



## Characteristics of surfers as bystander rescuers in Europe

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### ABSTRACT

**Introduction:** Coastal locations contribute significantly to global drowning, with surfers frequently conducting rescues. This study explored the characteristics of surfers as bystander rescuers in Europe.

**Methods:** A cross-sectional online survey collected demographics (age, sex, geographical location), surfing experience, ability, lifesaving and cardiopulmonary resuscitation (CPR) training, information seeking behaviors and previous performance of a rescue. Analyses comprised descriptive frequencies, binomial logistic regression with adjusted odds ratio (AOR) (95% confidence interval [CI]) and chi-squares ( $p < .05$ ).

**Results:** Europe-dwelling respondents totaled 1705 (76% male; 43% 25–34 years). Thirty-nine percent (39.2%;  $n = 668$ ) had previously performed a rescue. Likelihood of having conducted a rescue significantly increased with 6 or more years of surfing experience (6–10 years [AOR = 1.96; 95%CI: 1.20–3.22]; 11–15 years [AOR = 3.26; 95%CI: 1.56–6.79]; 16 years or more [AOR = 4.27; 95%CI: 2.00–9.11]) when compared to surfers with <1 year experience. Expert/professional ability surfers were 10.89 times (95%CI: 4.72–25.15) more likely to have conducted a rescue than novice/beginners. Respondents who had received both a certified lifeguard and CPR course were significantly more likely to have conducted a rescue (AOR = 3.34; 95%CI: 2.43–4.60).

**Conclusion:** Surfers who had previously conducted rescues commonly had more years of experience, higher self-rated surf ability and greater likelihood of having received certified training. However, not all surfers who have performed rescues had received training. Findings suggest surfers should receive rescue and CPR training before they start surfing at locations without trained supervision and refresh training regularly. Surfers are amenable to injury prevention information, especially online and via apps.

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## 1. Introduction

Unintentional drowning is estimated to claim the lives of 295,000 people per year around the world [1]. Many more require rescue, resuscitation and hospitalization due to a non-fatal drowning [2,3]. Such rescues may be performed by lifeguards or lifesavers in a paid or volunteer capacity [4]. In addition, rescues are also performed by bystanders [5,6] who are recreating nearby, or, in the case of children, are often family [7].

In many nations, drowning in the coastal environment is a significant contributor to the overall drowning burden [8–10]. While the provision of lifeguards at aquatic locations is often recommended as a drowning prevention strategy [11], drowning incidents often occur at unpatrolled locations or outside of patrolled areas [12]. Unpatrolled

locations result in often untrained bystanders responding to drowning emergencies [5,6,13], which is not without risk [7]. Surfers represent an important category of bystander rescuers reducing fatal drowning along the coast on both unpatrolled and patrolled beaches [14].

Understanding the dynamics of the ocean environment are essential to the practice of surfing. Surfers use rip currents to navigate through heavy waves and exit the water via heavy shore breaks [15]. Rip currents are a major hazard accounting for 75% of all people rescued by surfers in Australia and leading to panic and exhaustion in 85% of rescues [14]. Since surfers are often in, or close to rip currents, they are well positioned for early identification of swimmers in trouble who require rescue, thus preventing drowning [16]. Moreover, surfers are often on the scene, at non-patrolled locations or outside of patrolled areas (i.e., flags) and often surf outside of patrol hours (i.e., early morning hours) [6]. They are also generally fit, experienced in the surf and have a flotation device (their surfboard) to aid in a bystander rescue [6]. The presence of such a flotation aid, may also explain why surfers are more willing to undertake rescues and may be less at risk of the victim-instead-of-rescuer syndrome [7].

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The global surf population is estimated to be between 17 and 35 million participants reported by the International Surf Association (ISA), Surf Industry Manufacturers Association (SIMA), and Surfing Australia [17,18]. Of these, 4.5 million are surfers from Europe [17]. Given the estimates of the surfing population, surfers represent an important form of bystander supervision provided at open water locations to reduce drowning risk. It is therefore necessary to enhance understanding of the role of surfers in performing bystander rescues. Therefore, this study aimed to explore the self-reported characteristics of surfers as bystander rescuers in Europe, as well as identify predictors for performing a rescue, self-reported participation in lifesaving and cardiopulmonary resuscitation (CPR) training and attitudes and beliefs towards training and health and safety information for surfers.

## 2. Methods

Data for this study were collected from a convenience sample of surfers from across Europe through a cross-sectional online survey developed using Survey Monkey™ [19].

