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Injuries in Youngers Competitive Surfers - Study in a Portugal Championship

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Abstract

***Introduction:** Surfers are subjected to external factors (ocean currents, wind orientation, wave size, contact with the board and other surfers) that require adaptations, increasing the risk of injury during their practice. Thus, the objective of this study was to determine the prevalence of injuries in young competitive surfers and to analyses the associated factors.*

***Methods:** The sample involved 67 surfers who competed in ASCC Super Groms championship, aged between 6 and 14 years (10.64 ±2.27 years), 56 (83.6%) were boys. A questionnaire was administered during the days of competition by interview.*

***Results:** Sixteen (23.9%) surfer athletes reported having suffered an injury since they began their practice, 14 (20.9%) surfers had an injury in the 12-months period, with a total of 15 injuries, and 9 (13.4%) surfers reported had an injury in the 6-months period, with a total of 10 injuries. The average number of injuries per surfer was 0.15 and the average of injuries per injured surfer was 1.25. The most common injuries were fracture (40%) and lacerations (30%), located in cranium and face (30%) and foot and fingers (30%). Impacts of the board (30%) was the most prevalent injury mechanisms.*

***Conclusions:** Data showed that children and adolescents surfers, analyzed in this championship, presented moderate prevalence of injuries. It´s necessary to create more studies in the young population of surfers to better understand the injuries in order to draw up injury prevention strategies during training out of the water.*

Keywords: *adolescent, children, epidemiology, injury, prevalence, surf.*

Introduction

Surfing is a popular sport practiced at competitive and recreational levels on beaches worldwide, and the number of athletes in competitive surfing has also risen [1, 2]. International Surf Association estimates a number of 35 million surfers in over 70 countries [1], and the Portuguese Surf Federation indicates that there are approximately 10,000 federated athletes, 70 clubs and 140 surf schools in Portugal [3].

This modality practice is dependent on external factors, such as ocean currents, wind orientation, type of sea floor, size of the waves, water temperature, contact with the board and with other surfers. These factors require the athletes adaptations during your surf session [4], and these adaptations require speed of movement and can lead to the occurrence of injuries.

The normal surfing session lasts approximately two hours [5], but it is not uncommon for competitive surfers to get three to four hours in the water and to be surfing more than once per day [6].

Paddling is the most common movement performed by the surfer [7-9], and to perform this movement, the surfer have to perform an extension of the trunk so as to raise the upper chest off the deck of the board [5, 7, 9, 10]. Considering surfing session duration, chronic injury from paddling can occur because of

repeat motion, related to long-time paddling, during which the surfer has to maintain a continuous isometric contraction throughout hours of surf practice [5, 7, 9].

Currently, surfing has become an even more dynamic sport, particularly at competitive levels [9]. To meet these new requirements, materials used for surfing have undergone changes such as boards are becoming lighter and shorter, providing greater speed and improved hydrodynamics. Because of that, the instability of the board as well as the environment during the course of manoeuvers, consist of an ideal scenario for occurrence of injuries.

International studies of injuries in surfers are still scarce especially those that evaluate children and adolescents. Thus, the objective of this study was to determine the prevalence of injuries in young competitive surfers, as well as their type, location, and mechanism of injury, and to analyses the associated factors.

Materials and Methods

A cross-sectional descriptive survey was used for data collection in this this study. The study was approved by the RECI - Research in Education and Community Intervention Unit, the Piaget Institute's research unit. The Costa da Caparica Surfing Association allowed the realization of this study during the championship.

The study population comprised Youngers surfers, both boys and girls, who competed in ASCC Super Groms powered by Native Açaí surf championship, realized in May 12 and 13, 2018, by the Costa da Caparica Surfing Association.

In this championship they had 83 registrations, however some athletes registered simultaneously in 2 categories, and others didn´t attend on the day of the competition, making a total of 69 athletes who participated in the championship.

The championship includes the following categories: under-8, under-10, under-12, and under-14.

Inclusion criteria specified surfers who participated in this championship, of any age, who freely agreed to participate and signed the informed consent form (if under 18, the consent was signed by the responsible person), and were present during the data collection days.

