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Perceived and Real Water Competency and Drowning Risk Among Adults

Teresa Stanley
Drowning Prevention Auckland and University of Auckland, teresa.stanley@dpanz.org.nz

Kevin Moran
University of Auckland, Drowning Prevention Auckland, k.moran@auckland.ac.nz

Dawn Garbett
University of Auckland, d.garbett@auckland.ac.nz

Alan Ovens
University of Auckland, a.ovens@auckland.ac.nz

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Abstract

Traditionally, public understanding of drowning survival has focused on swimming capacity, often measured by how far a person can swim. With respect to the high incidence of adult drowning in high-income countries, using the more inclusive concept of water competency may yield a more comprehensive explanatory framework for understanding the reasons behind these drownings. Any competency base required to survive a drowning situation is dynamic, complex, and multi-faceted. Furthermore, perceptions of risk and capacity to cope with that risk are likely to be pivotal to the avoidance of drowning. Adults' perceived water competence was measured against their actual water competence in a pool environment. Adults were tested on their competence in entering and exiting water, floating, and swimming. Despite most adults (98%) being unable to swim more than 100 m in open water, more than half (59%) perceived themselves as good swimmers, and more than quarter (27%) thought they could swim more than 200 m at the post-survey. In conclusion, reality gaps were found in water competence among adult groups. Differences between perceived and actual competence suggest that many adults may underestimate the risk of drowning and overestimate their competency. This provides a plausible explanation as to why many adults drown.

Keywords: water competency, perceptions, drowning risk, adults

Introduction

Traditionally, water safety education to prevent drowning has focussed on the development of swimming skills. The inference of 'swim and survive' is that if one can swim, one can survive - that is, 'swim' equals 'safe' - which may not necessarily be the case. Unfortunately, no clear definition of what constitutes swimming proficiency in respect of drowning prevention has evolved. This lack of clarity has resulted in a confusion about not only what competencies are needed to stay safe, but also the level of competence required.

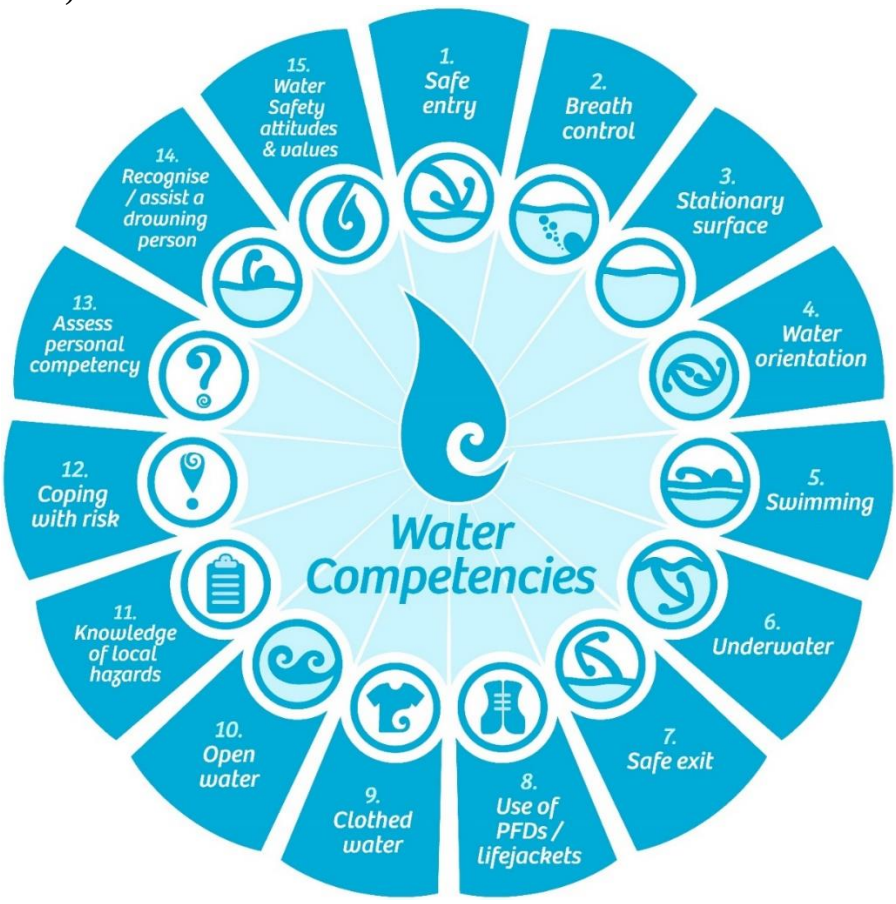
More recently it has become accepted that developing personal water competence is one of the initiatives successful in the prevention of drowning in open water environments (ILSF, 2007; Brenner et al., 2006; Bierens, 2006). In the context of drowning prevention, Moran (2013) defined water competence as "the sum of all personal aquatic movements that help prevent drowning, as well as the associated water safety knowledge, attitudes, and behaviours that facilitate safety in, on, and around water" (p. 4). This definition encompasses not only swimming competence, but also water survival skills such as floating, orientation, submersion, entering and exiting the water safely, and rescue skills, as well as the knowledge and critical thinking to enable safety in aquatic environments. Recent research by Stallman, Moran, Langendorfer, and Quan (2017) focussed on 15 evidence-based water competencies that underpin the prevention of drowning, as shown in Figure