### 2.1. Questionnaire development and content

The online survey was developed by members of Surfing Medicine International (SMI) (formerly the European Association of Surfing Doctors [EASD]) in January 2015 and featured 32 questions across five sections (Demographics; European Association of Surfing Doctors [EASD] knowledge; Injury and received training; Health and safety perceptions; and Safety precautions). Questions utilized a range of response options including tick box, multiple response and graded questions, generating quantitative data (Supplementary File 1). The draft questionnaire was piloted for comprehension with a small reference group of five international researchers. Once finalized, the survey tool was built using Survey Monkey™ [19]. The online survey was again piloted to ensure it was technically sound before commencing recruitment.

### 2.2. Recruitment

Surfers from all over the world were invited to participate in the survey. The survey was launched online on February 18th, 2015 and was promoted online on the website and Facebook™ page of the EASD [20]. Potential participants from existing EASD databases (compiled of members, partners, EASD conference attendees and EASD newsletter subscribers) were emailed a link to the survey.

The survey was further promoted by Magicseaweed (a popular surf website in Europe), the World Surf League (the world's biggest company in competition surfing), O'Neill (one of the biggest surf companies in the world), thirteen surfing associations and surf magazines. These organizations, associations and network of members were provided with a cover letter detailing the research and pre-made social media posts to ensure consistent communication regarding the survey.

The survey was open for responses between 18 February and 30 March 2015.

### 2.3. Data cleaning, coding and analyses

Once the survey had been closed, responses were downloaded from Survey Monkey™ and loaded into SPSS™ V20 [21] for analysis. In total, 2459 surveys were submitted. Responses were segmented based on country of residence of the respondent, with responses from countries outside of Europe ( $n = 362$ ; 14.7%) excluded from the analysis, in line with the study's aim. Prior to conducting analysis, a further 97 (3.9%) responses were excluded as they were from respondents under 18 years of age. Finally, those respondents who did not provide a response to the previous experience rescuing someone question were excluded ( $n = 295$ ; 12.0%), leaving a total of 1705 responses for analysis.

Coding of responses was conducted for ease of analysis. Respondent age was reported as a free text field. Single years of age were recoded into the following age groups: 18–24 years, 25–34 years, 35–44 years, 45 years and older. Of specific relevance to the study aim was the question which asked 'Have you ever saved someone else in the surf?' (e.g. surfer/swimmer/other)', with responses being yes or no. Characteristics of those who had and had not previously conducted rescues were analyzed by exploring sex, age group, years of surfing experience (<1 year, 1–2 years, 3–5 years, 6–10 years, 11–15 years and 16 years or more), self-rated surfing ability (novice/beginner, intermediate, advanced, expert/professional as defined in Table 1) and previous participation in training coded as (received no training, received some lifeguard training, received a certified course [lifeguard or CPR] or received both certified lifeguard and CPR training).

The information seeking behaviors of surfers who had and had not previously performed a surf rescue were also explored. This included current and preferred modes of communication, length of communication and topics. Finally, the carriage and use of a first aid kit by survey participants was also explored.

Analyses comprised descriptive frequencies, binomial logistic regression and chi squared tests of significance. The logistic regression models included age, years of surfing experience and self-reported ability when exploring likelihood of having conducted a rescue and participation in training. We calculated the adjusted odds ratio (AOR) with a 95% confidence interval (CI) using youngest age (18–24 years), lowest level of surfing experience (<1 year) and lowest level of self-rated surfing ability (novice/beginner) as the reference groups. Statistical significance was deemed  $p < .05$ . A map of the proportion of respondents from each country in Europe was created using Mapchart software [22].

### 2.4. Ethics

This study received ethics approval from UNSW Sydney Human Research Ethics Committee (HC200657).

## 3. Results

Of the 1705 complete responses from Europe, 23 countries were represented. The three countries recording the highest proportion of respondents were the Netherlands (24.3%;  $n = 414$ ), the United Kingdom (18.9%;  $n = 323$ ) and Germany (11.8%;  $n = 202$ ). (Fig. 1).

