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Australian surfers' awareness of 'surfer's ear'

Vini Simas ,[1] Wayne Hing,[2] Rodney Pope,[3] Mike Climstein[1,4]

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[1]Water Based Research Unit, Bond Institute of Health and Sport, Bond University, Gold Coast, Queensland, Australia
[2]Department of Physiotherapy, Faculty of Health Sciences and Medicine, Bond University, Gold Coast, Queensland, Australia
[3]School of Community Health, Charles Sturt University, Albury, New South Wales, Australia
[4]School of Health and Human Sciences, Southern Cross University - Gold Coast Campus, Gold Coast, Queensland, Australia

Correspondence to
Dr Vini Simas;
vsimas@bond.edu.au

ABSTRACT

Objectives To assess awareness of external auditory exostosis (EAE) among Australian surfers.

Methods This is a cross-sectional observational study, assessing professional and recreational Australian surfers. Currently, active surfers over 18 years of age, surfing year-round, were eligible to participate. After initial screening, individuals were asked to complete a questionnaire. All included volunteers underwent bilateral otoscopic examination, to assess the presence and severity of EAE.

Results A total of 113 surfers were included in the study and were divided into two groups, based on surfing status: 93 recreational surfers and 20 professional surfers. Recreational surfers were significantly older ($p<0.005$), more experienced (greater years surfing; $p<0.005$), with lower prevalence of otological symptoms ($p<0.05$). The most common symptoms were water trapping, impacted wax and hearing loss. Prevalence of EAE was high for both groups (95% in the professional surfers and 82.8% in the recreational surfers); however, recreational surfers had mild grade EAE (grade 1) as the most common presentation, as opposed to professionals who had severe grade EAE (grade 3) as the most common presentation ($p<0.05$ between groups). Awareness of the term 'surfer's ear' was high for both groups, as was knowledge of prevention options. However, fewer considered the condition to be preventable, and an even lower number reported regular use of prevention methods.

Conclusion Australian surfers had a high level of awareness of EAE; however, few reported using prevention methods, despite having a high prevalence of the condition. Health practitioners should screen susceptible individuals in order to recommend appropriate preventive measures.

What are the new findings

- This study examines the level of awareness of external auditory exostosis (EAE) among professional and recreational Australian surfers, and, to the best of our knowledge, is the first study to assess this topic in this population.
- Despite a high prevalence of EAE in both recreational and professional surfers (82.8% and 95%, respectively), only 25.8% of the participants in the recreational group and 20% of the professional group had been previously diagnosed with EAE.
- The term 'surfer's ear' is well-known among surfers and most of the participants cited at least one form of potential prevention for the condition.
- Few participants considered EAE to be preventable, and an even lower number reported regular use of prevention methods.
- Earplugs were the most commonly cited prevention form, while affected performance caused by the plugs was the main reason for not using this protective method.

INTRODUCTION

External auditory exostosis (EAE), most commonly referred to as 'surfer's ear', is a well-known clinical complication associated with long-term surfing.[1 2] The irreversible bony growth in the external auditory canal (EAC) is benign, typically multiple and found bilaterally. A diversity of clinical presentations has been reported, including an intermittent blocked feeling of the EAC, especially after water exposure, recurrent cerumen blockage, frequent ear infections, pain in the EAC and hearing deterioration due to the obstructive nature of the condition.[2]

The condition is diagnosed via otoscopy, which identifies the broad-based bone outgrowths arising from the temporal bone. The pathophysiology of EAE is not fully understood, and prevention remains unclear, as only observational studies have investigated this topic. However, the use of protective equipment (eg, earplugs and hoods) has been proposed to prevent its occurrence and is recommended.[3 4] Surgical removal is the only treatment for EAE, a procedure reserved for patients with severe and symptomatic cases; however, the treatment does not prevent recurrence,[5 6] highlighting the importance of prevention.