1. The 15 competencies are adaptable to the activity or environment and each merits its inclusion based on the published research evidence documented in the paper. Competencies 1–10 are in the practical or psychomotor domain, competencies 11-14 are cognitive, and 15 is in the affective domain. Collectively they cover individual factors associated with Newell's constraints model (1986) of the interaction of the individual, the task, and the environment.

Stallman and colleagues (2017) argued for a more holistic promotion of water competence that not only includes practical swimming and water safety competencies, but also the knowledge and critical thinking required to enable safety in and around water environments. Each of the 15 unique competencies in Figure 1 required inclusion. Furthermore, water competence includes competence under varying conditions and being aware of mitigating risk factors in those environments.

Recent evidence about swimming competency has highlighted concerns not only around what swimming competency means, but also around the differences between real and perceived competency (Laakso & Stallman, 2011; Moran et al., 2012; Petrass et al., 2012; Stallman et al., 2010). Anecdotal evidence suggests that many open water drowning fatalities involve victims who are described post-incident as being good swimmers. Furthermore, rescue victims on current reality television series (e.g., Piha Rescue in New Zealand, Bondi Rescue in Australia) often describe themselves as good swimmers. Given that the thrust of many traditional drowning prevention programs is to improve the practical swimming competency of participants (often children in the first instance), the critical issue in drowning prevention is how good is good enough.

Figure 1
Water Competencies for Drowning Prevention (Drowning Prevention Auckland, 2019)



The reasons are unclear for differences between what people think they can do, and what they actually can do. The lack of an international measure to define swimming competency is suggested as one reason that people may have an exaggerated confidence in their swimming competence (Dixon & Bixler, 2007). Confusion in the terminology of what constitutes being able to swim may be one reason. This may be exacerbated if distance swum is the only criteria to define swimming competency. A further compounding issue is the recency or time elapsed since swimming competency was achieved and evaluated. Most people participate in aquatic lessons during their school years achieving swimming distances and other water competencies at that time of their lives. They may not be able to achieve those same competencies later in their lives without regular practice, but still they

perceive they have the capacity to perform their earlier competencies. The more often and recently one swims and completes other aquatic activities, the more likely it is that their perceived competence matches their actual competencies. The 'Can You Swim' international study (Moran et al., 2012; Petrass & Blitvich, 2014; Petrass et al., 2012; Queiroga et al., 2013; Costa et al., 2020) provides an understanding of what children and young adults think they can do in controlled water environments (e.g., pool), but there is a need to develop this knowledge into "open" or natural water environments and for high-risk populations such as adult males and some minority populations.

