

## Drowning: a leading killer!

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RESEARCH NOTE

### The Global Burden of Drowning

Approximately 71% of the surface of the Earth, is covered by water, nearly three times greater than that covered by land. As humans we spend the first nine months of our lives submerged in liquid and then ironically, after birth, we are inept at swimming. Yet learning to swim is imperative, among other things, to help prevent drowning, a leading killer (World Health Organization [WHO], 2014).

Drowning kills at least 372,000 people worldwide every year and is the 3rd leading cause of unintentional death, accounting for 7% of all deaths stemming from accidents (WHO, 2014). It is also estimated that > 90% of all drownings happen in developing countries. Additionally, it is estimated that the ratio of those non-fatal drownings which require hospitalization - to fatal drownings is, by the most optimistic estimates, from 1- 4:1 (American Academy of Pediatrics Policy Statement, 2003; Szpilman, Bierens, Handley, & Orłowski, 2012), or, according to more dramatic records, as much as 10:1 (Langerdorfer, 2011). Of these, 5% to 10% will suffer permanent neurological injuries caused by long submersion, late basic life support maneuvers or long periods of rehabilitation (Weiss, 2010). And we still have not included those cases not requiring hospitalization. In addition to the human tragedy, drowning represents a huge economic problem with direct and indirect costs, including many Disability-Adjusted Life Years lost [DALY, WHO],

(Szpilman et al., 2012; World Health Organization, 2014). The DALY figure is high also because so many drowning victims are young, with a long productive life ahead of them. An estimated 1.3 million disability adjusted life years were lost in 2004 because of death and disability caused by drowning (Peden et al., 2008). In the United States alone, the estimated economic burden of drowning is 5.3 billion USD each year (Finkelstein, Corso, & Miller, 2006).

### Drowning Research/Statistics

Conceptually, “drowning” is a complex and multi-faceted phenomenon, characterized as a chain of events (Bierens, 2006). Accurate statistics demand a definition. Until recently, there was no consensus on such a definition. However, by 2002, the International Task Force on the Epidemiology of Drowning presented it’s recommendation to the drowning prevention community at the first world conference, Drowning 2002 (Amsterdam) and it was immediately adopted. It was then, quickly adopted by the World Health Organization. Drowning is “The process of experiencing respiratory impairment from immersion or submersion in liquid” (Association for Child Safety Promotion [APSI], 2015; van Beek, Branche, Szpilman, Modell, & Bierens, 2005).

Research on drowning as a phenomenon presents several difficulties - most of all, that global data concerning the number of occurrences are not accurate. Not all cases are

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registered (in Low and Middle Income Countries many cases occur where no records are kept of cause of death or deaths are simply not reported), or in other cases, certain events are not categorized as drowning according to WHO's International Classification of Disease (ICD 10) [e.g. transport accidents, suicide, homicide, natural disasters], (Szpilman et al., 2012). And finally, many nations are not represented in the global ICD 10 statistics, not meeting the WHO reliability criteria for inclusion (over 100 nations are not included). The full burden of drowning is therefore, vastly underestimated. It may well be 2-3 times greater than the reported figure.

Nevertheless, detailed analysis of the registered incidents allows the identification of risk factors of drowning. We would like to highlight the approach of Eleni Petridou and Alexandra Klimentopoulou (2006) which divided the risk factors into three broad categories: Sociodemographic, Environmental and Behavioural risk factors.

### **Risk Factors**

An in-depth analysis of the risk factors is the basis for the creation of targeted and effective strategies to prevent drowning. Gender is a risk factor. Globally, twice as many males drown as females. In many High Income Countries (HIC's) as many as ten times more males drown than females. Research has also shown that males more often overestimate their ability and underestimate risk (Moran et al., 2012). Age is another major risk factor. Globally, half of all drownings are among those under twenty five years of age. Here there is regional and economic variation. In many HIC's the peak is among middle aged men. In many LIC's the peak is among 1-14 yr olds. In Bangladesh, e.g. nearly half of all drownings (43%) are among 1-4 yr olds (WHO, 2014).

