International Journal of Aquatic Research and Education

Volume 8 | Number 4 Article 4

11-1-2014

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International Journal of Aquatic Research and Education, 2014, 8, 321-337
http://dx.doi.org/10.1123/ijare.2014-0054

International Journal of
Aquatic Research
and Education
www.IJARE-Journal.com
RESEARCH

Getting Out of the Water: How Hard Can That Be?

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Reasons for drowning are most commonly associated with failure to stay afloat or swim to safety. Some evidence suggests that victims drown because they cannot exit the water upon reaching the water's edge. College-aged physical education students (N = 37) completed a pretest survey of self-estimated capacity to exit the water under varied conditions. Participants were then tested in shallow water, deep water (flush edge), and deep water with a ledge (0.41 m) when fresh, after a 5-min swim in swimwear, in clothing, and while wearing a buoyancy vest. All participants were able to exit shallow and deep water when not fatigued, after a swim when wearing clothing or a buoyancy vest, but many failed to exit deep water over a 0.41 m ledge after swimming in clothing (35%) or in a buoyancy vest (49%). Significantly more females than males found exiting deep water difficult. Most participants (especially males) underestimated the demands of exiting deep water. The value of situational learning via exposure to exiting difficulties in simulated pool practices is discussed and recommendations about further research to enhance understanding of the challenges of exiting deep water to safety are suggested.

Keywords: water safety; drowning; drowning prevention; water competency

Reasons for drowning are most commonly associated with failure to stay afloat or swim to safety. Some evidence suggests that victims may also drown because they are unable to exit the water upon reaching the water's edge (Connolly, 2014). This appears to be more prevalent when the immersion is sudden, unintentional, and occurs in an open water setting. A problem exists in quantifying the extent of this phenomenon since most drowning incidents of this nature are not witnessed and such details are thus not reported. In spite of the likelihood that some drowning victims die because they cannot exit the water once reaching the water's edge, little is known about the real and perceived capacity of potential victims to extricate themselves from the water in an emergency.

While not likely to be wholly indicative of the extent of what Connolly (2014) has aptly referred to as *the exit problem* (since the problem is also likely to be experienced in recreational and intentional immersion activity), some inference

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from drowning statistics collated as 'unintentional immersion' or 'nonrecreational' can be made. In New Zealand, nonrecreational immersion incidents, where the victim had no intention of being in the water, accounted for one quarter (25%) of all drowning fatalities in the five-year period from 2008–2012 (Water Safety New Zealand, 2013). In Australia, in the year ending June 30, 2013, almost one fifth (18%) of all drowning fatalities were attributed to falling into water—more than the proportion that drowned during recreational swimming (16%; Royal Life Saving Society Australia, 2013). In the UK, an analysis of accidental drowning fatalities in 2004 reported that more than a quarter (28%) of the annual drowning toll were unintentional submersions and, of these, half (52%) were attributed to falling in (Royal Society for the Prevention of Accidents, 2005). Further underlining the incidental nature of falling into water, walking/running was identified as the activity immediately before drowning in one fifth (21%) of fatalities in the UK in 2011—twice the rate of drowning fatalities as a consequence of swimming in the same year (National Water Safety Forum, 2012).

In presenting a case for the importance of 'the exit problem' in drowning incidents, Connolly (2014) examined over 3,000 reports, from both official and media sources, which indicated that many victims had succumbed to various debilitating environmental factors such as cold, exhaustion, entrapment, water movement, and the inability to hold on at the water's edge. While such reports provide compelling evidence about the tip of the drowning risk iceberg (Moran, 2010), little is known about how often people get into difficulty getting out of the water that does not result in fatal drowning. Connolly further noted that while lifesaving organizations give advice on how to stay afloat in moving water, they "have devoted little space in their manuals to exiting the water" (p. 74). While entry and exit techniques are included in some lifesaving and water safety instructions manuals (e.g., Royal Life Saving Society—Australia, 2012; Lifesaving Society Canada, 2011; Royal Life Saving Society—UK, 2012), little is known about public understanding and perceptions of the risks associated with exiting the water in an emergency situation or what education, formal or informal, they may or may not have received.

The purpose of this paper is to explore the real and perceived capacity of young adults to safely exit the water and ascertain what safety knowledge about exiting the water is promoted and how/when such information is learned and skills practiced. As a consequence of this exploratory investigation, it is intended that recommendations for further study and evidence-based water safety education on the 'exit problem' are the research outcomes.

