury mechanism being non-contact and the most frequent injury occurring at the end of the matches. The most affected anatomical site was the upper limb with mild severity and a symptomatic return to activities. We concluded that padel players show a high injury rate per athlete, as well as a high injury rate per injured athlete.

Keywords | Health Surveys; Athletes Injuries; Sports Medicine; Racquet Sports.

RESUMO | O objetivo deste estudo foi analisar a prevalência de lesões em atletas brasileiros de pádel. Participaram 62 padelistas (40 homens), com idade média de 31,03±7,32 anos e com o treinamento periódico do esporte de pelo menos oito meses. Todos responderam ao Inquérito de Morbidade Referida (IMR), em uma etapa do circuito nacional da modalidade. O IMR continha questões que abrangiam desde a identificação dos atletas até o local anatômico, além de investigar o mecanismo, a natureza, o momento e a gravidade da lesão, assim como o retorno às atividades normais e recidivas. Os resultados revelaram uma taxa de lesão de 1,39 por atleta e 2,05 por atleta lesionado, sendo o mecanismo de lesão mais prevalente o sem contato e o momento de lesão mais frequente, o final das partidas. O local anatômico mais acometido foi o membro superior, com gravidade leve e retorno sintomático. Conclui-se que padelistas têm uma alta taxa de lesão por atleta, bem como uma alta taxa de lesão por atleta lesionado.

Descritores | Inquéritos Epidemiológicos; Traumatismos em Atletas; Medicina Esportiva; Esportes de Raquete.

RESUMEN | El objetivo de este estudio fue analizar la prevalencia de lesiones en atletas de pádel brasileños. Participaron 62 jugadores de pádel (40 varones), con una edad media de 31,03±7,32 años y al menos ocho meses de entrenamiento periódico en el deporte. Todos respondieron a la Encuesta de Morbilidad Referida (IMR) en una etapa del circuito nacional de este deporte. La IMR constaba de preguntas sobre los atletas, el local anatómico de la lesión, además de investigar el mecanismo, la naturaleza, el momento y la gravedad de la lesión, así como el regreso a las actividades normales y las reocurrencias. Los resultados indicaron una tasa de lesiones de 1,39 por atleta y de 2,05 por atleta lesionado; el mecanismo sin contacto fue el más prevalente; y el final de los partidos, el momento de lesión más frecuente. El miembro superior fue el local anatómico más afectado, con severidad leve y reocurrencia sintomática. Se concluye que los jugadores de pádel tienen una elevada tasa de lesiones por atleta y por atleta lesionado.

Palabras clave | Encuestas Epidemiológicas; Traumatismos en Atletas; Medicina Deportiva; Deportes de Raqueta.

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INTRODUCTION

Padel is a racket sport that has gained more practitioners worldwide every year[1], attracting fans of different ages, socioeconomic levels, and performance goals[2]. Its practice is performed in pairs on a rectangular court[3]. Match time is around 55 minutes, and the average duration of a rally is nine seconds[4]. This intermittent sport shows intensities similar to the demands of tennis[4] since it requires a series of movements, such as displacements, jumps, and turns, which involve successive efforts and sprints[5]. The most used shots during matches are drive volleys, smashes, and backhand volleys[4].

Since it is considered a relatively young sport with an exponential increase in amateur and professional athletes[6], including in Brazil[3], padel can lead to increased risks of injuries. A limited number of scientific studies have analyzed consequences of this sport[7]. Generally, a series of studies investigating injuries in different sports have suggested that such occurrences may be directly related to intrinsic—biology, biomechanics, psychology, age, body deterioration, injury history, lack of physical preparation, eating behavior, fatigue, overtraining, each athlete's risk behavior, among others—, and extrinsic predisposing factors—the environment in which the athlete is included, the type and condition of sports flooring, ambient temperature, etc[8-10]. However, few studies analyze the epidemiology of injuries associated with the practice of padel[11-14].

To date, research has indicated that personal incidence rate (number of injured players per 100 athletes) ranges from 49.8% to 86.7%[12,15], with an injury rate of 2.75 injuries per 1,000 hours of risk exposure[14]. Moreover, the literature indicates that padel injuries occur more frequently in lower limbs[12,15], affecting elbow complex the most, and most commonly damaging tendon and muscles[12,15]. In turn, amateur athletes show a greater number of shoulder injuries[13].