Males accounted for 75.6% ( $n = 1289$ ) of all respondents and the highest proportion of all respondents were aged 25–34 years ( $n = 726$ , 42.6%). The mean age of respondents was 32.05 years ( $SD = 8.48$ ; Range = 19–69 years). (Table 2) Over a third of all respondents (39.2%,  $n = 668$ ) reported having previously rescued someone. Forty five percent of males (44.8%) compared to 21.9% of female respondents reported having conducted a rescue. The 45 years and older age group (55.9%) and the 35–44 years age group (45.2%) recorded the highest proportion of respondents who had previously performed a rescue. Those with 16 years or more experience (74.3%) and with self-rated surfing ability of expert/professional (85.5%) were the categories with the highest proportion of respondents having reported previously

**Table 1**  
Definitions of surfing ability.

Surfing ability category	Definition
Novice/beginner	Surfing broken waves or unbroken waves straight to the beach.
Intermediate	Surfing unbroken waves left and right.
Advanced	Surfing unbroken waves left and right, and turning on the wave, staying close to the breaking part and controlling bottom and top turn.
Expert/professional	Surfing on a higher level than advanced.



**Fig. 1.** Map of Europe depicting geographical distribution of survey respondents ( $N = 1705$ ).

conducting a rescue. Those who had received both a certified lifeguard and CPR course recorded the highest proportion of respondents who had conducted a rescue (65.0%) (Table 2). Thirty-five percent (35.0%) of all respondents believed some kind of basic lifesaving and CPR course

should be obligatory for all surfers, rising to 46.8% of those who had previously conducted a rescue. Almost all (97.0%) respondents who had previously conducted a rescue resided in countries which border the Atlantic Ocean (Fig. 1).

**Table 2**

Demographics, surf experience, self-rated surf ability and participation in lifeguard/CPR training, comparing non-rescuers ( $n = 1037$ ) to rescuers ( $n = 668$ ).

	Total surfers	Non-rescuers	Rescuers
Total, n (%)	1705	1037 (60.8)	668 (39.2)
Sex, n (%)			
Male	1289	712 (55.2)	577 (44.8)
Female	416	325 (78.1)	91 (21.9)
Age group, n (%)			
18–24 years	430	275 (64.0)	155 (36.0)
25–34 years	726	473 (65.2)	253 (34.8)
35–44 years	438	240 (54.8)	198 (45.2)
45 and older	111	49 (44.1)	62 (55.9)
Surf experience, n (%)			
Less than 1 year	124	108 (87.1)	16 (12.9)
1–2 years	271	228 (84.1)	43 (15.9)
3–5 years	490	365 (74.5)	125 (25.5)
6–10 years	401	208 (51.9)	193 (48.1)
11–15 years	174	65 (37.4)	109 (62.6)
16 years or more	245	63 (25.7)	182 (74.3)
Self-rated surf ability, n (%)			
Novice/beginner	267	239 (89.5)	28 (10.5)
Intermediate	717	524 (73.1)	193 (26.9)
Advanced	638	262 (41.1)	376 (58.9)
Expert/professional	83	12 (14.5)	71 (85.5)
Participation in lifeguard/CPR training, n (%)			
Received no training	565	401 (71.0)	164 (29.0)
Received some lifeguard training	229	163 (71.2)	66 (28.8)
Received a certified course (lifeguard or CPR)	545	345 (63.3)	200 (36.7)
Received both a certified lifeguard and CPR course	366	128 (35.0)	238 (65.0)

### 3.1. Predictors for surf rescue

Males have 1.5 ( $B = 0.409$ ,  $p = .007$ , 95% CI 1.116–2.030) times the odds of having self-reported rescuing someone than females. Furthermore, having more than 5 years of surf experience increases the odds of self-reporting rescuing someone compared to surfers with less than 1 year of surf experience, respectively, 2.3 times the odds for 6–10 years surf experience ( $B = 0.811$ ,  $p = .019$ , 95% CI 1.144–4.425), 3.3 times the odds for 11–15 years surf experience ( $B = 1.181$ ,  $p = .002$ , 95% CI 1.563–6.791) and 4.3 times the odds for surfers with more than 16 years of surf experience ( $B = 1.451$ ,  $p < .001$ , 95% CI 1.999–9.110). Results also demonstrate that a higher self-rated surf ability increases the odds of having self-reported rescuing someone compared to surfers ranking themselves at the novice/beginner level, respectively, 2.0 times the odds for intermediate rated surfers ( $B = 0.675$ ,  $p = .008$ , 95% CI 1.196–3.224), 4.2 times the odds for advanced rated surfers ( $B = 1.426$ ,  $p < .001$ , 95% CI 2.438–7.111), and 10.9 times the odds for expert/professional rated surfers experience ( $B = 2.338$ ,  $p < .001$ , 95% CI 4.717–25.147). Finally, surfers who received both a lifeguard and CPR course demonstrated 3.3 times the odds ( $B = 1.207$ ,  $p < .001$ , 95% CI 2.433–4.597) of having self-reported rescuing someone compared to surfers who reported receiving no training at all. (Table 3).