Method

Participants and Procedure

Participants were young adults (N = 37) with a proven swimming capacity who were enrolled in an undergraduate Bachelor of Physical Education degree program. Of these, 21 were male (57%) and 16 were female (43%), 70% were 19–20 years of age, 16% were 21–22 years of age, and the remaining 14% were 23 years and older. Most (70%) self-identified as of European ethnicity, 5% as Maori, 19% as Pasifika, and 2% as 'other' ethnicity. Before the commencement of an aquatics education program that focused on water safety, participants completed a pretest

survey that was designed to provide a measure of self-estimated water competency and estimates of their capacity to exit the water under various conditions. Practical testing of exit skills was completed during 1 hr aquatics sessions/3 times per week over a 3-week period during the summer term (March–April 2014) in an outdoor 25 m pool (water temperature 21 °C). Appropriate lifeguard supervision and safety equipment were available at all times. Ethics clearance for the study was obtained from the University of Auckland Human Participants Ethics Committee (UAHPEC) as part of the *Can You Swim in Clothes?* Project (case number 010667).

Research Instruments

Data were collected via a brief, self-completed questionnaire and through observation of participants performing a series of practical swim tests. Content validity for both the questionnaire and observations is claimed based on the investigator expertise. The questionnaire sought information on demographic characteristics (including age, sex, and ethnicity) and self-estimates of swimming competency using a 4-point scale from *high, good, low,* or *no competence.* Information was sought on any previous difficulties participants had experienced when getting out of the water, and whether they had been taught exit activities at school or any other setting. A five-part question requiring true-false responses on exiting technique was also included as an indicator of prior learning. To test participants' perception of how difficult getting out of the water might be, a 4-point scale from *with ease* to *with difficulty* was used to estimate self-competency in exiting shallow water and deep water when wearing swimwear, clothes, and a buoyancy vest.

The second phase of the data gathering included the assessment of exiting competencies with varying degrees of difficulty—shallow water exit onto nonslip rubber matting (Figure 1), deep water flat deck exit onto nonslip rubber matting (Figure 2), and deep water exit over a 0.41 m bulkhead (Figure 3). Each of these challenges was assessed initially when participants were fresh as a baseline for comparative purposes, after they had swum continuously in swimwear for 5 minutes, after they had swum continuously in clothing for 5 minutes (see Figures 4 and 6), and, finally, after swimming continuously in a buoyancy vest for 5 minutes (Figure 5). In all, the practical testing involved three different challenges under four pre-exit conditions making a total of 12 trials per participant.

To assess actual exiting competency, attempts to exit the water were observed and recorded using a 5-point scale ranging from 1 = *not completed*, 2 = *completed with great difficulty,* 3 = *completed with difficulty,* 4 = *completed with slight difficulty,* and 5 = *completed with ease*. Participants were allowed multiple attempts if required but were stopped when they were clearly not going to achieve success. The first set of exit trials (shallow water, deep water flush edge, deep water with ledge) were undertaken when no prior strenuous water activity had taken place so that participants were deemed fresh for the exiting tasks. The second set of trials took place after a 5-min swim in swimwear where participants were asked to swim using any strokes vigorously without stopping or touching the pool bottom. The third set of trials took place after a 5-min vigorous swim while wearing everyday clothes (including swimwear, T-shirt, long sleeved sweater/pullover, and trousers [track pants]). The fourth set of exiting tasks was undertaken after a vigorous 5-min swim in swimwear wearing a buoyancy vest.

Figure 1 — Shallow water (1.0 m) exit point.

Figure 2 — Deep water (2.0 m) exit point.

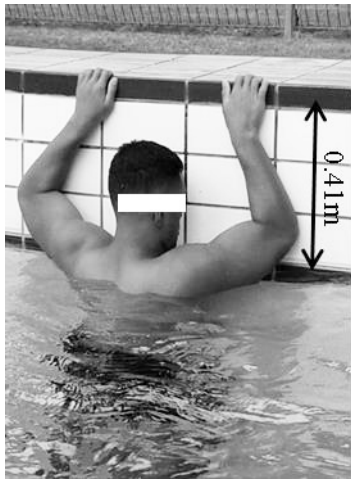

Figure 3 — Deep water 0.41 m bulkhead exit point.

Figure 4 — Clothing.

