**INFLUENCE OF PRACTICE TIME ON SURFING INJURIES**

*Influence of practice time on surfing injuries*

**ABSTRACT**

**Introduction:** studying the influence of surfing on the prevalence of injuries may contribute to prevention. **Objective**: to analyze the influence of time practicing sports and the occurrence of previous surgery on the profile and prevalence of injuries caused by surfing. **Methods**: 66 Brazilian surfers (26.16 ± 0.73 years old) participated in this study. Anthropometric data, physical activity level, surfing practice time and the prevalence of injuries (type of injury, anatomical region affected, and mechanism of injury) were evaluated. To assess which of the studied variables exerted significant influence on the mean number of injuries, a Poisson log-linear model was adjusted through R *software* (p < 0.05). **Results**: most surfers were classified as eutrophic (73%), very active (60.6%), had an average practice time of 10.1 ± 1 years, and were not members of a surfing federation (74%). It was also observed that 90.9% of participants reported injuries caused by surfing, 44.9% of which affected the lower limbs. The majority of these injuries affected the integumentary system (46.6%). The main mechanism of injury was impact with the board or seabed (40.4%). Furthermore, it was found that surfing federation members presented an average of 58.4% more injuries than non-members (*p = 0.007*). Surfers who had undergone previous surgeries showed an average number of injuries that was 56.9% higher than other surfers (*p = 0.012*). In addition*,* it was found that for each extra year of surfing, the average number of injuries increased by 2.5% (*p = 0.0118*). **Conclusion:** the average number of injuries increased with increment in time practicing the sport, occurrence of previous surgery and membership in a a surfing federation.

**Keywords**: injuries in athletes, prevalence, sports medicine.

**ABSTRACT**

**Introduction**: to study the influence of surfing on the prevalence of injuries, which can contribute to prevention. **Objective:**to analyze the influence of practice time in sports and the occurrence of previous surgery on the profile and prevalence of injuries caused by surfing. **Methods**: 66 Brazilian surfers (26.16 ± 0.73 years old) participated in this study. The anthropometric data, physical activity level, surfing practice time and the prevalence of injuries (type of injury, anatomical region affected and the mechanism of injury) were evaluated. To assess which of the studied variables exerted significant influence on the average number of injuries, a Poisson log-linear model was adjusted through software R (p < 0.05). **Results**: most surfers were classified as eutrophic (73%), very active (60.6%), had an average practice time of 10.1 ± 1 years and were not surfing federation members (74%). Also, it was observed that 90.9% of participants reported injuries caused by surfing, 44.9% of which affected the lower limbs and the majority of these reached the integumentary system (46.6%). The main mechanism of injury was impact with the board or seabed (40.4%). Furthermore, it was found that surfing federation members presented an estimated average of 58.4% more injuries than the ones who are not members (p = 0.007). Surfers who had undergone previous surgeries showed an estimated injury average 56.9% higher than the other surfers (p = 0.012). In addition, it was found that for each extra year of surfing, the estimated injury average increased by 2.5% (p = 0.0118). **Conclusion:** The surfers' estimated injury average increased with the increment in surfing practice time, occurrence of previous surgery and being a surfing federation member.

**Keywords**: injuries in athletes, prevalence, sports medicine.

**INTRODUCTION**

In recent years the number of surfers has increased, which has made it a popular sport worldwide (*1, 2, 3*). According to the *International Surfing Association*, it is estimated that there are approximately 35 million surfers on the planet (4). In Brazil, the estimate is that 1.3% of the population between 14 and 75 years old (approximately 1.,9 million surfers) is actively involved in this sport(5). However, despite having become very popular, scientific literature about the sport is still scarce (1), especially regarding the prevalence of injuries (6, 7, 8).

The development of boards and keels with improved hydrodynamics allows for increasingly faster and more complex maneuvers, accompanied by greater physical, physiological and technical demand. This factor may have contributed to the increased incidence of injuries in surfers (7, 8).

