International Journal of Aquatic Research and Education

Volume 6 | Number 2 Article 5

5-1-2012

# Can You Swim? Self-Report and Actual Swimming Competence Among Young Adults in Ballarat, Australia

Lauren A. Petrass
*University of Ballarat*, l.petrass@federation.edu.au

Jennifer D. Blitvich
*University of Ballarat*

G. Keith McElroy
*University of Ballarat*

Jack Harvey
*University of Ballarat*

Kevin Moran
*The University of Auckland*



## Recommended Citation

Petrass, Lauren A.; Blitvich, Jennifer D.; McElroy, G. Keith; Harvey, Jack; and Moran, Kevin (2012) "Can You Swim? Self-Report and Actual Swimming Competence Among Young Adults in Ballarat, Australia," *International Journal of Aquatic Research and Education*: Vol. 6: No. 2, Article 5.
DOI: https://doi.org/10.25035/ijare.06.02.05
Available at: https://scholarworks.bgsu.edu/ijare/vol6/iss2/5

*International Journal of Aquatic Research and Education,* 2012, 6, 136-148


# Can You Swim? Self-Report and Actual Swimming Competence Among Young Adults in Ballarat, Australia

**Lauren A. Petrass, Jennifer D. Blitvich, G. Keith McElroy, Jack Harvey, and Kevin Moran**

This paper reports the Australian findings in an international study comparing self-reported and actual swimming and aquatic skills of young adults. Physical Education and Sports Sciences students ($n = 263$) completed the "Can You Swim?" self-report survey and practical skills assessment, unaware that the practical tests replicated survey items. Relationships for comparisons between practical tests and their matched survey item were weak, indicating participants had inaccurate perceptions of their own swimming skills. Typically, they underestimated their competence in terms of distance and fundamental aquatic skills. Understanding of what constitutes different levels of swimming ability was poor; for example, most participants identified as average or good to excellent swimmers, but more than half of self-identified average swimmers and 20% of good to excellent swimmers estimated they could complete < 100 m of continuous swimming. The implications of study findings for drowning prevention and the need for further research are discussed.

**Keywords:** Swimming competence, water competency, drowning prevention, water safety

Drowning is a significant cause of unintentional death in Australia, and although a reduction has been observed in absolute numbers and per-capita risk of drowning in past decades (Mackie, 1999; Royal Life Saving Society Australia [RLSSA], 2008), recent drowning reports indicate that unintentional drowning deaths have increased 20.7% over the previous three years (RLSSA, 2009; 2010; 2011). Between July 1st 2010 and June 30th 2011, there were 315 drowning deaths in Australian waterways, the highest number for the last eight years (RLSSA, 2011). Young adults (aged 15–34 years) accounted for 27.0% of these deaths, with common locations including beaches; rivers; creeks or streams; and lakes, dams, or lagoons (RLSSA, 2011).

As in Australia, drowning has also been identified as a leading cause of death for young people in other high income countries (HIC), including the United States

Lauren Petress, Jennifer Blitvich, G. Keith McElroy and Jack Harvery are with the University of Ballarat, Health Sciences, Ballarat, Victoria, Australia. Kevin Moran is with the University of Auckland, Faculty of Education in Auckland, New Zealand.

(Quan & Cummings, 2003; Saluja et al., 2006), Canada (Canadian Red Cross, 2005; Weir, 2000) and New Zealand (Langley, Warner, Smith, & Wright, 2001; Moran, 2008). Among young adults, injury, and in particular drowning, is costly to the community through productive years lost, death, and disability (Witman, 2008). Accordingly, the Australian Water Safety Council (Australian Water Safety Council, 2008) has identified young adults aged 18–34 years as one of three key priority areas for drowning prevention. This is consistent with other high income countries, where males in late adolescence have been identified as a high risk group for drowning (Canadian Red Cross, 2005; Langley et al., 2001; Smith & Brenner, 1995).

Aquatic studies have identified several risk factors for this age group, including gender (Australian Water Safety Council, 2008; RLSSA, 2010), alcohol consumption in or around aquatic environments (Driscoll, Harrison, & Steenkamp, 2004; Quan, Bennett, & Branche, 2007; Taneja, Van Beeck, & Brenner, 2008), and risk taking behavior (Morgan, Ozanne-Smith, & Triggs, 2009), particularly in young males (Howland, Hingson, Mangione, Bell, & Bak, 1996; Moran, 2011). There is contention regarding the effectiveness of swimming and water safety lessons in reducing drowning-related mortality and morbidity and for youth, to date, this has not been evaluated (Brenner, Saluja, & Smith, 2003), nor has the level of swimming skill necessary to prevent drowning been established (Langendorfer, 2008).