Data Analysis

All data from the completed questionnaires were double entered into Microsoft Excel (2004) and data were transferred to SPSS version 22 (SPSS, Chicago, IL) for statistical analysis. Descriptive statistics expressed as frequencies and percentages were used to describe or characterize all numerical variables. These included four independent variables (gender, age, ethnicity, and self-estimated swimming competency) and four dependent variables related to previous experience, knowledge, perceptions of exiting task difficulty, and actual exiting competency. Chi-square

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DOI: https://doi.org/10.25035/ijare.08.04.04

Figure 5 — Deep water 0.41 m exit in buoyancy vest.

Figure 6 — Swimming in clothes.

tests of independence were used to test associations between the frequencies of the influences of age, gender, and ethnicity against the perceived and actual exertion required to perform the exiting tasks.

Results

In total, 37 participants completed the initial questionnaire and the practical assessments on getting out of the water. When asked to estimate their current swimming competency, one fifth (22%, $n = 8$) self-reported that they were weak swimmers who could swim less than 50 m; almost half (49%, $n = 18$) described themselves as average swimmers capable of swimming 50–200 m; and almost one third (30%, $n = 11$) described themselves as good swimmers, capable of swimming more than 300 m.

When asked how they felt about doing their estimated distances in open water, most thought they could achieve that distance with ease (68%, $n = 25$). When asked if they had ever experienced difficulty with getting out of water, 41% ($n = 15$) reported that they had. Of these, most recalled difficulty getting out on a rocky foreshore (47%), onto a boat (13%) or other craft (20%), and/or from rivers/inland water (20%). No significant differences were found by age, sex, and ethnicity in self-reported aquatic competency or in personal experience of 'the exit problem.'

Pretest Self-Estimates of Exiting Competency

Almost all participants (97%) predicted that they could exit shallow water with ease in swimwear. Three quarters (78%) thought they could get out of deep water with ease in swimwear. Two thirds (65%) thought they could get out when wearing a buoyancy vest, but less than half (46%) thought they could do this with ease in clothes.

Table 1 shows no differences by sex in the predictions of the easiest exiting task, that of getting out of shallow water, but significantly more males than females thought that other exiting tasks would be completed with ease. No significant differences were found when estimates were analyzed by age, ethnicity, or self-estimated swimming competency.

Knowledge of Exiting Techniques

Before practical testing, participants were asked about their understanding of exiting techniques and whether they had been taught these competencies. Table 2 shows that most participants could identify between poor and good techniques for exiting the water. No significant differences were found when knowledge of techniques was analyzed by sex, age, ethnicity, or self-estimated swimming competency.

When asked if they had ever been taught exiting techniques, most participants (76%, $n = 28$) reported that they had not. Of those who had (25%, $n = 9$), most had been taught how at school ($n = 7$) and some had been taught at a club ($n = 2$). When asked if they thought exiting skills should be taught at schools, most (97%, $n = 36$) thought that they should, and of these, 41% thought it *extremely important*, 41% thought it *very important*, and 18% thought it *quite important*.

Exiting Competency Assessment

When real exiting competency was assessed, most participants were able to exit with ease both shallow (95%) and deep water onto a flush deck (78%) when rested with no significant differences by sex, age, ethnicity, or self-reported swimming competency. Table 3 shows that one quarter (24%) of participants failed to exit the water over a 0.41 m ledge in deep water when unfatigued and significant differences were evident between sexes with more females than males unable to get out of the deep water (females: 50%; males: 5%).

Similar results were found when participants attempted the exits after a 5-min vigorous swim in swimwear. All participants managed to exit both shallow and deep water onto a flush deck, although fewer completed the deep water exit with ease (postswim: 51%; unfatigued: 78%). Fewer participants completed the deep water exit over the 0.41 m ledge of the pool bulkhead with ease after the swim (postswim: 8%; unfatigued: 14%). Table 4 shows that significantly more males than females were able to exit deep water over the bulkhead after 5 min of strenuous swimming with most females (75%) either failing (50%) or completing with great difficulty/difficulty (25%) compared with males (14%). No significant differences were found by age, ethnicity, or self-estimated swimming competency.

When the exit tasks were assessed after completion of a 5-min vigorous swim in clothes, all participants were able to exit the water at the shallow and deep end of the pool but more failed to complete the exit over the bulkhead (postswimwear swim: 24%; postclothes swim: 35%) and more completed the task with great difficulty/difficulty (postswimwear swim: 16%; postclothes swim: 62%). Table 5 also shows that while no males were judged to have completed the deep water exit over the 0.41 m ledge in clothes with ease, significantly fewer males than females failed to exit the water in this situation (males: 5%; females: 75%).