### 3.2. Predictors for participating in a lifeguard or CPR training/course

None of the variables significantly predicted receiving some lifeguard training. Surfers aged 25–34 had 1.4 ( $B = 0.353$ ,  $p = .011$ , 95% CI 1.085–1.867) times the odds of having participated in a certified course (lifeguard or CPR) than surfers aged 18–24. Surfers 45 years and older had 2.3 ( $B = 0.825$ ,  $p = .001$ , 95% CI 1.419–3.666) times the

**Table 3**

Binomial logistic regression of conducting a rescue by sex, age, years of surfing experience, self-rated surf ability and participation in lifeguard/CPR training.

	B	Sig.	AOR	AOR (95% CI)
Sex (Male / female)	<b>0.409</b>	<b>0.007</b>	<b>1.505</b>	<b>1.116–2.030</b>
Age group				
18–24 years (reference)	–	–	–	–
25–34 years	–0.241	0.111	0.786	0.584–1.057
35–44 years	–0.091	0.609	0.913	0.643–1.295
45 and older	0.069	0.804	1.072	0.620–1.852
Surf experience				
Less than 1 year (reference)	–	–	–	–
1–2 years	–0.114	0.740	0.892	0.455–1.750
3–5 years	0.133	0.692	1.142	0.593–2.199
6–10 years	<b>0.811</b>	<b>0.019</b>	<b>2.250</b>	<b>1.144–4.425</b>
11–15 years	<b>1.181</b>	<b>0.002</b>	<b>3.258</b>	<b>1.563–6.791</b>
16 years or more	<b>1.451</b>	<b>&lt;0.001</b>	<b>4.268</b>	<b>1.999–9.110</b>
Self-rated surf ability				
Novice/beginner (reference)	–	–	–	–
Intermediate	<b>0.675</b>	<b>0.008</b>	<b>1.964</b>	<b>1.196–3.224</b>
Advanced	<b>1.426</b>	<b>&lt;0.001</b>	<b>4.163</b>	<b>2.438–7.111</b>
Expert/professional	<b>2.388</b>	<b>&lt;0.001</b>	<b>10.891</b>	<b>4.717–25.147</b>
Participation in lifeguard/CPR training				
Received no training (reference)	–	–	–	–
Received some lifeguard training	–0.016	0.933	0.984	0.674–1.436
Received one certified course (lifeguard or CPR)	0.282	0.052	1.326	0.998–1.762
Received both a certified lifeguard and CPR course	<b>1.207</b>	<b>&lt;0.001</b>	<b>3.344</b>	<b>2.433–4.597</b>

Note: Bold text indicates statistical significance  $p < .05$ . AOR = Adjusted Odds Ratio. CI = Confidence Interval.

odds of having participated. When looking at predictors for receiving both a lifeguard and CPR course, people aged 35–44 years ( $B = -0.925$ ,  $p < .001$ , AOR = 0.397, 95% CI 0.268–0.588) and aged 45 years and older ( $B = -1.079$ ,  $p < .001$ , AOR = 0.340, 95% CI 0.186–0.621) had lower odds of having participated in training than surfers aged 18–24 years. However, a higher self-rated surf ability positively predicted participation in both lifeguard and CPR training, with intermediate surfers having 2.0 times higher odds of having participated ( $B = 0.716$ ,  $p = .011$ , 95% CI 1.178–3.552), advanced surfers having 3.2 times higher odds of participating ( $B = 1.168$ ,  $p < .001$ , 95% CI 1.759–5.878) and expert/professional surfers 5.1 times higher odds of

participating ( $B = 1.622$ ,  $p < .001$ , 95% CI 2.376–10.780) compared with novice/beginner surfers. (Table 4).

