

Epidemiological profile of beach tennis practitioners in Florianópolis region – Santa Catarina/Brazil

Perfil epidemiológico dos praticantes de Beach Tennis da Grande Florianópolis – Santa Catarina/Brasil

Perfil epidemiológico de los practicantes de Beach Tennis (Tenis Playa) en la Gran Florianópolis – Santa Catarina/Brasil

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ABSTRACT | Considering the growing number of practitioners and the low evidence regarding the characteristics of injuries in beach tennis, this work aims to describe the prevalence of injuries related to the practice of beach tennis in the Florianópolis. A retrospective cross-sectional epidemiological study was carried out from September to October, 2022. In total, 140 beach tennis practitioners were evaluated regarding the locations, types, and chronicity of injuries, as well as information about sporting experience and weekly practice volume. A total of 108 injuries were identified in 44 athletes (30.7%), 62 of which were chronic injuries (57.4%) and 46 were acute (42.6%). The upper limbs were the most affected, with the elbow (26.8%) and shoulder (13%) standing out. Tendinopathies (34.2%) and muscle injuries (25%) were the main types of injuries reported. The main elbow involvement was lateral elbow tendinopathy, comprising 90% of total elbow injuries. The predominant profile encompassed females, recreational practitioners, with some chronic soft tissue injuries, predominantly in the upper limbs, mainly elbows and shoulders. The shorter practice time and the amateurism of practitioners were found to influence the incidence of reported injuries.

Keywords | Beach Tennis; Injuries; Epidemiology; Athletes.

RESUMO | Tendo em vista o crescimento de praticantes e a baixa evidência a respeito das características das lesões no *beach tennis*, este trabalho visa descrever a prevalência de lesões relacionadas à prática desse esporte na região

de Florianópolis. Foi feito um estudo epidemiológico transversal retrospectivo entre setembro e outubro de 2022. Cento e quarenta praticantes de *beach tennis* foram avaliados quanto aos locais, tipos e cronicidade das lesões, bem como informações sobre a experiência esportiva e volume semanal de prática. Foi identificado um total de 108 lesões em 44 atletas (30,7%), sendo 62 lesões crônicas (57,4%) e 46 agudas (42,6%). A incidência média de lesões foi de 1,43 por 1.000 horas de exposição. Os membros superiores foram os mais acometidos, sendo o cotovelo (26,8%) e o ombro (13%) as regiões mais acometidas, respectivamente. Tendinopatias (34,2%) e lesões musculares (25%) foram os principais tipos de lesões relatadas. O principal acometimento no cotovelo foi a epicondilalgia lateral do cotovelo, compreendendo 90% do total de lesões desse complexo articular. O perfil identificado após a análise foi o predomínio de mulheres, praticantes recreativas, com algumas lesões crônicas de partes moles, com predomínio em membros superiores, principalmente cotovelos e ombros. O menor tempo de prática e o amadorismo dos praticantes demonstraram influenciar na incidência de lesões relatadas.

Descritores | *Beach Tennis*; Lesões; Epidemiologia; Atletas.

RESUMEN | Teniendo en cuenta el aumento del número de practicantes y la baja evidencia sobre las características de las lesiones en el *beach tennis*, este trabajo busca describir la prevalencia de lesiones relacionadas con la práctica de

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este deporte en la región de Florianópolis. Se realizó un estudio epidemiológico transversal retrospectivo entre septiembre y octubre de 2022. Se evaluaron ciento cuarenta practicantes de *beach tennis* en cuanto a la localización, tipos y cronicidad de las lesiones, así como las informaciones sobre la experiencia deportiva y el volumen de práctica semanal. Se identificó un total de 108 lesiones en 44 atletas (el 30.7%), de las cuales 62 fueron lesiones crónicas (el 57.4%) y 46 fueron agudas (el 42.6%). La incidencia media de lesiones fue de 1.43 por 1000 horas de exposición. Los miembros superiores fueron los más afectados, siendo el codo (el 26.8%) y el hombro (el 13.%) las regiones más afectadas,

respectivamente. Los principales tipos de lesiones relatadas fueron tendinopatías (el 34.2%) y lesiones musculares (el 25%). La principal afectación en el codo fue la epicondialgia lateral del codo, representando el 90% del total de lesiones de este complejo articular. El perfil identificado tras el análisis fue el predominio de mujeres, practicantes recreativas, con algunas lesiones crónicas de tejidos blandos, con el predominio en miembros superiores, principalmente codos y hombros. Se demostró que el tiempo de práctica más corto y el amateurismo de los practicantes influyen en la incidencia de lesiones relatadas.