Despite the high rates of drowning among adults (WSNZ, 2022), much of this literature has a focus on child and youth population groups. Minimal literature is available on what adults can do in water. Previous research with adults, perceptions with parents of young children (Stanley & Moran 2017), high-risk ethnic minority groups (Stanley & Moran, 2018), and older adults (Stanley & Moran, 2021), highlighted overestimation of their perceived water competence. Little is known about how adults assess their personal water competency (Competency 13) and risk estimation (Competency 11) related to open water (Competency10).

This current study aims to inform the field of drowning prevention by adding to the understanding of the perceptions and reality of adult water competence. To achieve this, we set the following objectives:

- Determine self-perceived adult swimming, entry, exit, and floating competence,
- Determine actual adult swimming, entry, exit, and floating competence, and
- Determine adult self-estimated difficulty to perform competencies.

Method

This study used a cross-sectional design with self-completed written survey methodology and practical water-based competency assessment. Adult members from seven community groups or workplaces in a large urban center surrounded by easy access to beaches were invited to take part in the study during the 2017/18 summer and autumn. The workplace organizations completed an employer-sponsored two-day water safety program as part of a workplace health and safety initiative. These employees were from workplaces not consistently working in or around water. The groups from the community were ethnic minority groups who completed a program of eight to ten sessions held over several weeks. Both courses were taught by drowning prevention staff in various pools with accessible deep water, controlled and safe environments for testing purposes. The research activities for this study were included in both programs. Research ethics approval

was obtained from the appropriate ethics committee and each participant signed an informed consent before beginning activities.

Participants

A total of 63 adults from three workplace (n = 16) or four community (n = 47) organizations completed a pre- and post-self-completion written questionnaire during their water safety course. The water safety program that adults participated in covered extensive water safety knowledge including knowledge of local beach hazards and risk mitigation. The participants completed five practical water competencies in a swimming pool during a pool-based educational session.

Survey Instrument

The pre- and post-course questionnaires were designed to be completed in about 10 minutes at the beginning and end of each two-day course. The questionnaire consisted of 14 closed questions based on previously validated studies (McCool et. al., 2009; Moran, 2003, 2006, 2008a; Moran & Stanley, 2013). The first four questions assessed socio-demographic characteristics including gender, age (*15–19 years, 20-29 years, 30–44 years, 45-64 years, 65+ years*), self-identified ethnicity (*New Zealand European, Māori, Pasifika, Asian* and "*Other*" ethnic groups) and length of residency in New Zealand *(<1 year, 1-4 years, 5-9 years, >10 years*).

Twelve questions sought information on physical water competency by asking participants whether they could swim and, if so, how they would rate their swimming competency using four response categories (*poor, fair, good, very good*) and how far they estimated they could swim non-stop (Moran, 2003). Participants were asked to estimate how long they thought they could swim non-stop *(less than one minute, less than five minutes, less than 15 minutes, less than one hour, more than one hour*). In addition, information was sought on when and where they had swum the estimated distance (*last month, last year, last 5 years, last 10 years*), how easily they thought they could swim the distance estimated in open water (*very easily, easily, with difficulty, with great difficulty*), and how often they swam in open water (*daily, weekly, about once a month, less than once a month, never*). Participants were asked: if they could float; if so, how they rated their floating competency using four response categories (*poor, fair, good, very good*); how long they estimated they could float non-stop (*less than one minute, less than five minutes, less than 15 minutes, less than one hour, more than one hour*); if they thought they could float that long in open water; and, if so, how easily (*very easily, easily, with difficulty, with great difficulty*).

Finally, Borg's Rating of Perceived Exertion (RPE) (1998) was used to determine the exertion expected (pre) or actual (post) to complete five practical skills. A modified version of the RPE previously developed for water safety studies

on clothing effects on competency (Moran 2014a, 2015) used a 15-point scale (6-20) that included exertion categories from *very, very light* (6-7), *very light* (8-10), *fairly light* (11-12), *somewhat hard* (13-14), *hard* (15-16), *very hard* (17-18), and *very, very hard* (19-20).

Practical Testing

Five practical skills were chosen to elicit a level of water competency amongst the adults - deep-water entry, deep-water exit, fast 25 m swim, five-minute float, and a five-minute swim.