### 3.3. Surfers opinions and beliefs regarding lifeguard/CPR courses, rescue materials and health and safety information

Surfers who had previously conducted a surf rescue were significantly more likely to believe that some kind of basic lifesaving and CPR course should be obligatory for all surfers ( $X^2 = 9.2$ ;  $p = .002$ ). Moreover, 42% (42.0%) of surfers surveyed reported having a first aid kit, with surfer rescuers significantly more likely to report having one ( $X^2 = 27.4$ ;  $p < .001$ ). When asked if they thought the first aid kit was sufficient for treating surfing injuries, 19.2% said yes, with surfer rescuers more likely to self-report they have a sufficient first aid kit ( $X^2 = 18.1$ ;  $p < .001$ ). Just over 10% (11.4%) of surfers stated they always brought their first aid kit along when they go surfing. Respondents who had previously conducted a surf rescue were significantly more likely to always bring their first aid kit when surfing ( $X^2 = 12.7$ ;  $p < .001$ ), whereas those who had never conducted a surf rescue were significantly more likely to say they never brought their first aid kit ( $X^2 = 16.0$ ;  $p < .001$ ). (Table 5).

Over three-fifths of respondents (68.3%;  $n = 1162$ ) were interested in receiving information about how to stay healthy and safe while surfing. Respondents commonly spent one to ten minutes (33.4%) or 11 min to one hour (26.7%) per week reading and learning about surf-related health information. Respondents most commonly looked for information about staying safe and healthy while surfing via online surf websites (54.5%), online links through social media (i.e., Facebook, Twitter) (39.8%), printed surfing magazines (16.5%) and by consulting a medical professional (i.e., surfing doctor, physiotherapist) (16.0%).

With respect to receiving surfer health and safety information in the future, respondents indicated they would prefer 1–5 min (31.1%) or 6–15 min (26.8%) sessions. Ideal information sources were predominantly the same as what is currently being used, with online surf websites (55.5%) and social media (36.0%) the most preferred. Despite only 5.5% of respondents reporting currently using an 'app' for information, 25.8% reported it would be an ideal means of receiving information.

The most common topics of health information surfers reported currently accessing were training and performance (52.7%), general knowledge about surf related health conditions and injuries (36.7%), nutrition

**Table 4**

Binomial logistic regression of participating in a lifeguard and/or CPR training by sex, age, years of surfing experience and self-rated surf ability.

	Model 1				Model 2				Model 3			
	Received some lifeguard training				Received one certified course (lifeguard or CPR)				Received both a lifeguard and CPR course			
	B	Sig.	AOR	AOR (95% CI)	B	Sig.	AOR	AOR (95% CI)	B	Sig.	AOR	AOR (95% CI)
Sex	–0.029	0.868	0.972	0.694–1.361	–0.149	0.245	0.861	0.670–1.108	–0.077	0.636	0.926	0.674–1.272
Age												
18–24 years (reference)	–	–	–	–	–	–	–	–	–	–	–	–
25–34 years	–0.254	0.157	0.776	0.546–1.103	<b>0.353</b>	<b>0.011</b>	<b>1.423</b>	<b>1.085–1.867</b>	–0.222	0.149	0.801	0.592–1.083
35–44 years	0.069	0.742	1.071	0.711–1.614	0.304	0.063	1.356	0.984–1.868	<b>–0.925</b>	<b>&lt;0.001</b>	<b>0.397</b>	<b>0.268–0.588</b>
45 years and older	0.260	0.430	1.296	0.681–2.469	<b>0.825</b>	<b>0.001</b>	<b>2.281</b>	<b>1.419–3.666</b>	<b>–1.079</b>	<b>&lt;0.001</b>	<b>0.340</b>	<b>0.186–0.621</b>
Surf experience												
Less than 1 year (reference)	–	–	–	–	–	–	–	–	–	–	–	–
1–2 years	0.224	0.478	1.250	0.674–2.320	0.066	0.782	1.069	0.668–1.709	–0.587	0.082	0.556	0.287–1.077
3–5 years	0.083	0.798	1.087	0.574–2.058	–0.156	0.525	0.855	0.528–1.385	–0.513	0.124	0.599	0.312–1.150
6–10 years	–.143	0.688	0.866	0.430–1.747	–0.224	0.400	0.799	0.475–1.346	–0.119	0.732	0.888	0.449–1.754
11–15 years	–0.271	0.519	0.763	0.335–1.737	–0.339	0.268	0.713	0.391–1.298	0.218	0.560	1.244	0.597–2.592
16 years or more	–0.773	0.085	0.462	0.192–1.111	–0.078	0.800	0.925	0.503–1.698	0.688	0.076	1.989	0.930–4.254
Self-rated surf ability												
Novice/beginner (reference)	–	–	–	–	–	–	–	–	–	–	–	–
Intermediate	–0.022	0.923	0.978	0.621–1.540	0.025	0.888	1.026	0.721–1.458	<b>0.716</b>	<b>0.011</b>	<b>2.046</b>	<b>1.178–3.552</b>
Advanced	–0.119	0.673	0.888	0.511–1.543	0.100	0.638	1.105	0.729–1.676	<b>1.168</b>	<b>&lt;0.001</b>	<b>3.216</b>	<b>1.759–5.878</b>
Expert/professional	0.433	0.319	1.542	0.658–3.614	0.545	0.120	0.580	0.292–1.153	<b>1.622</b>	<b>&lt;0.001</b>	<b>5.061</b>	<b>2.376–10.780</b>