The most common injuries in surfing are bruises and injuries due to cuts, followed by sprains, muscle strains, stings and fractures. In addition, studies show that in surfing most injuries are traumatic in nature, and are mainly caused by the impact of the surfer with his own board or with the seabed, as a result of the unsuccessful execution of maneuvers (7, 9).

In a study with surfers from the coast of Paraná (Brazil), it was verified that the most frequent type of injury in the recreational category was contusion in the lower limbs due to contact with the board(10). However, neither the physical activity level of surfers nor the influence of their practice time on the prevalence of injuries were investigated. Therefore, the objective of this study was to analyze whether the level of physical activity, surfing practice time, membership in a surfing federation and having undergone previous surgery influenced the type and prevalence of surf-related injuries.

**MATERIAL AND METHODS**

This is an observational cross-sectional analytical study (13) approved by the Research Ethics Committee in the Health Sciences Sector of the Federal University of Paraná (335,941), which followed resolution 466/12 of the National Health Council and was registered in the Brazilian Registry of Clinical Trials (RBR-752vkn). All participants were informed of the procedures and gave their informed consent in writing.

For the sample size calculation, the proportion of surfers was assumed to be 1.47% (7, 10) (2,803,770) of the total Brazilian population (190,732,694), according to the 2010 Census data. We used the formula in (1), with a 95% confidence interval and a sampling error of 3%:

n = z2α/2 \* N \* P \* (1-P)

ε2 \* (N-1) + z2α/2 \* (1-P) (1)

Where: n - sample size to be calculated; z2α/2 - critical value for the desired confidence level; N - population size; P - proportion of individuals who practice surf*ing* in Brazil; ε2: - sampling error.

Assuming such parameters, the result was 62 surfers. Thus, 66 surfers of both genders from the coast of Paraná were selected. All of them have surfed for at least 6 months, and are, aged between 18 and 42. Exclusion criteria were peripheral neurological and vascular comorbidities.

**Anthropometric assessment**

The anthropometric assessment was carried out through the measurement of body mass (Kg), on a Magna ® digital scale, and height (cm), by using a 2-metre long measuring tape attached to the wall. The body mass index (BMI) was calculated by dividing the body mass by the square of the height of participants (Kg/m ²), and classified according to the Ministry of Health (12) as: underweight (less than 18.5 Kg/m ²), eutrophic (18.5 to 24.9 kg/m ²), overweight (25 to 29.9 kg/m ²) and obese (greater than 30.0 kg/m ²).

**Physical Activity Level (IPAQ-*International Physical Activity Questionnaire* - long form)**

The level of physical activity was measured through a personal interview using the IPAQ long form, validated in Brazil by Matsudo *et al.* (13). This instrument assessed the intensity of the activity (walking, moderate activity and vigorous activity) and the time spent performing these activities in the week preceding the assessment. The questions referred to their activities at work and at home, such as physical activity on the way to work (for those who walk or ride their bicycles, for example), leisure time and time spent sitting (14). The results were calculated in minutes per week, following the procedural recommendations proposed by the IPAQ *Core Group* (15). Thus, individuals were classified according to the criteria of frequency and duration as follows: sedentary, insufficiently active, active and very active.

**The surf*ing* practice index**

Each participant was interviewed and reported their surfing category (amateur, recreational or professional), time practicing the sport (in years), weekly frequency of practice (number of days) and number of hours of daily practice. For the analyses, the surfing practice index was determined through the following equation: the surfing practice index is equal to the number of hours of daily practice, multiplied by the number of days spent surfing in the week, multiplied by the number of weeks in the year, multiplied by the number of years of practice. Through the result, it was possible to classify the participants of the study according to time spent surfing: little (2999 hours/week/year), moderate (between 3000 to 5999 hours/week/year) and intense practice (over 6000 hours/week/year).