The prevalence of EAE in surfers range from 38% to 80%,[7 8] when assessed via otoscopic examination. The surfing population in Australia is estimated at approximately 2.5 million[9]; therefore, the condition potentially affects more than 900 000 individuals Australia wide, and the number of susceptible surfers can be as high as 2 million. However, there appears to be only two studies that have reported the prevalence of EAE in Australian surfers,[10 11] and a large discrepancy exists

between the results. The first study was conducted by Hurst *et al*,[10] where the authors assessed surfers via otoscopy and found a prevalence of 78%. In the second study, Furness *et al*[11] conducted an online survey to investigate self-reported prevalence of chronic injuries related to surfing, and only 3.5% of the participants reported having EAE. The aforementioned disparity between these results may be likely, in part, due to a lack of awareness of the condition by surfers.

Therefore, the aim of the present study was to assess awareness of 'surfer's ear' in a cohort of professional and recreational Australian surfers, including use of protective methods for EAE.

METHODS

Study design

This research used a cross-sectional observational design.

Participants

Surfers were recruited from Australian boardrider clubs, professional surfing organisations (Surfing Queensland and the World Surf League), and through advertising in newspapers, surfing magazines, surfing websites and surf shops. Participants or the public were not involved in the design, or conduct, or reporting, or dissemination of this research.

Eligibility criteria

Currently active Australian surfers, both professional and recreational, over 18 years of age, surfing all year round, and with a minimum of 5 consecutive years of surfing experience, surfing at least five sessions per month, were invited to take part in the research. Participants were excluded if both the right and left EAC were occluded by cerumen, as this prohibited otoscopic examination.

Procedures

The research took place at the Water Based Research Unit (WBRU), Bond Institute of Health and Sport, Bond University, Gold Coast (Queensland, Australia). An explanatory statement and informed consent form were provided to all potential participants on arrival at the WBRU. Prior to completing written informed consent, all potential participants were given the opportunity to ask any questions about the research and the testing procedure. Each of them received a handout illustrating the otoscopic examination to be conducted, which also contained a simple overview of the research project and its purpose. The informed consent form was signed by those who were satisfied with the information provided and volunteered to participate.

At the WBRU, participants were asked to complete a questionnaire to collect basic demographic data and to examine their surfing habits, otological history, knowledge about EAE and utilisation of protective equipment. After completing the questionnaire, all participants underwent clinical examination of both ears, via otoscopy, by an experienced Sport and Exercise Physician, using a hand-held, battery-powered digital otoscope (Digital MacroView, Welch Allyn, USA), capable of acquiring digital images.

Outcome measures

In the questionnaire, participants were assessed with regard to surfing experience in years, and stance while surfing (ie, 'regular' if left foot forward or 'goofy' if right foot forward). They were then asked whether they had heard of surfer's ear, whether they considered it to be a preventable condition, whether they knew of any forms of prevention, and about their regular use of protective equipment (eg, ear plugs, hood). They were also asked about otological symptoms (eg, otalgia, hearing loss), and whether they had previously seen a doctor (general practitioner or specialist) because of otological complaints. Additionally, they were questioned about previous history of otitis externa and EAE.

All participants had their ears examined via otoscopy, and digital images of the EAC were recorded. Images were assessed to determine the presence of EAE, if any lesions were present and the degree of severity, based on the obstruction of the EAC. The grades of severity were adopted from a previously published one-to-three scale[12] (figure 1; grade 1: up to 33% of obstruction; grade 2: between 34% and 66% of obstruction; grade 3: more than 67% of obstruction).

