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An investigation of surf participation and injury prevalence in Australian surfers: a self-reported retrospective analysis

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**An investigation of surf
participation and injury prevalence
in Australian surfers:
A self-reported retrospective
analysis**



**A report to the New South Wales
Sporting Injuries Committee**

by

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Executive Summary:

This project was undertaken by staff members of Southern Cross University's School of Health and Human Sciences and was funded totally by the New South Wales Sporting Injuries Committee. Surfing Australia provided valuable support by promoting this project to its membership and also within the surf industry.

This study involved a retrospective survey of Australian surfers in order to establish the prevalence, type, and severity of injuries sustained in the 12 month period immediately prior to participating in this survey. A total of 772 surfers accessed the survey web site with 685 of these completed the majority of questions, thus representing a response rate of 88.7%.

Key findings of this research are:

1. A total of 272 (38.4%) of 685 respondents indicated that they had sustained an injury in the 12 months prior to completing the survey, which was severe enough to keep them out of the water while it healed. A number of these had sustained more than one injury with the total number of reported injuries being 389.
2. Of the 389 reported injuries the most common forms were identified as involving the:
 - i. Knee (n = 62, 15.9%)
 - ii. Ankle and foot (n = 58; 14.9%)
 - iii. Torso (n = 54, 13.9%)
 - iv. Shoulder (n = 51; 13.1%)
 - v. Head (n = 50; 12.8%)
 - vi. Hip/groin/leg (n = 35; 9.0%)
 - vii. Neck and spine (n = 31; 7.9%)
 - viii. Arm, including hand (n 27; 6.9%)
3. A total of 118 (19.3%) of 611 respondents sustained an injury that required them to attend hospital for assessment. Of these, 25 (n = 611, 4.1%) were admitted to hospital requiring them to stay for between 1-9 nights.

4. A total of 90 (14.7%) of 613 respondents had been treated by their doctor for a skin cancer or lesion in the 12 month period immediately prior to completing the survey. Of these, 3 respondents were diagnosed with melanoma and 6 as having a basal cell carcinoma (BCC).
5. A total of 146 (23.9%) of 613 respondents reported having had a sea ulcer in the 12 months prior to completing the survey.
6. 34 of (6.6%) 515 respondents perceived that they had significant loss of income due to extended periods of recovery and/or rehabilitation from a surf related injury sustained in the past 12 months.
7. 17.2% (n = 106) respondents indicated that they "never" conduct any form of warm-up activity prior to surfing and 24.8% (n = 153) indicated that they "never" drank additional fluids before surfing.
8. A total of 562 (96.1%) of 585 respondents believed that surfing played an important part in their general health and wellbeing.

Conclusions:

The surfing environment, like many sports, is inherently dangerous. Participation may lead to injury with one in three surfers possibly experiencing an injury severe enough to keep them out of the water for varying periods of time in any 12 month period.

Respondents to this survey reported spending on average more than 9-11 hours per week in the water. As a result, it is speculated that many of these injuries are likely a product of the total time spent surfing, which may increase the stress on key structures associated with the sport (e.g. the shoulder and back) from possible overuse type injuries and/or mechanisms.

Recommendations:

1. injury prevention strategies should be implemented in surfing and targeted generally across all participants;
2. general guidelines for hydration and the benefits of an appropriate warm-up need to be communicated to all participants;
3. attention should be made to areas in which injuries most frequently occur e.g. the knee, ankle, lower back and shoulder;
4. the "Slip! Slop! Slap! Seek! Slide!" message of the Cancer Council needs reinforcing with a more appropriate campaign targeting surfers in an effort to increase their use of sun protection strategies all year round;
5. further analysis is needed to establish the true cost of injury on the medical system; and
6. further analysis is needed involving a larger sample before these results can be considered indicative of participants in this sport.

1.0 Background:

1.1 Surfing: A brief overview

Surfing is an iconic Australian pastime that is enjoyed by more than 2.5 million Australians. One of surfing's great advantages is that it can be enjoyed by young and old across the lifespan. The 2006-07 Sweeney Sport Report shows 14% of the population are active surfers and the sport's popularity exceeds that of other sports, such as cricket, netball, surf life saving and basketball (Surfing Australia, 2008). For some regional communities such as the North Coast, surfing is part of their community and lifestyle (Surfing Australia, 2008) and makes significant contributions to the economy of these communities. Globally the sport has grown to such an extent that it is referred to as an industry with many of its associated brands being some of the most recognised in the world. Yet, in spite of its obvious appeal and popularity, research into this sport is sparse.

Surfers vary in their level of involvement within the sport, from those who only get to the water occasionally to those who consider it an essential aspect of their daily lives. A typical surfing session is approximately two hours long (Taylor et al., 2004) but it is not unusual for surfers to spend 3-4 hours at a time in the water and to surf more than once a day. The age range of surfing participants is wide with organised competitions for under twelve year olds through to Masters, and with competitions at regional, state, national and international levels.

Participants also take up the sport as a lifestyle. Participants who started surfing as adolescents continue their involvement into adulthood, and today, surfers aged in their 70s are a common sight on Australia's beaches. In addition, females are a growing segment of the surfing community and it has been suggested that they account for 10% of all participants currently involved in the sport (Surfing Australia, 2008).

1.2 Surf safety and related issues

While surfing is seen as a healthy outdoor activity, safety is an important issue. A recent study on adventure sports in New Zealand reported surfing as the fourth highest for

injury claims with an injury rate of 11.1 per 1000 participants (Bentley et al., 2006). The nature of the environment means that it is inherently dangerous and deaths have been reported from drowning and shark attacks directly linked to participation in the sport. Surf safety is multi faceted and is not limited to injuries. Factors which impact on surf safety, range from immediate to longer term issues. Immediate issues include ocean knowledge and awareness and safe exercise practices, including warm up and cool down behaviour and re-hydration. Longer term problems include sun exposure, which is important in eye and skin protection. In response to growing concerns in relation to surf safety in younger participants, the "Safe Surfing Program" was developed in conjunction with the Australian Sport Commission and is delivered by Surfing Australia surf schools. However, the effectiveness of this program is yet to be established.

Published research of surf injuries in Australia is limited with some dating back more than 2 decades (e.g. Lowden et al., 1987; Lowden et al., 1983). Investigation into aspects of surf safety have included marine hazards (Nathanson et al., 2007), otological issues (Taylor et al., 2004), sun exposure (Dozier et al., 1997), types of injuries or mechanisms (Avilés-Hernández et al., 2007; Taylor et al., 2005; Nathanson et al., 2007) and injury rates (Bentley et al., 2006; Roger & Llyod, 2006; Taylor et al., 2004).

There is a growing popularity of this sport with younger participants, with the highest rates of participation seen within the 16-29 year old male cohort (Surfing Australia, 2008). Yet little is known about the level of prior knowledge related to safe participation that these participants bring to this sport. It is also possible that some surfers are simply ignoring issues such as the "Slip-slop-slap-see-slide" message of the Cancer Council. Unlike land based sport activities, surfing has the added element of an individual activity in an unforgiving environment. Poor reading of the surf conditions can lead to dangers such as being caught in dangerous currents and rips, or caught under waves with the ultimate consequence of drowning. While immediate aspects of surf safety such as ocean knowledge are important to prevent accidents, there are also important physiological aspects related to participation that need consideration. While surfing is conducted in a liquid environment, much of the time spent is on paddling (Meir et al., 1991; Mendez-Villanueva et al., 2005), which is a highly demanding activity (Meir et al., 1991) with

consequent potential impacts on hydration. Aspects such as excessive sun exposure are also important and may influence skin cancer rates (Noble-Jerks et al., 2006). Therefore information on the current practices and knowledge of Australian surfers is important for safety aspects of the sport of surfing and the education of its participants.