Palabras clave | Beach Tennis; Lesiones; Epidemiología; Atletas.

INTRODUCTION

Beach tennis was created approximately in 1987 in Ravenna, Italy. This sport began to be professionalized in 1996 and is currently regulated by the International Tennis Federation (ITF). According to the ITF, more than 500,000 people practice this sport worldwide. The modality arrived in Brazil in 2008, in Rio de Janeiro, spreading to coastal cities in other states and even some inland areas shortly after. Today, according to the ITF, Brazil is the second “greatest sport power” in the world, behind only Italy¹⁻³

The success of beach tennis in Brazil and worldwide is due to the fact that it is a sport practiced by individuals of different age groups and levels of physical fitness/competitiveness, in addition to requiring only two or four people to play a match^{1,2}. Due to this high acceptance by the world population for the sport, beach tennis seems to emerge as an enjoyable option for individuals looking to start some physical activity^{1,2}.

Despite being a “noncontact” sport and, thus, being considered a safer sport, it is known that all types of physical activity carry a certain risk of injury⁴. Notably, injuries can lead to physical disability, which, in turn, may lead to absence from work, need to use public healthcare resources, and personal expenses⁴. Moreover, it has already been proven that lower injury incidence rates are strongly correlated with better results in the competitive season, as, for example, evidenced by Eirale et al.⁵ in professional soccer teams.

Despite the considerable increase in the number of practitioners and the growing popularity of the sport, there is only one published study on beach tennis injuries, carried out with 206 practitioners, on the French island of Réunion, in the Indian Ocean⁶. Therefore, the literature still lacks studies on the most prevalent injuries in beach tennis practitioners,

as possibly the latter French study does not represent the same findings in other “great power” in the sport.

Thus, determining the prevalence of injuries in TB practitioners from different locations, as well as to describe anthropometric and sociodemographic characteristics and their habits related to sports practice is significantly important, so that we can carry out comparisons of injury rates with other locations and analyze any causal factor that could influence a greater occurrence of these. Information about musculoskeletal injuries is fundamental to provide the best treatments, guidelines, and strategies for injury prevention. Thus, the objective of this study is to describe the incidence of injuries related to BT in the Greater Florianópolis region via a cross-sectional retrospective study.

METHODOLOGY

This retrospective cross-sectional epidemiological study included beach tennis practitioners in the Florianópolis region to verify the prevalence of injuries in professional and amateur practitioners. All participants signed an informed consent form before answering the questions.

Participants and inclusion criteria

Individuals aged over 18 years who practiced beach tennis regularly (at least once per week) and who lived in Florianópolis were included. Individuals who did not complete the questionnaire and those aged under 18 years were excluded.

Research development and data collection

The data collection was conducted via an online questionnaire, developed by the researchers, on the

Google Forms® platform. The first section of the questionnaire consisted of the sociodemographic and personal characteristics of the practitioners, such as sex, age, municipality of residence, handedness, and schooling level. The following section addressed factors related to the practice of beach tennis such as practice time, category classification following the 2022 Brazilian Tennis Confederation (CBT) regulation, frequency of practice, frequency of “extra beach tennis” physical training, and average time for each workout. The third section dealt with the investigation of the reported presence of pain and injury related to the practice of beach tennis, namely: pain intensity and location, investigation of previous injuries, type of injury, measures taken to deal with or treat the injury, time absent from practice, and level of return to sport. Finally, the fourth section focused on “extra beach tennis” physical activities, such as other sports and activities that the individual practiced regularly for leisure, competitiveness in other sports, place, and time of practice.

To reach as many practitioners as possible, the questionnaire was sent to arenas, gyms, and private beach tennis courts in the city of Florianópolis, in addition to being disseminated via social networks (Instagram® and WhatsApp®). Data collection was conducted over a two-month period, during September and October, 2022.

The study was conducted following the tennis-specific extension of the International Olympic Committee (IOC) consensus statement on methods for recording and reporting epidemiological data on injuries and illnesses in sports⁷. The use of the standard established by the IOC for tennis was considered valid due to the proximity between these tennis modalities, in addition to the absence of specific evidence for beach tennis.