The entry and exit were rated on a scale of 1–4 as follows: *did not complete; completed with poor form; completed with good form;* and *completed with excellent form.* The form was graded by the researcher with poor being assessed as either incorrect form or completed with great difficulty, good was assessed as able to complete correctly with some difficulty, and excellent form was correctly performed with ease. Participants were instructed on safe and unsafe types of entry. The 25 m swim was rated for time swum non-stop with no stroke or speed specified (time achieved assessed on a 3-point scale): 1, *more than 1 min*; 2, *between 30-60 sec*; 3, *less than 30 sec*). The stationary float was completed in deep water, with participants instructed to have minimal swimming motion, timed on a 4-point scale: 1, *less than 15 sec*; 2, *15-59 sec*; 3, *1 - 5 min*; 4, *more than 5 min*. The distance swim was completed non-stop in five minutes with no stroke or speed specified (distance achieved assessed on a 3-point scale): 1, *less than 25 m*; 2, *26- 100 m*; 3, *more than 100 m*.

Pilot Study

A pilot study involving 38 employees from five workplaces with working environments in or around water was completed prior to the study. All participants were experienced and confident in and around water, and thus not representative of the normal adult population in terms of water competence. Participants reported high levels of self-estimated swimming, floating and rescue competence, and testing in a pool confirmed this. Just over half the group could swim 200 m in five minutes and were largely proficient in entries and exits. This present study repeated the pilot study with three key improvements. The first change was to increase the sample size. The second was to ensure participants who were more reflective of the adult drowning data, which in New Zealand is one-third (30%) Māori or Pasifika and predominantly adult (90%) males (80%) (Water Safety New Zealand, 2020a). Finally, minor amendments in layout and clarification of questions were made to the pre- and post-course surveys to improve the data collected.

Data Analysis

All data were entered anonymized into SPSS Statistics Version 25 (Armonk, NY, USA) for statistical analysis. All four components of the research were matched to each individual participant. Frequencies and percentages were generated to report categorical variables such as demographic data and perceptions of competence and risk. Chi-square tests were used to determine any association between dependent variables (such as perceived swimming competency and risk) and independent variables (such as gender, age group, and ethnicity) with statistical significance reported when $p < 0.05$. Where multiple responses were included (for example, swimming and floating competency), results were dichotomized for ease of interpretation with *poor* and *fair* grouped as *poor/fair* and *good* and *very good* grouped as *good/very good*. Paired sample *t*-tests were undertaken to compare pre- and post-activity results.

Results

Demographics

Seven groups with a total of 63 participants completed the study as part of a water safety education program, of whom most (71%, *n* = 45) were male. One-quarter identified as NZ European (22%, *n* = 14) and Māori (25%, *n* = 16). Almost one-half of the participants identified as Pasifika (44%, *n* = 28) and a small group identified with other ethnicities from Australia, Europe, and South America (8%, *n* = 5). Over one-third of participants were aged 16-19 years (40%, *n* = 25), then age groups were evenly spread throughout the working age population (20-29 years 22% (*n* = 14), 30-44 years 19% (*n* = 12), 45-64 years 17% (*n* = 11), over 65 years 2% (*n* = 1). Most (91%, *n* = 57) had lived in New Zealand all their lives (68%, *n* = 43), or for more than 10 years (22%, *n* = 14).

Perceptions of Swimming and Flotation Competence

Almost all participants (98%, *n* = 62) believed they could swim. In the pre-course survey, more than half (54%, *n* = 34), believed they were *good/very good* swimmers, and one-quarter estimated they could swim more than 200 m non-stop (22%, *n* = 14) and swim longer than 15 minutes (25%, *n* = 16). Three-quarters (73%, *n* = 45) had swum the distance in the past year and most (79%, *n* = 50) had swum the distance in open water. After testing, slightly fewer participants (94%, *n* = 59) responded they could swim, although slightly more perceived themselves as *good/very good* swimmers (63%, *n* = 38). More thought they could swim farther than 200 m (29%, *n* = 18) and could swim longer than 15 minutes (34%, *n* = 21). The pre- and post- paired sample *t*-test, in Table 1, shows the significant improvement reported in the means for estimated swimming distance.