Instrument

Based on a previous exploratory study [11], a specific questionnaire entitled "Surf Injuries" was used.

The first part of the questionnaire involved items concerning age, gender, position of the feet on the board (regular or goofy), years of surf practice, training regularity per week, hours of training sessions and hours of recreational surfing per week, performing warm-up before surf practice, and performing other sports regularly at least twice a week.

The second part of the questionnaire was focused on the occurrence of injuries arising from the surf practice in 4 different periods: during the whole surf practice, at the time of data collection, during last 12 months, and 6-month period.

To minimize recall bias but maximize injury capture, we decided to choose the period of 6 months for the athlete to describe the injury. The practitioners who presented an injury in the last 6 months were asked to continue to fill out the questionnaire regarding the injuries characteristics: type and location of injury, the moment of injury occurrence; if performed treatment and, in affirmative case, what kind of treatment was applied; the mechanism of injury and, if this mechanism was caused by a manoeuvre, the manoeuvre that caused the injury. It was only possible for respondents to specify the characteristics of a maximum of three injuries (those considered most serious and / or needing more time for recovery).

An injury was defined as any condition or symptom that occurred as a result of surfing and had at least one of the following effects: the surfer had to stop the surf activity (training, competition or free surf) for at least one day; the surfer did not have to stop the activity, but had to change the activity (to fewer hours of practice or training, a lower intensity of effort, or was less able to perform certain gestures or manoeuvres / techniques); the surfer sought advice or treatment from health professionals to address this condition or symptom [12].

The interview was conducted in a single moment by the investigator in the form of interview (structured interview), which could clarify doubts which emerged, without interfering with their opinions or producing biased answers.

Data Analysis

The statistical analysis was performed with the Statistical Package for Social Sciences (SPSS), version 24.0.

Firstly, descriptive statistics were obtained regarding all variables in the study. Hereafter, the incidence proportion (IP) was calculated [13, 14]. To determine the IP, the total number of participants who had at least one injury during the past year was divided by the total number of participants.

The influence of the included variables on the presence of injury (6 month-period) was assessed using binary logistic regressions, based on the Enter methods, and crude and adjusted odds ratios (by sex and age), and respective confidence intervals were calculated. Statistical significance was set at 0.05.

Results

Our sample comprised 67 surfers, aged between 6 and 14 years (10.64±2.27 years), fifty-six (83.6%) were boys and 11 (16.4%) girls.

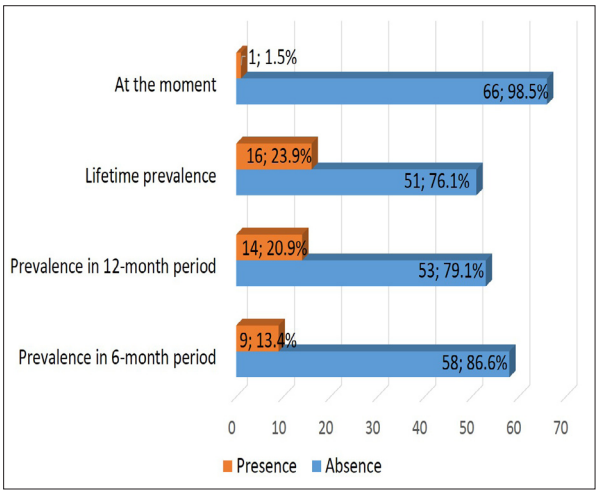
Concerning the positions of the surfers' feet on the board, 41 (61.2%) surfers were in the regular position, that is, their left foot was forward, and the right foot back functioning as a base; and 26 (38.8%) were goofy, that is, their left foot was positioned back as the base.

Regarding the years of surf practice, twenty-four (35.8%) surfers practiced this modality between 1 and 2 years, 33 (49.3%) between 3 and 5 years, 6 (9%) between 6 and 7 years, and only 4 (6%) practice surf between 8 and 9 years. The most of surf trained twice a week (23; 34.3%), 12 (17.9%) surfers trained once a week, 14 (20.9%) three times a week, 6 (9%9 four times, 8 (11.9%) five times, 2 (3%) trained 6 times, and 2 (3%) all days of week.