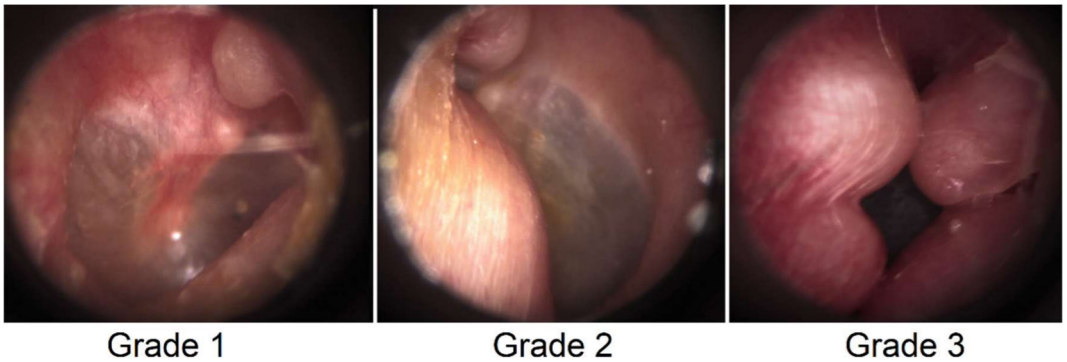

Figure 1 Exostosis grades of severity. Grade 1: up to 33% of obstruction of the external auditory canal (EAC); grade 2: between 34% and 66% of obstruction of the EAC; grade 3: more than 67% of obstruction of the EAC.

Table 1 Participants' characteristics

Characteristics	Professional group (n=20)	Recreational group (n=93)
Age in years (mean±SD)*	29.0±4.0	52.3±12.9
Gender (n (%))		
Male	14 (70)	88 (94.6)
Female	6 (30)	5 (5.4)
Surfing experience in years (mean±SD)*	21.2±5.6	36.0±15.0
Stance (n (%))		
Regular	16 (80)	70 (80.6)
'Goofy'	4 (20)	18 (19.4)
Regular otological symptoms (n (%))*	18 (90)	63 (67.7)
Average no of regular symptoms (mean±SD)	2.9±1.1	2.3±1.3
Previously seen doctor due to otological symptoms (n (%))	12 (60)	58 (62.4)
Previous otitis externa (n (%))	12 (60)	38 (41.2)
Previous diagnosis of EAE (n (%))	4 (20)	24 (25.8)
Previous surgery for EAE (n (%))	2 (10)	4 (4.3)

*Denotes statistically significant difference between groups (p<0.05).
EAE, external auditory exostosis; n, number of individuals.

Data analysis

Data were analysed descriptively to determine means and SD and tested for normality by assessing skewness, kurtosis, Q-Q plots and the Kolmogorov-Smirnov test. For continuous variables, differences between professional and recreational surfers were assessed using independent-samples t-tests, or, for non-normally distributed variables, Mann–Whitney U tests. For categorical outcomes, a χ^2 test of independence was used to assess any differences between the groups. The level of significance, alpha, was set a priori at 0.05 for all statistical tests. All analyses were performed with SPSS statistical software (V.25.0 for Windows, SPSS).

RESULTS

A total of 113 surfers (90.3% males) were eligible to take part in our study; 93 recreational (82.3%) and 20 professionals (17.7%). Table 1 shows characteristics for both professional and recreational groups. Recreational surfers were significantly older (p<0.005), more experienced (greater years surfed; p<0.005) and had a lower prevalence of regular otological symptoms (p=0.017) than professional surfers. Of those participants reporting otological symptoms (18 professional surfers; 63 recreational surfers), the most common complaints were water trapping (88.9% of professional surfers, 66.7% of recreational surfers), impacted wax (83.3% of professional surfers, 61.9% of recreational surfers) and hearing loss (44.4% of professional surfers, 49.2% of recreational surfers). Of note, the number of surfers who had previously sought medical advice due to otological symptoms was high for both groups (60% of professional surfers and 62.4% of recreational surfers).

Auditory exostosis was diagnosed in 19 professional surfers (95%) and 77 recreational surfers (82.8%), with no statistical difference between groups (figure 2). However, as can be seen in figure 2, grade 3 EAE was significantly more prevalent in the professional group

