

Article

Is Swimming and Water Safety Education Associated with Greater Water Safety Knowledge and Positive Attitudes in Young Adults?

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Abstract

Swimming and water safety education can reduce drowning risk, yet research among the Turkish population is limited. This study examined differences in water safety attitude and knowledge scores by self-reported participation in swimming and lifeguard education, including any differences seen by participant gender. A cross-sectional survey collected data on demographics, swimming experience, perceived ability, aquatic location use, swimming and lifeguard education participation, water safety knowledge and self-reported attitudes. Among 255 participants (51.4% female; mean age 22), 83.9% reported being able to swim. Females were significantly less likely than males to self-report swimming ability ($\chi^2 = 5.99$; $p = 0.018$) or prior lessons with a qualified teacher ($\chi^2 = 4.10$; $p = 0.043$). Swimming or lifeguard education did not significantly affect attitude scores overall or by gender. However, both forms of education were significantly associated with knowledge scores overall and by gender, with males showing significant differences in knowledge levels after swimming ($\chi^2 = 16.46$; $p < 0.001$) and lifeguard education ($\chi^2 = 11.93$; $p = 0.003$). Findings indicate that swimming and lifeguard education were significantly associated with greater water safety knowledge but not with positive attitudes. Gender disparities persist, with females reporting lower self-reported swimming ability and males showing higher water safety knowledge after education. Expanding swimming and lifeguard education in Türkiye could enhance water safety knowledge.

Keywords: drowning prevention; education; attitude; knowledge; swimming



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1. Introduction

Drowning is a significant yet underrecognized threat to public health in Türkiye [1]. On average, each year between 2013 and 2019, there were 750 unintentional deaths due to drowning in Türkiye [2], though detailed, all-age, population-level studies on drowning in the country are limited [3]. Although sparse, research conducted to date in Türkiye has shown that a lack of knowledge about water safety is a major contributor to drowning incidents [2,4].

Türkiye has a population of just over 86 million and is a country bordered by sea on three sides (by the Black Sea, the Sea of Marmara, the Aegean Sea, and the Mediterranean Sea), with a total coastline of approximately 8333 km. In addition, Türkiye has numerous

rivers, dams, and more than 200 inland lakes. These geographical characteristics contribute to easy access to water and, as a result, an increased risk of drowning. Drowning rates in Türkiye range from 0.89 to 1.24 per 100,000 in studies, with rates of approximately 1.44 per 100,000 among males and 0.28 to 0.48 per 100,000 among females [3].

What is apparent from national level data is the significant drowning risk among adolescents aged 15–24 years of age (1.40 per 100,000 population). After those aged 65+ years (1.72 per 100,000 population), the 15–19-year-old and the 20–24-year-old age groups have the second and third highest fatal drowning rates in Türkiye, respectively (1.40 and 1.04 per 100,000 population) [2]. This finding mirrors international data that indicates drowning among adolescents is a particular concern [5], with no evaluated interventions found to be effective in reducing the drowning burden for this age group [6].

In recent years, there has been a significant increase in the number of initiatives and campaigns that aim to prevent drowning. At a global level, the World Health Organization (WHO) recommends six interventions and four cross-cutting implementation strategies to reduce drowning risk [7]. These include strengthening public awareness of drowning through strategic communications, including efforts to enhance community water safety, and educating about the importance of taking safety precautions in, and around, water. Research has shown that educating people about water safety may help reduce water-related injuries and deaths, including via the provision of classroom-based education, which improves student behaviours, attitudes and risk awareness [8,9]. Furthermore, acknowledging the importance of teaching swimming and water safety skills, another of the WHO-recommended actions [7], educational efforts that support skills-based education, such as learning to swim or lifeguard education, are also recommended. Learning to swim can serve a protective function against drowning [10,11], while the lowest rates of drowning occur in supervised locations, such as those patrolled by lifeguards and lifesavers [12,13]. Beyond simply learning to swim, it has been acknowledged in the literature that a more cohesive approach to drowning prevention is water competence, the combination of both swimming skills (and other personal aquatic movements like survival and rescue skills) and water safety knowledge, attitudes, values, judgements and behaviours [14–16].

The risk of drowning is not solely dependent on education and skill level; demographic factors also play an important role. Gender in particular leads to significant differences in drowning rates, with males drowning at much higher rates than females in almost every country in the world [17]. Factors believed to contribute to this risk differential include higher exposure to water among males [18], being less likely to wear life jackets, and being more likely to participate in water-related activities under the influence of alcohol [19]. As such the development, implementation and evaluation of any drowning prevention interventions must be sensitive to these gender differences [3].