Surfer were questioned how many hours per week they dedicate to the surf training and how many hours they realize free surf, and the data showed that the most of surfers (23; 34.3%) trained between 5 and 8 hours per week, twenty (29.9%) surfers trained between 3 and 4 hours, 18 (26.9%) until 2 hours, 5 (7.5%) between 9 and 12 hours and only 1 (1.5%) surfer said that trained between 13 and 16 hours per week. Regarding free surf practice, thirty-one (46.3%) surfers performed until 2 hours, 16 (23.9%) between 3 and 4 hours, 17 (25.4%) between 5 and 8 hours, and 3 (4.5%) between 9 and 12 hours per week.

Most of surfers (62; 92.5%) referred performing warm-up before surf practice, and twenty-nine (43.3%) reported performing other type of sport with a regularly at least twice a week.

Graph 1 showed the prevalence's analyzed in this study.



Graph 1. *Prevalence of injuries in surfer athletes*

Thirteen (92.9%) individuals reported having suffered one injury during surf practice in the last 12 months and only 1 (7.1%) reported two injuries. The total number of injuries in a 12-month period was 15.

Eight (88.9%) surfers reported having suffered only one injury in the 6-month period of time and one (11.1%) surfer reported two injuries totalizing 10 injuries.

An IP of 0.119 (CI95%: 0.041-0.197) injuries per surfer per year was calculated.

The average number of injuries per surfer (total number of injuries / total number of surfers) was 0.15 and the average of injuries per injured surfer (total number of injuries / number of injured surfers) was 1.25.

Table 1 show relative and absolute frequencies of the type and location of the injuries in the last 6 months.

Table 1. *Location and type of injury*

Body localization of injury	Type of injury				
	Fracture	Muscle injury (strain, contusion)	Joint injury (cartilage, meniscus, ligament injury/ sprain, luxation)	Laceration	**Total**
Cranium and face	1 (75%)	---	---	2 (25%)	**3 (30%)**
Thorax/ chest/ribs	1 (100%)	---	---	---	**1 (10%)**
Lumbar spine	1 (100%)	---	---	---	**1 (10%)**
Arm	---	---	---	1 (100%)	**1 (10%)**
Ankle	---	---	1 (100%)	---	**1 (10%)**
Foot and fingers	1 (100%)	1 (100%)	1 (100%)	---	**3 (30%)**
Total	**4 (40%)**	**1 (10%)**	**2 (20%)**	**3 (30%)**	**10 (100%)**

The most of injuries occurred during the training performance (7; 70%), 2 injuries happened during the free surf practice and 1 injury occurred during the competition.

Only one surfer (10%) didn't perform some kind of treatment for injury. Of the nine (100%) surfers who underwent treatment, four (44.4%) did resting or medication, 3 (33.3%) did physiotherapy, 1 (11.1%) had immobilization, and 1 (11.1%) was submitted to surgery.

Table 2 shows absolute and relative frequencies of the mechanisms of injury. Regarding the manoeuvre that caused the injury, tube was responsible for 1 (50%) injuries and both aerial for 1 (50%).

Table 2. *Mechanism of injury*

Mechanism of injury	TOTAL
Impact of the board	3 (30%)
Impact with another surfer	2 (20%)
Impact of animals, rocks, coral	2 (20%)
During paddling	1 (10%)
During a maneuver	2 (20%)
Total	**10 (100%)**

Table 3 shows the relationship between the occurrence of injury and gender, age group, stance, years of surf practice, weekly duration and frequency of training.

It was found that girls surfers had 1.67 more probability of having an injury, adolescents surfers (equal or more than 10 years old) had 5.65 more probability of having an injury than children (until 9 years old) surfers, regular surfers had 2.47 more probability than goofy surfers; individuals who had surfed more than five years had 1.79 odds of having an injury compared with those who had surfed until 4 years; surfers who trained more than 8 hours per week had 1.33 more chances than those who trained until 8 hours, and surfers who trained more than 3 times a week had 1.43 more probability of injury than those who trained less a week. However, all these data don't present a statistical significance.