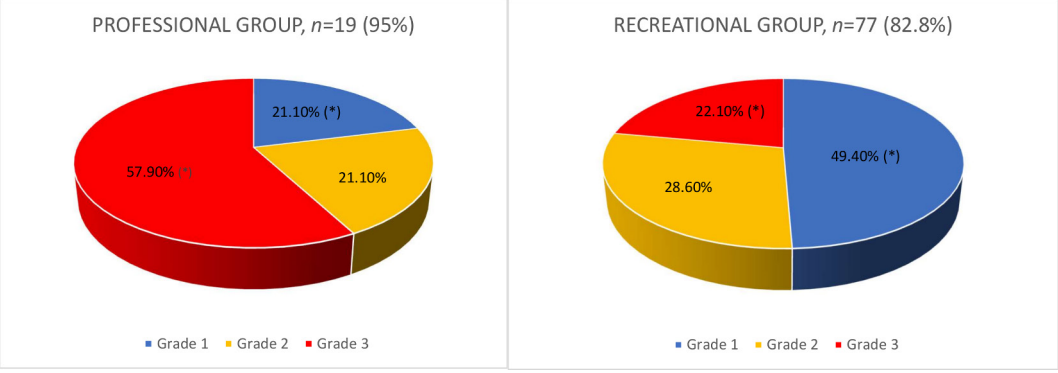

Figure 2 Prevalence and severity of auditory exostosis. *Denotes statistically significant difference between groups (p<0.05). n, number of individuals with auditory exostosis.

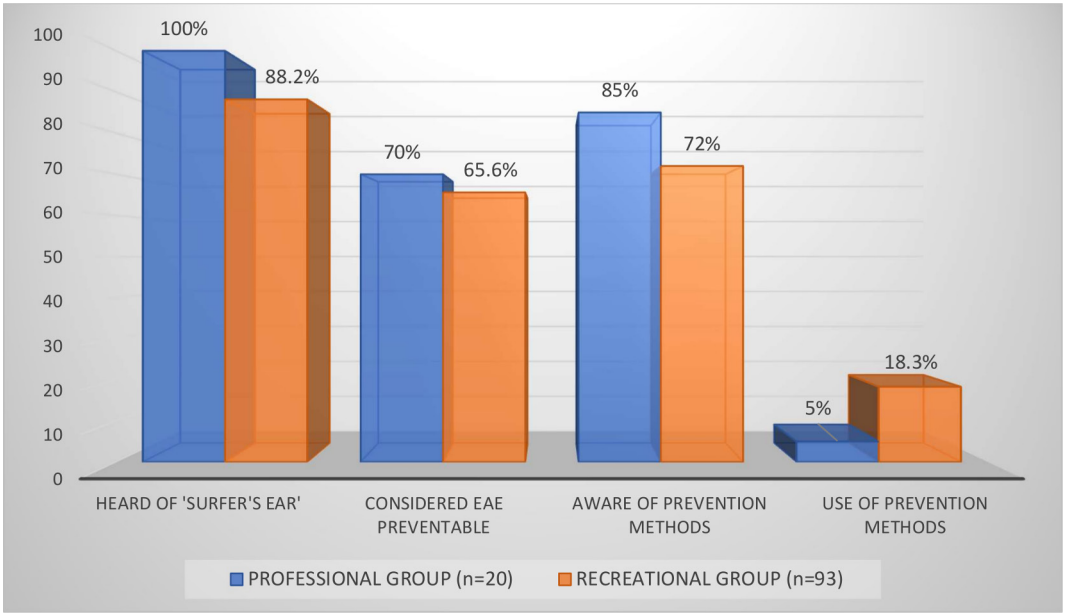

Figure 3 Awareness and use of prevention methods. EAE, external auditory exostosis.

(p<0.05), whereas grade 1 EAE was significantly more prevalent in the recreational group (p<0.05). Of those having EAE, the majority of the individuals had bilateral lesions; however, a significantly higher number of surfers in the professional group were found to have bilateral lesions (94.7% in the professional group vs 58.4% in the recreational group; p<0.05). Notably, only 20% of professional surfers and 25.8% of recreational surfers had been previously diagnosed with EAE (table 1). The recurrence rate following surgery, where this had occurred, was high for both groups: 100% in the professional group (2 out of 2) and 50% in the recreational group (2 out of 4).