2.0 Objectives

The aim of this study was to determine the level of knowledge and current practices in relation to activity and safety aspects of the sport of surfing in recreational surfers within Australia. Specifically this study investigated the current rates of participation and time spent by surfers in this pastime along with their related exercise practices, pre-activity preparation strategies and hydration practices. This research also established the prevalence of surf related injuries in the 12 months immediately preceding this study and the nature of these reported injuries. In addition, sun protection practices adopted by respondents and reported skin cancers/lesions were also reported.

The study is significant in that it has provided a critical analysis of these aspects of surf participation among Australian surfers, which is currently unknown. Ultimately these findings may help to identify areas of surf safety and education which may need to be changed to enhance the safety of the sport's participants.

3.0 Methods:

3.1 Participants

A self-selected, random sample of surfers residing in Australia was invited to participate in this research. A comprehensive survey instrument was developed for online delivery using the professional version of the www.Surveymonkey.com platform. Potential respondents to this survey were advised of its availability via a range of online surf industry sources. Principal of these was the project's industry partner, Surfing Australia, who, in addition to distributing notification directly to its membership by email, also provided a "news" story and link on the homepage of its corporate web site (see Appendix A). Additional media releases (see Appendix B) were distributed to general electronic and print media outlets

and surf specific publications promoting this research and inviting interested surfers to consider participating. A link to the dedicated survey web site was provided in the media release.

The modern Australian surfer not only has access to the World Wide Web but uses this technology in increasing numbers to keep informed about the best spots to surf and the prevailing conditionings at any given time of day. Given the nature and geographical distribution of the target sample a mail survey was not deemed appropriate and it was felt that a larger response rate could be achieved by making the questionnaire available online on selected surfing industry web sites. The recent growth of the Internet has opened up opportunities for survey research, "...which promises greater efficiency and expanded opportunities to reach large numbers of subjects" (Turner & Turner 1998, p. 1). The Internet is widely available and potential respondents may have been able to access it from their homes, workplace or through Internet cafes, local libraries, educational institutions, local community centres and the like.

World Wide Web based delivery of surveys may be most suited to carefully targeted and highly motivated populations (Neuman 2004). However, Neuman (2004) cautions that there are some negative factors associated with web based distribution of surveys. These include the fact that not everyone has access to the Internet and identifying lists of users for distribution management is clearly problematic. It may also be that those who respond via this medium may or may not differ from those who do not have access to the survey via the Internet.

Mailed questionnaires are typically accompanied by a cover letter explaining the purpose of the survey and encourage potential respondents to participate in the associated research. However, given that this questionnaire is to be administered online a cover letter was not warranted. Notwithstanding this, the web site housing the survey had an introductory page that provided a brief overview of the survey, how to complete it and asked for a response within a specified time frame. Once the data collection phase was completed the web site link was made inactive.

3.2 Survey design

The survey tool used a combination of “yes/no”, checklist and simple response questions. The survey tool was developed specifically for this study but was adapted from a survey utilised in similar research involving retired rugby league and cricket players (Noble-Jerks et al., 2003; Weatherby et al., 1999a). The survey tool had a total of 14 web “pages” containing a total of 44 major questions; some questions had sub-sections that required additional information from participants. The first 4 pages presented information related to the rationale for the research, ethics approval and consent, and tips on how to complete and submit the survey successfully. The survey covered five categories relating to the following areas:

1. **Level of participation in surfing** e.g. hours surfed per week, types of surf, location, equipment used, etc.
2. **Surf related travel and expenditure** e.g. distance from home typically travelled, expenditure on equipment, expenditure on surf related travel, etc.
3. **Personal information** e.g. age, gender, whether a recreational or competitive surfer, etc.
4. **Information about other forms of exercise/sport undertaken** e.g. surf specific training, training for general health and fitness, etc.
5. **Surf safety and injuries** e.g. pre-participation practices, sun protection strategies, surf related accreditations, types of injury sustained in past 12 months, etc.

Each category addressed separate issues of interest, some of which were specific to the industry partner, Surfing Australia. As a result not all results of the survey were relevant to this report e.g. category 2 questions identified above.

Ethics approval for the project was granted by the Southern Cross University Human Research Ethics Committee (ECN-09-148). After the initial development of the survey form, it was distributed to relevant experts in the sport/sports injuries field for input and

feedback regarding face validity and relevance of questions. This group was comprised of three sports scientists, a research methodologist, a sport psychologist and the Sport Development Manager for Surfing Australia. This process resulted in a number of small changes being made to the survey tool. This was followed a pilot study being completed by a total of 27 respondents representative of the target population (i.e. surfers). This process allowed for further refinement and modifications of the survey instrument, principally related to the “structural” presentation of questions in order to comply with the Survey Monkey application. Once these changes were made the final version of the survey was submitted to the University Ethics Committee for their records.

3.3 Analysis

Predominantly a descriptive analysis was employed to summarise and present the results of each question utilising SPSS 18.0. Cross tabs were also utilised to cross-tabulate two variables and to thus display their bivariate relationships (association). Where appropriate t-tests were also utilised to test for differences between identified groups of results for continuous variables (e.g. age, years surfed, etc) and chi-squared test for independence for categorical variables (e.g. type of surf craft, wave size, etc.). An alpha level of $p \leq 0.05$ was used for all statistical comparisons. All data were summarised using descriptive statistics (mean [\pm SD]), frequencies and percentages.

4.0 Results:

A total of 772 persons participated in the survey. However, some respondents did not complete all questions. For a total of 87 participants, the amount of missing data was significant and therefore not included. On this basis descriptive analyses were based on $772-87 = 685$ respondents.

4.1 Characteristics of respondents

A total of 585 males, 96 females and 4 transgender persons responded to the survey. Numbers and percentage figures are presented in Table 1. The overall mean age was 31.7 (± 12.85 ; range = 12-67) years, with a median of 30 years. Males were generally older than females with a mean age of 31.9 (± 12.9) and 29.7 (± 12.2) years respectively

but not significantly so ($p = 0.123$). Numbers and percentages for 10 year age categories are presented in Table 2.

Table 1: Gender categories of respondents (N = 685).

Gender	n	%
Male	585	85.4
Female	96	14.0
Transgender	4	0.6
Total	685	100.0

Table 2: Age of respondents by gender and 10 year age category distribution (N = 685).

Age Categories	Males	%	Females	%	All*	%
12-19	126	21.5	23	24.0	149	21.8
20-29	154	26.3	31	32.3	186	27.1
30-39	146	25.0	19	19.8	166	24.2
40-49	84	14.4	13	13.5	98	14.3
50-59	64	10.9	10	10.4	74	10.8
60 and over	11	1.9	0	0.0	12	1.8
Total	585	100.0	96	100.0	685	100.0

*The 4 Transgender respondents were ultimately included in the "All" category and not identified elsewhere in any gender category analysis for confidentiality reasons.