In Türkiye, males account for 79% of drowning fatalities [2] reporting higher participation in sport and leisure activities when compared to females, due to a range of social and cultural barriers [20]. However, as Türkiye modernizes and opportunities for women improve [21], there is a need to ensure women have equitable access to swimming and water safety education to ensure drowning rates remain low, particularly among the adolescent and young adult age groups.

Further, given the high drowning rates among the older adolescent age group in Türkiye, and the importance of strategies to improve awareness of drowning risk and reduce such risk, including skills education, this study aimed to evaluate the water safety knowledge and attitudes of university students in a coastal region of Türkiye. Specifically, we aimed to compare the knowledge and attitude scores of students who had undergone swimming and lifeguard education with those who had not received such education. We expected to find that students who had received education were more knowledgeable

in water safety practices and held higher (i.e., positive) attitude scores than those who had not yet received such education. As a secondary aim, we were also interested in examining if there were any gender differences with respect to self-reported swimming ability, knowledge and attitudes of students in Türkiye.

2. Materials and Methods

2.1. Study Design

This study used a cross-sectional survey design methodology.

2.2. Study Location

This research was conducted in Antalya, a city located on the southern coast of Türkiye. Antalya is a coastal city bordering the Mediterranean Sea and is frequently visited by both local and international tourists during the summer season. Numerous public beaches, swimming pools, and waterparks are scattered throughout the city centre and its surroundings, as well as numerous rivers and lakes in the eastern and western regions of Antalya, all of which contribute to its high drowning incident rate (5.48 per 100,000 population yearly), which is 3.5 times higher than the average annual rate of 1.58 per 100,000 population reported for coastal cities in Türkiye [22].

2.3. Study Participants

The population of this study was determined using a convenience sampling method and consisted of 255 students (aged 22.31 ± 2.14 years, range: 18–32 years) currently enrolled at the undergraduate level (4-year program) in the Faculty of Sport Sciences from the departments of physical education and sports, coaching education, sports management and recreation, representing approximately 40% of the total faculty student body ($n \approx 650$). This faculty was chosen because it offers basic education in swimming and lifeguarding to students. The student population comprises both locals to Antalya and those who have moved to Antalya for their studies.

The inclusion criteria for the study were being an officially enrolled student at the faculty and providing informed consent to participate in the study. All students were invited to participate in the study, regardless of their year of enrolment. Exclusion criteria were limited to those who did not provide informed consent to participate in the study or who left some or all of the questions—excluding demographic data—unanswered in the survey.

Participants were categorized by gender. In addition, the participants' previous formal education in swimming and water safety was evaluated. Formal education includes structured and organized swimming and water safety education (e.g., school classes, swimming lessons, and lifeguard courses), and individuals who had not participated in such education were classified as having no formal training.

2.4. Data Collection

Potential participants were asked to complete a survey via Google Forms (Google, Mountain View, CA, USA), which was open from January 2023 to March 2023. The link to access the questionnaire was shared with participants via QR code in the classroom or class WhatsApp (Meta, Menlo Park, CA, USA) groups by the group moderator (a student), at the request of the author [AI].

The questionnaire consisted of 5 sections: social–demographic characteristics (three questions asking about gender, date of birth, and educational status); background experience of swimming and self-reported swimming ability (six questions: if the participants could swim, if they had ever taken a swimming class with a qualified instructor, from

whom they learned to swim, how they described their swimming ability, how far they could swim without stopping, and how long they could stay afloat). Perceived swimming ability was self-reported, with participants asked to classify their own ability level (e.g., very weak swimmer, weak swimmer, average swimmer, good swimmer, very good swimmer and excellent swimmer); visitation and usage of aquatic locations (whether they had visited and/or entered the water at the following locations in last 12 months; beach, river, lake, dam, home pool, public pool/aquatic facility, water park); knowledge on water safety and attitudes towards water safety (questions on which were sourced from a previously validated questionnaire developed by Ekanayaka et al. [23]). The knowledge level scale consisted of 15 questions with yes, no, and do not know answers. Example questions included items such as “At the beach, do you swim only in the area between the red flags” and “Alcohol is a risk factor for drowning”. The attitude scale consisted of 17 five-point Likert questions, such as “If there are no lifeguards/police around, I would get into the water” and “Jumping into the water to rescue someone who is drowning helps to become a hero among colleagues” where possible responses ranged from strongly disagree to strongly agree.