Table 1 Pretest Estimates of Exit Competency by Sex

	Total		Male		Female		χ^2	*p*
	n	%	*n*	%	*n*	%		
How would you describe your ability to get out of shallow water in swimwear?								
Complete with ease	36	97.3%	20	95.2%	16	100%	0.835	0.659
Complete with difficulty	1	2.7%	1	2.7%	-	-		
How would you describe your ability to get out of deep water in swimwear?								
Complete with ease	29	78.4%	19	90.5%	10	62.5%	7.098	0.029*
Complete with difficulty	8	21.6%	2	9.5%	6	37.5%		
How would you describe your ability to get out of deep water in clothes?								
Complete with ease	17	45.9%	14	66.7%	3	18.8%	9.566	0.023*
Complete with difficulty	20	54.1%	7	33.3%	13	81.2%		
How would you describe your ability to get out of deep water in a buoyancy vest?								
Complete with ease	24	64.9%	21	100%	3	18.8%	27.396	0.001*
Complete with difficulty	13	35.1%	-	-	13	81.2%		
Total	37	100%	21	100%	16	100%		

Note. *Significant at the 0.05 level.

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DOI: https://doi.org/10.25035/ijare.08.04.04

Table 2 Knowledge of Exit Technique by Sex

	Total		Male		Female	
	n	%	*n*	%	*n*	%
Tuck chin onto chest (poor technique)						
Correct response	27	73.0%	14	66.7%	13	81.2%
Incorrect response	10	27.0%	7	33.3%	3	18.8%
Place both hands palm down on the edge (good technique)						
Correct response	36	97.3%	21	100%	15	93.8%
Incorrect response	1	2.7%	-	-	1	6.2%
Avoid kicking the legs during lifting (poor technique)						
Correct response	27	73.0%	17	81.0%	10	62.5%
Incorrect response	10	27.0%	4	19.0%	6	37.5%
Briefly submerge before lifting body out of water (good technique)						
Correct response	25	67.6%	13	61.9%	12	75.0%
Incorrect response	12	32.4%	8	38.1%	4	25.0%
Press both elbows to the chest during lifting (poor technique)						
Correct response	29	78.4%	17	81.0%	12	75.0%
Incorrect response	8	21.6%	4	19.0%	4	25.0%
Lean backward and twist body to one side (poor technique)						
Correct response	28	75.7%	13	61.9%	12	75.0%
Incorrect response	9	24.3%	8	38.1%	4	25.0%
Total	37	100%	21	100%	16	100%

Table 3 Exiting Water Competency When Fresh

	Total		Male		Female		χ^2	*p*
	n	%	*n*	%	*n*	%		
Exit shallow water in swimwear when fresh								
Not completed	-	-	-	-	-	-		
Completed with great difficulty	-	-	--	--	-	-		
Completed with difficulty	-	-	-	-	-	-		
Completed with slight difficulty	2	5.4%	1	2.7%	1	6.2%	0.039	0.843
Completed with ease	35	94.6%	20	95.2%	15	93.8%		
Exit deep water with flush deck in swimwear when fresh								
Not completed	-	-						
Completed with great difficulty	-	-						
Completed with difficulty	1	2.7%	-	-	1	6.2%		
Completed with slight difficulty	7	18.9%	4	19.0%	3	18.8%	1.354	0.508
Completed with ease	29	78.4%	17	81.0%	12	75.0%		
Exit deep water in swimwear over a 410 mm bulkhead when fresh								
Not completed	9	24.3%	1	4.8%	8	50.0%		
Completed with great difficulty	2	5.4%	1	4.8%	1	6.2%		
Completed with difficulty	6	16.2%	2	9.5%	4	25.0%	16.130	0.003*
Completed with slight difficulty	15	40.5%	12	57.1%	3	18.8%		
Completed with ease	5	13.5%	5	23.8%	-	-		
Total	37	100%	21	100%	16	100%		

Note. *Significant at the 0.05 level.

https://scholarworks.bgsu.edu/ijare/vol8/iss4/4
DOI: https://doi.org/10.25035/ijare.08.04.04