The majority of respondents indicated that their place of residence was NSW (53.9%), followed by Queensland (17.4%), ACT (8.3%), Western Australia (7.5%) and Victoria (5.3%). South Australia, Tasmanian and Northern Territory represent 3.4%, 2.3% and 1.5% of respondents respectively. Three (0.4%) respondents indicated their place of residents as “other”.

4.2 Surfing Activity and type of craft

Table 3 presents means, standard deviations, median, minimum and maximum statistics for hours surfed in summer or winter and number of years surfed.

Table 3: Mean hours surfed per week by season and total years surfed.

	n*	Mean (\pm SD)	Median	Mode	Min	Max
Summer hrs/week	708	10.9 (8.50)	10	10	0	60
Winter hrs/week	708	8.3 (6.98)	6	10	0	45
Years surfed	684	17.9 (13.18)	14	3	0	59

*58 results from respondents (n = 766) reporting zero hours surfed for both summer and winter were excluded from this summary. This was done to reduce bias of including invalid zero hours surfed.

The majority of respondents (62.4%) surfed a short board with the next most popular category of surf craft being a bodyboard (20.3%). Respondents indicated that typically they surfed with a friend (32.9%) or friends (22.9%), or alone (32.1%) and with the majority (78.7%) surfing between 1-2.5 hours on each occasion. However, a number of respondents (19.6%) indicated that they generally surfed for longer than this with sessions lasting a minimum of 2.5 hours and exceeding 3 hours. The majority of respondents (63.2%) also indicated that they generally surfed at beach breaks with a small number (4.1%) indicating that they surfed off-shore reefs. The vast majority of

respondents (80.7%) most liked surfing waves between 0.9-1.8 metres. A detailed summary of these results is provided in Table 4.

Table 4: Type of surf craft, surf companion, surf location and preferred wave size of respondents.

Category		n	Category %
Surfboard type	Short board	466	62.4
	Knee board	7	0.9
	Malibu/Mini Mal	117	15.7
	Bodyboard	152	20.3
	Other	5	0.7
Surfing companion	Alone	240	32.1
	With a friend	246	32.9
	With 2-3 friends	171	22.9
	With family member	46	6.2
	Family and friends	44	5.9
Surfing session length	Less than 1 hour	14	1.9
	1-1.5 hours	161	21.6
	1.5-2 hours	259	34.7
	2-2.5 hours	167	22.4
	2.5-3 hours	103	13.8
	More than 3 hours	43	5.8
Surfing location	Beach breaks	472	63.2
	Point break-sandy	106	14.2
	Point break-rocky	48	6.4
	Reef breaks-close	90	12.0
	Reef breaks-offshore	31	4.1
Wave size	1-2 ft	40	5.4
	3-4 ft	314	42.0
	4-6 ft	289	38.7
	6-8 ft	85	11.4

As can be seen in Table 5 the majority of respondents typically described themselves as “recreational” surfers. A small number (3.2%) described themselves as being professional surfers who derived their income from the sport. More than half of all respondents (52.4%) have never been a member of a boardriders club, while a further 23.1% are lapsed members.

Table 5: Category of surfer, boardriders club membership and competitive level (N = 685).

Category		n	Category %
Type of surfer	Recreational	490	71.5
	Recreational plus local comps	98	14.3
	Recreational plus local, regional, state	82	12.0
	Professional	15	2.2
Local club association	Current member	168	24.5
	Previous member	158	23.1
	Never a member	359	52.4
Competition level	Never competed	302	44.1
	Local club	117	17.1
	Regional/State	187	27.3
	<i>Non-rep regional</i>	75	10.9
	<i>Regional</i>	46	6.7
	<i>State</i>	66	9.6
	National/Pro-am/Prof	79	11.5
	<i>National</i>	32	4.7
	<i>Pro-am</i>	25	3.6
	<i>Professional</i>	22	3.2

N.B.: Details in *italics* indicate sub-groups of linked competitive level

4.3 Safety activity participation and abilities

Respondents were asked a range of questions linked to their safety and additional forms of training or sporting activity. Tables 6, 7 and 8 provide a summary of these details.

A total of 292 respondents (44.0% of 663) have never participated in any form of surf safety/education course. However, 20.2% (n = 134) and 18.9% (n = 125) of respondents respectively indicated that they had undertaken such courses at either their local surf life

Table 6: Safety activity participation and swimming ability.

Category		n	Category %
Surf safety/education Course (n = 663)	Never participated	292	44.0
	High school	125	18.9
	Local Surf Life Saving or Boardriders club	134	20.2
	Other organisation	50	7.5
	Surfing Australia	62	9.4
Certificates/accreditations (n = 665)	No certificates	333	50.1
	First aid	237	35.6
	Resuscitation/CPR	203	30.5
	SLS Bronze medallion or better	155	23.3
	Surfing Australia coach	53	6.8
Swimming ability (n = 663)	Cannot swim	1	0.2
	Up to 50 mtrs	2	0.3
	Up to 100 mtrs	43	6.5
	Up to 400 mtrs	115	17.3
	Up to 800 mtrs	97	14.6
	1000+ mtrs	405	61.1
Surf specific training (n = 639)	Yes	108	16.9
	No	531	83.1
Other training (n = 639)	To improve general fitness	200	31.3
	Help improve surfing	38	5.9
	To help improve surfing and general fitness	330	51.6
	No extra training	71	11.1

saving/boardriders club or through their high school. A total of 332 respondents held at least one accreditation/certificate. Of those holding just one accreditation/certificate 18.6% (n = 63) held a current first aid certificate, 7.1% (n = 24) held a current resuscitation/CPR certificate and 15.7% (n = 53) a Surf Life Saving Bronze medallion or better. Just 3.6% (n = 12) held a current Surfing Australia coaching accreditation. A number of respondents had multiple certificates or accreditations related to surfing/surf safety with 27.8% (n = 94) having two, 18.3% (n = 62) having three and 8.9% (n = 30) having four. The total numbers within each individual category are presented in Table 6.

When asked about their swimming ability the vast majority (93.1%) indicated that they could swim 100 metres or more in open water, while 7% indicated that they could swim 100 metres or less. In addition a total of 16.9% indicated that they participate in additional surf specific training with more than half (72.8%) of these undertaking this training on their own and without the assistance of an accredited coach. Further, more than half of respondents indicated that they undertook additional training (non-surf specific) as a way of improving their general fitness and surfing. Table 7 provides a summary of the different forms of training being undertaken by respondents and the weekly number of sessions participated in each form of training. A total of 41.1% (n = 263) of respondents also indicated that they participated in some form of other sport activity on a regular basis in addition to surfing.

When asked about their pre- and post-surfing preparation only 21.4% (n = 132) of respondents (n = 617) "always" conducted some form of warm-up routine prior to going in the water, while 17.2% (n = 106) indicated that they "never" conduct a warm-up routine. Further, just 1.9% (n = 12) conduct some form of cool-down routine after their session. Similarly just 21.4% (n = 132) indicated that they "always" drank additional fluids, such as water, prior to going in the water as a means of promoting adequate hydration, while 24.8% (n = 153) indicated that they "never" drank additional fluids before surfing. In contrast 68.4% (n = 422) of respondents "mostly" or "always" drank fluids after their session.

4.4 Sun protection strategies and reported skin damage

Respondents were asked about their occupation and how they would describe it (e.g. indoors or outdoors). A total of 617 surfers responded to this question with 277 (44.9%), 72 (11.7%) and 268 (43.4%) indicating that they would generally describe their occupation/daily activity as being one that involved them being “inside”, “outside” or a combination of both respectively.