The original questionnaire was translated from English into Turkish, and then back-translated to ensure equivalence of meaning. During this process, a pilot test ($n = 40$) was conducted to assess the linguistic and cultural appropriateness of the questions. Following the pilot test, the final version of the questions was developed based on participant feedback. Some expressions were adapted to the Turkish context. For example, in the question regarding the number to call in emergencies, the number in the original survey has been replaced with “112,” which is used in Türkiye. In addition, linguistic expressions were simplified and edited to improve readability. Moreover, internal consistency was assessed using Cronbach’s alpha. Cronbach’s $\alpha = 0.72$ for the knowledge on water safety scale and Cronbach’s $\alpha = 0.88$ for the attitudes towards water safety scale, and the scales had acceptable and good internal consistency, respectively [24].

2.5. Data Cleaning, Coding and Analysis

Data were downloaded from Google Forms in a Microsoft Excel (Microsoft, Redmond, WA, USA) spreadsheet and imported into IBM SPSS Statistics Version 30.0 (IBM, Armonk, NY, USA) for analysis [25]. Date of birth was converted into age in years using a Microsoft Excel formula to calculate the number of years between the recorded date of birth and the last day of data collection. In three instances, the date of birth was entered incorrectly; these responses were converted to unknown age. Individual year of age was converted to age groupings (18–20 years, 21–23 years, 24–26 years, and 27 years and older) for ease of analysis.

Answers to knowledge questions were converted from ‘yes’, ‘no’, ‘do not know’, to correct or incorrect, with the do not know responses considered incorrect (Table S1). Total correct scores were calculated for each respondent to provide a composite score of each individual’s water safety knowledge out of a total possible 15 points. Total attitude scores were calculated according to participants’ responses to the statements assessing “Attitudes towards water safety”. Participants marked one of the following options for each statement: ‘Strongly agree’, ‘Agree’, ‘Neither agree nor disagree’, ‘Disagree’ and ‘Strongly disagree’. Since the questionnaire items used in the study consisted of both positive and negative statements, reverse scoring was applied to negative statements so that a high score reflected a positive attitude rather than a negative one. Accordingly, in negative items, ‘Strongly disagree’ was scored as 5 and ‘Strongly agree’ as 1; in positive items, the opposite was applied, with ‘Strongly agree’ scored as 5 and ‘Strongly disagree’ as 1 (Table S2). As a result, total attitude scores could range from a minimum score of 17 to a maximum score of 85, with higher scores indicating more positive and safer attitudes toward water safety [23].

Participants' knowledge and attitude levels were assessed based on Bloom's cut-off point [26]. The knowledge level was classified as 'high' for those scoring between 12 and 15 points (80–100%), 'moderate' for those scoring between 9 and 11.85 points (60–79%), and 'low' for those scoring below 9 points (below 60%). Attitude level was classified as 'high' for participants scoring 71.4–85 points (80–100%), 'moderate' for those scoring 57.8–70.7 points (60–79%), and 'low' for those scoring below 57.8 points (below 60%).

The Shapiro–Wilk test was used to examine and determine if the data were normally distributed, and skewness and kurtosis values were also checked. Descriptive statistics were reported. Chi-square tests of independence were used to examine gender differences in the responses, as well as the association between swimming and lifeguard education (those who had received this education compared to those who had not), and the participants' level of knowledge and attitude scores, which were scored as low, moderate, or high. Statistical significance was deemed $p < 0.05$, with a modified Bonferroni correction applied for chi-square tests and effect sizes (Cramér's V) using three levels for knowledge and attitude scores [27].

To assess the effect of gender on behavioural outcomes related to different types of water bodies, separate binary logistic regression analyses were conducted for each body of water. In the analyses, the dependent variables were the "visiting" and "entering the water" states for each setting, coded as binary (0 = no, 1 = yes). Gender was included in the model as a categorical (factor) variable. For each model, regression coefficients (B), standard errors (SE), odds ratios (OR), and 95% confidence intervals were calculated and reported. Odds ratios were used to interpret the magnitude of gender's effect on the relevant behaviour.

A 2×2 factorial MANOVA (Multivariate Analysis of Variance) was used to evaluate the main and interaction effects of swimming/lifeguard education and gender on participants' levels of knowledge and attitudes regarding water safety. In models yielding significant results from the multivariate analysis, follow-up univariate ANOVAs were conducted to determine which dependent variable (knowledge or attitude) the effect was concentrated on, and the effect size values (partial eta squared, η_p^2) were reported to determine the practical significance of the observed differences. The analyses were conducted using JASP Version 0.19.3 (University of Amsterdam, Amsterdam, The Netherlands).