Table 4 Exiting Water Competency After 5 Minutes Swimming in Swimwear

	Total		Male		Female		χ^2	*p*
	n	%	*n*	%	*n*	%		
Exit shallow water in swimwear after 5 min swim								
Not completed	-	-	-	-	-	-		
Completed with great difficulty	-	-	-	-	-	-		
Completed with difficulty	-	-	-	-	-	-		
Completed with slight difficulty	4	10.8%	1	4.8%	3	18.8%	1.843	0.175
Completed with ease	33	89.2%	20	95.2%	13	81.2%		
Exit deep water in swimwear after 5 min swim								
Not completed	-	-	-	-	-	-		
Completed with great difficulty	-	-						
Completed with difficulty	5	13.5%	1	4.8%	4	25.0%		
Completed with slight difficulty	13	35.1%	8	38.1%	5	31.3%	3.191	0.203
Completed with ease	19	51.4%	12	57.1%	7	43.8%		
Exit deep water in swimwear over a 410 mm bulkhead after 5 min swim								
Not completed	9	24.3%	1	4.8%	8	50.0%		
Completed with great difficulty	3	8.1%	1	4.8%	2	12.5%		
Completed with difficulty	3	8.1%	1	4.8%	2	12.5%	14.936	0.005*
Completed with slight difficulty	19	51.4%	16	76.2%	3	18.8%		
Completed with ease	3	8.1%	2	9.5%	1	6.3%		
Total	37	100%	21	100%	16	100%		

Note. *Significant at the 0.5 level.

Table 5 Exiting Water Competency After 5 Minutes Swimming in Clothes

	Total		Male		Female		χ^2	*p*
	n	%	*n*	%	*n*	%		
Exit shallow water in clothes after 5 min swim								
Not completed	-	-	-	-	-	-		
Completed with great difficulty	-	-	-	-	-	-		
Completed with difficulty	2	9.5%	2	9.5%	-	-	3.721	0.156
Completed with slight difficulty	13	33.3%	5	23.8%	8	50.0%		
Completed with ease	22	61.1%	14	66.7%	8	50.0%		
Exit deep water in clothes after 5 min swim								
Not completed	-	-	-	-	-	-		
Completed with great difficulty	2	5.4%	-	-	2	5.6%		
Completed with difficulty	16	43.2%	7	33.3%	9	56.3%	6.605	0.109
Completed with slight difficulty	14	37.8%	10	47.6%	4	25.0%		
Completed with ease	5	19.0%	4	19.0%	1	6.3%		
Exit deep water in clothes over a 410 mm bulkhead after 5 min swim								
Not completed	13	35.1%	1	4.8%	12	75.0%		
Completed with great difficulty	7	18.9%	6	28.6%	1	6.3%		
Completed with difficulty	16	43.2%	13	61.9%	3	18.8%	19.815	0.001*
Completed with slight difficulty	1	2.7%	1	4.8%	-	-		
Completed with ease	-	-	-	-	-	-		
Total	37	100%	21	100%	16	100%		

Note. *Significant at the 0.05 level.

When the exit tasks were completed after a 5-min swim wearing a buoyancy vest, all participants were again able to exit the water at the shallow and deep end of the pool but almost twice as many failed to complete the exit over the bulkhead compared with the attempt after a 5-min swim in swimwear alone (postswimwear swim: 24%; postbuoyancy vest swim: 49%). Table 6 shows that significantly more females than males failed (females: 93%; males: 15%) the deep water bulkhead exit and twice as many females found it difficult to exit deep water onto a flush deck when wearing a buoyancy vest (females: 53%; males: 26%). No significant differences were found when clothing and buoyancy vest data were analyzed by age, ethnicity, or self-reported swimming competency.

When the exit tasks were analyzed by mean scores of the group ($n = 37$), Figure 7 shows that, when compared with exits performed with no prior exercise (i.e., not fatigued), the capacity to exit the water for each task (i.e., shallow water, deep water flush edge, deep water with 0.41 m ledge) dropped as the exertion demands increased. The greatest depreciation in exiting performance was associated with the pre-exit 5-min swim in clothes, followed by the buoyancy vest swim, and the 5-min swim in swimwear.

Discussion

The primary goal of this project was to study the challenge of exiting deep water after undergoing a series of pre-exit swimming survival demands. In addition to exploring ways of quantifying the difficulties of getting out of deep water, a secondary goal was to compare perceived and actual competencies so as to establish how well participants could assess the demands of getting out of deep water in an emergency. Getting out of shallow water (1 m depth) onto a flush pool deck unassisted was established as a baseline task and a hierarchy of increasingly difficult exiting skills were undertaken when unfatigued and after strenuous simulated survival swimming tasks that included swimming in swimwear, when clothed, and when wearing a buoyancy vest.

