

Prevalence of scapular dyskinesis and shoulder pain in amateur surfers from Rio Grande do Sul: A cross-sectional study

Prevalência de discinesia escapular e dor no ombro em surfistas amadores do Rio Grande do Sul: um estudo transversal

Prevalencia de discinesia escapular y dolor de hombro en surfistas aficionados de Rio Grande de Sul: um estudio transversal

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ABSTRACT | The paddling movement represents 51.4% of total surfing practice time, generating high muscle demand for the shoulder complex. Despite this, there is a gap on the literature on the prevalence of pain and scapular dyskinesis (SD) in surfers. This study sought to evaluate the prevalence of SD and shoulder pain in amateur surfers in the state of Rio Grande do Sul, Brazil. It is a cross-sectional descriptive observational study. The sample consisted of 21 men, aged between 18 and 42 years, surfing for at least two years. The outcomes evaluated were static SD, dynamic SD, shoulder pain – by the numerical pain rating scale –, pectoralis minor muscle length, and score on the Western Ontario Shoulder Instability Index. Continuous variables were expressed in mean and standard deviation. Categorical variables were expressed as percentages. Data associations were tested through chi-square test and Pearson correlation test. SD was present in 71.4% of the sample, with a higher prevalence of Type I dyskinesia (57.1%), and 42.9% presented shoulder pain during evaluation. SD was observed in most of the studied population, while pain was present in just under half of the participants. Although SD is a very prevalent find in amateur surfers, no correlation was observed between pain and reduced life quality.

Keywords | Scapula/injuries; Pain; Shoulder; Sport.

RESUMO | O movimento de remada representa 51,4% do tempo total de prática do surfe, gerando alta demanda muscular do complexo do ombro. Apesar disso, há uma lacuna na literatura sobre a prevalência de dor e discinesia escapular (DE) em surfistas. Este estudo teve o objetivo de avaliar a prevalência de e dor no ombro em surfistas amadores do estado do Rio Grande do Sul, no Brasil. Trata-se de estudo observacional descritivo transversal. Foram incluídos 21 homens, com idade entre 18 e 42 anos, que praticassem surfe há no mínimo dois anos. Os desfechos avaliados foram DE estática, DE dinâmica, dor no ombro – através da escala numérica da dor –, comprimento do músculo peitoral menor, e escore no *The Western Ontario Shoulder Instability Index*. As variáveis contínuas foram apresentadas em média e desvio-padrão. As variáveis categóricas foram expressas em percentual. Associações dos dados foram testadas através do teste qui-quadrado e do teste de correlação de Pearson. A DE estava presente em 71,4% da amostra, tendo uma maior prevalência a discinesia do tipo I (57,1%), e 42,9% apresentaram dor no ombro durante o momento da avaliação. DE foi observada na maioria da população estudada, enquanto dor foi apresentada por pouco menos da metade dos participantes. Embora a DE seja um achado muito

Study conducted at the Centro Universitário Ritter dos Reis (Uniritter) – Porto Alegre (RS), Brazil.

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prevalente em surfistas amadores, não foi observada correlação com dor e redução da qualidade de vida.

Descritores | Escápula/lesões; Dor; Ombro; Esporte.

RESUMEN | El movimiento del remo representa el 51,4% del tiempo total de práctica de surf, generando una alta demanda muscular del complejo del hombro. Sin embargo, existe una brecha en la literatura sobre la prevalencia del dolor y la discinesia escapular (DE) en los surfistas. Este estudio tuvo como objetivo evaluar la prevalencia de DE y dolor de hombro en surfistas aficionados del estado de Rio Grande do Sul, Brasil. Estudio observacional descriptivo transversal. Se incluyeron 21 hombres de 18 a 42 años que habían surfeando durante al menos 2 años. Los resultados evaluados fueron DE estática, DE dinámica, dolor de hombro

usando la escala numérica de dolor, longitud del pectoral menor y puntaje en The Western Ontario Shoulder Instability Index. Las variables continuas se presentaron como media y desviación estándar. Las variables categóricas se expresaron como porcentaje. Las asociaciones de datos se probaron utilizando la Prueba Chi-cuadrado y el Coeficiente de Correlación de Pearson. La DE estaba presente en el 71,4% de la muestra, con una mayor prevalencia de discinesia tipo I (57,1%) y el 42,9% tenía dolor de hombro durante la evaluación. DE se observó en la mayoría de la población de estudio, mientras que el dolor en poco menos de la mitad de los participantes. Aunque el DE es un hallazgo muy frecuente en los surfistas, no hubo correlación con el dolor y la reducción de la calidad de vida.