2.6. Ethics

This study received ethical approval from the Clinical Research Ethics Committee of Akdeniz University (KAEK-626/2022). At the start of the survey, participants received a link to the study's consent form. After reviewing the information about the research, they indicated their informed and voluntary consent by selecting the consent option in the initial question. Participation in the study was voluntary, and the survey was anonymous. In addition, the survey did not collect any personal data from the participants. The study was carried out in accordance with the Declaration of Helsinki.

3. Results

In total, 255 students responded to the survey, of whom 51.4% ($n = 131$) were female. The age of respondents ranged from 18 to 35 years, with the largest proportion of respondents aged 21–23 years (57.3%). The mean respondent age was 22.07 years ($SD = 2.62$). Although most respondents (83.9%; $n = 214$) indicated they could swim, there were gender differences, with a significantly lower proportion of females reporting being able to swim (78.6%) than males (89.5%) ($\chi^2 = 5.999$; $p = 0.018$). Students most commonly reported having learned to swim from a family member (36.9%), with just over one quarter (26.2%) having learned from a swimming teacher (Table 1).

Table 1. Participant characteristics and self-reported swimming ability.

Variable	Total <i>n</i> (%)	Female <i>n</i> (%)	Male <i>n</i> (%)	χ^2 (<i>p</i> Value)	<i>V</i>
Total	255 (100)	131 (100.0)	124 (100.0)	-	-
Age group					
18–20 years	70 (27.5)	35 (26.7)	35 (28.2)	3.525 (0.474)	0.118
21–23 years	146 (57.3)	76 (58.0)	70 (56.5)		
24–26 years	22 (8.6)	12 (9.2)	10 (8.1)		
27 years and older	14 (5.5)	8 (7.2)	6 (6.8)		
Unknown	3 (1.2)	0 (0.0)	3 (2.4)		
Able to swim?					
Yes	214 (83.9)	103 (78.6)	111 (89.5)	5.999 (0.018)	0.148
No	41 (16.1)	28 (21.4)	13 (10.5)		
From whom did you learn to swim? ¹					
Family member	79 (36.9)	44 (42.7)	35 (31.5)	4.660 (0.198)	0.148
Friend	11 (5.1)	6 (5.8)	5 (4.5)		
Self-taught	68 (31.8)	26 (25.2)	42 (37.8)		
Swimming teacher	56 (26.2)	27 (26.2)	29 (26.1)		
Self-reported swimming ability ¹					
Excellent swimmer	6 (2.8)	1 (1.0)	5 (4.5)	3.534 (0.618)	0.129
Very good swimmer	19 (8.9)	11 (10.7)	8 (7.2)		
Good swimmer	57 (26.6)	27 (26.2)	30 (27.0)		
Average swimmer	96 (44.9)	46 (44.7)	50 (45.0)		
Weak swimmer	33 (15.4)	16 (15.5)	17 (15.3)		
Very weak swimmer	3 (1.4)	2 (1.9)	1 (0.9)		
Distance able to swim (in metres [m]) without stopping ¹					
<50 m	57 (26.6)	34 (33.0)	23 (28.7)	6.929 (0.140)	0.180
50–100 m	75 (35.0)	31 (30.1)	44 (39.6)		
101–200 m	37 (17.3)	18 (17.5)	19 (17.1)		
201–300 m	17 (7.9)	10 (9.7)	7 (6.3)		
>300 m	28 (13.1)	10 (9.7)	18 (16.2)		
Duration of floating ability ¹					
<30 s	12 (5.6)	5 (4.9)	7 (6.3)	6.620 (0.250)	0.176
30 s–1 min	15 (7.0)	6 (5.8)	9 (8.1)		
1–2 min	19 (8.9)	13 (12.6)	6 (5.4)		
2–6 min	31 (14.5)	18 (17.5)	13 (11.7)		
7–15 min	30 (14.0)	11 (10.7)	19 (17.1)		
>15 min	107 (50.0)	50 (48.5)	57 (51.4)		

¹ *n* = 214, *V* = Cramér's *V*.

Of those who indicated they could swim (*n* = 214), self-reported swimming ability was most commonly rated as average (*n* = 96; 44.9%) or good (*n* = 57; 26.6%). Only 2.8% of respondents who could swim believed themselves to be excellent swimmers (*n* = 6). When asked to quantify their ability, respondents most often reported being able to swim 50–100 m without stopping (*n* = 75; 35.0%), while a further 22% (*n* = 57; 22.4%) indicated they could swim less than 50 m without stopping. With respect to floating ability, half of all respondents (*n* = 107) reported being able to float for more than 15 min (Table 1).