With regard to awareness, most participants in both groups (100% of the professional surfers and 88.2% of the recreational surfers) had previously heard of the term 'surfer's ear' (figure 3), with no significant difference between the groups in this regard. However, fewer individuals considered the condition to be preventable, despite the fact that most participants could cite at least one prevention method (no significant difference between groups). Interestingly, in both professional and recreational groups, even though there was a high level of awareness of the condition among participants, very few surfers reported using prevention methods on a regular basis—a number that was even lower in the professional group. The only professional surfer who reported regular use of earplugs started using the protective equipment after being diagnosed with EAE. In the recreational group, only 8 out of the 24 previously diagnosed with EAE (33.3%) reported regular use of protective equipment. The most commonly cited form of prevention was earplugs, with all (100%) professional surfers that were aware of prevention options citing this as the only effective method. Within the recreational group, of those aware of prevention methods (67 surfers), 73.1% cited earplugs, 11.9% cited alcohol-based eardrops, 7.5% cited hoods and 7.5% cited a combination of the previous three methods. For both groups, the most common reason for not using prevention methods was that it can potentially affect performance, by potentially altering both hearing and balance.

DISCUSSION

Main findings

The primary aim of the present research was to determine the level of awareness of EAE among professional and recreational Australian surfers. Additionally, we aimed to assess the use of protective equipment by the participants.

Our results revealed a high prevalence of EAE in both recreational and professional surfers (82.8% and 95%, respectively; figure 2). However, only 25.8% of the participants in the recreational group and 20% of the professional group had been previously diagnosed with EAE. Interestingly, most of the individuals in both groups had previously reported otological symptoms and had seen a health practitioner for that complaint (table 1).

The term 'surfer's ear' is well-known among surfers (figure 3) and most of the participants cited at least one form of potential prevention for the condition. However, fewer considered the condition to be preventable, and this may be one of the explanations for the low number of surfers who reported regularly using prevention methods. The most common form of prevention cited was ear plugs. However, few opted to use them due to a potential of decreased hearing and balance and thus altering and effecting surfing performance.

Relation to previous studies

In a study conducted in the UK investigating awareness and attitudes of surfers towards EAE,[13] it was reported that the majority of the participants (66.6%) believed that the

condition was inevitable, a result similar to what was found in our study. Additionally, many surfers in the previous study similarly reported that earplugs reduced balance and limited their surfing performance. In another study conducted in the UUK, Reddy *et al*[14] reported that 60% of surfers knew about the potential preventability of auditory exostoses, but only 2% admitted regular use of water precautions, such as ear plugs or hoods. This number is similar to what we found in the professional group. Reddy *et al*[14] also reported that surfers with an awareness of preventability were significantly more likely to use water precautions and concluded that health promotion may increase the use of water precautions in the prevention of auditory exostosis.

Earplugs appear to be the most common prevention method reported in the literature[4 6]; however, their value remains unclear, as there appear to be no trials assessing the long-term benefit and efficacy, including usage rate, among surfers.

Limitations

It is important to note that the findings of this study must be interpreted with caution, mainly due to the study design, but also due to the relatively low number of participants in the study. Additionally, otological symptoms are a self-reported outcome and, therefore, a potential limitation as symptoms may not be related to a presence of exostosis.

Future directions

The use of earplugs and alternative options, such as hoods and different formulations of ear drops, should be investigated in future studies. Furthermore, future research should assess barriers to the use of protective equipment by surfers, in order to inform recommendations for prevention methods.

CONCLUSION

The purpose of this study was to assess awareness of EAE among Australian professional and recreational surfers, and also the use of prevention methods within this population. Despite a high level of awareness, the use of prevention methods was low. Health practitioners are encouraged to discuss EAE with their patients who regularly surf, as otological symptoms are common and surfers seek medical advice for this reason. Prevalence of EAE and its recurrence after surgical procedure are high; therefore, future research should focus on effective prevention methods for this condition.

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Competing interests None declared.

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Data availability statement All data relevant to the study are included in the article or uploaded as online supplementary information. This research used deidentified participant data, and all data relevant to the study are included in the article.

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ORCID iD

Vini Simas http://orcid.org/0000-0001-5797-2917

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