Definition of injury

This study followed the definition of injury by the IOC consensus. This definition characterizes injury as any condition that affects an athlete's normal state of health, regardless of its consequences on the athlete's participation or sport performance, or if the individual sought care from a health professional⁸.

Statistical analysis

Data were tabulated and stored in Google Sheets® for later analysis using the SPSS v17.0 software (SPSS, USA). A descriptive analysis of the sociodemographic and professional data of the participants was performed.

Questionnaire responses were expressed as frequency, mean, and percentage. To estimate the total incidence of injuries per 1,000h, the model proposed by Minghelli et al.⁹ (2019) was employed. The total number of injuries among the individuals studied was multiplied by the total number of training hours of the injured individuals. Then, the total value was adjusted to a proportion per 1000h. To estimate hours, a weekly practice time of 7h and a month equals 4.34 weeks were assumed. The association between nominal qualitative variables was assessed using the Chi-squared test (χ^2). A 5% significance level was used.

RESULT

The survey was conducted with 143 beach tennis practitioners. Females represented most of the study sample (69.2%). Table 1 shows the anthropometric and sociodemographic characteristics of these practitioners.

“Recreational” athletes, that is, those who do not participate in official competitions, represented 49.6% of the total sample, as shown in Table 2. We classified as “free-time physical activity” all physical activities and sports practiced, excepting beach tennis.

Table 1. Anthropometric and sociodemographic data of the study population

Characteristic	n=143	% of the total
Average: 34 years old (18–64)		
Age (years)		
18 to 30 years	55	37.6%
31 to 40 years	44	31.2%
41 to 50 years	2	20.6%
<51 years	15	10.6%
Sex		
Male	44	30.8%
Female	99	69.2%
Height (m)	1.67m (out of 38 individuals ¹)	
Weight (kg)	68.6kg (out of 38 individuals ¹)	
BMI	24.6 – Normal (out of 38 individuals ¹)	
Handedness		
Right-handed	134	93.7%
Left-handed	9	6.3%
City of residence (n)		
Florianópolis	112	78.3%
São José	20	14%
Palhoça	8	5.6%
Biguaçu	3	2.1%
Other	0	0
Schooling (n)		
Complete higher education	108	75.5%
Incomplete higher education	30	21%
Complete high school	4	2.8%
Incomplete high school	1	0.7%
Incomplete Secondary education	0	0

¹The collection of Height and Weight data were performed in a second moment, and consequently the analysis of BMI as well. It was not possible to contact all participants in the collection.

Table 2. Data related to beach practice tennis and other physical activities

Characteristic	n=143	% of the total
Technical level¹		
Professional category	2	1.4%
Category A	5	3.5%
Category B	15	10.5%
Category C	24	16.8%
Category D	26	18.2%
Does not compete	71	49.6%
Practice time (years)		
<1 year	83	58.2%
1 to 3 years	41	28.4%
3 to 5 years	15	10.6%
5 to 10 years	3	2.1%
>10 years	1	0.7%
Beach tennis frequency		
1× per week	45	31.9%
2× per week	49	34.8%
3× per week	33	22.7%
4× per week	10	7.1%
5× or more	6	3.5%
Average hours of practice² (hour)		
Less than 1 hour	17	11.5%
From 1 to 2 hours	97	65.6%
From 2 to 3 hours	23	15.5%
From 3 to 4 hours	7	4.7%
More than 4 hours	4	2.7%
Training volume (hours/week)		
Less than 2 hours	42	29.37%
From 2 to 4 hours	46	32.17%
From 4 to 6 hours	30	20.98%
More than 6 hours	25	17.48%

(continues)

Table 2. Continuation

Characteristic	n=143	% of the total
Free-time physical activity		
No practice, and not intending to	2	1.4%
No, but intending to	5	3.5%
Yes, but not regularly	15	10.5%
Yes, less than 6 months ago	27	18.9%
Yes, more than 6 months ago	94	65.7%
Weekly frequency (other activities)		
1 day/week	9	6.4%
2 days/week	10	7.1%
3 days/week	35	25%
4 days/week	34	24.3%
5 days/week	30	21.4%
6 days/week	17	12.1%
7 days/week	5	3.6%
Extra activities		
Bodybuilding	72	37.1%
Walk	29	14.5%
Race	27	13.3%
Functional training	18	9.3%
Pilates	11	5.6%
Cycling	10	5.1%
Soccer	8	4.1%
Yoga	5	2.6%
Cross-training	5	2.6%
Volleyball	4	2%
Others	5	2.6%