Respondents were asked about their visitation and water entry at different types of aquatic locations. Beaches were the most popular aquatic location both for visitation (98.0%; *n* = 250) and entering the water (97.3%; *n* = 248). By contrast, locations such as dams and rivers were popular for visitation (75.7% and 74.1%, respectively), yet respondents were far less likely to enter the water (20.8% for dams and 36.5% for rivers).

Females were approximately twice as likely as males to visit a dam ($OR = 2.154$, $p = 0.011$), but they were less likely than males to enter the water at the dam ($OR = 0.497$, $p = 0.027$). Similarly, females were half as likely as males to enter the water in a lake ($OR = 0.507$, $p = 0.008$), and they were significantly less likely than males to enter the water in a river ($OR = 0.415$, $p < 0.001$). In other water areas, there was no significant difference between females and males in either visitation or swimming behaviour (Table 2).

Table 2. The effect of gender on visiting and entering water behaviours according to body of water.

Body of Water	B	SE	OR	95% CI *		p
				Lower	Upper	
Visit						
Beach	−0.357	0.922	0.699	0.115	4.258	0.698
Dam	0.768	0.300	2.154	1.196	3.881	0.011
Home Pool	0.073	0.292	1.075	0.607	1.906	0.804
Lake	0.414	0.377	1.512	0.722	3.166	0.273
Public						
Pool/ Aquatic facility	0.596	0.348	1.815	0.917	3.592	0.087
River	−0.172	0.287	0.842	0.480	1.478	0.549
Water park	0.116	0.271	1.123	0.660	1.910	0.668
Entering the water						
Beach	−0.884	0.846	0.413	0.079	2.169	0.296
Dam	−0.699	0.317	0.497	0.267	0.924	0.027
Home Pool	0.079	0.272	1.082	0.635	1.844	0.771
Lake	−0.679	0.254	0.507	0.308	0.835	0.008
Public						
Pool/ Aquatic facility	0.309	0.279	1.363	0.788	2.355	0.268
River	−0.880	0.267	0.415	0.246	0.700	<0.001
Water park	−0.435	0.253	0.647	0.394	1.062	0.085

B = Regression coefficients, SE = Standard errors, OR = odds ratio, CI = 95% Confidence Interval. * Odds ratio scale.

With respect to previous experiences with swimming and lifeguard education, 44.3% ($n = 113$) of respondents had previously participated in a swimming class with a trained instructor, while 29.4% of respondents had participated in lifeguard education ($n = 75$). Males were significantly more likely to report having participated in both swimming ($\chi^2 = 7.769$, $p = 0.005$) and lifeguard education ($\chi^2 = 5.501$, $p = 0.019$) when compared to females (Table 3).

Table 3. Previous experiences with swimming and lifeguard education.

Type of Previous Experiences	Yes <i>n</i> (%)	No <i>n</i> (%)	χ^2 (<i>p</i> Value)	<i>V</i>
Swimming education				
Total	113 (44.3)	142 (55.7)	7.769 (0.005)	0.175
Male	66 (53.2)	58 (46.8)		
Female	47 (35.9)	84 (64.1)		
Lifeguard education				
Total	75 (29.4)	180 (70.6)	5.501 (0.019)	0.147
Male	45 (36.3)	79 (63.7)		
Female	30 (22.9)	101 (77.1)		

V = Cramér's V.

Two separate 2×2 MANOVA analyses were conducted to examine participants' levels of knowledge and attitudes regarding water safety (Table 4). In the first model, the main

effect of swimming education was found to be statistically significant (Wilks' $\Lambda = 0.907$, $F(2, 250) = 12.79$, $p < 0.001$, $\eta_p^2 = 0.093$). However, the main effect of gender ($p = 0.510$) and the interaction effect ($p = 0.250$) were not significant. Subsequent univariate analyses showed that this significant difference was only due to knowledge scores ($F(1, 251) = 24.56$, $p < 0.001$, $\eta_p^2 = 0.089$), while there was no significant difference between the educated and uneducated groups regarding attitude scores ($F(1, 251) = 0.042$, $p = 0.838$).

Table 4. Multivariate analysis of variance (MANOVA) results for the effects of swimming and lifeguard education and gender on water safety knowledge and attitude.