Table 7: Types of additional training undertaken by respondents (n = 640).

Type of training	Sessions per week							Total
	0	1	2	3	4	5		
Weight training	n	363	89	97	55	19	17	277
	%	56.7	13.9	15.2	8.6	3.0	2.7	43.3
Structured exercise class such as aerobics, boxercise, etc.	n	512	51	47	16	12	2	128
	%	80.0	8.0	7.4	2.5	1.9	0.3	20.0
Stretching	n	192	100	96	92	51	109	448
	%	30.0	15.6	15.0	14.4	8.0	17.1	70.0
Running/jogging	n	300	127	100	60	26	27	340
	%	46.9	19.9	15.6	9.4	4.1	4.2	53.1
Cycling	n	366	121	61	38	16	38	274
	%	57.2	18.9	9.5	5.9	2.5	5.9	42.8
Swimming	n	331	139	69	51	24	26	309
	%	51.7	21.8	10.8	8.0	3.8	4.1	48.3
Walking	n	257	79	65	73	41	125	383
	%	40.2	12.4	10.2	11.4	6.4	19.6	59.8
Pilates and/or yoga	n	499	85	22	18	7	9	141
	%	78.0	13.3	3.4	2.8	1.1	1.4	22.0

Table 8 provides details of the types of sun protection strategies being employed in the warmer (October to March) and cooler months (April to September) by respondents when surfing. From these results we can see that 64% (n = 395) of respondents “always” or “most of the time” applied sunscreen/zinc to their nose when surfing during the warmer months, while a total of 54% (n = 333) applied sunscreen to all exposed areas of skin when surfing in the warmer months. However, the use of strategies such as the wearing of rash vests (short or long sleeved) and surf caps is less popular among respondents in the warmer months. The rates of sunscreen/zinc use on the nose, face and neck, and for all exposed areas of the skin in the cooler months is approximately half of that reported in the warmer months (see Table 9).

When not surfing but outdoors working or for some other form of recreational/relaxation activity during the daytime, the most popular forms of sun protection reported by respondents were wearing a shirt (“most of the time” or “always” = 481; 77.9%) and/or sunglasses (“most of the time” or “always” = 455; 73.7%). The option of wearing a wide brimmed hat was the least popular, with 77.5% (n = 478) of respondents indicating that they either “never” or only “sometimes” used this strategy.

A total of 90 respondents (n = 613; 14.7%) reported that they had been treated by a medical practitioner for skin cancers or lesions in the 12 months immediately prior to completing the survey. Of these, 3 respondents were diagnosed with melanoma and 6 as having a BCC. A total of 224 separate skin cancers/lesions were reported, indicating that some respondents had more than one for the period. Table 10 provides a summary of these by age and frequency. The most common site category was the upper body (from below the neck to above hips) with 54.1% (n = 112) of all reported skin cancers/lesions. However, the most common location for skin cancers/lesions was the face with 21.9% (n = 49) of all reported skin cancers/lesions (see Table 11). This equates to a mean rate of occurrence across all respondents answering “yes” to this question of 9.1 (\pm 12.1; median = 4.8) skin cancers/lesions per 1000 hours surfed in the 12 month reporting period.

Table 8: Sun protection strategies reported by respondents (n = 617).

Period	Strategy		Never	Sometimes	Mostly	Always	
Warmer months	Sunscreen/zinc nose	n	138	84	147	248	
		%	22.4%	13.6%	23.8%	40.2%	
	Sunscreen/zinc face neck	n	63	96	187	271	
		%	10.2%	15.6%	30.3%	43.9%	
	Sunscreen all exposed skin	n	118	166	151	182	
		%	19.1%	26.9%	24.5%	29.5%	
	Short sleeve rash vest (or wetsuit)	n	153	188	144	132	
		%	24.8%	30.5%	23.3%	21.4%	
	Long sleeve rash vest (or wetsuit)	n	200	178	113	126	
		%	32.4%	28.8%	18.3%	20.4%	
	Surf cap	n	501	71	21	24	
		%	81.2%	11.5%	3.4%	3.9%	
	Cooler months	Sunscreen/zinc nose	n	227	175	90	125
			%	36.8%	28.4%	14.6%	20.3%
Sunscreen/zinc face neck		n	174	200	106	137	
		%	28.2%	32.4%	17.2%	22.2%	
Sunscreen all exposed skin		n	289	161	75	92	
		%	46.8%	26.1%	12.2%	14.9%	
Short sleeve rash vest (or wetsuit)		n	315	140	57	105	
		%	51.1%	22.7%	9.2%	17.0%	
Long sleeve rash vest (or wetsuit)		n	116	73	127	301	
		%	18.8%	11.8%	20.6%	48.8%	
Surf cap		n	529	49	20	19	
		%	85.7%	7.9%	3.2%	3.1%	

Statistically ($p < 0.05$) there were no differences between the reported frequency of skin cancers between males and females ($p = 0.87$), hours spent surfing per week (warmer months $p = 0.17$; cooler months $p = 0.97$), or competitive level ($p = 0.81$). However, when all respondents were combined, there was for age ($p < 0.01$), with a higher percentage rate of skin cancer reported within the identified age categories with advancing years (i.e. 12-19 yrs = 3.3%; 20-29 yrs = 4.8%; 30-39 yrs = 12.4%; 40-49 yrs = 29.8%; and 50 yrs and over = 39.7%).

Type of craft surfed ($p < 0.01$) was also linked to a higher percentage rate of reported skin cancers with body board riders least likely to report a skin cancer, (8.3%) followed by short board riders (12.6%) and malibu riders being most likely (28.0%) to report a skin cancer in the 12 month period immediately prior to the survey. There was also a link between total years surfed and higher rates of reported skin cancer ($p < 0.01$) among respondents who had been surfing for more years (mean = 28 yrs, ± 14.0 , SE 1.47) compared with those who did not report a skin cancer and on average had less total years surfing (mean = 6.5 yrs, $\pm 12.3.0$, SE 0.53).

Table 10: Frequency of reported skin cancer/lesions by age category (n = 90)

Age group	Number of skin cancers reported per person									Group total
	1	2	3	4	5	6	7	8	17	
12-19	2	-	-	1	-	-	-	-	-	6
20-29	2	2	1	-	-	-	-	-	-	9
30-39	11	3	1	-	-	-	1	1	1	52
40-49	13	3	6	1	2	-	-	-	-	51
50-59	8	5	1	1	4	-	3	-	-	66
60 or over	1	1	-	1	-	2	3	-	-	40
Total	37	28	27	16	30	12	49	8	17	224

Table 11: Skin cancer/lesion site and number reported by surfers (n = 90).

General area of body	Reported location	f	%	Rank
Neck and above (f = 92; 41.1%)	Head	7	3.1	10
	Ear	10	4.5	7
	Face	49	21.9	1
	Nose	5	2.2	11
	Mouth/lip	5	2.2	11
	Forehead	13	5.8	5
	Neck	3	1.3	12
Upper body (below neck to above hips) (f = 112; 50.0%)	Shoulder	9	4.0	8
	Chest	10	4.5	7
	Back (general)	11	4.9	6
	Upper back	16	7.1	4
	Abdomen	1	0.4	14
	Lower back	3	1.3	12
	Upper arm	9	4.0	8
	Forearm	22	9.8	3
	Hand	31	13.8	2
Lower body (buttocks and below) (f = 12; 5.4%)	Buttocks	1	0.4	14
	Knee	2	0.9	13
	Lower leg (incl' foot)	9	4.0	8
Unspecified (f = 8; 3.5%)		8	3.6	9
Total		224	100.0	

f = frequency of injury reported in each location.