Recently, a number of studies have considered self-reported swimming competency as a risk factor for drowning (Gulliver & Begg, 2005; Howland et al., 1996; Mael, 1995; Moran, 2008); however, confirmation of self-report against actual skill level has not occurred because of the difficulty in objectively evaluating actual swimming competency. While the value of self-reported health behavior has been challenged (Mickalide, 1997; Nelson, 1996; Robertson, 1992), aquatic studies that have considered self-reported swimming competency have consistently illustrated that, compared with females, males report higher levels of swimming proficiency (McCool, Moran, Ameratunga, & Robinson, 2008; Moran, 2008; Morgan, Ozanne-Smith, & Triggs, 2008) and underestimate risks associated with aquatic environments (Brenner et al., 2003; Howland et al., 1996; McCool et al., 2008; Moran, 2006). Because there is a dearth of research that objectively measures actual swimming competence, further research is required to confirm whether the higher level of swimming proficiency reported by males is based on their actual swimming competence or their overestimation of skill level. It is also important to determine whether an overly optimistic view is likely to increase drowning risk.

This study therefore aimed to (a) examine the relationship between self-reported and actual swimming skills among young adults, (b) determine whether this relationship differs between males and females, and (c) ascertain whether swimming experience impacts on this relationship.

# Method

## Participants and Procedure

First year Bachelor of Education (Physical Education) and Bachelor of Exercise and Sport Science students were invited to participate in the "Can You Swim?" study over 2009/2010. Participants completed a survey form and were tested before

the commencement or during the first sessions of the Swimming and Water Safety course in their undergraduate degree. To ensure that content acquired in this course did not influence study results, participants completed the survey before their first swimming class. In an attempt to further minimize response bias, participants were not informed that the practical test items that they would undertake later replicated the swimming items on the survey.

Following the completion of the self-report survey, all practical items were assessed in the initial Swimming and Water Safety classes before the specific skills being introduced in class. For several sessions, one or two practical test items were assessed at the beginning of each session, with testing taking approximately 10–15 min each time. The study received approval from the University Human Research Ethics Committee and voluntary signed consent was obtained from all participants before completion of the survey and practical swim assessment.

## Instruments

Data were collected via the "Can You Swim?" self-report survey and through observation of participants completing the "Can You Swim?" practical swimming tests. Both the "Can You Swim?" self-report survey and practical test procedures were based on instruments developed for a similar study in New Zealand that examined the water competency of beginner physical education students at the University of Auckland (Moran, 2010). To date, neither validity nor reliability data have been published for the complete "Can You Swim?" survey, although validity (of two questions) and reliability (of one question) were reported in a PhD study (Moran, 2006).

In this study, the "Can You Swim?" self-report survey was modified slightly from the New Zealand version. One demographic question was altered for relevance to the Australian population, and an additional section (part B) was added to determine the swimming and water safety experience and qualifications held by participants. The remaining questions were almost identical to those used in the original survey, with only minor changes made to question wording.

Part A of the modified "Can You Swim?" survey comprised 20 questions designed to provide insight into the self-reported swimming competence of participants for a variety of swimming and water safety skills (for example, How would you describe your ability to swim compared with others like you? Could you swim 100 m nonstop on your back? Could you perform a safe dive into water in the deep end of the pool?). Part B contained two questions to determine the level of swimming and water safety experience (Have you completed swimming lessons or been involved in school or squad swimming?) and aquatic qualifications (for example, Have you had rescue/lifeguard training? If yes, please indicate all qualifications and year completed.). The introduction included instructions informing participants not to consult with others and not to take too long to answer the questions as the first response is usually the most accurate. It also advised participants to ask the survey administrator if they had any questions.

To establish content validity, the "Can You Swim?" survey was reviewed by four Australian experts in the field of swimming and water safety. As changes proposed to the original survey were minor, a small sample of experts was deemed sufficient. Some minor changes were made in response to feedback before the final survey administration.

Test-retest reliability was also assessed before survey administration to determine the stability of item responses. A group of 21 young adults (aged 18–24 years) similar to the study participant group was invited to complete the "Can You Swim?" survey on two occasions one week apart to determine test-retest reliability. A relatively short interval such as one week increases the likelihood that response differences are due to random instrument error rather than true changes in participant behavior (Anastasi & Urbina, 1997; Pedhazur & Pedhazur-Schmelkin, 1991).

To enable the relationship between self-report and actual swimming skills to be determined, the practical skills assessments, which consisted of six skills that addressed individual swimming, survival, and rescue skills, corresponded to the "Can You Swim?" self-report survey items. The selected aquatic skills are considered fundamental to swimming and water safety programs (RLSSA, 2004). They included a continuous swim of up to 425 m (participant choice of stroke, no speed requirement); a 100 m swim on the back; floating, with minimal swimming action (up to 10 min); an underwater swim (up to 25 m); and a dive entry (into 2 m water depth). A 25 m contact rescue of a simulated unconscious person and a surface dive (to 2 m depth) were performed by participants but are not reported in this paper. Standardized instructions for each practical test ensured all participants received the same information. For further details of the practical test items, see Moran et al. (2012) appearing in this same issue.