Results of a pretest questionnaire suggested that, while many (76%) had not been formally taught exiting techniques, most participants (68–97%) could identify good and poor components of exiting techniques. Almost half (41%) reported that they had experienced difficulty when attempting to exit the water in their past aquatic activity. When asked to predict the ease or difficulty they might have in exiting the water, most were confident of their capacity to exit shallow (97%) and deep water (78%) with ease, but fewer thought they would do this with ease when wearing a buoyancy vest (65%) or in clothes (46%). Males were more confident about getting out of deep water with ease in clothes (males: 67%; females: 19%) or when wearing a buoyancy vest (males: 100%; females: 19%). When tested, however, only half of the males (51%) actually were able to exit deep water with ease after a 5-min swim; even fewer were able to after a 5-min swim in clothes (19%) or when wearing a buoyancy vest (45%). None could climb out with ease over the 0.41 m bulkhead after the clothed swim. This overestimation of aquatic competency by males is consistent with the findings of previous studies (Brenner, Saluja, & Smith, 2003; Gulliver & Begg, 2005; Howland, Hingson, Mangione, Bell & Bak, 1996; McCool, Moran., Ameratunga, & Robinson, 2008; Moran, 2008, 2011; Moran, Stallman et al., 2012; Moran & Stanley, 2013).

Table 6 Exiting Water Competency After 5 minutes Swimming in Buoyancy Vest

	Total		Male		Female		χ^2	*p*
Exit shallow water in a buoyancy vest after 5 min swim								
Not completed	-	-	-	-	-	-		
Completed with great difficulty	-	-	-	-	-	-		
Completed with difficulty	-	-	-	-	-	-		
Completed with slight difficulty	5	14.3%	1	5.0%	4	26.7%	3.286	0.070
Completed with ease	30	85.7%	19	95.0%	11	73.3%		
Exit deep water in a buoyancy vest after 5 min swim								
Not completed	-	-	-	-	-	-		
Completed with great difficulty	-	-	-	-	-	-		
Completed with difficulty	9	25.7%	1	5.0%	8	53.3%		
Completed with slight difficulty	10	28.6%	6	30.0%	4	26.7%	11.617	0.003*
Completed with ease	16	45.7%	13	65.0%	3	20.0%		
Exit deep water in a buoyancy vest over a 410 mm bulkhead after 5 min swim								
Not completed	17	48.6%	3	15.0%	14	93.3%		
Completed with great difficulty	2	5.7%	2	28.6%	-	-		
Completed with difficulty	4	11.4%	4	20.0%	-	-	21.282	0.001*
Completed with slight difficulty	9	25.7%	8	40.0%	1	6.7%		
Completed with ease	3	8.6%	3	15.0%	-	-		
Total	35	100%	20	100%	15	100%		

Note. *Significant at the 0.05 level.

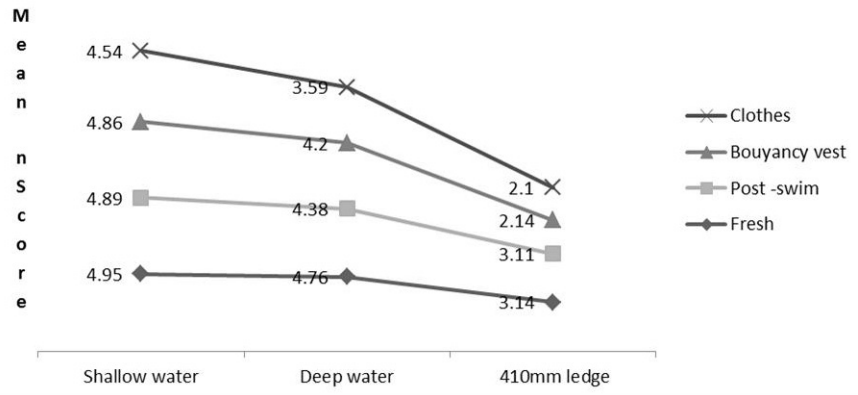

Figure 7 — Comparison of group mean scores for difficulty in getting out of the water.