However, the studies conducted show evidence for European athletes, especially in Spain[11-15]. No study found so far has analyzed Brazilian athletes. This may affect preventive and rehabilitative interventions aimed at players due to differences in culture, athletes' degree of professionalism, and economic investment between Brazil and Europe, as observed in other sports[16].

This context indicates that, though padel has exponentially increased and gained more space in national sports, there is still no history of the injuries affecting Brazilian athletes due to the lack of clinical records with information on injuries and the limited number of scientific investigations available on this modality. The described panorama affects preventive and rehabilitative interventions directed at players.

Thus, the organization of an injury record, associated with predisposing factors, can offer great preventive value since, from the moment we understand athletes' health, we can obtain more closely control injury origin. This would facilitate the rehabilitation of injuries, resulting in safer returns to sports practice and better sports performance due to training continuity[17]. Specific assessments can identify these risk segments and help guide prevention strategies that include errors and develop recommendations for the game[17]. In the absence of athletes' clinical records, one epidemiological resource that could be used to record and to quantify injuries and associate them with particular causative factors of the sport is the Reported Morbidity Survey (RMS)[18], an instrument validated and used in various sports, such as swimming, athletics, soccer, and basketball, among others, allowing for affected people to report their injuries, fating back to a certain period[19-21].

In this context, this study aimed to analyze the prevalence of injuries in Brazilian padel athletes. Specifically, we sought to assess the anatomical site, mechanism, nature, moment, and severity of injuries, as well as the return to normal activities and injury recurrence of athletes participating in a phase of the padel national circuit. Considering previous studies conducted in other countries[11-14], we expect an injury incidence rate ranging from 40% to 80%, and lower limbs to be identified as the most frequent injury site, as well as a considerable number of injuries in the elbow and shoulder joints.

METHODOLOGY

This is an analytical, cross-sectional study with a quantitative approach[22]. In accordance with ethical procedures, the Resolution No. 196/1996 of the National Health Council was respected. All participants signed an informed consent forms.

Our sample consisted of 62 volunteer padelists of both sexes (40 men and 22 women), who competed in the 4th Stage of the Brazilian Padel Circuit in 2017, based in the municipality of Porto Alegre, Rio Grande do Sul. This was the last stage of the main championship of the sport in Brazil, played by athletes from different states. Participants were aged from 18 to 42 years (31.03±7.32 years) who had periodically trained for the sport for at least eight months.

Players were divided into two groups according to their level of competitiveness and classified according to the championship registration: the 1st category was composed of professionals (n=40; 26 men and 14 women), and the 2nd category, by aspiring professionals (n=22; 14 men and 8 women). It was observed that up to seven matches can be played by each athlete per circuit, and that each match lasts approximately 55 minutes.

The instrument used to characterize possible injuries was the Reported Morbidity Survey (RMS)[18], adapted for the sport. Specifically, this instrument aims to collect information on sports injuries and their related variables, such as number of injuries, type, moment, mechanism, and affected anatomical site and return to normal physical activities. For data collection, two individually trained interviewers approached the athletes after the end of their championship matches. Then, structured interviews that addressed injury occurrence in the eight months prior to this study, their characteristics, and whether they were suffered during training or in competitions were conducted. The interviews were conducted individually in a place without external influence.

The data obtained were analyzed descriptively, according to the presence of injury, and the variables were expressed as mean and standard deviation (SD). The relation between the characteristics of the outcome of interest (injury) and athletes' competition categories (1st and 2nd Category) were analyzed with the Chi-squared test and Fisher's exact test for dichotomous variables. For data analysis, the STATA 14.0 program (StataCorp, Texas, USA) was used, and the significance level considered was α=0.05.

RESULTS

Results showed that, among the 62 athletes interviewed, 42 reported having suffered at least one injury in the last eight months—totaling 86 injuries—with an average injury rate of 1.39 per athlete and an average injury rate of 2.05 per injured athlete. Table 1 shows the association of extrinsic and intrinsic risk factors, according to the absence or presence of injuries. We found no statistically significant differences between athletes' characteristics and injury presence or absence.