For consistency in the assessment of practical skills, three experienced water safety researchers developed specific criteria for each practical test item. Initially, the three researchers and an honors student assessed a small number of participants ($n = 5$) using the set criteria and independently observed and scored the skills. Scores were then moderated between the four testers to determine a final score. Following the same procedure, assessment of further participants ($n = 28$) was conducted by two researchers and the honors student. Once consistency was established, the remaining participants were assessed by one of the two researchers following the set criteria.

## Data Analysis

A Microsoft ACCESS database was developed for data entry. All reliability data were manually entered into the ACCESS database on two separate occasions and exported to Microsoft Excel for data cleaning. Cleaned reliability data were then transferred to PASW Version 18 for data analysis. Kappa statistics ($\kappa$) were used to confirm the reliability of nominal survey questions while weighted Kappa statistics ($\kappa_W^2$) were used to confirm the reliability of ordinal survey questions. After establishment of validity and reliability, all self-report surveys and corresponding practical assessment results from the larger study group were subject to the same data entry and cleaning process in preparation for analysis.

The association between self-reported and actual swimming competence was determined using the Somer's $d$ statistic. This is an asymmetrical index of the association between two ordered nonparametric variables—a predictor variable, $x$ (in this case self-reported skill) and a predicted variable, $y$ (observed skill)—with range from –1 to +1. The extremes reflect a perfect association, and the value 0 indicates an absence of association (Siegel & Castellan, 1988). To interpret the strength of the associations, descriptive categories assigned by de Vaus (2002) were used: $d =$ 0.01–0.09, trivial/no association; $d = 0.10$–$0.29$, low to moderate; $d = 0.30$–$0.49$,

https://scholarworks.bgsu.edu/ijare/vol6/iss2/5
DOI: https://doi.org/10.25035/ijare.06.02.05

moderate to substantial; $d = 0.50–0.69$, substantial to very strong; $d = 0.70–0.89$, very strong; and $d = 0.90–0.99$, near perfect association.

The McNemar-Bowker test was used to investigate differences between self-reported and actual swimming skill. The McNemar-Bowker test is considered appropriate where both variables are categorized in exactly the same way. Accordingly, this test was fitting for the analysis between self-reported number of laps and the continuous swim practical assessment as both variables were categorized as *cannot swim or completes less than 100 m*, *completes between 101–300 m*, and *completes between 301–450m continuously*.

## Results

With regard to reliability, kappa ($\kappa$) or weighted kappa ($\kappa_W^2$) values ranged from 0.59 to 1.00 for questions where statistics were calculated. For two questions, a value could not to be calculated, as on one occasion for each question, values were constant for all participants in which case kappa is indeterminate. Of the remaining questions, test-retest reliability indicated near perfect agreement ($\kappa$ or $\kappa_W^2 = 0.81–1.00$) for 11 (50%) questions, substantial agreement ($\kappa$ or $\kappa_W^2 = 0.61–0.80$) for eight (36%), while one question had moderate agreement ($\kappa$ or $\kappa_W^2 = 0.41–0.60$; Landis & Koch, 1977). Thus, the results of the test-retest reliability demonstrated that the survey questions were reliable.

Survey respondents ($n = 263$) also completed the practical testing. These participants were aged between 17–19 years (75.4%) or 20–24 years (24.6%) and 54% were male. More than half (59.3%) reported that they had completed formal swimming and water safety lessons (defined as participation in a swimming and water safety program outside of school) with females slightly more likely to have completed lessons (64.1% and 55.3% for females and males, respectively). The majority reported commencing swimming lessons between the age of 6 months and 5 years (48.3%) or between 6 and 10 years (46.1%), while very few commenced lessons between 11 and 19 years (5.6%). Half (50.4%) of these participants, however, undertook lessons for ≤ 1 year only and very few participants (9.8%) completed > 3 years. The remaining participants reported taking part in formal swimming lessons for > 1–2 years (28.3%) or > 2–3 years (11.5%). A majority (58.9%) of participants also reported involvement in high school swimming programs, while few (18.6%) reported participation in squad swimming.

As expected, a substantial to very strong, positive and significant relationship was observed between self-reported ability to swim and self-reported number of laps ($d_{yx} = 0.556$, $p < .001$). This relationship was stronger for females ($d_{yx} = 0.632$, $p < .001$) than for males ($d_{yx} = 0.492$, $p < .001$; Figure 1). Irrespective of gender, the majority of self-reported non to weak swimmers (96.1%) also perceived that they could complete less than 100 m. Surprisingly, only 54.4% of self-categorized good to excellent swimmers reported that they could complete between 301–400m+ continuously. The other self-categorized good to excellent swimmers reported that they could not complete 100 m continuously (20.2%), or could only complete 101–300 m (25.4%).