¹The technical level was defined as per the Brazilian Tennis Confederation classifications.²A total of 148 training sessions were considered, as some individuals practiced beach tennis with different workloads in the same week

Location, type, and severity of lesions

A total of 108 injuries were reported in 44 athletes (30.7% of participants). The overall incidence of injuries was 1.78 per 1,000h of exposure. Among the reported injuries, 46 (42.6%) were acute and 62 (57.4%) were chronic. These injuries occurred in the upper limbs (47.2%), lower limbs (44.4%), and axial region (8.3%). Elbows showed the highest frequency of injuries, followed by shoulders and hips (Table 3). The main types of injuries reported were tendinopathies and muscle injuries. Table 3 shows data on time off and performance in sport upon return.

Table 3. Anatomical region of acute and chronic injuries, and characteristics of injuries and return to sport

Anatomical region	Total		Acute injuries		Chronic injuries	
	n=108	% of the total	n=46	% of acute	n=62	% of chronicles
Axial		8.3%	5	10.9%	4	6.4%
Cervical	8	7.4%	4	8.7%	4	6.4%
Low back	1	0.9%	1	2.2%	0	
Upper limbs	51	47.2%	20	43.5%	31	50%
Shoulder	15	13.9%	7	15.2%	8	12.9%
Elbow	29	26.8%	10	21.7%	1	30.6%
Hand/wrist	7	6.5%	3	6.5%	4	6.4%
Lower members	48	44.4%	21	45.6%	27	43.5%
Hip	12	11.1%	1	2.2%	11	17.7%
Thigh	5	4.6%	3	6.5%	2	3.2%
Knees	11	10.2%	2	4.3%	9	14.5%
Calf	11	10.2%	8	17.4%	3	4.8%
Foot/ankle	9	9.2%	7	15.2%	2	3.2%

(continues)

Table 3. Continuation

Characteristics of injuries and return to sport	n	% of the total
Type of injury	n=108	
Tendinopathy	37	34.2%
Muscular	27	25%
Sprain	14	12.9%
Dislocation	3	2.8%
Fracture	2	1.8%
Bruise	0	0
Others	2	1.8%
Did not know how to inform	23	21.3%
Surgical procedure due to injury		
Yes	1	0.9%
No	107	99.1%
For what injury?	Meniscal injury	
Injured member¹	n=44	
Dominant	29	65.9%
Non-dominant	9	20.4%
Both	1	2.3%
It was not in an extremity (cervical, lumbar)	5	11.3%
Length of absence		
1 to 3 days	8	18.2%
4 to 7 days	3	6.8%
1 to 2 weeks	8	18.2%
3 to 4 weeks	8	18.2%
1 to 2 months	6	13.6%
3 to 6 months	9	20.4%
more than 6 months	2	4.5%
Return to practice		
Much worse	2	4.5%
Worst	8	18.2%
Same level	20	45.4%
Best	11	25%
Much better	3	6.8%

¹Considering the 44 individuals who reported injury

Association of variables with injuries

A descriptive analysis of the sociodemographic and professional data of the participants was carried out. Questionnaire responses will be expressed as frequency, mean, and percentage. The association between nominal qualitative variables was assessed using the Chi-squared test (χ^2). The significance level used was 5% (Table 4).

Table 4. Association of variables with injuries

Characteristic	Total		No injury		with injury		p value
	N=143	%total	n	%	n	%	
Sex							
Male	44	30.8%	28	1.6%	16	11.2%	.334
Female	99	69.2%	71	49.7%	28	19.6%	
Age (years)							
18 to 30	55	37.6%	44	30.4%	11	7.1%	.095
31 to 40	44	31.2%	30	21.3%	14	9.9%	
41 to 50	29	20.6%	7	12.1%	12	8.5%	
>51	15	10.6%	8	5.7%	7	5.0%	
Practice time							
<1 year	83	58.2%	69	48.2%	14	9.9%	.001
1 to 3 years	41	28.4%	21	14.9%	20	13.5%	
3 to 5 years	15	10.6%	8	5.7%	7	5.0%	
5 to 10 years	3	2.1%	1	0.7%	2	1.4%	
>10 years	1	0.7%	0	0	1	0.7%	