Table 3. *Relationship between the presence of injury (event) and non-modifiable sample factors and surf practice characteristics*

Variables (reference class*)	$\text{OddsRatio}_{\text{Crude}}$ (CI 95%); p-value	$\text{Odds Ratio}_{\text{Adjusted}^{**}}$ (CI 95%); p-value
Gender (male*) female	1.67 (0.19-14.86); 0.647	---
Age group (children*) adolescents	5.65 (0.66-48.17); 0.113	---
Stance (*goofy) regular**	2.47 (0.47-12.94); 0.284	3.11 (0.56-17.17); 0.193
Years of surf practice (until 5 years*) more than 5 years	1.79 (0.31-10.17); 0.514	1.08 (0.18-6.43); 0.935
Weekly duration (until 8 hours) more than 8 hours	1.33 (0.14-12.85); 0.808	0.839 (0.84-8.39); 0.881
Weekly training (until 3 times*) more than 3 times	1.43 (0.32-6.46); 0.639	0.84 (0.17-4.03); 0.824

*Reference class; **adjusted for gender and age group (Enter model)

Discussion

The data obtained in our study showed a moderate prevalence of injuries in the sample of young surfers analyzed. Comparing to other national study, the data of Minghelli et al. [11] study revealed 29.6% of injuries in a 12-month period in 1,016 surfers aged between 8 and 64 years, with a total of 398 injuries, and this study showed a percentage of 20.9% in the same period of data collection. It should be noted that the ages of the sample varied between the studies; this study only evaluated children and adolescents, and the other study also included adults in the sample.

Divergent data were obtained of other studies which showed a high level of injuries in surfers. Meir et al. [6] evaluated 685 Australian surfers, aged between 12 and 67 years, most of whom were recreational and they found that 44.5% of the sample had sustained an injury in the prior 12 months.

Our data revealed 0.119 injuries per surfer per year and high values were obtained in Minghelli et al. study [11] that showed 0.296 injuries. The same was observed in the average number of injuries per surfer that was 0.15 in this study and 0.39 in Minghelli et al. study [11], and the average of injuries per injured surfer that was 1.25 in this study and with a value of 1.32 in Minghelli et al. study [11]. The differences observed in these studies can be related to different time-periods (last six months and last twelve months) and the different age in these samples.

Comparing to other international studies, Meir et al. [6] revealed an average number of injuries per surfer of 0.64 and an average of injuries per injured surfer of 1.43. Furness et al. evaluated 1,348 Australian surfers by online survey and the average number of injuries per surfer was 0.37. Taylor et al. [5] assessed 646 Australian surfers and the average number of injuries per surfer was 0.26 and average of injuries per injured surfer was 1.15, higher values than those obtained in this study.

The most common types of injuries found in this study were fracture (40%), following of lacerations (30%). Taylor et al. [5] and Minghelli et al. [11] data revealed that fracture corresponded to 8.9% of injuries, similar data of Nathanson et al. [15] that obtained 8%, but data of Steinman et al. study showed only 2.5% of fractures. Steinman et al. [16] commented that lacerations were responsible for 44% of injuries and Nathanson et al. [15] obtained nearby results once reported 42% of lacerations. Minghelli et al. [11] showed values of 23.5% of lacerations, and Furness et al. found that the skin injuries were responsible for 18.9%. These date are difficult to compare with this study because of the different classifications of type of injury including accidents with marine animals, ear injuries, acute gastroenteritis, and others. This study evaluated mostly musculoskeletal injuries and one skin injury (laceration).

These types of injuries (fractures and lacerations) can occur by contact with the board, rocks, sea bed and can be prevented with the use of protective material. Various protective materials have been developed (for example, helmets and nose pads) to prevent these injuries, however, surfers can them "little aesthetic" and "ridiculous" and choose not to use them.