Palabras clave | Escápula/lesiones; Dolor; Hombro; Deporte.

INTRODUCTION

Surfing is a world-renowned sport with an estimated number of 35 million practitioners worldwide¹. Australia, Brazil and the United States are considered the countries with the highest potential for the sport². In Brazil, estimates are that approximately 1.3% of the population (approximately 1.9 million people) practice it³.

Paddling, an internal and external rotation movement close to 90° abduction, is essential for surfing, since it is how the athlete moves⁴, representing up to 51.4% of the total practice time in the sport⁵. Repetitive shoulder movements above the head at high speed during sports may lead to shoulder muscle discoordination⁵, which in turn may impair joint movements⁶, leading to scapular dyskinesis (SD).

SD corresponds to biomechanical changes due to muscle imbalances, causing irregularity in scapula movement in relation to the ribcage⁷. Changes in scapular kinematics may occur due to muscle fatigue, trauma, pre-existing injuries⁸, or pectoralis minor muscle shortening⁹. Muscle imbalance and synchronism changes in glenohumeral and scapulothoracic joints may lead to painful conditions in sports that require upper limb movement above the head¹⁰. The prevalence of SD in other sports ranges from 75% in volleyball players¹¹ to 58.3% in swimmers. Among these athletes with SD, 80% have shoulder pain¹². In addition, SD may increase shoulder pain chance by 43%, even in asymptomatic athletes¹³.

Although surfing is a very practiced sport, the prevalence of SD and shoulder pain in surfers is not known. Therefore, this study sought to evaluate the prevalence of SD and shoulder pain in amateur surfers in the state of Rio Grande do Sul, Brazil.

METHODOLOGY

This is an observational, descriptive, cross-sectional study, carried out according to Strobe recommendations¹⁴. It was approved by the Research Ethics Committee of the Centro Universitário Ritter dos Reis (UniRitter), under the Opinion No. 2,945,304. All participants signed the informed consent form (ICF).

Participants were recruited between October and November 2018. Sampling was done by convenience, through digital ads with the invitation image disclosure. Inclusion criteria were: male amateur surfing athletes from Rio Grande do Sul, aged between 18 and 42 years, surfing for at least two years. Exclusion criteria were individuals with shoulder complex fracture history, adhesive capsulitis medical diagnosis, surgery history on shoulder, cervical or thoracic spine and neurological problems.

A pilot study with 10 participants was conducted to analyze evaluation measures reliability. Volunteers were recruited by convenience and participated in the pilot study after signing the ICF.

Interested subjects answered an online questionnaire to verify the eligibility criteria. The questionnaire consisted of questions about anthropometric data, surfing time,

average monthly surfing time, presence of shoulder pain, history of shoulder dislocation, fractures, or surgeries and practice of other physical activities.

After completing the questionnaire, a face-to-face data collection was scheduled with the athletes able to participate. The evaluations were approximately 20 minutes long. All evaluations were conducted by the same examiner. The examiner conducted a previous training with the 10 individuals for familiarization.

SD was evaluated through the methods *slide lateral scapular test* (SLST) (static evaluation) and filming (dynamic evaluation). The SLST consists of a bilateral measurement of the distance between scapula lower angle and corresponding spinous process, with shoulder in three different positions: 0°, 45° and 90° abduction^{15,16}. When comparing the values, asymmetry greater than 1.5 cm between the sides was considered as presence of SD (Figure 1)⁸.