Comparisons were made between the practical skills test and the matched survey questions. Generally, weak relationships were observed, and only a small number of differences (reported throughout) were observed between males and

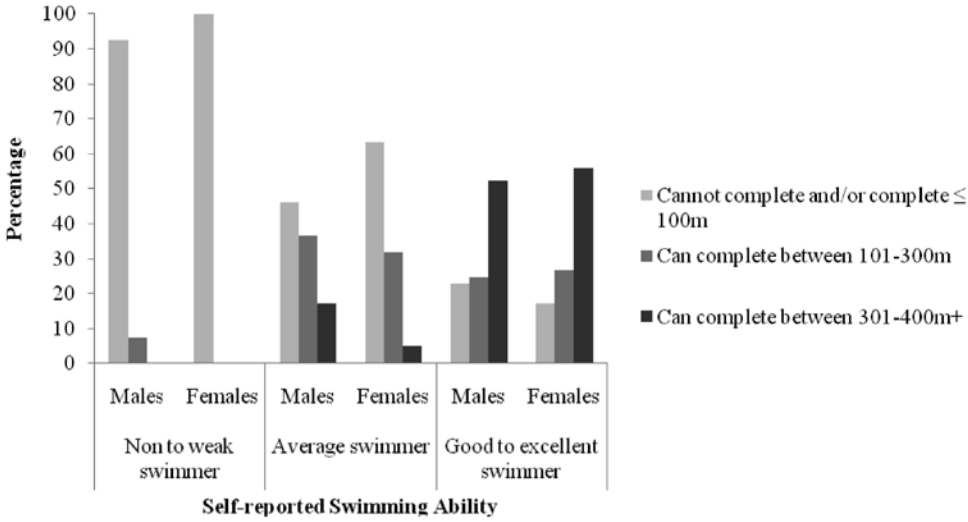


**Figure 1** — Association between self-reported ability to swim and self-reported number of laps, classified according to gender.

females. For example, comparison between self-reported ability to swim and the continuous swim practical assessment demonstrated a low to moderate positive association ($d_{yx} = 0.252$, $p < .001$; Figure 2). Consistent with this result, the McNemar-Bowker test indicated a significant difference between the self-reported number of laps and the continuous swim practical assessment ($\chi^2_M = 150.143$, df = 3, $p < .001$), with a comparable trend observed to that presented in Figure 2. That is, the majority of participants who reported that they could not swim, or could complete less than 100 m, actually completed between 101–300 m (26.9%) or completed 301–400 m+ (64.7%). Only 10 participants (8.4%) who reported that they could not swim or could complete less than 100 m actually estimated correctly. Participants who self-reported that they could swim 101–300 m also underestimated this capacity, with 18.8% estimating correctly, while the other 81.2% actually completed 301–400 m. Participants who indicated that they could swim greater distances (i.e., 301–400 m) tended to be more accurate in their perceptions. For example, 94.6% of participants who reported that they could complete 301–400 m actually completed this distance.

When considering the ability to swim 100 m on the back analogous to earlier comparisons, a low to moderate positive association was observed ($d_{yx} = 0.155$, $p < .001$). Although most (78.1%) participants who self-reported they could complete the task easily/very easily did so with good form and pace, 18.2% completed the task with poor form and pace, and five participants who reported that they could complete this task easily/very easily did not complete 100 m. For participants who reported that they could complete 100 m on back with difficulty, two-thirds (67.1%) completed the task with good form and pace, while almost one-third (31.5%) completed with poor form and pace and one participant did not complete the 100 m. Of participants who reported that they could complete the task with great difficulty,

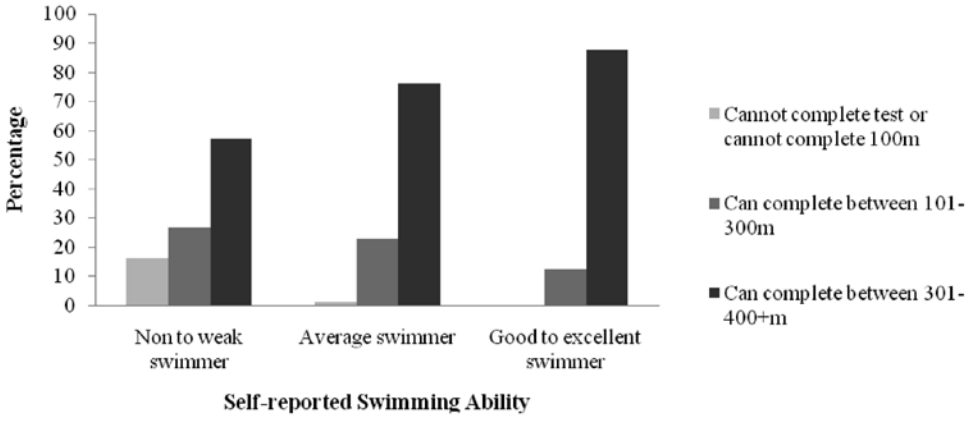


**Figure 2** — Association between self-reported swimming ability and practical test of continuous swim.

all completed the 100m: over half (56.5%) completed the task with good form and pace, and 43.5% completed the 100 m with poor form.