(continues)

Table 4. Continuation

Characteristic	Total		No injury		with injury		p value
	N=143	%total	n	%	n	%	
Technical level							
Professional	2	1.4%	1	0.7%	1	0.7%	.007
Category A	5	3.5%	3	2.1%	2	1.4%	
Category B	15	10.5%	6	4.2%	9	6.3%	
Category C	24	16.8%	12	8.4%	12	8.4%	
Category D	26	18.2%	19	13.3%	7	4.9%	
Does not compete	71	49.7%	58	40.6%	13	9.1%	
Training volume hours/week							
Less than 2 hours							.229
From 2 to 4 hours	42	29.4%	32	22.4%	10	7.0%	
From 4 to 6 hours	46	32.2%	28	1.6%	18	12.6%	
From 6 to 8 hours	30	21.0%	19	13.3%	11	7.7%	
More than 8 hours	25	17.5%	20	14.0%	5	3.5%	
Free-time physical activity							
No, and not intending to	2	1.4%	2	1.4%	0	0	.153
No, but intending to	5	3.5%	5	3.5%	0	0	
Yes, but not regularly	15	10.5%	12	8.4%	3	2.1%	
Yes, less than 6 months ago	27	18.9%	21	14.7%	6	4.2%	
Yes, more than 6 months ago							
	94	65.7%	59	41.3%	35	24.5%	
Weekly activity							
1 day/week	9	6.4%	8	5.7%	1	0.7%	.326
2 days/week	10	7.1%	8	5.7%	2	1.4%	
3 days/week	35	25.0%	27	1.3%	8	5.7%	
4 days/week	34	24.3%	21	15.0%	13	9.3%	
5 days/week	30	21.4%	20	14.3%	10	7.1%	
6 days/week	17	12.1%	10	7.1%	7	5.0%	
7 days/week	5	3.6%	2	1.4%	3	2.1%	

Shoulder and elbow injuries

The main injuries reported in the shoulder were tendinopathies, totaling 41% of all shoulder injuries (Table 5). Among the 14 individuals with shoulder injuries, 13 underwent some type of intervention to treat or deal with the condition, with “physical therapy” and the combination of “physical therapy, massage, and medication” being the most common, both representing approximately 21% of the treatment options. Only one individual did not undergo treatment.

Regarding elbow injuries, most participants reported lateral elbow tendinopathy (tennis player’s epicondylitis), with 90% of all elbow injuries reported, against 10% of elbow ligament injuries (Table 5). Most of those affected by epicondylitis stayed one to two weeks away from the beach tennis practice. Among the treatment options reported by athletes, “physical therapy” and the combination of “physical therapy and medication” were the most listed (37.5% and 18.7%, respectively). In total, two practitioners did not undergo intervention.

Table 5. Shoulder and elbow injuries

Characteristic of shoulder injuries	n	% of the total
Injury type		
Tendinopathy	10	41.6%
Muscular	9	37.5%
Ligamentous	2	8.3%
Dislocation	1	4.2%
Fracture	0	0
Others	2	8.3%
Length of absence		
1 to 3 days	3	21.4%
4 to 7 days	1	7.1%
1 to 2 weeks	3	21.4%
3 to 4 weeks	2	14.3%
1 to 2 months	1	7.1%
3 to 6 months	3	21.4%
More than 6 months	1	7.1%
Type of treatment		
Physical therapy	3	21.4%
Physical therapy, massage, and medication	3	21.4%
Physical therapy, massage, medication, and acupuncture	2	14.3%
Physical therapy and massage	1	7.1%
Physical therapy, pilates, and occupational therapy	1	7.1%
Massage	1	7.1%
Osteopathy	1	7.1%
Medicines	1	7.1%
No treatment	1	7.1%

(continues)