Figure 1. SLST test: distance between scapula lower angle and corresponding spinous process, neutral position of upper limbs at 0°, shoulder abduction at 45° and shoulder abduction at 90°

For filming, the surfer remained in orthostasis, shirtless and with his back to the evaluator. A mobile phone camera was positioned 204 cm away from the athlete, the height varying according to the individual, so that scapular region was apparent. Three attempts were made for movement familiarization with three active repetitions of shoulder lift without resistance¹⁷. The SD was classified as: (I) prominence at scapula medial edge; (II) prominence visualized at lower angle along with anticipated scapular elevation; (III) downward scapular rotation and a rapid scapular movement during arm return to the side of the body; (IV) unchanged¹⁸. Afterwards, it was classified as “yes” if it represented Type I, II or III and “no” if it represented type IV¹⁹.

Shoulder pain intensity at data collection was evaluated using the numerical pain rating scale (NPRS)²⁰. NPRS was recommended in previous studies based on ease of use²¹, patient preference²², lower inconsistency, discriminatory power and reproducibility²³.

The pectoralis minor length was measured with the individual in orthostasis, in neutral position, relaxed and with arms next to the body. The distance between coracoid process and 4th costosternal⁹ joint was measured with tape measure (Figure 2)²⁴. This method was validated and proved reliable when compared to pachymeter²⁴. The Pectoralis Minor Index (PMI) was calculated by dividing the muscle length measure by the individual's height and multiplying by 100. PMI values less than or equal to 7.65 cm were considered shortened²⁵.



Figure 2. Measurement of pectoralis minor muscle length with a tape measure between coracoid inferomedial process and 4th costoesternal joint

Life quality was assessed through the *Western Ontario Shoulder Instability Index* (WOSI)²⁶. The WOSI is a questionnaire designed to evaluate life quality in patients with shoulder instability, and consists of 21 questions, with four domains: physical symptoms; sports, recreation and work; lifestyle; and emotional state. The obtained score varies from 0 (no reduction life quality) to 2,100 points (worse life quality)²⁷.

Descriptive analyses were used to characterize the sample. Continuous variables were tested for normality with Shapiro-Wilk and presented in mean and standard deviation. Categorical variables were expressed as percentage. Associations between categorical variables were tested using the chi-square test. Pearson correlation test was used to investigate continuous variables association. Intraclass correlation coefficient (ICC) was carried out to verify the pilot study measures reliability. Significance values of $p < 0.05$ and a 95% confidence interval were adopted.

RESULTADOS

We evaluated 21 athletes; Table 1 shows their characteristics.

Table 1. Sample characteristics*

Variable	N=21
Age	28(5)
Height	1.76 (0.7)
Hand dominance (%)	
L	90.5
R	9.5
Injury (%)	
Arthrosis	4.8
Bursitis	4.8
Labrum injury	4.8
Dislocation	14.3
Muscle rupture	4.8
Impact syndrome	4.8
Tendinitis	14.3
None	47.6
Practice time in hours/month (%)	
1 to 5h	14.3
5 to 10h	23.8
10 to 15h	23.8
15 to 20h	19
20h or +	19
Practice time in years (%)	
6 to 10	33.3
10 or +	66.7
Pain during surfing (%)	
Yes	19
No	81
Pain after surfing (%)	
Yes	52.4
No	47.6
Practice of other physical activity (%)	
Running	19
Functional training	47.6
Soccer	28.6
Fighting	19
Weight training	19
Swimming	33.3
Skateboarding	9.5
Frequency per week (%)	
1	5
2 to 3	50
3 to 4	20
5 or +	20
None	5

* Values expressed as mean (standard deviation), except when otherwise indicated.

The ICC, performed in the pilot study to evaluate the measurements of SD and pectoralis minor muscle length, showed good reliability, with ICC values between 0.8 and 0.9.

The dynamic evaluation showed that 15 individuals (71.4%) had some SD type at the time of collection, with a higher prevalence of Type I (57.1%). The SD static evaluation showed five participants (23.8%) with positive results. Nine athletes (42.9%) had shoulder pain at face-to-face evaluation (Table 2). The answers to WOSI questionnaire pointed for a greater impact of physical symptoms on life quality, with a mean of 215.52 (± 171.74). The PMI did not show a value corresponding to muscle shortening (Table 3).