Effect	Wilks' Λ	F (2, 250)	p	η_p^2
Model 1: Swimming education				
Swimming education	0.907	12.790	<0.001	0.093
Gender	0.995	0.676	0.510	0.005
Interaction (education X gender)	0.989	1.396	0.250	0.011
Model 2: Lifeguard education				
Lifeguard education	0.950	6.542	0.002	0.050
Gender	0.993	0.888	0.413	0.007
Interaction (education X gender)	0.996	0.507	0.603	0.004

η_p^2 = partial eta squared.

Similarly, in the second model, the main effect of lifeguard education was found to be statistically significant (Wilks' $\Lambda = 0.950$, $F(2, 250) = 6.54$, $p = 0.002$, $\eta_p^2 = 0.050$). In this model as well, the effects of gender ($p = 0.413$) and interaction ($p = 0.603$) did not reach statistical significance. Univariate analyses conducted for lifesaving education confirmed that education again significantly affected only the level of knowledge ($F(1, 251) = 12.99$, $p < 0.001$, $\eta_p^2 = 0.049$), while it did not result in a significant change in attitude ($F(1, 251) = 0.860$, $p = 0.355$).

When both genders were combined, there were no statistically significant differences in the participants' attitude scores (low, medium, high) between those who received swimming education ($\chi^2 = 1.846$, $p = 0.397$) and lifeguard education ($\chi^2 = 5.436$, $p = 0.066$) and those who did not. In contrast, a significant difference was found in terms of knowledge scores (low, medium, high) between those who received swimming education ($\chi^2 = 20.028$, $p < 0.001$) and lifeguard education ($\chi^2 = 12.699$, $p = 0.002$) and those who did not (Table 5).

No significant differences were found between female participants who received swimming education and those who did not in terms of knowledge levels ($\chi^2 = 5.668$, $p = 0.059$) and attitude levels ($\chi^2 = 1.300$, $p = 0.522$). Similarly, no significant differences were found in terms of level of knowledge ($\chi^2 = 3.747$, $p = 0.059$) and attitude scores ($\chi^2 = 0.971$, $p = 0.615$) between women who had received lifeguard education and those who had not. However, among male participants, a significant difference was found in knowledge levels between those who received swimming education and those who had not ($\chi^2 = 16.458$, $p < 0.001$), but no significant difference was found in attitude levels ($\chi^2 = 2.848$, $p = 0.241$). Similarly, a significant difference was found in knowledge levels between those who had received lifeguard education and those who had not ($\chi^2 = 11.925$, $p = 0.003$), but no significant difference was observed in attitude levels ($\chi^2 = 5.507$, $p = 0.064$) (Table 5).

Table 5. Distribution of attitude and knowledge scores levels (Low, Moderate, High) by swimming and lifeguard education.

	Formal Swimming Education <i>n</i> (%)	No formal Swimming Education <i>n</i> (%)	χ^2 (<i>p</i> Value)	<i>V</i>	Formal Lifeguard Education <i>n</i> (%)	No Formal Lifeguard Education <i>n</i> (%)	χ^2 (<i>p</i> Value)	<i>V</i>
Total								
Attitude								
Low	20 (17.7)	33 (23.2)	1.846 (0.397)	0.085	9 (12.0)	44 (24.4)	5.436 (0.066)	0.146
Moderate	59 (52.2)	63 (44.4)			42 (56.0)	80 (44.4)		
High	34 (30.1)	46 (32.4)			24 (32.0)	56 (31.1)		
Knowledge								
Low	13 (11.5)	38 (26.8)	20.028 (<0.001)	0.280	10 (13.3)	41 (22.8)	12.699 (0.002)	0.223
Moderate	53 (46.9)	78 (54.9)			32 (42.7)	99 (55.0)		
High	47 (41.6)	26 (18.3)			33 (44.0)	40 (22.2)		
Males								
Attitude								
Low	11 (16.7)	17 (29.3)	2.848 (0.241)	0.152	5 (11.1)	23 (29.1)	5.507 (0.064)	0.211
Moderate	34 (51.5)	26 (44.8)			26 (57.8)	34 (43.0)		
High	21 (31.8)	15 (25.9)			14 (31.1)	22 (27.8)		
Knowledge								
Low	7 (10.6)	17 (29.3)	16.458 (<0.001)	0.364	7 (15.6)	17 (21.5)	11.925 (0.003)	0.310
Moderate	31 (47.0)	34 (58.6)			17 (37.8)	48 (60.8)		
High	28 (42.4)	7 (12.1)			21 (46.7)	14 (17.7)		
Females								
Attitude								
Low	9 (19.1)	16 (19.0)	1.300 (0.522)	0.100	4 (13.3)	21 (20.8)	0.971 (0.615)	0.086
Moderate	25 (53.2)	37 (44.0)			16 (53.3)	46 (45.5)		
High	13 (27.7)	31 (36.9)			10 (33.3)	34 (33.7)		
Knowledge								
Low	6 (12.8)	21 (25.0)	5.668 (0.059)	0.208	3 (10.0)	24 (23.8)	3.747 (0.059)	0.169
Moderate	22 (46.8)	44 (52.4)			15 (50.0)	51 (50.5)		
High	19 (40.4)	19 (22.6)			12 (40.0)	26 (25.7)		

V = Cramér's *V*.