Table 5. Continuation

Characteristic of elbow injuries	n:	% of the total
Injury type		
Lateral elbow tendinopathy (lateral epicondylitis)	27	90%
Ligamentous	3	10%
Muscular	0	
Dislocation	0	
Fracture	0	
Length of absence		
1 to 3 days	4	25%
4 to 7 days	2	12.5%
1 to 2 weeks	5	31.2%
3 to 4 weeks	2	12.5%
1 to 2 months	1	6.2%
3 to 6 months	2	12.5%
More than 6 months	0	0
Type of treatment		
Physical therapy	6	37.5%
Physical therapy and medication	3	18.7%
Physical therapy, medication, and muscle strengthening	1	6.2%
Physical therapy, pilates, and occupational therapy	1	6.2%
Physical therapy and massage	1	6.2%
Massage and medication	1	6.2%
Massage and strengthening	1	6.2%
No treatment	2	12.5%

DISCUSSION

This study aimed to describe the prevalence of injuries in beach tennis. We found a predominance of female and recreational practitioners. Moreover, an incidence rate of 1.78 injuries was observed per 1,000h of exposure, and it seems that the shorter practice time and the amateurism of practitioners may influence the incidence of injuries. Among the injuries, chronic ones predominate, and the upper limbs are the most affected, especially shoulders and elbows. Berardi et al.⁶ found similar results, with 178 injuries in 206 players (with a predominance of male players), totaling 1.81 injuries per 1,000h of play. The authors found that shoulders were the most frequently injured, as well as that most upper limb injuries were chronic tendinopathy in recreational players.

Comparison with overhead sports

Main injuries

According to Posner et al.¹⁰, the main segment affected in pitching sports (overhead) are the shoulders, accounting for 31% of all injuries in professional baseball pitchers, followed by 26% of elbow injuries¹⁰. The main potentially harmful radiological findings in throwing athletes (tennis, volleyball, javelin throwing) are internal impaction, superior labrum anterior and posterior lesions (SLAP),

and injuries to the supraspinatus and infraspinatus muscles. Despite the high prevalence of shoulder injuries in volleyball athletes, they were not as common as ankle, knee, and finger injuries¹¹. It is believed that many of these injuries are caused by joint adaptations due to the great demand for powerful shoulder rotation movements¹².

Risk factors

Similar to other overhead sports, beach tennis presents a repetitive demand for power in the shoulder and elbow joints, mainly in actions such as the serve, smash, and hook. In throwing sports such as baseball, tennis, and American football, it is common to identify adaptive changes in bone, capsuloligamentous structures, and muscles, in addition to pathological indications in image exams of the athletes' shoulders¹¹. Some of the main adaptive patterns in the dominant shoulder of throwing athletes that were previously interpreted as pathophysiological include the glenohumeral internal rotation deficit (GIRD)¹³⁻¹⁵, described by Burkart et al.¹³ as greater than 25% compared to the contralateral limb. Moreover, a decrease in total range of motion (TROM) has been noted, described by Wilk et al.¹⁵ as greater than 5% when compared to the contralateral shoulder¹³⁻¹⁵. However, according to Keller et al.¹⁶, the literature is still limited on chronic adaptations of glenohumeral rotation and its correlation with shoulder and elbow injuries, as results did not reach statistical significance, despite suggesting a higher incidence of injuries in athletes with GIRD and TROM deficits^{8,16-18}.

Regarding external load, Matsuura et al.¹ found that training volume above 16 hours/week were associated with shoulder and elbow injuries when analyzing risk factors for upper limb injuries in young baseball players¹. Similarly, Møller et al.¹⁹ analyzed the impact of training volume on young handball athletes and its correlation with shoulder injuries. They found that athletes who underwent 60% increases in acute training volume were twice as likely to have a shoulder injury when compared to increases of up to 20% in the same week¹⁹. This greater exposure to activity is expected to be one of the risk factors for developing upper limb injuries, as they are typically caused by the accumulation of microtraumas from the repetition of throwing motion²⁰.

Since evidence of risk factors in throwing sports remains limited, it is suggested that a general shoulder screening should be performed considering range of motion, strength, power, and other standardized measures, such as GIRD and TROM analysis, which can have

an important role in the prevention and treatment of these injuries^{21,22}.

Comparison with racket sports

Beach tennis is a sport that presents strokes similar to tennis such as forehand, backhand, serve, slice, lob and, smash. A descriptive study of professional tennis players identified that more than 50% of male and female withdrawals from competition can be attributed to injuries²³. In another recent descriptive study, it was observed that university tennis injuries were more prevalent in matches than in training, and that they occurred significantly more in the lower limbs, followed by the upper limbs and trunk. In this same study, the main injuries reported were strains, sprains, inflammations, and tendinitis, with no significant differences between sexes²⁴.