Table 2. Assessed scapular dyskinesis of static / dynamic form and shoulder pain

Variables	n=21
Scapular dyskinesis – static (%)	
SLST	
Positive	23.8
Negative	76.2
Scapular dyskinesis – dynamic (%)	
Type I	57.1
Type II	14.3
Type III	0
Type IV	28.6
Positive	71.4
Negative	28.6
Shoulder pain (%), NPRS	
Yes	42.9
No	57.1

NPRS: numeric pain rating scale; SLST: slide lateral scapular test.

Table 3. WOSI questionnaire and Pectoralis Minor Index*

Variables	n=21
PMI	
D	10.93 (0.96)
E	11.40 (1.01)
WOSI	
Physical symptoms	215.52 (171.74)
Sport, recreation and work	70.29 (78.97)
Lifestyle	64.67 (68.75)
Emotions	58.62 (45.73)

* Values expressed as mean (standard deviation), except when otherwise indicated. PMI: Pectoralis Minor Index; WOSI: The Western Ontario Shoulder Instability Index.

A low correlation was found (Cramer V 0.499) between dynamic SD and not practicing weight training (chi-square 5.219). There was no correlation between SD and shoulder pain; between static and dynamic method for SD evaluation; between pain, life quality and pectoralis minor length; or between SD and pectoralis minor length.

DISCUSSION

This study sought to evaluate the prevalence of SD and shoulder pain in amateur surfers. We observed in the sample a SD prevalence of 71.4%, dynamically evaluated, and a shoulder pain prevalence of 42.9%.

SD is fairly common in sports context, especially in modalities requiring large upper limbs movements, which overloads the shoulder joint complex muscles, possibly causing shoulder pain^{11,12,28}. In this sense, this study shows innovative results when observing prevalence values of SD and pain in surfing athletes, which had not yet been reported in literature. The ICC values observed in the pilot study ranged from 0.8 to 0.9, demonstrating good reliability between the SD measures and pectoralis minor length, which reinforces our findings.

Although the presence of SD and pain was observed in the evaluated athletes, no correlation was observed between the outcomes. A recent study evaluated SD through SLST in 135 individuals separated into two groups, with and without shoulder pain, and showed there was no correlation between SD and shoulder pain, concluding that SD may represent a normal variability of movement²⁹.

The correlation between SD presence and non-performance of weight training found in this study may indicate that the practice of this physical activity helps in reducing muscular imbalance of shoulder complex. In this sense, early detecting this dysfunction and performing exercises that can reduce these imbalances may be an interesting tool in injury prevention.

Different results between the SD evaluation methods were observed. The dynamic form evaluation better reflects the sport functional gesture. When comparing SD during a concentric gesture, eccentric gesture and at rest, a study with 37 individuals practicing weight training observed there is no association between SD and shoulder pain at rest or during daily life activities, however, there is a relation between SD and shoulder pain during efforts. Individuals with SD are 16 times

more likely to experience pain during activities that require greater effort³⁰. These findings corroborate ours, since SLST evaluation in static form, at rest, showed that only 23.8% of the individuals had SD, and in dynamic form 71.4% had the outcome.

We suggest that pectoralis minor shortening may modify scapula positioning⁹, however, we did not find any individuals with such shortening. Similarly, one study observed no difference in pectoralis minor length in subjects with and without pain³¹.

Among WOSI questionnaire domains, individuals reported greater life quality reductions related to physical symptoms. This result may show that the shoulder pain in evaluated individuals affects them during performance of certain movements, corroborating with a previous study involving handball athletes³². Although the athletes had SD and some of them had pain, this does not seem to have influenced their life quality and function, since questionnaire scores were not high.

Strong points of our study are the population studied and the good reliability of the measurement. However, it has some limitations that must be considered. The small number of participants may have influenced the analyzes results, although similar studies in volleyball and swimming athletes evaluated samples of 12 and 36 subjects, respectively^{11,12}. In addition, only male and amateur athletes were included, so the results cannot be extrapolated to other populations.

CONCLUSION

With this study, we concluded SD was observed in most of the studied population, and pain in just under half. Although SD is a very prevalent find in amateur surfers, no correlation was observed between pain and reduced life quality. Future longitudinal studies are necessary to verify potential risk factors and treatment methods for this population.

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