The results of the exiting tests suggested that, with this group of aquatically competent and physically fit young adults, all participants coped with the demands of getting out of shallow water but many experienced progressively greater difficulty in getting out of deep water. The most demanding exit consisted of climbing out over a 0.41 m bulkhead after swimming in clothes for a period of 5 min after which no participant could exit with ease and more than one third (35%) failed to exit the water at all. While age and ethnicity did not appear to influence exit competency, significant differences were evident between males and females in all exits from deep water over the 0.41 m bulkhead, irrespective of pre-exit activity demands.

It is worth noting that swimming competency also did not appear to be a factor in successful exiting of the water, with very good female swimmers experiencing similar difficulties to their male and female counterparts of lesser swimming competency. This is surprising since one would expect that good female swimmers would possess the upper body strength required of the more demanding deep water exiting techniques. It is possible that superior upper body strength among the males in this group of fit, young adults accounted for these differences but further research is required to confirm/refute such speculation and to see if this is the case in other less physically capable populations.

The debilitating influence of wet clothing on deep water exits was especially noticeable and probably the consequence of the increased exertion during the strenuous swim before attempting to exit and/or the additional weight of wet clothing felt during the lifting phase of the exit. One possible outcome of this finding might be the suggested removal of clothing before attempting to climb out of the water, especially if the edge is not flush with the water level. This, however, may be contraindicated in cold conditions where hypothermia may be an issue or in extreme conditions where the energy cost and ease of removing clothing may increase risk of failure to survive drowning. As suggested by Golden and Tipton (2002), the issue of hand grip, dexterity, and the capacity to hold on is also likely to influence exiting competency in cold conditions. Further study of the effects of cold and the effect of various forms of attire (for example, different layers of clothing for summer/winter, with and without footwear) on attempting to exit the water will add to our understanding of the exit problem and make water safety and survival advice better informed.

The difficulty encountered by many in exiting the water wearing a buoyancy vest requires further investigation. It appeared that the bulk of the buoyancy vest restricted the lifting phase of the deep water exit over a 0.41 m ledge for many participants, both male and female, and irrespective of swimming proficiency. This raises an interesting question as to whether a buoyancy vest should be removed before attempting an exit of this nature in an emergency; the consequences of which would be lost buoyancy in the event of a failure to exit that may then exacerbate continued survival in the water. Further research of buoyancy vest exits in a variety of settings and with varied victim capabilities is required so as to determine what strategy to recommend.

Limitations

While the results of this study advance our understanding of the exit problem identified by Connolly (2014), several limitations merit consideration when planning further studies of the phenomenon and suggest caution when attempting to generalize the findings of this study to other situations and populations. First, the participants in the study were not representative of the general population because, as students of physical education, their water competency and levels of fitness were likely to be higher than the norm. Second, the sample size was small and the power of the findings requires further validation with larger samples. Third, because of timetable constraints and concurrent program demands, it was not possible to balance the order of the testing with/without clothing and with/without buoyancy vest to cancel out any learning/training effect. To reduce this possibility in future testing, it is advised that half of the participants undergo the tests with clothes first and buoyancy vests second, with the other half doing the reverse order. Fourth, because of the exploratory nature of the study, no observer objectivity statistics were calculated so future studies would be strengthened by the inclusion of such analyses. Fifth, measures of exiting competency were developed specifically for this study and content validated only by the author in conjunction with peer expert advice and observations of students not involved with the study in a pilot test before the commencement of the study. In addition, the reliability of the test was not assessed by test-retest pilot study and requires further scrutiny. Further validation of the measure developed by triangulation with other relevant indicators of physical exertion (such as upper body strength and power, body power-weight ratios) would further enhance our knowledge. Sixth, the exit activities and pre-exit swimming took place in the confines of a pool and thus did not wholly reflect the demands of exiting open water in a variety of more demanding environments (such as cold water, slippery ledges, underwater obstacles, swift currents, waves, darkness). Further studies involving different subpopulations and different environments will help address this limitation. These limitations notwithstanding, the results of this study suggest that ‘the exit problem’ poses a serious risk of drowning and further exploration of the phenomenon using similar but refined protocols is warranted.

Conclusions

I believe this to be the first study that has attempted to quantify the demands of getting out of the water, a factor that has been postulated as a cause of drowning after survival of the initial immersion and return to the water’s edge has been

accomplished (Connolly, 2014). Even in the relatively benign surrounds of a swimming pool, it was apparent that many of the swimmers in this study failed to exit deep water when confronted with a 0.41 m bulkhead. Furthermore, a series of progressively more challenging pre-exit swimming tasks exacerbated the exit problem even though many of the participants were physical fit and competent swimmers. Further research is required to determine the difficulties others such as children, youth, and adults may experience in getting out of the water, especially in a variety of open water settings.