A low to moderate association ($d_{yx} = 0.221$, $p < .001$) was also observed when comparing the actual and self-reported float. All participants who reported that they could complete this task easily/very easily completed 15 or more minutes of floating (44.0%) or up to 8 min (56.0%). For participants who reported they could complete the float with difficulty, 22.6% achieved 15 or more minutes, while 77.4% attained 8 min. Participants who stated they could complete this task with great difficulty were spread across the three categories: 15 min or more (25.0%), up to 8 min (65.0%), or did not complete or completed 3 min (10.0%).

When contrasting actual and self-reported capacity to perform a safe dive into deep water a trivial association was observed ($d_{yx} = 0.035$, $p < .001$). Most (76.0%) participants who reported that they could complete the task easily/very easily completed the dive with good form; however, 24.0% completed the dive with poor form. This trend was also consistent for participants who reported that they could complete the task with difficulty. The inverse was illustrated for participants who reported that they could complete the dive with great difficulty: two-thirds completed the dive with poor form, while one-third completed the dive with good form.

Following these comparisons, further analyses were conducted to determine whether participation in formal swimming and water safety lessons impacted upon self-reported or actual swimming competence. No significant association was found between self-categorized swimming competence and the completion of formal swimming and water safety lessons ($d_{yx} = 0.053$, $p = 0.365$). Likewise, no significant association was found between self-reported number of laps and the completion of formal swimming and water safety lessons ($d_{yx} = 0.032$, $p = 0.576$) or between actual number of laps and participation in formal swimming and water safety lessons ($d_{yx} = 0.056$, $p = 0.365$). In the latter case, when categorized according to gender, a low to moderate positive significant association was found for females ($d_{yx} = 0.209$, $p = 0.030$; Figure 3), but not for males ($d_{yx} = 0.069$, $p = 0.406$).

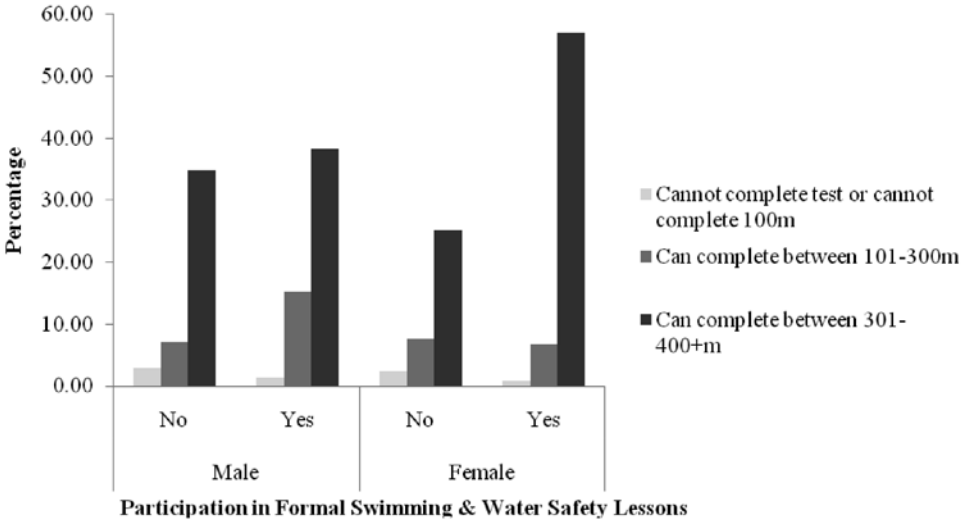


**Figure 3** — Association between continuous swim practical test and participation in formal swimming and water safety lessons, classified according to gender.

Associations between the assessment of other practical skills and the completion of swimming and water safety lessons were also found to be trivial and nonsignificant. For example, float ($d_{yx}$ = 0.049, $p$ = 0.428), dive ($d_{yx}$ = 0.034, $p$ = 0.598), and swim on back ($d_{yx}$ = 0.008, $p$ = 0.900).

## Discussion

This study sought to understand the relationship between self-reported and actual swimming competence in the context of adolescent drowning prevention. Despite a number of studies considering self-reported swimming skill as a risk factor for drowning (Gulliver & Begg, 2005; Howland et al., 1996; Mael, 1995; Moran, 2008), to date, confirmation against actual skill level has not occurred.