4. Discussion

This study aimed to compare the water safety knowledge and self-reported attitudes of students at a university in a coastal region of Türkiye who had undergone swimming or lifeguard education with those who had not yet received such education. Our key findings showed that previous participation in swimming or lifeguard education was associated with higher water safety knowledge. While guidance on drowning prevention strategies explicitly supports the teaching of swimming and water safety skills [7], this study adds to the growing body of evidence that suggests that water safety knowledge must be conferred alongside swimming skills as a more holistic approach to contributing to drowning prevention (i.e., aquatic literacy) [8,28,29]. Future research within the Turkish context should explore barriers and opportunities for expanded provision of swimming and water safety education (both skills and knowledge) at an earlier age, via systems-based approaches such as schools [30].

The MANOVA results revealed that both swimming and lifeguard training were significantly associated with higher levels of knowledge ($p < 0.001$) but did not show a statistically significant association with attitude scores ($p > 0.05$), which has traditionally been more challenging to influence, particularly among young people [31]. However, previous research has shown that educational training can improve water safety attitudes

among younger children [32]. As both knowledge and attitude are vital components of behaviour [33], we suggest that further work is needed to determine the optimum educational content and delivery modes for this cohort. Future research could conduct qualitative data collection with young people to identify their current behaviours and attitudes, and co-design curricula to encourage water safe behaviours.

Although 60% respondents perceived themselves to be intermediate or good swimmers, swimming instruction rarely occurred with a qualified swimming instructor, with respondents more commonly being taught to swim by family members or being self-taught. Such results likely suggest that opportunities for formal learn-to-swim are limited in Türkiye, even among a cohort that is more highly educated than the general population (university students). It is proposed that future research should explore the current provision of formal swimming instruction in Türkiye to identify population-level coverage, as well as barriers and opportunities to expanding such coverage, as a drowning prevention intervention [7,11]. In addition, research could also explore intermediate outcomes with respect to swimming competency (i.e., ability to swim 25 m) for those who receive swimming instruction from family as compared to the achievements of those who learn via formal swimming lessons. Insights could inform future interventions, particularly in contexts with limited resources for formal swimming education, such as Türkiye.

Our analysis took a particular interest in gender differences within our cohort. We found that women were less likely to report being able to swim when compared to men, and also less likely than men to have previously participated in swimming lessons with a qualified instructor. This may be due to previously reported cultural and religious barriers to women participating in physical activity [34], including swimming, with culturally sensitive strategies such as women-only swimming hours, single-sex instruction and culturally appropriate swimwear suggested to overcome these disparities [35].

However, self-report data on swimming ability may be prone to optimism bias, with literature reporting that males are more likely to overstate their swimming ability [36–38] due to a mix of lower risk appraisal, overconfidence and poor self-reflection [39]. Our data may identify a discrepancy between males' qualitative descriptors of their swimming ability (i.e., excellent swimmer, weak swimmer) and quantitative descriptors (i.e., distance they are able to swim without stopping in metres and duration of floating ability in seconds). Despite our data indicating that women self-reported being less likely to be able to swim than males, we found no significant differences between males and females in self-reported swimming ability, the distance they were able to swim without stopping, and the duration of floating ability.

However, there were gender differences identified among our cohort regarding exposure to potential drowning risk, with high visitation but lower water entry among females in aquatic locations such as lakes and rivers when compared to males. This disproportionate water entry and previously stated propensity among males to overstate their swimming ability are likely contributing to data that indicate that men fatally drown at a rate that is four times that of women in Türkiye and globally [2]. Findings that males were significantly more likely than females to report increased knowledge if they had participated in swimming or lifeguard education may be positive in light of the overrepresentation of males among drowning victims in Türkiye. However, the lower reported likelihood of being able to swim and lower participation in swimming lessons with qualified instructors among females in our sample should be considered in light of increasing female participation in recreational activities [21].