Given the difficulties observed in this study that exiting deep water after performing simulated survival activities posed even for good swimmers, it would appear prudent to place greater emphasis on this aspect of water safety education. In addition, given the disparity between the preconceived ideas of how difficult getting out of deep water might be and the actual exiting tasks when tested, it would also seem prudent to promote teaching strategies that incorporate experience of simulated emergency scenarios (such as getting out on a slippery slope or onto an unstable boat/kayak) so that people are forewarned about potential dangers and are able to manage the life-threatening challenges associated with the exit problem more effectively.

References

Brenner, R.A., Saluja, G., & Smith, G.S. (2003). Swimming lessons, swimming ability and the risk of drowning. *Injury Control and Safety Promotion, 10*(4), 211–216. PubMed doi:10.1076/icsp.10.4.211.16775

Connolly, J. (2014). Drowning: The exit problem. *International Journal of Aquatic Research and Education, 8*(1), 73–97. doi:10.1123/ijare.2013-0029

Golden, F., & Tipton, M. (2002). *Essentials of sea survival*. Champaign, IL: Human Kinetics.

Gulliver, P., & Begg, D. (2005). Usual water-related behaviour and 'near-drowning' incidents in young adults. *Australian and New Zealand Journal of Public Health, 29*(3), 238–243. PubMed doi:10.1111/j.1467-842X.2005.tb00761.x

Howland, J., Hingson, R., Mangione, T.W., Bell, N., & Bak, S. (1996). Why are most drowning victims men? Sex differences in aquatic skills and behaviors. *American Journal of Public Health, 86,* 93–96. PubMed doi:10.2105/AJPH.86.1.93

Lifesaving Society Canada. (2011). *Teaching Swim for Life*. Ontario: RLSS Canada.

McCool, J.P., Moran, K., Ameratunga, S., & Robinson, E. (2008). New Zealand beachgoers' swimming behaviours, swimming abilities and perception of drowning risk. *International Journal of Aquatic Research and Education, 2*(1), 7–15.

Moran, K. (2011). (Young) Men behaving badly: Dangerous masculinities and the risk of drowning in aquatic leisure activities. *Annals of Leisure Research, 14*(2-3), 260–272. doi:10.1080/11745398.2011.615719

Moran, K. (2010). Risk of drowning: The iceberg phenomenon re-visited. *International Journal of Aquatic Research and Education, 4*(2), 115–126.

Moran, K. (2008). Will they sink or swim? New Zealand youth water safety knowledge and skills. *International Journal of Aquatic Research and Education, 2*(2), 114–127.

Moran, K., Stallman, R.K., Kjendlie, P-L., Dahl, D., Blitvich, J.D., Petrass, L.A., . . . Shimongata, S. (2012). Can you swim? Real and perceived water competency among young adults. *International Journal of Aquatic Research and Education, 6*(2), 122–135.

Moran, K., & Stanley, T. (2013). Readiness to rescue: Bystander perceptions of their capacity to respond in a drowning emergency. *International Journal of Aquatic Research and Education, 7*(4), 290–300.

National Water Safety Forum (UK). (December 2012). UK water-related fatalities 2011. Water Incident Database Report (WAID). Retrieved from http://www.nationalwatersafety.org.uk/waid/info/waid_fatalincidentreport_2011.pdf.

Royal Life Saving Society - Australia. (2013). *National Drowning Report 2013*. Retrieved from: http://www.royallifesaving.com.au/__data/assets/pdf_file/0003/9759/RLS_NationalDrowningReport_2013.pdf.

Royal Life Saving Society - Australia. (2012). *Swimming & Lifesaving: Water safety for all Australians* (6th ed.). Chatswood, New South Wales: Elsevier Australia.

Royal Life Saving Society – UK. (2012). *Lifesaving manual for instructors*. Lisburn, UK: RLSS.

Royal Society for the Prevention of Accidents (RoSPA). (2005). Suspected accidental drowning 2005. Retrieved from: http://www.rospa.com/leisuresafety/statistics/accidental-drownings-2005.aspx.

Water Safety New Zealand. (2013). *Drowning fact sheet. Activity – immersion incidents.* Wellington: WSNZ. Retrieved from: http://www.watersafety.org.nz/assets/PDFs/Drowning/2012-Fact-Sheets/Immersion-Incidents-2008-2012.pdf.