**Referred Morbidity Survey (RMS)**

The questionnaire was constructed based on Hoshi *et al*. (16), and modified according to the reality of the sport. The instrument aimed to gather data about injury type, body part affected, moment the surfer suffered the injury, and mechanism of injury. For the type of injury caused by the sport variable, 6 categories were established: integumentary (laceration and burn by a marine animal), muscular (bruising and muscle injury), bone (fractures), joint (dislocation), ligament (sprain or ligament injury), and others. The affected body parts were categorized into 4 segments: head, upper limbs, lower limbs and upper body. The moment when the surfer suffered one of these injuries was categorized as: during training or during competition. The mechanisms that prompted the injury were categorized into 4 types: paddling and duck diving; fall off the board(impact with the seabed and with the board); animal injury (Portuguese man o’war and jellyfish); and maneuvers. The RMS  was answered through an interview, in which the participants were asked to recall all injuries they had suffered during practice of the sport, taking into account all years of practice.

**Data analysis**

Statistical analysis was carried out with the use of R *software*. The data were submitted in their entirety to the Kolmogorov-Smirnov test to verify the normality of distribution. Nominal and/or ordinal variables were described in absolute frequency and percentage, while the numerical variables were described in mean and standard error of the mean (SEM). In order to assess which variables exert significant influence on the mean of the surfers' injury, a log-linear Poisson model was adjusted (17). The significance level was set at p < 0.05

**RESULTS**

The sample consisted of 66 surfers, 73% of whom were eutrophic, with a predominance of practice time between 0-10 years (56%) and a weekly frequency of 3.5 ± 0.2 days/week. Regarding the index of surfing practice, most surfers (65%) were classified as having "little practice" in the recreational category. Furthermore, from all participants, 74% were non-federated. Demographic, anthropometric and physical characteristics are listed in table 1.

**Table 1**. Demographic, anthropometric and physical characteristics of participants (n = 66).

|  |  |  |
| --- | --- | --- |
| **Characteristics** | **Mean ± SEM (%)** | |
| Age (years, mean ± EPM) | | 26.16 ± 0.72 |
| Practice time  0 to 5 years | | 10.12 ± 1  22 (33) |
| 5 to 10 years | | 15 (23) |
| Above 10 years  Weekly frequency (days/week)  Number of hours per day | | 29 (44)  3.5 ± 0.2  2.4 ± 0.15 |
| *Surfing practice* index *(*hours/week/year) | | 4998 ± 863 |
| Little practice | | 34 (52) |
| Moderate practice | | 12 (18) |
| Intense practice | | 20 (30) |
| Category  Amateur  Recreational | | 15 (23)  43 (65) |
| Professional | | 8 (12) |
| Federated  Yes  No  Classification of BMI | | 17 (26)  49 (74) |
| Low weight | | 4 (6) |
| Eutrophic | | 48 (73) |
| Overweight | | 13 (20) |
| Obese | | 1 (2) |

Note: SEM - Standard Error of the Mean. The results reflect absolute and relative frequency (%).

Table 2 shows the results of the International Physical Activity Questionnaire (IPAQ), in which most of the surfers were classified as very active (40%), followed by active (36.4%), while only 1.5% were classified as insufficiently active.

The analysis of the results obtained from the Reported Morbidity Survey, in relation to the injuries caused by surfing, showed the occurrence of at least some kind of injury along the sports career in 60 surfers (90.9%). Among these, 14 participants (23.3%) reported having suffered only one injury, 11 (18.3%) reported two injuries, 15 (25%) reported three injuries, 10 (16.6%) reported four injuries, 5 (8.3%) reported five injuries, 2 (3.3%) reported six injuries, 1 (1.6%) reported seven injuries and 1 (1.6%) reported eight injuries, totaling 100% of injuries. Thus, an occurrence of 178 injuries was found among the 66 participants in the study. According to table 3, considering the type of injuries, it was observed that 44.9% (n = 80) of the injuries affected the lower limbs, 20.2% (n = 36) affected the upper limbs, 18.5% (n = 33) affected the head and 16.3% (n = 29) affected the upper body. Most of the injuries occurred in the integumentary system, representing 46.4% of cases, followed by 28.1% of muscle injuries, 14.6% of ligament injuries, with only 3.4% of joint injuries, 1.1% of bone injuries and 6.2% without a definite diagnosis.