In the pre-course survey, most participants (91%, *n* = 57) believed they could float. Of those, one-third (36%, *n* = 21) believed they could float *easily/very*

easily and two-thirds (71%, n = 42) thought they could float for more than five minutes. At the end of the testing, slightly fewer (84%, n = 53) believed they could float, and more participants were more confident in their level of floating competence (66%, n = 35 reported being able to float *easily/very easily).* Fewer participants thought they could float for more than five minutes (62%, n = 35). The means test (Table 1) shows a significant increase in perceived open water floating competence.

Chi-square tests were undertaken to compare differences based on gender, ethnicity, age group, or residency with perception in competence before and after the testing (Table 2). Pre-activity males were significantly more likely than females to: perceive that they could swim well (males 64%, vs. females 29%; $\chi2(1) = 6.958$, $p = 0.008$); report that they had swum in open water (males 91%, vs. females 50%; $\chi2(1) = 13.269$, $p \leq 0.001$), and that they could float (males 96%, vs. females 78%; $\chi2(1) = 4.716$, $p = 0.030$). Males were less likely to report they could swim for less than one minute (males 33%, vs. females 67%; $\chi2(2) = 6.813$, $p = 0.033$). At post-activity, males were still significantly more likely than females to estimate they could swim well (males 75%, vs. females 31%; $\chi2(1) = 9.671$, $p = 0.002$).

When analysed by ethnicity (Table 2), pre-activity Māori and Pasifika were significantly more likely than New Zealand European to estimate they could swim for less than one minute (Māori and Pasifika 59%, vs. New Zealand European 7%; $\chi2(4) = 20.926$, $p \leq 0.001$) and less than 25 m (Māori and Pasifika 52%, vs. New Zealand European 14%; $\chi2(4) = 12.546$, $p = 0.014$). Post-activity Māori and Pasifika adults were still more likely to perceive they could swim for less than one minute (Māori and Pasifika 41%, vs. New Zealand European 7%) and less than 25 m (Māori and Pasifika 33%, vs. New Zealand European 5%). Analysis by ethnicity showed no statistical differences for floating competency, or across all parameters when analysed by age group or residency.

Actual Water Competencies (Entry, Exit, Flotation, Fast and Slow Swim)

Five water competencies were tested with results shown in Table 3. One-fifth of participants could either not complete or completed the deep-water entry with poor form in the pool (22%). Almost one-half (47%) could complete the deep-water entry with excellent form. There was no statistical difference for entry competence when analysed by gender or ethnicity.

Table 1 *Pre- and Post-Activity Perceived Swimming and Floating Competency by Gender and Ethnicity*

Water Competencies	Male *n* %	Female *n* %	NZ European *n* %	Māori/ Pasifika *n* %	Total *n* %
Estimate swim *well/very well*					
Pre-activity	29 64.4%*	5 27.8%*	8 57.1%	22 50.0%	34 54.0%
Post-activity	33 86.8%*	5 13.2%*	8 57.1%	25 61.0%	38 63.3%
Estimate swimming time (>1min)					
Pre-activity	15 33.3%*	12 66.7%*	1 7.1%*	26 59.1%*	27 42.9%
Post-activity	12 26.7%	6 37.5%	1 7.1%*	17 40.5%*	18 29.5%
Estimated swimming distance* (>25m)					
Pre-activity*	14 31.1%	11 44.0%	2 14.3%*	23 52.3%*	25 39.7%
Post-activity	8 17.8%	7 41.2%	1 7.1%	14 32.6%	15 24.2%
Estimate can float					
Pre-activity	43 95.6%*	14 77.8%*	12 85.7%	40 90.9%	57 90.5%
Post-activity	38 84.4%	15 83.3%	12 85.7%	37 84.1%	53 84.1%