Swimming competence is often described with respect to distance, with a direct relationship implied between competence and distance swum. To our knowledge, however, despite the use of distance as a common measure of swimming competence, the distances necessary for classification into different competency categories (e.g., poor, good, or excellent) have not been established. Most young adults in this study identified themselves as average or good to excellent swimmers. Slightly more than half of the average swimmers, and 20% of good to excellent swimmers, estimated that they could complete less than 100 m of continuous swimming. While there was substantial variation in their estimated number of laps, the majority of participants across all self-reported competency categories (non to weak, average, and good to excellent) actually completed 301–400 m+ continuously. This indicates that young adults in this population were somewhat inaccurate in their perceptions of their swimming competence, generally underestimating the distance they could

complete. It also demonstrates that for participants in this study, a consistent perception of what constitutes an average or good to excellent swimmer was not evident.

This trend was also observed for the other swimming skills examined (float, swim on back, and dive into deep water), where the majority of participants who self-categorized at the lowest level (i.e., unable to complete task) actually completed the task to the highest or second highest level. This finding further indicates that participants within this study tended to underestimate their performance of fundamental swimming skills.

These findings are of interest as they illustrate that participants in this study had a relatively poor self perception of aquatic skill level, along with a somewhat limited understanding of what constitutes swimming competence. While water safety researchers and practitioners would typically define swimming competence to include a range of survival skills along with the capacity to swim continuously for a "reasonable" distance (Laakso & Stallman, 2011; Stallman, 2011), this does not appear to be the case for study participants, some of whom considered themselves to be good-to-excellent swimmers even though they self-reported as able to complete less than 100 m of continuous swimming. Many of those who self-categorized as average or good to excellent swimmers reported their skill level for the other aquatic skills examined in this study to be below the midpoint of the Likert scale used in the survey.

The findings of this study are important, particularly as previous aquatic studies suggest that an overestimation of swimming skill level may expose individuals to high risk aquatic situations (Brenner et al., 2003; Howland et al., 1996), which has been linked to the high rate of drowning deaths in young adult males (Taneja et al., 2008). According to the current findings, self report assessment is not accurate as a method to estimate the risk of drowning, as it does not closely correspond with actual skills. Because this study is one of very few to compare self-reported and actual swimming competence, further research is required to examine the accuracy of self-reported swimming competence in relation to actual swimming competence in a more general population.

Researchers have indicated that increased swimming competence, through some form of swimming instruction, may be an effective drowning prevention strategy for persons of all ages (Brenner et al., 2003) and that teaching swimming and water safety knowledge and skills will contribute to positive water safety perceptions and attitudes and lead to safer behavior in aquatic environments (Moran, 2008). Others have argued that on a population basis, there may be adverse effects of such a program, as adolescents who are confident in their swimming abilities may increase their exposure and be more likely to swim in unsafe settings, potentially increasing their drowning risk (Brenner et al., 2003; Smith & Brenner, 1995). Given the findings of this study indicated that participants had relatively inaccurate self perceptions of aquatic skill level, perhaps it is an under-estimation of risk, rather than an over-estimation of competence, that leads to drowning among those with increased exposure. The notion that increased confidence may lead to increased exposure has an interesting parallel in the literature with a school-based bicycle safety education program "Bike Ed" (for children aged 9–14 years) in Australia, where it has been shown that par-

ticipation in the program did not reduce the risk of bicycle injury in subsequent years and indicated possible harmful effects in some children (Carlin, Taylor, & Nolan, 1998). Similarly, in the United States, elimination of high school-based driver education programs led to reduction in early licensing of adolescents and a consequent net reduction in crash incidence of drivers of that age, perhaps due to a decrease in exposure (Robertson, 1980).

While participants in this study reported whether they had involvement in squad or high school swimming, as the effectiveness of these programs in educating students in swimming and water safety skills has not been investigated, and as there is likely to be variation in programs, the relationship between these programs and the accuracy of participant self-reported and actual swimming skill level was not considered. Further research is required to determine the effectiveness of squad and high school swimming in educating young adults about safe participation in a variety of aquatic environments compared with formal swimming lessons. Squad and high school swimming provides an ideal setting for the development of water safety skills and knowledge among an age group recognized to be at high drowning risk, and for this reason, research investigating this issue is recommended.

## Limitations

While the current study advances our understanding of the relationship between self-report and actual swimming competence in young adults, there are limitations that merit consideration when planning future studies. First, these findings are based on first year Bachelor of Education (Physical Education) and Bachelor of Exercise and Sport Science students and because of their interest in physical activity it is likely that these students have higher levels of physical fitness and motor skills and thus higher levels of swimming competency than the general population of this age group. Therefore, results may not generalize to other adolescent populations. Strategic sampling in future research is essential to understand the relationship between self-reported and actual swimming competence across different adolescent groups, to determine whether self-reported swimming competency is a risk factor for drowning.