Note: Bold text indicates statistical significance ( $p < .05$ ). AOR = Adjusted Odds Ratio. CI = Confidence Interval.



**Table 5**First aid kit availability, suitability and usage when surfing, comparing non-rescuers to rescuers,  $\chi^2$  ( $p$  value).

	Total surfers <i>n</i> = 1705	Non-rescuers ( <i>n</i> = 1037)	Rescuers ( <i>n</i> = 668)	$\chi^2$ ( $p$ value)
Do you have a first aid kit?				
Yes, <i>n</i> (%)	716 (42.0)	365 (51.0)	351 (49.0)	27.358 ( $p < .001$ )
No, <i>n</i> (%)	506 (29.7)	334 (66.0)	172 (34.0)	
No response, <i>n</i> (%)	483 (28.3)	338 (70.0)	145 (30.0)	–
If you do have a first aid kit, do you think it is sufficient for treating surfing injuries?				
Yes, <i>n</i> (%)	328 (19.2)	140 (42.7)	188 (57.3)	18.073 ( $p < .001$ )
No, <i>n</i> (%)	389 (22.8)	228 (58.6)	161 (41.4)	
No response, <i>n</i> (%)	988 (57.9)	669 (67.7)	319 (32.3)	–
If you do have a first aid kit, do you bring your first aid kit along when you go surfing?				
Always, <i>n</i> (%)	195 (11.4)	82 (42.1)	113 (57.9)	12.667 ( $p < .001$ )
Sometimes, <i>n</i> (%)	351 (20.6)	181 (51.6)	170 (48.4)	0.635 ( $p = .426$ )
Never, <i>n</i> (%)	287 (16.8)	180 (62.7)	107 (37.3)	15.993 ( $p < .001$ )
No response, <i>n</i> (%)	553 (32.4)	275 (49.7)	278 (50.3)	–

(32.0%), injury prevention (32.4%) and hazards at their local surf spot (28.9%). The information respondents would be most interested in receiving in the future largely mirrored what they currently consume – namely training and performance information (50.4%), general knowledge about surf related health conditions and injuries (40.3%) and injury prevention (38.8%). More respondents were interested in receiving information about CPR in the future (16.8%), than were currently accessing such information at the time of the survey (9.7%).

#### 4. Discussion

Drowning is a global threat to public health, with coastal locations being a key contributor to the overall drowning burden [10]. Although lifeguarded locations are recommended as a drowning prevention strategy [10,11], it is impossible for all coastal environments where people enter the water, to be supervised, particularly as Europe has less lifeguarded beaches than countries such as Australia [23]. In such scenarios, bystanders [5,6,13], including surfers [14] often come to the aid of people in trouble in the water. Furthermore, it has been reported that surfers also frequently conduct rescues at lifeguarded beaches which could be explained because they are already in the water and, in some situations, in close proximity to the drowning victim [14]. This could lead to the possibility of being able to intervene faster than a lifeguard could. This study aimed to explore the characteristics and training of surfers as bystander rescuers in Europe and identified that just over a third of all respondents (39%) had previously rescued someone in the surf, lower than the 63% of Australian surfers in a recent study [14]. Key findings, and their implications from the current study, are now discussed.

##### 4.1. Sex and age

In the present study, males were 1.5 times more likely to self-report having conducted a rescue than females. This is consistent with data from a study of Australian surfers [14] and rescue data from a range of aquatic environments in Australia [5,7] identifying males as overrepresented in rescuer data. This may be due to increased exposure and thus drowning risk among males in the coastal environment [11] and a propensity towards risk taking behavior [24]. It may also be due to hormonal differences in responses to stressful situations between males and females [25]. However, one-fifth of all female surfers surveyed (22%) reported having previously conducted a surf rescue. This is important, given the increase in female surfers in recent years. Over the

last three decades, there has been a sharp rise in female participation in surfing, from an estimated 3–5% in the 1990s to estimates of 20–30% of surfers worldwide [26].