*Significant differences

Table 2 *Actual Water Competency in Closed Water by Gender*

	Male (n = 45)		**Female (n = 18)**		**Total**	
	n	***%***	***n***	***%***	***n***	***%***
Deep-water Entry						
Did not complete	0	0%	2	11.1%	2	3.2%
Poor form	10	22.2%	2	11.1%	12	19.0%
Good form	14	31.1%	6	33.3%	20	31.7%
Excellent form	21	46.7%	8	44.4%	29	46.0%
Deep-water Exit*						
Did not complete	4	8.9%	6	33.3%	10	15.9%
Poor form	5	11.1%	2	11.1%	7	11.1%
Good form	11	24.4%	8	44.4%	19	30.2%
Excellent form	25	55.6%	2	11.1%	27	42.9%
Stationary Float*						
Less than 15 seconds	12	26.7%	6	33.3%	18	28.6%
15 seconds – 1 minute	18	40.0%	2	11.1%	20	31.7%
1 - 5 minutes	15	33.3%	9	50.0%	24	38.1%
More than 5 minutes	0	0%	1	5.6%	1	1.6%
25m Fast Swim						
Less than 30 seconds	7	15.5%	1	5.6%	8	12.7%
30 – 60 seconds	30	66.7%	10	55.5%	40	63.5%
More than 1 minute	8	17.8%	7	38.9%	15	23.8%
5-minute Swim						
Up to 25 m	5	11.1%	5	27.8%	10	15.9%
26 – 100 m	36	80.0%	13	72.2%	49	77.8%
101 – 200 m	4	8.9%	0	0%	4	6.3%

*Significant differences by gender

Almost one-half of participants could exit deep water with excellent form (49%), 16% could not exit a pool from deep water. Males reported significantly better proficiency than females in the deep-water exits being more likely to perform a deep-water exit with excellent form (males 56%, vs. females 11%; $\chi 2(3) = 12.471$, $p = 0.006$). Females were significantly more likely to not be able to exit (females 33%, vs. males 9%). There were no differences when analysed by ethnicity.

Almost one-third (29%) could not float for more than 15 seconds and two-thirds (60%) for not more than one minute. When analysed by gender, although not significant, males were more likely than females to be unable to float for more than one minute ($\chi 2(3) = 7.017$, $p = 0.071$; males 67%, vs. females 44%). No ethnicity differences in floating competence were recorded.

Most participants (64%) completed the 25 m fast swim in 30-60 seconds. One-quarter (24%) took longer than one minute to complete 25 m. No statistical differences were found when analysed by gender; however, Māori and Pasifika adults were more likely to take longer than one minute to complete 25 m (Māori and Pasifika 30%, $n = 13$) as compared with New Zealand Europeans (14%, $n = 2$) ($\chi 2(4) = 13.602$, $p = 0.009$).

None of the adults could swim more than 200 m continuously in five minutes. Only four participants (7%) could swim more than 100 m. Most participants (78%) could swim between 26 m and 100 m continuously in five minutes. No significant gender differences were evident. Ethnicity analysis reported Māori and Pasifika ethnicities as being more likely to swim less than 25 m (Māori and Pasifika 23%, $n = 10$, vs. New Zealand European 0%, $n = 0$) ($\chi 2(4) = 17.736$, $p = 0.001$).

Borg's Test for Expected and Actual Exertion to Complete Activities

Borg's RPE scale was used to estimate expected (pre-course survey) and actual (post-course survey) exertion required to complete each of the five practical activities (Table 3). For ease of analysis, the top four grades reported (6-12) were divided into 'easy' and the bottom four (12-20) into 'hard'. Most participants rated both expected exertion levels (53% - 94%) and actual exertion levels (68% - 90%) as 'easy'.

A paired sample *t*-test was completed to determine any changes in the expected difficulty to undertake each task in the pre-activity survey and the actual exertion experienced reported in the post-activity survey. Significantly more thought it easier to swim 25 m in a pool post-activity (t (62) = 2.555, $p = 0.013$). No other significant statistical differences were evident.