Second, although procedures were implemented to minimize interobserver variation and any potential bias, inter- and intrarater objectivity statistics were not calculated. To improve the methodological quality of future studies, these statistics should be calculated and reported in manuscripts where multiple researchers are involved in the collection and evaluation of actual swimming skills. In retrospect, we realize the calculation of objectivity statistics could have provided a baseline for future work and in doing so, made an important contribution to the field.

Finally, because accuracy of recall of past experiences decreases over time, self-reporting of involvement in swimming and water safety lessons may be viewed as problematic. This is likely to be less of a concern for high school and squad swimming, as the recall period is reduced. How best to collect information relating to young adults' (18–34 years) participation in swimming and water safety lessons as a child requires further consideration to ensure that future studies are not confounded by recall bias.

## Conclusion

This study is important in that it enabled a comparison between self-reported and actual swimming competency of participants. Findings indicate that the majority of first year Bachelor of Education (Physical Education) and Bachelor of Exercise and Sport Science students within this study had inaccurate perceptions of their own swimming skill levels, underestimating their competence in terms of both distance and fundamental swimming and water safety skills. Findings also indicated a lack of consistency among participants in their perception of what constitutes different levels of swimming competence (e.g., non- to poor swimmer, average or good to excellent swimmer). Regardless of their self-categorization of competence, the majority were able to swim more than 300 m, which reinforces the underestimation of their skill level. Only two gender differences were observed. The relationship between self-reported ability to swim and self-reported number of laps was stronger for females than for males, and participation in formal swimming lessons was significantly associated with actual number of laps only for females.

The general underestimation of swimming skill levels observed in this study indicates that self-report of swimming competence is not accurate as an estimate of drowning risk, because self assessment does not closely correspond with actual skill, at least for this population. Further research is required with more general populations to determine whether self-perception of swimming competence is a risk factor that merits further attention and/or to establish whether this needs addressing in drowning prevention programs. Likewise, exploration is required to determine whether accuracy of estimation of risk in different aquatic settings varies between swimmers and to ascertain how, or indeed whether, risk perception can be enhanced. Investigation of the effectiveness of swimming and survival skills programs must also be conducted to determine their impact on swimming and survival skills and on water safety knowledge and behavior.

## References

Anastasi, A., & Urbina, S. (1997). *Psychological testing* (7th ed., pp. 84–112). London: Prentice-Hall Inc.

Australian Water Safety Council. (2008). *Australian water safety strategy 2008-2011*. Sydney: Australian Water Safety Council.

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.

Canadian Red Cross. (2005). *The facts about drowning in Canada*. Ottawa, Canada: Canadian Red Cross.

Carlin, J.B., Taylor, P., & Nolan, T. (1998). School based bicycle safety education and bicycle injuries in children: A case-control study. *Injury Prevention, 4,* 22–27.

de Vaus, D.A. (2002). Bivariate analysis: Nominal and ordinal variables. *Surveys in social research* (pp. 241-270, 5th ed.). N.S.W. Australia: Allen & Unwin.

Driscoll, T.R., Harrison, J.A., & Steenkamp, M. (2004). Review of the role of alcohol in drowning associated with recreational aquatic activity. *Injury Prevention, 10*(2), 107–113.

Gulliver, P., & Begg, G. (2005). Usual water-related behaviour and "near drowning" incidents in young adults. *Australian and New Zealand Journal of Public Health, 29*(3), 238–243.

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*(1), 93–96.

Landis, J.R., & Koch, G.G. (1977). The measurement of observer agreement for categorical data. *Biometrics, 33*(1), 159–174.

Langendorfer, S. (2008). Does learning to swim prevent drowning? *International Journal of Aquatic Research and Education, 2*(1), 1–6.

Langley, J.D., Warner, M., Smith, G.S., & Wright, C. (2001). Drowning related deaths in New Zealand, 1980-94. *Australian and New Zealand Journal of Public Health, 25*(5), 451–457.

Laakso, B.W., & Stallman, R.K. (2011). The validity of a 1000m distance test as a predictor of swimming competence. Proceedings of the World Drowning Prevention Conference, Da Nang, Vietnam, 10-13th May, 2011, p.225. Retrieved November 10th, 2011, from: http://www.worldconferenceondrowningprevention2011.org/SiteMedia/w3svc1092/Uploads/Documents/WCDP2011_Swim&WS_Stallman_p225-226-Abstract.pdf

Mackie, I.J. (1999). Patterns of drowning in Australia. *The Medical Journal of Australia, 171,* 587–590.

Mael, F.A. (1995). Staying afloat: Within-group swimming proficiency for whites and blacks. *The Journal of Applied Psychology, 80*(4), 479–490.

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

Mickalide, A. (1997). Threats to measurement validity in self reported data can be overcome. *Injury Prevention, 3,* 7–8.