Age was not found to be a significant factor impacting likelihood of having conducted a rescue. This indicates that training must be targeted based on other factors such as surfing experience. However, it must be noted that there are a range of age-related drowning risk factors [27], including an increased risk of a range of medical conditions, most notably cardiac conditions [28]. While older surfers may be fitter than their same aged non-surfing cohort, and their years of surfing experience may make them more skilled, and confident, in performing rescues, surfers of older age must be warned of the age-related risks of a cardiac event occurring while under the physical stress of performing a rescue. Regardless of age, all surfers must carefully consider their own physical capabilities [7], and thus risk, when choosing to perform a rescue, as well as undergoing regular physical health checks.

##### 4.2. Experience and ability

Respondents were significantly more likely to have performed a rescue if they had six or more years of surf experience. This is pleasing to note and may indicate that the first five years of surfing involve focus on safety of self and learning the skills of surfing, while from six years or more experience, a surfer is more likely to care for and respond to the safety needs of those around them. However, surfing experience had no impact on likelihood of having received lifeguard or CPR training. While this study has identified the optimal time period within which surf safety and drowning prevention advocates must ensure that surfers have received training (i.e., before surfing at locations without trained supervision, but ultimately within the first five years of commencing surfing), further research is needed to identify strategies to ensure surfers such training is initially undertaken and then maintained. Given techniques evolve and recall of skills and knowledge diminish over time [29,30], this underscores the need for regular training. Furthermore, it is essential to provide guidance for less experienced surfer rescuers to reduce their own risk of drowning.

The concept of ‘surf years’ typically reflects the number of years of surfing practice. However, this provides limited detail on variability in participation and exposure, including exposure to those who need rescuing in the surf. It is more useful to know how many hours on average per week a surfer surfs. A standard definition for one surf year (1 SY) has been proposed as being an average of ‘five hours spent surfing per week for the entire year’ [31]. Implementation of a standard definition and tool to convert individual surfing practices to this definition, could improve research regarding exposure to injury and conduct of rescues for this specific population [31]. Furthermore, to understand the actual skills and capacity of surfers in the ocean environment, it is essential to collect more detailed information on the conditions participants practice, and potentially perform rescues, in during their ‘surf year’.

The present study also identified that surfers with higher self-rated surf ability (i.e., intermediate, advanced and expert/professional) were significantly more likely to have conducted a rescue when compared to a novice/beginner level respondent. This was most pronounced for those expert/professional ability surfers, who reported an 11 times higher likelihood of having performed a rescue, when compared to a novice/beginner. Additionally, respondents who assessed their surfing skill as intermediate, advance and expert/professional were all significantly more likely to have undertaken both certified lifeguard and CPR training. While both higher self-reported surfing experience and participation in certified lifeguarding and CPR training may confer reduced risk when conducting a surf rescue, there is a need to confirm congruence between self-reported and actual surf ability and further define quantitatively and qualitatively the role experience plays when conducting rescues to plan future training and risk reduction interventions.

#### 4.3. Opinions regarding importance of training and information seeking behaviors

As was reported in a study of Australian surfer rescuers [14], the present study identified an association between training and likelihood of having conducted a rescue. When compared to those who had received no training, respondents who had received both a certified lifeguard and CPR course were three times more likely to have conducted a rescue. This is a positive finding, suggesting that those surfers more likely to conduct a rescue have received some training in rescue techniques and CPR which may increase the chances of performing a safe and effective rescue. Survival and neurologic outcome after a drowning incident are often based on reversing hypoxia; thus quickly enacting effective CPR is vital [11]. As such, surfers with CPR skills are an important asset to drowning prevention. However, further research is required to explore the temporal relationship between participation in certified lifeguard and CPR training and actual conduct of rescues among surfers.

Surfers who had previously conducted a surf rescue were significantly more likely to believe that basic lifesaving and CPR training should be obligatory for all surfers. Surfers with this first-hand rescue experience may be powerful advocates to encourage other surfers to undertake such training. Similarly, given the receptiveness of the respondents in receiving training, advocacy opportunity may exist with governments in coastal areas, insurance companies, professional surfing leagues and surf media across Europe to promote this type of essential training for surfers.