Table 3 *Estimated Self-Competence Reported as 'Confident' by Gender*

		Male (n = 45)		**Female (n = 18)**		**Total**	
		n	***%***	***n***	***%***	***n***	***%***
Deep-water entry - pool	Pre	38	84%	15	83%	53	84%
	Post	42	93%	15	83%	57	91%
Deep-water entry – open water	Pre	34	76%	13	72%	47	75%
	Post	40	89%	14	78%	54	86%
Deep-water exit - pool	Pre	38	84%	15	83%	53	84%
	Post*	41	91%	11	61%	52	83%
Deep-water exit – open water	Pre	34	76%	12	67%	46	73%
	Post*	37	82%	8	44%	45	71%
Swim 25 m fast - pool	Pre	29	64%	8	44%	37	59%
	Post*	38	84%	11	61%	49	78%
Swim 25 m fast – open water	Pre*	30	67%	7	39%	37	59%
	Post*	35	78%	9	50%	44	70%
Float 5 minutes - pool	Pre	33	73%	14	78%	47	75%
	Post	37	82%	14	78%	51	81%
Float 5 minutes – open water	Pre	34	76%	12	67%	65	73%
	Post	38	84%	13	72%	51	81%
Swim 5 minutes - pool	Pre	29	64%	10	56%	39	62%
	Post	35	78%	13	72%	48	76%
Swim 5 minutes - open water	Pre	27	60%	7	39%	34	54%
	Post*	34	76%	9	50%	43	68%

*Significant differences

When analysed by gender, no pre-activity statistical differences were observed. Post-testing reported significant variances by gender for the deep-water exit ($\chi 2(1) = 8.029$, $p = 0.005$) and the 25 m fast swim pool ($\chi 2(1) = 4.050$, $p = 0.044$). No differences in expected or actual exertion for the activities by ethnicity were reported.

Discussion

The purpose of this study was to determine if there were any gaps between perceived and actual water competencies in a closed (swimming pool) environment. To enable this, adult participants were asked what their perceptions were of their own practical water competency and then tested on five water competencies. Finally, after the activity in the pool, they were asked again what their perceptions were about their water competency.

An important finding from this research is the relatively poor physical swimming and floating water competencies displayed by the adults enrolled in the study. Most participants could not swim more than 100 m in five minutes in a pool (94%) or float for more than one minute in a pool (60%). Furthermore, although significantly more thought it easier than expected to swim 25 m in a pool, one-quarter (24%) took longer than one minute to complete a 25 m fast swim, a competency that could be required when escaping from a sinking boat or exiting from a rip current. It is also lower than that suggested for an American Red Cross 'water competency' definition to enter closed, deep-water environments, from a study of 1,024 adults (Quan et al., 2015). The level suggested for 'water competency' included a one-minute float as well as 25 m propulsion on back or front. It was also recognized that this level of competence may not transfer to other tasks and environmental contexts. The level of swimming and floating competencies displayed in this study is unlikely to provide protection in high-risk open water situations such as floating to wait for assistance or swimming to a safe exit point.

Participants in this study identified predominantly with minority ethnic groups (69% Māori or Pasifika). An earlier study on self-estimations of water competency of 194 Māori or Pasifika adults (Stanley & Moran, 2018) identified lower socio-economic status as a contributing reason for lower levels of estimated swimming competence. Māori and Pasifika may not have had the opportunity to attend formal swimming lessons and are less likely to participate in aquatic sport or recreation. Lower swimming and floating competence may be one reason why Māori and Pasifika are overrepresented in New Zealand drowning statistics.

Despite the very low swimming competence recorded, most participants (63%) in this study still perceived themselves as proficient swimmers after the

testing, suggesting an anomaly between what adults perceive as a proficient swimmer. In addition, post-activity more participants perceived they could swim longer, and significantly more thought they could swim further than they perceived initially, estimating they could swim more than 200 m regardless of no participants being able to do so in the 5-minute test period. Males were significantly more likely than females to perceive they could swim well both pre- and post-activity, and more likely to report they could swim further. Previous studies of adult perceptions among parents with young children (Stanley & Moran 2017), adults from high-risk ethnic minority groups (Stanley & Moran, 2018) and older adults (Stanley & Moran, 2021) reported similar overestimation in competence. This gap between their perceived and actual swimming competence is likely to be problematic in preventing drowning and may be one of the reasons for overrepresentation of some groups in drowning among adults.