**Table 2** - Levels of physical activity in minutes/week of participants (n = 66).

|  |  |
| --- | --- |
| IPAQ | Mean ± SEM (%) |
| Type of activity | 1541.9 ± 148.3 |
| Work  Transport | 342.5 ± 97.5  285.0 ± 38.2 |
| House | 238.2 ± 32.6 |
| Leisure | 676.0 ± 67.8 |
| Total per domains | 1541.9 ± 148.3 |
| Walking | 377.5 ± 62.8 |
| Moderated | 666.7 ± 63.5 |
| Vigorous | 497.7 ± 68.4 |
| Classification |  |
| Very active | 40 (60.6) |
| Active | 24 (36.4) |
| Active enough | 1 (1.5) |

Note: SEM - Standard Error of the Mean. The results reflect absolute and relative frequency (%).

**Table 3-**Absolute and relative distribution of type of injury by anatomical region of occurrence

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Head | Upper body | UL | LL | Total |
| Integumentary | 20 (11.2) | 9 (5.1) | 12 (6.7) | 42 (23.6) | 83 (46.6) |
| Muscle | 8 (4.5) | 14 (7.9) | 13 (7.3) | 15 (8.4) | 50 (28.1) |
| Bone | 1 (0.6) | 0 (0) | 0 (0) | 1 (0.6) | 2 (1.1) |
| Joint | 0 (0) | 0 (0) | 4 (2.2) | 2 (1.1) | 6 (3.4) |
| Ligament | 0 (0) | 0 (0) | 7 (3.9) | 19 (10.7) | 26 (14.6) |
| Other | 4 (2.2) | 6 (3.4) | 0 (0) | 1 (0.6) | 11 (6.2) |
| Total | 33 (18.5) | 29 (16.3) | 36 (20.2) | 80 (44.9) | 178 (100) |

Note: UL-upper limbs. LL-lower limbs. The results reflect absolute and relative frequency (%).

The most common mechanism of injury (table 4) was found to be fall or shock with the board and/or the seabed (40.4%), followed by maneuvers (28.1%), paddling or "duck dive" (19.7%) and finally contact with animals such as the Portuguese man o’war and jellyfish (11.8%), with this prevalence distinguished between the different types of affected tissues. Most of the injuries (93.3%) occurred during training, and only 6.7% occurred during competitions.

To evaluate the influence of the variables on the number of injuries, a log-linear Poisson model was used. Through this technique, it was possible to ascertain which variables exert significant influence on the number of injuries and also to perform interpretations. After deleting the non-significant variables and verifying the quality of the fit, the model described in table 5 was reached.

**Table 4-**Absolute and relative distribution of the type of injury by mechanism of occurrence

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Paddling | Drop and shock | Animal | Maneuver | Total |
| Integumentary | 12 (6.7) | 43 (24.2) | 16 (9.0) | 12 (6.7) | 83 (46.4) |
| Muscle | 14 (7.9) | 19 (10.7) | 1 (0.6) | 16 (9.0) | 50 (28.1) |
| Bone | 0 (0) | 1 (0.6) | 0 (0) | 1 (0.6) | 2 (1.1) |
| Joint | 2 (1.1) | 3 (1.7) | 0 (0) | 1 (0.6) | 6 (3.4) |
| Ligament | 4 (2.2) | 4 (2.2) | 0 (0) | 18 (10.1) | 26 (14.6) |
| Other | 3 (1.7) | 2 (1.1) | 4 (2.2) | 2 (1.1) | 11 (6.2) |
| Total | 35 (19.7) | 72 (40.4) | 21 (11.8) | 50 (28.1) | 178 (100) |

Note: The results are absolute and relative frequency (%).