This study has collated important data on how surfers and surfer rescuers seek and consume information on surfing health and safety. More than 65% (68.3%) of respondents indicated they were interested in receiving information about how to stay healthy and safe while surfing. Online surfing websites and social media platforms appear to be the best channels to provide this vital information to surfers. Given the rapid explosion of mobile app technology since the survey was conducted in 2015, and respondents' willingness to receive information via this medium, provision of information via apps should be explored, as has been done for sports injury prevention [32,33] and broader healthcare [34]. The opportunity mobile apps provide to contact surfers 'on the go' and with targeted local hazard information, such as via geofencing [35], is a powerful opportunity to improve surfer safety. Alternative strategies may be needed to provide health and safety information to the 35% of respondents who were uninterested in receiving health and safety information.

#### 4.4. Geographic variability

Almost all of the respondents (97%) who stated they had performed a surf rescue resided in countries bordering the Atlantic Ocean. Though a convenience sample only, the geographical distribution of respondents to the survey who had performed a surf rescue may indicate that people who surf in the Atlantic Ocean which sees larger waves [36] may rescue more people than surfers in areas with smaller waves (such as the North Sea and the Mediterranean Sea) indicating more risk of injury and drowning in seas with larger and more powerful waves [37,38], as has been hypothesised [39]. Similarly, surfers in wilder conditions seem more likely to encounter rescue situations and might be more at risk of drowning themselves, indicating the need for better training in how to deal with hazardous conditions. This hypothesis could be tested in future research which gains further information about rescues and examines these by the geographical location of the rescue, with a focus on collecting data on environmental factors such as rip currents (a factor in 75% of rescues by Australian surfers [14]), wave size, predominant wind direction, seafoam, pollution, rocks or manmade hazards [24,40]. There exist opportunities for policy makers in areas without capacity to engage lifeguards, to train local surfers in rescue and resuscitation. This may be especially helpful during summer months with associated increased coastal visitation and tourism.

#### 4.5. Future research opportunities

Further research is required to explore in more detail surfers' experiences in and perceptions of performing bystander rescues, the psychological impact of performing rescues and training needs to better equip surfers with the skills to undertake bystander rescues effectively and safely. Similarly, there is a need for an epidemiological study exploring the risk of surfers themselves drowning while conducting a rescue.

#### 4.6. Strengths and limitations

There are several strengths associated with this study. It is the first study of its kind that the authors are aware of in Europe and the second study of its kind globally [14]. Alongside demographics of surfers as rescuers, this study also explores experience and self-reported ability, as well as exposure to lifeguarding and CPR training. Study findings provide valuable information for enhancing the effectiveness and safety of surfers as bystander rescuers, not only in Europe, but globally.

There are however limitations. This study is cross-sectional in nature and subject to the usual limitations of such surveys, such as recall bias [41]. Similarly, social desirability bias may have been a factor in males being more likely to self-report having conducted a rescue [42]. The study reports the findings of surfers from Europe only, therefore it is recommended that a similar study be carried out in other regions of the world. Participation bias is also likely. The sample is biased towards more highly educated and skilled surfers by virtue of promotion of the survey throughout the Surfing Medicine International group of medically trained doctors who enjoy surfing. Due to the online survey design, it may be possible that the same respondent completed the survey more than once. The survey asked if respondents had ever rescued someone from the surf and if the respondent had ever received some training or completed a certified lifeguarding or CPR course. It did not look at the temporal relationship between the two, thus respondents may have undertaken training after performing a rescue. The survey also did not record if the certified training completion qualifications were current at the time of undertaking the rescue or completion of the survey. Similarly, the age of the respondent at the time of taking the survey may not be the age the respondent was when they conducted the rescue.

### 5. Conclusion

Coastal drowning is a key contributor to the global public health problem of drowning. This study has highlighted that surfers perform an important role in performing bystander rescues. Those surfers who have performed bystander rescues of someone in the surf were often more experienced, had higher levels of self-rated ability and were more likely to have received certified lifeguarding and CPR training. There is a need to ensure all surfers receive training in safe rescue and resuscitation before they start surfing without trained supervision. After the sixth year of surfing the likelihood of performing a rescue significantly increases. Similarly, such training must be regularly refreshed, with surfers of 16 years or more experience also conducting rescues. Further research is required to explore in more detail surfers' experiences in and perceptions of performing bystander rescues, the psychological impact of performing rescues and training needs to better equip surfers with the skills to undertake bystander rescues effectively and safely.

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## Declaration of Competing Interest

None to declare.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ajem.2021.06.018>.

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