Floating competence was another activity where participants were significantly more inclined to report improvement post-activity. A further gap between perception and reality was demonstrated in floating competence where two-thirds (62%) of participants believed they could float for more than five minutes despite most (98%) being unable to do so.

Being able to enter and exit water to a safe exit point are key competencies to prevent drowning. Most participants in this study were able to enter the water with *good* or *excellent* form in the pool (78%) with many lower scores due to unsafe entry rather than inability to enter the water. It is concerning that one-sixth (16%) of participants were unable to exit the water at all. These results are not dissimilar to a study of youth exiting the water, where one-quarter were unable to exit the deep end of a pool (Moran, 2014b).

Over one-half of the participants in this study expected and reported both the entries and exits to be easy to complete with low exertion. One-sixth of participants were unable to exit the water, highlighting a further gap between perceived and real competence. Females were almost three times less likely than males to be able to exit the water. Moran (2014b) provided evidence that exiting competence does not appear to be related to swimming or floating competence, those who may be able to exit proficiently may not be competent swimmers or floaters. These results also indicate factors other than water competence, such as poorer upper body strength to weight ratio, may influence competence in exiting the water.

Results from this study showed significant disparities when analyzed by gender, supporting previous literature of greater male overestimation of competence (Moran, 2009, 2010; Stanley & Moran, 2017, 2018) and

underestimation of risk (Gulliver & Begg, 2005; Moran 2006; Smith & Brenner, 1995) as key factors in the overrepresentation of males in drowning statistics (Water Safety New Zealand, 2022; World Health Organization, 2014). This study, however, shows reasons that drowning may also be related to their understanding of their own proficiency in water competence.

Limitations

This study provided valuable evidence of gaps between perceived and actual water competencies and sheds new light on why some are at greater risk of drowning than others. There are, however, some limitations in the study that suggest caution in reading these results.

First, because the participants were selected from courses aimed at adults participating in workplace or community drowning prevention education, Māori and Pasifika ethnicities and males are over-represented in the study. In addition, the study did not include high-risk older adults. We recommend further research be conducted with this older age group. Second, because participants were part of a workplace or community group enrolled in a water safety program, it is possible that their interest in water safety was not representative of adults generally, and their willingness to take part in the research may have introduced a response bias. Thirdly, swimming, floating, entry and exit competencies were the only physical water competencies included in the study; it is recommended other physical competencies for drowning prevention be included, such as submerging, and wearing clothes (Moran 2014, 2015) or lifejackets (Moran, 2019a, 2019b, Stallman et al., 2017). Finally, all water competencies were tested in a pool, it is recommended that further testing be undertaken in open water where most fatal and non-fatal drowning occurs.

Conclusion

This study shows a disparity between what adults think about their risk of drowning and how well they can cope with that risk. To the authors' knowledge, it is the first study where adults, predominantly high-risk males and minority ethnic groups, have been asked about their perceived water competence and then tested in-water.

Almost all adults were assessed with very low levels of water competence, especially in the floating, swimming and exiting water competencies. The performance levels recorded in this study were lower than other studies of adults and would not meet the levels recommended for children by the end of primary school (Royal Life Saving Society Australia, 2015; Water Safety New Zealand, 2020b), and would not be likely to provide much protection from drowning, especially in open water. Despite these low levels of personal practical water competence, most perceived themselves as proficient, with an even higher

perceived competency after the testing, highlighting a discrepancy between what they believe is proficient, and what competency is required to be safe in water.

This study has developed new insights on the gap between what adults think they can do and what they actually can do in coping with drowning risk. Most adults overestimated their water competence. The gap was greater for males and minority groups, supporting the supposition that the greater the gap between reality and perception, the greater the risk of drowning since males and ethnic minority people are at greatest risk. We recommend that further in-water studies be completed in open water to determine whether discrepancies between perceived and actual water competence in open water settings are exacerbated by similar or other factors.

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