**Table 5-**Log-linear Poisson Model

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Estimate | Standard error | z value | p value |
| Intercept | 0.475 | 0.139 | 3.412 | 0.0006 |
| Time *surfing* | 0.025 | 0.010 | 2.517 | 0.0118 |
| Federated | 0.460 | 0.172 | 2.667 | 0.0076 |
| Surgery | 0.451 | 0.180 | 2.507 | 0.0122 |

It is possible to see that three variables -- surfing time (in years), whether the surfer is a federation member, and surgery history -- are related to the highest average of surfers' injuries. The interpretations for this model are performed through the exponential estimates, which means that these values are interpreted as “average ratios”. Thus, the estimated average of injuries is 58.4% greater among federated surfers, as opposed to non-federated ones. The 95% confidence interval for this estimate was 12.7%, 121.8%. Surfers who underwent surgery have an estimated average number of injuries 56.9% greater than those who did not, with a 95% confidence interval of (9.1%, 121.2%). For the surfing time variable, estimates were made according to cumulative years of surfing practice. Hence, for each exceeding year of surfing*,* the estimated average of injuries grows 2.5%, with a 95% confidence interval of (0.5%, 4.5%).

This model allows for predictions of average incidence of injury expected for each athlete, using the following equation (2):

|  |  |
| --- | --- |
|  | (2) |

**DISCUSSION**

Popularly, surfing is a sport practiced by athletes of different ages and often associated with long periods of practice. In the present study, the average practice time among the participants of the survey was 2.4 daily hours, with a weekly frequency of 3.5 days. Moreover, 29 surfers (44%) reported practicing the sport for over 10 years. Similar results were observed by Moraes, Guimarães and Gomes (10), who investigated the prevalence of injuries in surfers from the coast of Paraná, where the majority of participants (47%) stated they had been surfing for 10 years or more, practicing the sport from 2 to 4 times a week (65%), 2 to 4 hours per day (92%). Similarly, Steinman *et al.* (6), when investigating the Northeast, Southeast and South of Brazil, found that their participants practiced the sport an average of 2.6 days per week, with an average duration of 2.6 hours.

In this study, the participants were subdivided into categories, with most belonging to the recreational category (65%), followed by 23% belonging to the amateur category and only 12% to the Professional category. Moraes, Guimarães and Gomes (10) showed similar results, with 70% of the sample being recreational surfers, 28% amateurs and 2% professionals. These outcomes are supported by another study by Base *et al.* (7), who also concluded that the sample was of surfers belonging to the recreational category (67%), followed by amateurs (29%) and professionals (3%) of the coastal States of the Northeast, Southeast and South of Brazil.

Regarding the level of physical activity, the ACSM - *American College of Sports Medicine* (18) - emphasizes that in order to promote and maintain health, it is necessary that healthy adults practice moderate aerobic physical activity for at least 30 minutes a day, five times a week. Alternatively, those adults can engage in intense aerobic physical activities for at least 20 minutes a day, three times a week. Most surfers in this study were categorized as very active (60.6%) or active (36.4%), according to IPAQ, which is consistent with Romariz, Guimarães and Marinho’s study (19), in which 83.2% of the investigated surfers were classified as very active (83.2%).

Concerning BMI, Mendez-Villanueva and Bishop (1) indicated that excessive weight can be disadvantageous when executing some specific surfing maneuvers, as well as when practicing the sport, since coordination and stamina may be affected. In this sense, the practice of physical exercise can directly influence the control and maintenance of body weight, as it is able to reduce the amount of fat and increase or maintain lean body mass. In our study, most surfers were classified as eutrophic (73%), suggesting that the level of physical activity is contributing in the regulation of body mass.

In our study, 60 out of 66 participants reported some form of injury, leading to a total of 178 injury occurrences, from the period when the practice of *surfing* started until the time of the survey. Taylor *et al.* (20), in a study conducted in Australia with 646 surfers of different levels of training, reported that 145 surfers presented 168 acute injuries over the previous 12 months, constituting 0.26 injuries per surfer in a one-year period. Another similar study (21), also conducted in Australia, indicated that out of a total of 1,348 surfers, 512 participants reported acute injuries over 12 months, totaling 739 injuries and constituting the rate of 1.79 injuries per 1,000 hours surfed. Considering this rate, surfing seems to be a relatively safe sport, since other sports, such as Australian football, have an injury rate of 25.7 injuries per 1,000 hours played.