Table 1. Mean (SD) of padel athletes' characteristics according to the occurrence of injury (n=62)

	Absent injury (n=20)	Present injury (n=42)	p
Age (years)	32.6 (8.4)	30.3 (6.7)	0.248
Weight (kg)	73.9 (12.3)	75 (12.7)	0.748
Height (m)	1.7 (0.8)	1.8 (0.9)	0.276
BMI (kg/m^2)	24.7 (3.3)	24.2 (2.6)	0.568
Training time (years)	12.2 (8.6)	12.8 (7.4)	0.782
Weekly training hours	10.0 (10.4)	9.5 (10.4)	0.839

Table 2 shows the association of competitiveness level in relation to the characteristics of the injuries suffered by participants. We observed that the most affected anatomical site was the upper limbs, with a non-contact injury mechanism, occurring during competition games, although we found no differences between athletes' competition level. We found a statistically significant relation between the injury time and the athletes' categories (p=0.046), indicating that injury moment is different according to the category.

Table 3 shows the association of the category with severity, return to normal activity, and injury recurrence suffered by the participants. Regarding injury severity, we found a predominance of mild injuries with a symptomatic return to the sport and high recurrence, but we observed no significant differences between participants' competition levels.

Table 2. Absolute frequency distribution (n) and relative frequency (%) of injuries according to anatomical site, mechanism, nature, and moment, according to athletes' category (n=86)

Anatomical site				
	Lower limbs	**Upper limbs**	**Torso**	
1st category	16 (27.1)	36 (61.0)	7 (11.9)	p=0.759
2nd category	8 (36.4)	12 (54.6)	2 (9.0)	
Mechanism				
	Contact with the ball	**Object on the ground**	**No contact**	
1st category	9 (14.7)	4 (6.6)	48 (78.7)	p=0.363
2nd category	1 (4.0)	3 (12.0)	21 (84.0)	

(continues)

Table 2. Continuation

	Nature			
	Physical training	Training game	Competition game	
1st category	5 (8.2)	29 (47.5)	27 (44.3)	p=0.055
2nd category	4 (16.0)	5 (20.0)	16 (64.0)	
	Moment			
	Beginning	Middle	End	
1st category	12 (19.7)	14 (23.0)	35 (57.4)	p=0.046*
2nd category	8 (32.0)	10 (40.0)	7 (28.0)	

*: Significant effect.

Table 3. Absolute frequency distribution (n) and relative frequency (%) of severity, return to normal activity, and injury recurrence, according to athletes' category (n=86)

	Severity			
	Mild	Moderate	Severe	
1st category	39 (63.9)	12 (19.7)	10 (16.4)	p=0.916*
2nd category	17 (68.0)	4 (16.0)	4 (16.0)	
	Return to normal activity			
	Asymptomatic	Symptomatic		
1st category	21 (34.4)	40 (65.6)		p=0.830
2nd category	8 (32.0)	17 (68.0)		
	Recurrence			
	No	Yes		
1st category	31 (50.8)	30 (49.2)		p=0.639*
2nd category	11 (44.0)	14 (56.0)		

DISCUSSION

This study aimed to investigate the prevalence of sports injuries in Brazilian padel athletes by applying the RMS, associating them with risk factors specific to the athletes' modality. Generally speaking, results failed to reveal statistically significant differences in the comparison between injured and non-injured athletes in relation to their characteristics. We also found no differences between athletes' category. Thus, our findings indicate that involvement arises regardless of the athletes' category, thus, directly related to practice of the sport.

We found a 67.74% prevalence of injuries in our sample in the eight months prior to this study. This result is related to other European studies on the practice of padel that reported an injury rate between 49.9% and 86.70%[11,12,15], in addition to studies on practitioners of other sports with similar motor skills, such as professional tennis players, who showed a 56% involvement rate[23]. Therefore, our study is in the intermediate range of these numbers.

Injury rate among athletes who reported at least one case in the last eight months was 2.05, that is, more than two injuries per athlete. When this rate was assessed among all competitors, it remained high (1.39), thus characterizing a high injury rate. When computing these results with those reported in other sports, such as volleyball and swimming, which also used the RMS as an evaluation instrument, we observed that padelists show higher injury rates per injured athletes[24,25]. The specificity of the analyzed sports, regarding the characteristics of their specific motorskills[2] and the different motor actions performed in the context of a game (e.g., padel and swimming), are possible explanations for the differences found.

The highest prevalence of reported injuries occurred in the upper limbs by overuse (no contact) and shoulders were the most affected anatomical site, in agreement with the findings of Wilk et al.[26]. Specifically, these authors reported injuries due to repetitive motions with the upper limbs in racket sports above the head, as is the case with padelists, due to excessive mobility generating biomechanical changes to the structures involving the shoulder complex, making athletes more prone to injuries.