4.1. Practical Applications

The findings of this study provide important insights for the development of public health policies aimed at contributing to preventing drowning incidents in Türkiye, as recently published research has found that there is much scope for improvement [40]. Findings support the expansion of learn-to-swim and lifeguard education in Türkiye as a means of improving water safety knowledge for both males and females. However, this education was not significantly associated with improved water safety attitudes among our cohort, indicating an opportunity for further research and potential co-design with young adults. A gender-sensitive lens is needed for the implementation of any future strategies to improve swimming and water safety education among the population in Türkiye. Further, future research could explore the as-yet-unmeasured impact of extending swim education within family units in Türkiye, which has been found to have generational impacts in low-income communities in the United States of America [41].

Additionally, local governments should invest in creating safe swimming areas, particularly in frequently used dams and river areas, in addition to the coast. Expansion of lifeguarding education may also enhance first aid and cardiopulmonary (CPR) skills and knowledge among the community to aid in layperson response to drowning incidents. In this context, the data obtained via this study, and the insights they inform, can contribute to the design of targeted and contextually relevant interventions aimed at reducing drowning incidents in Türkiye.

4.2. Strengths and Limitations

To the best of our knowledge, this study is the first research in Türkiye to assess young adults' knowledge, attitudes, experiences, and skills regarding water safety. The use of a pre-validated questionnaire [23] is also a strength. However, the study has some limitations. Although the internal consistency of the questionnaire used in the study was found to be high and the comprehensibility of the questions was confirmed by a pilot test, test–retest reliability and comprehensive validity analyses of this scale have not been conducted on the Turkish sample. For this reason, it is recommended that this questionnaire be examined more comprehensively on the Turkish population in future studies. To assess the risk of drowning, participants were asked to indicate the aquatic locations they had visited and/or entered, but information on the recency and frequency of these visits was not collected. This may limit the ability to fully measure exposure to the risk of drowning among this cohort: a topic worthy of further research. The questionnaire was cross-sectional in nature, introducing the possibility of bias [42]. An anonymous survey was used to combat this. Respondents' participation in swimming and lifeguard education is self-reported. This reliance on personal recall may introduce self-assessment bias, potentially leading to inaccuracies in the reported levels of formal training. To improve transparency, future studies should aim to verify such information through official certification records or practical performance evaluations. In addition, as male tend to overstate their swimming ability [36–38], self-reports may not accurately reflect their actual skill level. Future research should therefore address this issue. Further, the survey did not capture a timeframe in which the education occurred, nor its duration (e.g., 3 days) or level (e.g., basic/advanced), which may have an impact on the assessment of the impact of education on knowledge and attitudes. While this study utilized a convenience sample, which may limit its generalizability to the broader population, the sample size accounts for approximately 40% of the total undergraduate students in the faculty. This high participation rate provides a substantial reflection of the specific student body studied, although it may not represent the general population. Further, study participants were students from the faculty of sport sciences, and it is likely that this cohort is more educated

on swimming and water safety than the general population. This limits the generalizability of the findings to the general population and suggests the need for future studies with different cohorts to assess differences.

5. Conclusions

Our study identified that previous participation in swimming and lifeguard education was found to be associated with higher water safety knowledge levels. Conversely, no significant association was observed between participation and self-reported water safety attitudes. Gender differences persist, with females reporting lower swimming ability than males, and seeing no statistically significant increase in knowledge scores. Our findings, and the drowning burden in Türkiye, suggest there remains scope to enhance the provision of swimming and water safety skills education (including lifeguard education) to the Turkish population to contribute to reducing drowning risk via improved water safety knowledge. Further, as opportunities for women to participate in aquatic sport and recreational activities further increase, there is a vital need to enhance the access of women and girls to swimming and water safety skills education to support safe participation and offset the increased exposure to drowning risk that increased aquatic activity will likely present.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/safety12020053/s1>, Table S1: Scoring scale for knowledge questions; Table S2: Scoring scale for attitude questions.

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Institutional Review Board Statement: This study received ethical approval from the Clinical Research Ethics Committee of Akdeniz University (KA EK-626/2022; Approval Date: 26 October 2022). The study was carried out in accordance with the Declaration of Helsinki.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study. At the start of the survey, participants received a link to the study's consent form. After reviewing the information about the research, they indicated their informed and voluntary consent by selecting the consent option in the initial question. Participation in the study was voluntary, and the survey was anonymous.

Data Availability Statement: The datasets generated or analyzed during this study are not publicly available due to ethical restrictions, but are available from the corresponding author on reasonable request.

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Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

WHO	World Health Organization
V	Cramér's V
MD	Mean difference
95% CI	95% Confidence Interval
ES	Effect Size (Cohen's d)

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