4.5 Sea ulcers

A total of 23.9% (146; n = 613) of respondents reported that they had experienced a sea ulcer in the 12 months prior to completing the survey. A number of these had multiple sea ulcers during this period with a total of 385 cases reported. This equates to a mean rate of occurrence across all respondents answering "yes" to this question of 7.6 (\pm 13.0; median = 4.4) sea ulcers per 1000 hours surfed in the 12 month reporting period. Table 12 provides a summary of their location and number.

Table 12: Sea ulcer site and number reported by surfers (n = 146).

Reported location	f	%
Neck	1	0.3
Back	3	0.8
Arm	8	2.1
Hand/finger	22	5.7
Knee	43	11.2
Lower leg	26	6.8
Ankle	69	17.9
Foot/toe	196	50.9
Unspecified	17	4.4
Total	385	100.0

f = frequency of injury reported in each location.

The majority (n = 65; 44.5%) of respondents reporting a sea ulcer continued surfing and let the ulcer heal naturally, while 27.4% (n = 40) also continued to surf but also self managed the ulcer by purchasing over-the-counter medication. Just 7.5% (n = 11) received medical advice from a doctor to treat their ulcer and stayed out of the water until it healed. The same number (n = 11) received medical attention for their ulcer but continued surfing and another 7.5% stayed out of the water but treated the ulcer themselves by using over-the-counter medication. 5.6% (n = 8) self managed their ulcer by staying out of the water until it healed.

The three most common sites were the foot/toe (50.9%) followed by the ankle (17.9%) and knee (11.2%). Statistically ($p < 0.05$), irrespective of time of year, the occurrence of sea ulcers increases with the hours surfed ($p < 0.001$). Reported rates were also significantly ($p < 0.001$) higher among younger surfers (mean age 25.4 yrs, ± 10.4 , SE 0.86), whom also spend more time per week on average in the water, than older surfers (mean age 34.3 yrs, ± 12.7 , SE 0.58). There is also a significantly ($p < 0.001$) higher reported rate among surfers who have surfed less in terms of years (mean yrs surfed

13.7, ± 10.66 , SE 0.88) compared with those whom have been surfing for longer (mean yrs surfed 19.7, ± 13.6 , SE 0.63).

4.6 Injury prevalence and location

Two hundred and seventy-two respondents (44.5% of 611) indicated that they had sustained a total of 389 injuries related to their surfing in the 12 months prior to the survey that was severe enough to keep them out of the water while the injury healed/recovered. The general location of these injuries (where specified), injury type, frequency and category rank based on these responses are presented in Table 13.

The top three most frequent (anatomical) locations of these injuries were to the knee (15.9%), the ankle/foot (14.9%), and torso (13.9%). Of these ($n = 611$), 19.3% ($n = 118$) were required to attend hospital for various forms of assessment/treatment. These included setting of fractures, sutures, tests, observation, x-ray, and medical advice. Twenty-five respondents were admitted into hospital requiring a stay of between 1-9 nights in duration.

This equates to a mean rate of occurrence for all respondents indicating that they had sustained a severe injury of 3.5 (± 3.4 ; median 2.6) injuries per 1000 hours surfed in the 12 month reporting period. There was no statistically significant ($p = < 0.05$) differences in the rate of injury by gender ($p = 0.08$), age ($p = 0.31$), type of board used ($p = 0.14$) or size of waves surfed ($p = 0.21$). However, there was for level of competition ($p < 0.001$) and surf location ($p < 0.03$), with those competing at a national level (e.g. Australian Titles) or surfing off-shore reefs respectively being more likely to injury themselves. Further analysis established that for those respondents (32.7%) who indicated that they "never" warmed up prior to surfing that there was a greater likelihood of injury risk ($p = 0.04$). Injury occurrence was also positively ($p < 0.001$) linked to the total hours surfed, irrespective of time of year, and age ($p = 0.04$).

Table 14 provides a summary of the anatomical location where a respondent had a laceration in the 12 months prior to completing the survey. Respondents reported a total

of 195 separate lacerations, which indicates that some respondents had multiple lacerations in this period. 39.5% (n = 77) of these were identified as requiring stitches.

4.7 Impact of injuries

Respondents were asked to indicate if, in their opinion, the injuries sustained in the 12 month period immediately before participating in the survey had impacted negatively on them in some way. They were asked to select from a list of 5 “consequences” (see Table 15). 17.6% (n = 91) of respondents indicated that they believed they had incurred additional medical cost associated with their injuries that were not covered by their private health insurance/cover. 1.9% (n = 10) had retired early from surfing as a result of their injuries and 34.6% (n= 178) felt that they were currently experiencing limitations in their ability to carry out normal recreational activities. Finally, 6.6% (n = 34) perceived that they had significant loss of income due to extended periods of recovery and/or rehabilitation from their injuries and 7.8% (n = 40) perceived that their injuries had impacted on their ability to perform work for which they had previously been trained.

Notwithstanding the above respondents were asked to indicate how they perceived the contribution of surfing to their general sense of health and wellbeing. Overwhelming respondents (n = 562) “agreed” (n = 11; 19.0%) or “strongly agreed” (n = 451; 77.1%) with the statement that “surfing makes an important contribution to my perceived sense of health and well-being”.

Table 13: Rank order of injury according to frequency rate reported by respondents (n = 272).

Location of injury (category total and % of all incidences n = 389)	Injury description	Total reported injuries (n = 389)		% of reported cases* (n = 272)
		f	%	
Head (f = 50; 12.8%)	Head laceration	15	3.9	5.5
	Face laceration	10	2.6	3.7
	Eye - injury	6	1.5	2.2
	Ear drum	5	1.3	1.8
	Ear injury	4	1.0	1.5
	Nose - fracture	4	1.0	1.5
	Head - concussion	3	0.8	1.1
	Face - nerve damage	1	0.3	0.4
	Jaw - dislocation	1	0.3	0.4
	Eye socket - fracture	1	0.3	0.4
Neck and spine (f = 31; 7.9%)	Neck-injury unspecified	13	3.3	4.8
	Spinal - disc injury	6	1.5	2.2
	Spine - fracture	5	1.3	1.8
	Neck - nerve pain	2	0.5	0.7
	Neck - vertebrae injury	2	0.5	0.7
	Neck - spine vertebrae injury	1	0.3	0.4
	Neck - fracture	1	0.3	0.4
	Spine - fracture	1	0.3	0.4

Table continued over page...

Table 13 continued...