Thus, a hypothesis that explains these results may be associated with the specificity of the motor actions

performed during the practice of this sport. A possible explanation is that taller players show more frequent shoulder injuries since they perform smashes more often, a shot that allows the athlete a wider field of action to perform a successful shot[11]. Moreover, we can assume that the repetition of specific actions is a determining factor for athletes suffering one or several types of musculoskeletal injuries typical of padel, although a greater muscle imbalance and a lower range of joint movement can also directly affect players[14].

Note that, some studies analyzing padel injuries in other countries, such as Spain, have found lower limbs as the most affected anatomical location[12,13]. We could have expected these results in our study due to the characteristics of the game, in which sudden and highly intensity direction changes with accelerations and decelerations, as well as instable jumps and landings are frequent. All these actions demand a lot from players' joints and muscles, leading to high levels of lower limb injuries[13]. However, it is still unclear which specific factors would explain this difference. A possible explanation may be associated with psychological factors, since the location of a match, fans and their involvement in the games, and the distinctive level of the competitions in several countries can force players to maintain a high state of concentration and activation[27,28]. Thus, for example, hitting a smaller amount of balls and having to ensure the scoring of points with greater consistency can influence greater psychological demands and lead to distinctions in the injuries. Likewise, athletes' individual characteristics, such as their ability level, considering previous motor experiences in the different phases of motor development[29] and cultural differences which influence the frequency of practice of padel in Brazil and Spain, as well as the training methods used in different locations worldwide can also influence the different injury types. However, it is noteworthy that it is necessary to conduct other studies using, for example, motivation measures, cognitive abilities, match context (audience, championship type), flexibility or electromyography, to deepen and to test such explanatory hypotheses.

In this study, we found statistically significant differences between athletes in the 1st and 2nd category in relation to injury moment. This can be explained by the fact that aspiring professional athletes are less physically prepared and thus injured at the beginning and middle of matches, whereas professional athletes are more injured at the end of matches, regarding the injury mechanism without contact (overuse).

Although not statistically significant, we emphasize that the participating sample was much smaller compared than the ones in other studies conducted with other sports, which evaluated much more than twice as many injured individuals[12,14]. Even then, the overuse mechanism was highly prevalent, indicating the excess of repetitive movements related to muscle fatigue. This result is in line with those reported by Sá et al.[29], that indicate the contractility of fatigued muscles as a limitation to the absorption capacity of shock and stress, causing excessive or poorly compensated overload, preventing proper balancing and disorganizing the system which causes injuries.

Nature of the injury was more prevalent in competitive games, considering that, during competitions, athletes tend to exceed their physical capacity. This statement corroborates the study by Waldén, Hägglund, and Ekstrand[30], who also noted that orthopedic injuries in soccer athletes from European clubs occurred mostly during competitive games. Regarding severity, mild injuries were the most prevalent, according to the RMS. However, more than 65% of athletes, professional or aspiring, who suffered these injuries returned to their activities with painful symptoms and had recurrences. These values were higher than the findings of Vanderlei et al.[24], who, when using the RMS to evaluate swimmers, found that 14.29% of the injuries suffered in the improvement category showed recurrences. However, as already suggested by the differences in the characteristics of their specific motor skills and by the different motor actions performed in playing these sports, these results should be cautiously compared.

Finally, this study has some limitations that should be emphasized. One of them refers to the lack of greater control of athletes' training time and type, as well as the specific practices of padel. Such information would enable the better understanding of injuries occurrence and explain our results. Another limitation of this study is that the possible relation between the number of matches performed by each athlete in the championships, rest time, and injury occurrence were disregarded. Future studies might verify this relationship since the pressure suffered by athletes coming from different sources (e.g., opponents, fans) verified in competitions, together with energy demands, can affect injury occurrence in padel. In this context, it is important to highlight players' physical preparation to prevent padel injuries, and a greater awareness of professionals and athletes in relation to prevention is necessary. By anatomical and biomechanical studies of

the limbs affected by injuries, and considering the main shots used in padel, a physical program to prevent injuries which would positively affect the general improvement of athletes' performance could be drawn.

CONCLUSION

We conclude that Brazilian athletes show a high rate of injury per practitioner and a high rate of injury per injured athlete. Upper limbs are the most affected regardless of the athletes' performance category. With the results of this study, we hope such information can contribute to a better understanding of injuries in these athletes. Finally, we highlight the need for further studies since there is a wide gap in the literature on this sport in the Brazilian scenario.

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