Moran, K. (2006). *Re-thinking drowning risk: The role of water safety knowledge, attitudes and behaviours in the aquatic recreation of New Zealand youth.* Unpublished Doctoral thesis, Massey University, Auckland, New Zealand.

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. (2010). Real and perceived swimming competency, risk estimation, and preventing drowning among New Zealand youth. In P-L. Kjendlie, R.S. Stallman & D. Dahl (Eds.) *Proceedings of the XIth International Symposium on Biomechanics and Medicine in Swimming* (pp. 368-371). Oslo: Norwegian School of Sport Sciences.

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.

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

Morgan, D., Ozanne-Smith, J., & Triggs, T. (2008). Descriptive epidemiology of drowning deaths in a surf beach swimmer and surfer population. *Injury Prevention, 14,* 62–65.

Morgan, D., Ozanne-Smith, J., & Triggs, T. (2009). Self-reported water and drowning risk exposure at surf beaches. *Australian and New Zealand Journal of Public Health, 33*(2), 180–188.

Nelson, D.E. (1996). Validity of self reported data on injury prevention behavior: Lessons from observational and self reported surveys of safety belt use in the US. *Injury Prevention, 2,* 67–69.

Pedhazur, E.J., & Pedhazur-Schmelkin, L. (1991). *Measurement, design, and analysis: An integrated approach* (pp. 81–117). Hillsdale, NJ: Lawrence Erlbaum Associates Inc.

Quan, L., Bennett, E.E., & Branche, C.M. (2007). Interventions to prevent drowning. In L.S. Doll, S.E. Bonzo, D.A. Sleet, J.A. Mercy & E.N. Hass (Eds.), *Handbook of injury and violence prevention* (pp. 81-96). New York, USA: Springer+Business Media, Inc.

Quan, L., & Cummings, P. (2003). Characteristics of drowning by different age groups. *Injury Prevention, 9,* 163–168.

Robertson, L.S. (1980). Crash involvement of teenage drivers when driver education is eliminated from high school. *American Journal of Public Health, 70*(6), 599–603.

Robertson, L.S. (1992). The validity of self-reported behavioural risk factors: Seatbelt and alcohol use. *The Journal of Trauma, 32*(1), 58–59.

Royal Life Saving Society Australia [RLSSA]. (2004). *Swimming and lifesaving: Water safety for all Australians* (5th ed.). Sydney: Elsevier Mosby.

Royal Life Saving Society Australia [RLSSA]. (2008). *The national drowning report 2008*. Sydney: The Royal Life Saving Society Australia. http://www.royallifesaving.com.au//resources/documents/2008_Drowning_Report.pdf

Royal Life Saving Society Australia [RLSSA]. (2009). *The national drowning report 200*9. Sydney: The Royal Life Saving Society Australia.

Royal Life Saving Society Australia [RLSSA]. (2010). *The national drowning report 2010*. Sydney: The Royal Life Saving Society Australia.

Royal Life Saving Society Australia [RLSSA]. (2011). *The national drowning report 2011*. Sydney: The Royal Life Saving Society Australia.

Saluja, G., Brenner, R.A., Trumble, A.C., Smith, G.S., Schroeder, T., & Cox, C. (2006). Swimming pool drownings among US residents aged 5-24 years: Understanding racial/ethnic disparities. *American Journal of Public Health, 96*(4), 728–733.

Siegel, S., & Castellan, N.J. (1988). *Asymmetrical association for ordered variables: Somer's $d_{BA}$. Nonparametric statistics for the behavioral sciences* (2nd ed., pp. 303–310). Singapore: McGraw-Hill Inc.

Smith, G.S., & Brenner, R.A. (1995). The changing risks of drowning for adolescents in the U.S. and effective control strategies. *Adolescent Medicine (Philadelphia, Pa.), 6*(2), 153–170.

Stallman, R.K. (2011). A graded approach to a definition of 'Can Swim.' *Proceedings of the World Drowning Prevention Conference,* Da Nang, Vietnam, 10-13th May, 2011, p.214. Retrieved November 10th, 2011, from http://www.worldconferenceondrowningprevention2011.org/SiteMedia/w3svc1092/Uploads/Documents/WCDP2011_Swim&WS_Stallman_p214_Abstract.pdf

Taneja, G., Van Beeck, E., & Brenner, R.A. (2008). Drowning. In M. Peden, K. Oyegbite, J. Ozanne-Smith, A.A. Hyder, C. Branche, F. Rahman, et al. (Eds.), *World report on child injury prevention* (pp. 59–77). Geneva, Switzerland: World Health Organisation.

Weir, E. (2000). Drowning in Canada. *Canadian Medical Association Journal, 162*(13), 1867.

Witman, G.D. (2008). Economic cost of drowning in inland lakes and rivers. *International Journal of Aquatic Research and Education, 2*(1), 56–58.