Location of injury (category total and % of all incidences n = 389)	Injury description	Total reported injuries (n = 389)		% of reported cases* (n = 272)
		f	%	
Shoulder (f = 51; 13.1%)	Shoulder - injury unspecified	24	6.2	8.8
	Shoulder - dislocation	14	3.6	5.1
	Rotator cuff injury	6	1.5	2.2
	Shoulder - laceration	3	0.8	1.1
	Shoulder AC joint	2	0.5	0.7
	Collarbone - fracture	2	0.5	0.7
Torso (f = 54; 13.9%)	Lower back-injury	30	7.7	11.0
	Ribs - fracture	7	1.8	2.6
	Ribs - cartilage damage	5	1.3	1.8
	Ribs - soft tissue injury	4	1.0	1.5
	Back - laceration	3	0.8	1.1
	Back - soft tissue injury	2	0.5	0.7
	Thorax - soft tissue injury	1	0.3	0.4
	Lung-collapsed	1	0.3	0.4
	Pancreatitis (blunt trauma)	1	0.3	0.4
Arm including hand (n = 27; 6.9%)	Arm/Elbow unspecified	4	1.0	1.5
	Hand/wrist/finger - injury	4	1.0	1.5
	Arm/Elbow - laceration	3	0.8	1.1
	Hand/Finger - laceration	3	0.8	1.1
	Finger - fracture	3	0.8	1.1
	Elbow - dislocation	2	0.5	0.7
	Hand - fracture	2	0.5	0.7
	Elbow - fracture	1	0.3	0.4
	Wrist - fracture	1	0.3	0.4

Table continued over page...

Table 13 continued...

Location of injury (category total and % of all incidences n = 389)	Injury description	Total reported injuries (n = 389)		% of reported cases* (n = 272)
		f	%	
Hip/groin/leg general (f = 35; 9.0%)	Leg - soft tissue	8	2.1	2.9
	Groin region - soft tissue injury	6	1.5	2.2
	Leg - laceration	6	1.5	2.2
	Hip - injury	5	1.3	1.8
	Hamstring - soft tissue injury	5	1.3	1.8
	Hip - laceration	2	0.5	0.7
	Leg - injury	2	0.5	0.7
	Leg - fracture	1	0.3	0.4
Knee (f = 62; 15.9%)	Knee injury unspecified	34	8.7	12.5
	Knee - laceration	8	2.1	2.9
	Knee - dislocation	8	2.1	2.9
	Knee - cartilage injury	7	1.8	2.6
	Knee - fracture	3	0.8	1.1
	Knee-surgery unspecified	2	0.5	0.7
Ankle and foot (f = 58; 14.9%)	Ankle - soft tissue injury	18	4.6	6.6
	Foot - laceration	18	4.6	6.6
	Foot/Toe injury	9	2.3	3.3
	Foot - fracture	5	1.3	1.8
	Ankle - fracture	4	1.0	1.5
	Ankle - laceration	2	0.5	0.7
	Toe - fracture	2	0.5	0.7

Table continued over page...

Table 13 continued...

Location of injury (category total and % of all incidences n = 389)	Injury description	Total reported injuries (n = 389)		% of reported cases* (n = 272)
		f	%	
Miscellaneous (f = 25; 6.4%)	unspecified	11	2.8	4.0
	Skin cancer [†]	3	0.8	1.1
	Rash	2	0.5	0.7
	Stitches	2	0.5	0.7
	Surgery	2	0.5	0.7
	Cuts	2	0.5	0.7
	Nearly drowned [†]	1	0.3	0.4
	Sea ulcers [†]	1	0.3	0.4
	Infection	1	0.3	0.4
	Total	389	100.0	143.0

f = frequency of injury reported in each location.

*Respondents may have reported multiple injuries.

[†]Reported by respondent as an injury and included in results.

Table 14: Anatomical site of lacerations as a result of surfing (n = 117).

Location on body	Responses		% of reported cases* (n = 117)
	f	%	
Head	34	17.4	29.1
Face	28	14.4	23.9
Neck/back	9	4.6	7.7
Chest/abdomen	1	0.5	0.9
Arm	9	4.6	7.7
Hand/finger	10	5.1	8.5
Upper leg	2	1.0	1.7
Knee	10	5.1	8.5
Lower leg/ankle	22	11.3	18.8
Foot/toe	65	33.3	55.6
Unspecified	5	2.6	4.3
Total	195	100.0	166.7

f = frequency of injury reported in each location.

*Respondents may have reported multiple lacerations.

Table 15: Perceived consequences of injuries sustained by respondents during or after retirement from surfing.

Perceived consequence	No	Unsure	Yes	n
Significant loss of income due to extended periods of recovery and/or rehabilitation	462 (89.7)	19 (3.7)	34 (6.6)	515
Limitations with respect to job opportunities that you were previously trained for	454 (88.3)	20 (3.9)	40 (7.8)	514
Medical costs incurred by you that were not covered either by a health fund or club insurance	405 (78.3)	21 (4.1)	91 (17.6)	517
Limitations on current ability to carry out normal recreational activities e.g. walking, gardening, etc.	309 (60.0)	28 (5.4)	178 (34.6)	515
Early retirement from surfing due to injury	483 (93.6)	23 (4.5)	10 (1.9)	516

N.B.: Not all respondents answered this question. Figures in () are percentages.

5.0 Conclusions & Recommendations:

5.1 Injuries related to participation

By its very nature the surf can be a hostile and dangerous environment. This research has provided a valuable snapshot of injury prevalence and injury consequences over a 12 month period associated with the sport of surfing. One in three surfers is likely to experience one or more surf related injuries as a result of their participation in the sport in any given 12 month period.

The most common form of consequence associated with surfing appears to be a laceration of some kind as a result of being struck by a board or striking some other object e.g. reef/rock. Notwithstanding this, the four most common areas of the body where an injury was reported related to the knee, ankle/foot, torso (principally the lower back) and shoulder. The specific mechanisms of these injuries were not asked for but it

appears reasonable to assume that many of these will be a result of the mechanical stress and repetitive nature of common movements associated with this sport. On this basis an injury prevention programme that focuses on increasing the stability and mobility around these joints may help to reduce the incidence of these injuries. Any such program should aim to address any imbalances that may exist and that typically occur as a result of repetitive movements, and aim to achieve muscular balance to aid in protection of joints and connective tissue. For example, functional balance training on unstable surfaces may not only improve proprioception but also reduce the likelihood of injury to the ankle, knee and lower back (Gillett, 2009; Ruiz, 2005; Verhagen et al., 2004). As a result, a systematic programme of sport specific conditioning that works to reduce the incidence of the more common injuries identified in this study would appear to have merit. Many respondents were already actively involved in a range of additional forms (e.g. weight training, stretching, running/jogging, swimming, etc.) of training that may play an injury prevention role.

Some injuries are severe enough to stop a surfer from participating in the sport while the injury heals and may also require a small number of participants to attend and/or be admitted to a hospital. In a relatively small number of cases some of these injuries may impact negatively on a participant's income, ability to work in their chosen vocation, participate in other forms of recreation and result in additional medical costs. However, overwhelmingly participants feel strongly that their participation in surfing plays an important part in their perceived sense of health and wellbeing.

5.2 Skin cancer and sun protection strategies

A total of 90 (14.7%) respondents had been treated by their doctor for a skin cancer or lesion. The face, with 21.9% (n = 49) of all reported skin cancers/lesions, was the most common location for skin cancers/lesions. Age was a significant contributor to the reported rates of skin cancer, indicating the link between total exposure and likelihood of sun damage potentially leading to skin cancer with advancing years. This is also supported by evidence that the total years surfed also leads to higher rates of reported skin cancer. The type of craft surfed was also linked to a higher rate of reported skin

cancers with malibu riders, who on average are older than all other categories of craft user, being most likely to report a skin cancer.

The use of sun protection strategies in the summer months is at best variable among respondents. A significant number of surfers indicated that they employ little if any methods of protecting themselves from sun exposure irrespective of the time of year.