The most frequent locations of injuries observed in this study were the cranium and face and foot and fingers, 30% respectively. Similar data were obtained in Taylor et al. study [5] that found 26.6% of face injuries and in Woodacre et al. [17] study that showed that head injuries were the most common location of injuries (24%). Furness et al. noted that the head/face regions had the highest frequency of injury, representing 13.3%.

Minghelli et al. study [11] revealed that knee and leg (16.7%), shoulder and arm (15.4%), lumbar spine, and cranium and face (both 14.9%) were the most anatomy locations of injuries. Meir et al. [6] revealed that 14.9% of injuries occurred in the ankle and foot.

These data are in accordance with the type of injuries more frequent in this study. In this way, we can conclude that most injuries that affect young surfers are acute injuries, not chronic injuries such as low back pain, tendinitis, or injuries resulting from the performance of better technical gestures such as ligament injuries, because they don't have the same years of practice of an adult, and the same motor skill level compared to adults.

In this study, the principal mechanisms of injury were by impact, including impact of the board (30%), followed by impact of another surfer and impact of animals, rocks, coral (both with 20%). Most of the lacerations are likely to be caused by the sharp fin, tail, or the nose of the board. Surfboard fins are rigid, have sharp trailing edges and tips, and are capable of

causing deep lacerations [9]. In Minghelli et al. study [11] the impact of the board (27.1%) was the most prevalent injury mechanisms.

Similar results were obtained in other studies in which the board was responsible for the highest number of injuries [5,17,18]. Nathanson et al. [15] noted that direct trauma from a surfboard was the most common cause of acute surfing injuries (67%).

The performance of a maneuver also consisted of principal mechanisms of injury obtained in this study (20%) and the maneuvers that led to the injuries included the tube and aerial; these manoeuvres are considered as high risk in terms of injuries. Steinman et al. [16] showed that 16% of injuries were caused by the tube manoeuvre, Minghelli et al. [11] revealed that aerial and tube performance caused 12.1% and 7.6% of injuries, respectively.

Nathanson et al. [15] commented that the tube and aerial manoeuvres were responsible for 10% and 6% of injuries, but the authors considered, trimming, take-off, recovering the board and paddling to be surf techniques. Hereupon, it became difficult to compare our results with other studies, since each study classified different techniques as manoeuvres.

Statistical analysis using logistic regression models, that evaluated the factors that are more associated with injuries, revealed that female surfers, old age group, regular surfers, surfers who practice this sports more than 5 years, surfers who trained more hours and with a higher weekly frequency had more probabilities of injury, but it wasn´t verified statistical significance.

Data of this study are difficult to compare with another studies because of the different ways of injuries classification (acute and chronic injuries; musculoskeletal, ear, skin, nerve injuries; period of time of injuries – 6-months, 8-month, 12-month periods or lifetime period of practice; the way of data collection – questionnaire, interview, on line questionnaire). Thus, new studies are needed to create data collection protocols regarding surfer injuries and the injuries could be evaluated by health professionals and/or using imaging exams to confirm the diagnosis.

This study contains some limitations which included the data collection approach of an interview relying on the memory of the participant, therefore it was decided to choose the period of 6 months for the athlete to describe the injury, minimize recall bias. Because it was decided to reduce the period of presence of injuries, the number of injuries was also reduced, making it difficult to draw more solid conclusions about these injuries.

Conclusions

Data of this study showed that children and adolescents surfers, analyzed in this championship, presented moderate prevalence of injuries, possibly because they present less training requirements, less years of practice, less motor skill, not allowing more demanding technical gestures comparing with an adult surfer.

The most common types of injuries were fracture and lacerations, the most serious involving the cranium and face, and foot and fingers, and the impact of the board the principal mechanism of injury.

This type of study is to help devise injury prevention strategies during training out of the water, including strategies to encourage the use of protective material such as protective helmets, protectors of board structures which may be sharp, and the use of leash to prevent the board from striking another practitioner, and to respect the wave priority by preventing more than one surfer from catching the same wave in the same direction.

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