Tennis and beach tennis differ in terms of the flooring of the courts, as the latter is played on sand, whereas the former is played on clay, grass, concrete, or carpet. This condition leads to another divergence, as in tennis the ball is allowed to bounce once on the ground, thus stimulating greater displacements of the tennis player during points disputes. Another difference is the size of the courts and nets: in beach tennis, the court for doubles measures 16m × 8m and the net stands 1.70m above the ground. Meanwhile, the tennis court for singles measures 23.77m × 8.23m, for doubles, 23.77m × 10.7m, and the net height is 0.14m¹.

A major sport in Asia, badminton is considered the fastest among racket sports, and at a competitive level, it requires excellent physical conditioning. It is played predominantly with overhead movements. The game is physically challenging and demands complex movements with dynamic postural changes in the form of lunges, displacements, reaches, and jumps. Furthermore, repetitive “forehand” and “backhand” blows performed above the head generate excess stress on the upper limbs. Despite the high demand, its characteristic injuries are rarely severe and affect the lower limbs more, especially the knees in cases such as ligament sprains and patellar tendinopathy. In the upper limbs, the shoulder was the most common region in which pain was reported, with rotator cuff tendinopathy being the most prevalent diagnosis. Most injuries were due to overload, considered chronic and more common in young athletes²⁵.

Padel is a racket sport performed on a court that allows the ball to bounce off the walls and continue the game. Particularly popular in Spain, Argentina, and parts

of Brazil, it features a professional circuit worldwide, bringing together the best athletes in the ranking. In recreational padel player, injuries were more prevalent in the lower limbs for 53.1% of the total injuries, followed by the upper limbs (37.5%) and trunk (9.4%). The most common type of injury was ligament sprains (43%) and unknown factors were the top perceived cause of injury (40%), followed by fatigue (19%) and poor technique (15%). Other variables such as racket type and court surface material were not associated with injury²⁶.

Comparison with other beach or sand sports

Previous studies have reported incidence of injuries with longer recovery time in indoor sports (closed court, hard surface) than in their beach or sand version, as the case of beach handball. A possible reason for this lower incidence in beach sports is the reduced speed when changing direction²⁷. This ratio of fewer severe injuries is also seen in beach soccer, which despite presenting a higher number of hallux contusions and abrasion injuries, ankle sprains were considered less frequent in its beach variant when compared to traditional soccer². It is also interpreted that the soft surface of the sand softens erroneous landings and falls from heights.

The soft surface of sand sports also affects jumping mechanics when compared to the hard surface. On sandy soil, beach volleyball athletes present a greater propulsive phase of the jump and greater absorption of it. This finding may explain a lower incidence of patellar tendinopathy, which typically occurs in athletes who use many jumps and landings on rigid surfaces⁶.

This study is the first to consider the practice of other (extra) physical activities by beach tennis athletes, which proved to be an important factor to consider since 84.6% of beach tennis practitioners practice other physical activities regularly, with bodybuilding, walking, and running being predominant.

Study limitations include those typical of a retrospective study. There are confounding factors related to players' memory, underestimation of possible injuries, and issues regarding the diagnosis of injuries, which was not always performed by a health professional. As this is a collection conducted via an online questionnaire, it is possible that interpretation errors occurred when filling out the questions. Despite the investigation of the practices of other physical activities, this study did not differ injuries as occurring during the beach tennis practice and occurring during other physical activities. Moreover, this study

did not consider other components that could influence injuries (multifactorial), such as hours of sleep, stress, anxiety, and diet, suggesting further studies.

The information in this study is fundamental for health professionals to effectively screen and evaluate BT practitioners, aiming to provide the best possible therapeutic choice for these athletes. Moreover, we highlight that joint work can aid prevent and minimize the risk of injuries among BT practitioners.

CONCLUSION

This study found a predominance of female and recreational beach tennis practitioners. Chronic soft tissue injuries predominate over acute ones and the upper limbs are the most affected, especially elbows and shoulders. Most athletes affected by these injuries sought care from health professionals to treat their conditions, with the physical therapist being the main professional to be consulted. Finally, the shorter practice time and the amateurism of practitioners was found to impact the incidence of reported injuries.

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