The majority of respondents to the survey lived in New South Wales (53.9%), where the average annual ambient temperature for the period 2000-2008 was 24.9°C (ABS, 2010). Further, the average annual UV rating ranges from 6-7 (UV rating of High) for the region south of Sydney and north to Coffs Harbour, to 8-11 (UV rating of Very High) for Coffs Harbour to the Sunshine Coast in South East Queensland respectively (BOM, 2011). As a result, the lack of sun protection while surfing is a significant issue for surfers.

The Bureau of Meteorology (BOM) and Cancer Council Australia advise that a UV rating of 3 or above should prompt Australians to take 5 steps to protect themselves from the harmful effects of sun damage. These are:

1. "Slip" on some sun-protective clothing - that covers as much skin as possible
2. "Slop" on SPF30+ sunscreen - make sure it is broad spectrum and water resistant. Put it on 20 minutes before you go outdoors and every two hours afterwards. Sunscreen should never be used to extend the time you spend in the sun
3. "Slap" on a hat - that protects your face, head, neck and ears
4. "Seek" shade
5. "Slide" on some sunglasses - make sure they meet Australian Standards

This is an area for concern given the enormous amount of resources devoted to educating the general population about the importance of sun protection by organisations such as Cancer Council Australia. It would appear that the "Slip-slop-slap-see-slide" is

having little impact on significant numbers of surfers. In contrast, when outdoors participating in some other form of activity (e.g. work or recreation) almost 80% of respondents indicated that “most of the time” or “always” they wore a shirt to protect themselves from the sun and almost 75% indicated that they wore sunglasses “most of the time” or “always”.

5.3 Sea ulcers

A total of 146 (23.9%) of 613 respondents reported having had a sea ulcer with their reported occurrence being highest among younger surfers. Sea ulcers result from skin abrasions, often caused by rubbing on the deck of a surfboard, that become infected from bacteria found in sea water. This is consistent with the most common site being the foot/toe reported in this research. Their occurrence also increases with the hours surfed.

Typically the majority of surfers choose to continue surfing and do not seek medical attention for their ulcer. Just over a quarter of those reporting a seas ulcer treat it themselves by purchasing over-the-counter medications and use this while still continuing to surf.

5.4 Hours spent surfing and physical activity

With respect to the average time spent surfing, this sport appears to play an important part in allowing surfers to meet or exceed the World Health Organisation’s (WHO) guidelines on physical activity for adults between the age of 18-64 (irrespective of gender). The WHO’s (2011) web site states that:

In adults aged 18–64, physical activity includes leisure time physical activity (for example: walking, dancing, gardening, hiking, swimming), transportation (e.g. walking or cycling), occupational (i.e. work), household chores, play, games, sports or planned exercise, in the context of daily, family, and community activities. In order to improve cardiorespiratory and muscular fitness, bone health, reduce the risk of NCDs [noncommunicable diseases] and depression:

1. Adults aged 18–64 should do at least 150 minutes of moderate-intensity aerobic physical activity throughout the week or do at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous-intensity activity.
2. Aerobic activity should be performed in bouts of at least 10 minutes duration.
3. For additional health benefits, adults should increase their moderate-intensity aerobic physical activity to 300 minutes per week, or engage in 150 minutes of vigorous-intensity aerobic physical activity per week, or an equivalent combination of moderate- and vigorous-intensity activity.
4. Muscle-strengthening activities should be done involving major muscle groups on 2 or more days a week.

Research by Meir et al. (1991) has established that 60 minutes of recreational surfing produces an average heart rate of 135 (\pm 6.9) beats.min⁻¹ with a mean energy expenditure of 2077 (\pm 322.1) kJ. This is equivalent to 33.7 kJ.min⁻¹, suggesting that surfing is comparable to a variety of other recreational sports in terms of energy cost, including freestyle swimming, tennis and cycling. Respondents in this survey indicated that they spent an average of 10.9 (\pm 8.5) hours per week in summer and 8.3 (\pm 6.9) hours per week in winter surfing. This is well above the 300 minutes (5 hours) of moderate intensity activity recommended by the WHO.

These levels of regular physical activity will play an important part in weight control and the maintenance of general cardiovascular fitness and associated health. Notwithstanding this, 88.8% (n = 568 of 639) of respondents also participate in additional forms of physical activity to help improve their surfing and/or general fitness. Further 41.1% of respondents also indicated that they participate in other forms of sport activity (e.g. football, rugby league, cricket, etc.). The rates of physical activity reported by respondents to this survey also exceed the national weekly median of 2.5 times per week in persons aged 15 years and over reported by the Australian Sports Commission (2010).

The Australian Sports Commission (2010) identifies “surf sports” as one of the top 10 non-organised physical activities that Australians participate in. Significant numbers of surfers participate in the sport with a friend (32.9%) or friends (22.9%), while others prefer to surf alone (32.1%). Being able to participate in this sport alone is possibly one of the many attractions of surfing to substantial numbers of participants. In addition surfers generally do not appear to feel the need to be part of a club with over 52% of respondents indicating that they have never been a member of a boardriders club and a further 23% being lapsed members.

5.5 Warm-up and hydration practices

17.2% respondents indicated that they “never” conduct any form of warm-up activity prior to surfing and only 21.4% indicated that they “always” conducted some form of warm-up routine prior to going in the water. However, there was no evidence that there was a link between lack of warm-up and injury prevalence in this research. Yet the role and benefits of an appropriately applied warm-up has been clearly articulated in the literature (e.g. Safran et al, 1989; Shellock & Prentice, 1985; Woods et al., 2007), although the role of static stretching in this process as an injury prevention strategy is no longer supported (Shrier, 1999). Notwithstanding this, there appears to be justification in placing more emphasis on the education of surfers about the benefits of warm-up to their safe participation in the sport.

With respect to pre-surf hydration 24.8% of respondents indicated that they “never” drank additional fluids before surfing. Given that most surfers will spend 1-3 hours in the water the need for adequate levels of hydration prior to entering the water cannot be over stated. Recreational surfing requires participants to perform numerous bouts of high intensity work interspersed with intervals of lower intensity activities (Meir et al., 1991). This type of exercise can result in significant loss of body water characterised by a reduction in body mass (Burke & Hawley, 1997). This can lead to dehydration and inadequate temperature regulation, which has a detrimental effect on performance and places increased stresses on the cardiovascular and thermoregulatory systems (Cochrane & Sleivert, 1999; Francesconi et al., 1987; Meir & Halliday, 2005). Even mild fluid loss (2% of body mass) can have an impact on performance, with severe dehydration being

lethal (Burke & Hawley, 1997; Jennings et al., 1998; Oppliger & Bartok, 2002). As a result, there is a need to provide surfers with information about the need for adequate fluid intake prior to entering the water as a means of minimising the impact of fluid lost via evaporation while in the water.

5.6 Recommendations:

1. injury prevention strategies should be implemented in surfing and targeted generally across all participants;
2. general guidelines for hydration and the benefits of an appropriate warm-up need to be communicated to all participants;
3. attention should be made to areas in which injuries most frequently occur e.g. the knee, ankle, lower back and shoulder;
4. the "Slip! Slop! Slap! Seek! Slide!" message of the Cancer Council needs reinforcing with a more appropriate campaign targeting surfers in an effort to increase their use of sun protection strategies all year round;
5. further analysis is needed to establish the true cost of injury on the medical system; and
6. further analysis is needed involving a larger sample before these results can be considered indicative of participants in this sport.