Regarding the prevalence of the type of injuries, it can be seen that the majority of them occurs in the integumentary system (lacerations and burns), representing 46.6% of the cases, followed by 28.1% of muscle injuries (contusions and strains), 14.6% of ligament injuries (sprains), 3.4% of joint injuries (dislocations), and only 1.1% of fractures. Steinman *et al.* (6) report that 44% of injuries are lacerations and 17% comprised contusions. Similarly, Moran and Webber (22) found that lacerations (59%) and contusions (15%) were responsible for the majority of injuries. In Base *et al.* (7), most of the injuries found in professional surfers were contusions (29%), followed by lacerations (23%). Moraes, Guimarães and Gomes (10) showed that the prevalent type of injury was contusion (29%). Likewise, Mitchell, Brighton and Sherker (23) indicated that contusions comprised 25.3%, while lacerations comprised 19.1% of the total number of injuries during surfing training and competition. Woodacre, Waydia, and Wienand-Barnett (24) found that lacerations corresponded to 31% of the injuries, followed by contusions (24%). In addition, Nathanson *et al.* (9) showed that lacerations and contusions were the second and third most common type of injury, respectively.

Among the most affected body parts, considering the type of injury, it was observed that 44.9% (n=80) of injuries affected the lower limbs, with the integumentary system being the most affected (lacerations and burns). As for the other parts, 20.2% (n=36) of injuries affected the upper limbs, with the muscle system being the most affected (contusions and strains), 18.5% (n = 33) of injuries affected the head, with the integumentary system being the most affected, and 16.3% (n=29) of injuries affected the trunk, with the muscle system being the most affected. Likewise, Steinman *et al.* (6) reported that the most frequent lacerations were in the lower limbs. Feet (22%) and legs (11%) were the most affected areas. Mathur, Guimarães and Gomes (10) also observed that lacerations in the feet were the most frequent ones (9%). Nathanson *et al.* (9) suggest that the most common injuries in amateur surfers are lacerations on the head and on lower limbs. Moran and Webber (21) affirmed that the head was affected by injuries the most (32%), the main cause being contusion (50%). Furness *et al.* (25) reported that the lower back corresponded to 23.2% of the total chronic injuries, followed by 22.4% for the shoulders, and 12.1% for the knees,  but the authors did not associate which type of injury was the most recurrent per area. Therefore, it can be suggested that the surfers on the coast of Paraná presented the same types of injuries when compared to those reported in other locations in Brazil and in the world: the most frequent injuries were lacerations and contusions, while the lower limbs were the most affected areas.

In Base *et al.* (8), muscle strain had a prevalence of 12.5%. In Steinman *et al.* (7), this injury was responsible for 9.6% of total injuries. In our study, muscle strain was reported as an injury in the muscle system (along with contusions), which represents 28.1% of the total injuries, similar to the study by Furness (21), which reported that 30.3% of the injuries were in the muscle system. Therefore, the comparison with some studies is limited due to methodological criteria.esearch conducted by Lowdon, Pateman & Pitman (26) and Lowdon *et al*., (27) , in which sprains and strains were quantified together as muscle-ligament injuries, are examples of the limitation.

Sprain, reported as an injury in the ligament system in our study, represented 14.6% of the total injuries, with prevalence in the lower limbs. The main factor responsible for this type of injury were the maneuvers (10.1%). In Moraes, Guimarães and Gomes (10), sprain represented 9% of the total injuries and affected mostly the lower limbs. In their research, the maneuvers were also the main factor responsible for this type of injury (47%), which is similar to the findings of our study. Woodacre, Waydia and Wienand-Barnett (24) indicate that joint sprains were the third most frequent type of injury (15%). At the same time, Taylor *et al.* (20) reported that this type represented 28.6% of total injuries, but Steinman *et al.* (6) indicated that only 6% of total injuries were joint sprains.