6.0 Project limitations:

As with any research in which a sample from a larger population is studied, a number of limitations exist to this work. These are:

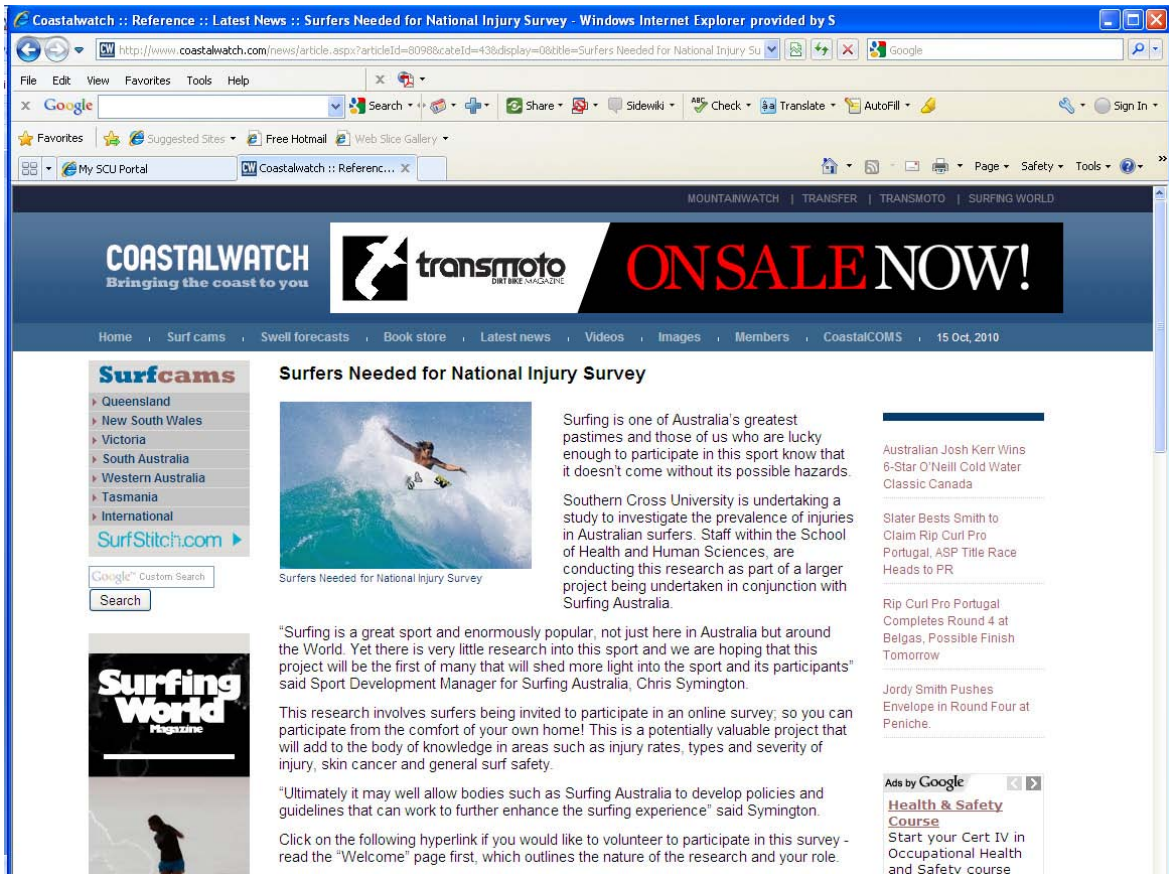
- i) The generalisability of the results. This research was conducted using a sample of self-identified current surfers who were predominantly residents of New South Wales and Queensland. Therefore, in order to apply these findings with some confidence research using a larger sample of surfers from all States/Territories of Australia is needed.

- ii) This research was retrospective and relies upon a respondent's ability to recall their injury information in the past 12 months.

- iii) Only respondents who had access to a computer were able to take part in the survey. As a result, future research should utilise a combination of print and electronic questionnaire formats to increase the accessibility of this survey.

7.0 Supporting documentation

7.1 Sample industry web site story (www.coastalwatch.com) identifying the NSW Sporting Injuries Committee as the funding body for the surf injury project



7.2 Generic media release copy

An invitation to surfers to be involved in a national injury research project

Surfing is one of Australia's greatest pastimes and those of us who are lucky enough to participate in this sport know that it doesn't come without its possible hazards.

Southern Cross University is undertaking a study to investigate the prevalence of injuries in Australian surfers. The research is being conducted in conjunction with Surfing Australia and with funding received from the New South Wales (NSW) Sporting Injuries Committee. The research team is led by Dr. Rudi Meir and involves other staff from within the School of Health and Human Sciences.

"Surfing is an iconic Australian sport and yet very little research has been conducted into it as a pastime. This project will examine one aspect of participation in the form of injury prevalence and we certainly hope to ultimately conduct more research in this sport" said Meir.

This research involves surfers being invited to participate in an online survey; so you can participate from the comfort of your own home! This is a potentially valuable project that will add to the body of knowledge in areas such as injury rates, types and severity of injury, skin cancer and general surf safety.

Sport Development Manager for Surfing Australia, Chris Symington said "Surfing is a great sport and enormously popular, with some 2.5 million participants here in Australia and many more millions from around the World. Surfing Australia is hoping that this project will be the first of many that will shed more light into the sport and its participants"

"Ultimately it may well allow bodies such as Surfing Australia and the NSW Sport Injuries Committee to develop policies and guidelines that can work to further enhance the experience of surfers" said Symington.

Click on the following hyperlink if you would like to volunteer to participate in this survey - read the "Welcome" page first, which outlines the nature of the research and your role.

<http://www.surveymonkey.com/s/surfinginjuryproject2010>

Participation is completely anonymous and the project has been approved by the Southern Cross University Human Research Ethics Committee. This survey will only be available to access for approximately 4 weeks and will be removed from the web site on the 7th November 2010.

-Ends-

8.0 Acknowledgements:

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Southern Cross University's School of Health and Human Sciences continues its involvement in innovative and relevant research within the sport and exercise industries and with respect to this project provided a range of administrative and research support. We would like to also acknowledge the contribution of research statistician, Dr. Margaret Rolfe.

Industry partner, Surfing Australia, actively supported this project by promoting participation to its members and assisting with the distribution of the online survey via its corporate web site. Their, support and specifically that of Surfing Australia's Sport Development Manager, Mr. Chris Symington, was central to the success of this project and we thank them for their time and efforts.

In addition, the following industry entities graciously provided access to their corporate web sites to both promote this research and to provide a direct link with the dedicated online survey web site:

- Tracks Magazine: <http://www.tracksmag.com/>
- CoastalWatch: <http://www.coastalwatch.com/>
- Morrison Media, publishers of Surfing Life, Long Boarding and Riptide magazines: <http://morrisonmedia.com.au/>

Finally, to the more than 680 Australian surfers who took the time to complete the survey and participate in this study. Their enthusiasm for their sport was evident by their active involvement and willingness to provide details of their participation and injury history in the 12 months prior to participation in the survey. We are confident that their

involvement will prove beneficial to current and future surfers, not just in Australia but internationally.

Thank you.

Dr. Rudi Meir - on behalf of the research team

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