Joint injuries (dislocations) occurred only in 3.4% of the total number of injuries, as well as in Steinman *et al.* (6), in which dislocations were reported by 3.0% of respondents. In Base *et al.* (7) and Nathanson, Hyanes and Galanins (28) no complaints of dislocations were found.

In the present study, fractures accounted for only 1.1% of all injuries and its main causative agents were the maneuvers and falling off the board, with the head and the lower limbs being the most affected body parts. These results are similar to those found in Steinman *et al.* (6) and Woodacre, Waydia and Wienand-Barnett (24), in which the fractures were responsible for 2.5% and 3% of the total injuries, respectively. In Base *et al*. (7), the fractures represent 5.4% of total injuries, similar to the 6.0% found by Nathanson, Hyanes and Galanins (28). Lowdon *et al.* (27) reported 9.0% of occurrence, and Taylor *et al*. (20) indicated 8.9%. In all these studies, fractures were more frequent in lower limbs and had maneuvers as the main Etiologic Agent, in line with the findings of our study. On the other hand, Sano and Yotsumoto (29) have demonstrated the occurrence of single rib fractures in 50% of surfers admitted in hospital service with chest injuries, during a six-year period, compared to 21% of people with chest injuries associated with other sports.

Integumentary system injuries (burns and lacerations), which are the most frequent type of injuries in our study, can be explained by the fact that marine animals that cause burns, like jellyfish and the portuguese man o’war, seek warmer waters, such as the ones on the coast of Paraná. This fact was not found in the study by Lowdon *et al.* (27), carried out in Southeastern Australia, where the temperature of the water is cold, causing low appearance of jellyfish. In relation to lacerations, these can be attributed to contact between some part of the body and sharp structures of the board, such as the keels and the beak; or due to the impact of the surfer with the seabed or stones near the surfing site.

Muscle and ligament injuries (which are the 2nd and 3rd most frequent types of injuries in our study, respectively) may suggest predisposition to injuries of a traumatic nature due to the repetitive strain; therefore, inadequate physical preparation and the characteristics of the sport may be direct causes of these injuries. Thus, further research on the topic is needed.

We found in our study that criteria such as surfing time, whether the surfer is a member of a federation, and surgery history predict a statistically higher average of estimated injuries. For the surfing practice time variable, estimates indicate that the average number of injuries grows 2.5% every year, demonstrating that an athlete with 25 years of *practice,* who is a member of a federation and has a history of surgery, will have an average of 7.4 injuries throughout their career.

Information about the average estimate of injuries presented in this study are consistent with the recommendations suggested by Steinman *et al*. (6), which show the importance of conducting studies to quantitatively estimate the incidence of injuries. This way, information is important to support the development and adoption of strategies for the prevention and treatment of injuries. In this sense, the strategies can be directed from the use of protective equipment (6, 7, 8, 20, 24) to the prevention of risk behavior (30), and even the insertion and adequacy of surfers’ physical preparation (6). In addition to the adoption of awareness campaigns for surfers, in the sense of promoting habits that reduce risks of injury, such as previous warm-up to the exercise (10).

**CONCLUSION**

Surfers of the coast of Paraná showed a high prevalence of injuries, most of which occurred in the lower limbs and affected the integumentary system. The prevalence of injuries was influenced by factors such as higher practice time, previous surgeries, and federation membership. Therefore, we suggest the adoption of strategies to reduce the exposure of surfers to factors that predispose to injuries. In order to avoid such injuries, some of the strategies are the development and use of protective equipment, educational campaigns addressing the need of habits that reduce the risks of injury, physical preparation according to the specificities of the sport and category, as well as . The present study provides evidence that the aforementioned measures may be especially important for federated surfers who compete professionally.

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