Other major risk factors include lack of supervision of young children, failure to provide barriers to water (especially near the home), unsafe water supply, unsafe water crossings, overcrowded and poorly maintained boats, and more. These risk factors are often poorly understood by the general public and awareness

of the need for water safety and water safety practices is, in general, often weak.

### **Interventions**

Due to variability of situations which could lead to a drowning episode, experts suggest the adoption of a multi-layer prevention model, rather than opting for isolated measures, since no single measure can prevent all deaths and injuries caused by submersion (Brenner, 2003; Weiss, 2010). Although there are some nuances, this view of multi-layer prevention is supported by major global organizations with responsibilities in this matter, from which we highlight the World Health Organization, the American Academy of Pediatrics, the American Red Cross and the International Task Force on Open Water Drowning Prevention. Among the preventive measures we would like to emphasize are: alarms and surrounding safety barriers for swimming pools, the covering of swimming pools, close adult supervision of children, the provision and training of lifeguards, well designed and well placed safety signage and flags (especially at beaches), strengthening of policy regarding safe boat transportation (overloading, maintenance, etc.), knowledge of resuscitation techniques, the use of personal flotation devices, dissemination of water safety information, and instruction in swimming and water safety. All of these might be considered both steps in raising water safety awareness and practical applications of such.

### **Learn to Swim: An Essential Intervention**

What does "knowing how to swim" really mean? Some authors define mastery of this competence as swimming a given distance, while others put the emphasis on *how* this/any given distance is swum (Stallman, Junge, & Blixt, 2008). In the teaching of swimming there is a tendency to emphasize an error correction style of teaching, giving a strong emphasis to the technical mastery of movements, in a stable and predictable environment (Light & Wallian, 2008). This fails to recognize that learning to swim is a dynamic process in which the person, the task at hand and the environment all influence the learning process, and the outcome

(Langerdorfer, 2015). We must also remember that learning to swim usually takes place in quiet water while the majority of drownings occur in open water. Here the environment has raised the stakes, the challenge is greater. Sadly, many cannot meet the increased challenge; a person who can swim in quiet water cannot necessarily swim in open water [perhaps rough, cold water, wearing clothing, etc.] (Kjendlie et al., 2013; Tipton, Reilly, Rees, Spray, & Golden, 2008).

The impact that swimming lessons have in preventing drowning episodes has been only poorly quantified. In the huge Bangladesh study, (where exposure to water is part of daily living and drowning is of epidemic proportions), researchers followed a cohort (N=132,000) for five years. Half had been taught to swim, half had not. They found a huge reduction in drownings (Linnan, Rahman, Rahman, Scarr, & Cox, 2011). A case-control study in rural China has found a protective effect of swimming lessons on drowning among children aged 1–4 years (Yang, Nong, Li, Feng, & Lo, 2007). Among high income countries (HICs), a case-control study in the U.S. found a positive association between swimming skill and drowning prevention in children less than five years of age (Brenner et al., 2009). Otherwise, this relationship remains poorly understood.

These studies provide powerful support for water safety education, though deeper understanding of the protective value of the competencies taught within these programs continues to be poorly understood. Nonetheless, it is agreed that all children should receive water safety training, which may be an effective factor in reducing the risk of drowning (American Red Cross, 2009; Asher, Rivara, Felix, Vance, & Dunne, 1995; European Child Safety Alliance, 2007; International Life Saving Association, 2015).

In some cultures, undue emphasis is placed on swimming for its competitive, entertainment

value. Here, recognition of the need for drowning prevention seems to be under-emphasized and poorly understood; a failure to understand the scope of the global burden of drowning. Teaching aims towards the maximization of swimming efficiency, aiming to swim a given distance in the shortest time possible. In other cultures, it has long been realized that there is no contradiction between learning those competencies which make a person less susceptible to drowning and those competencies which prepare the path towards higher levels of performance and competition. Aquatic movement researchers and practitioners and drowning prevention researchers and practitioners, share in the responsibility for drowning prevention though they are often unaware of it. "We're in the same boat - brother" (Stallman & Kjendlie, 2013).

The question "What should be taught to children?" is too infrequently asked. There remains great variation in what is taught and programs continue to be guided by tradition and expert opinion. The great variation is proof that we have not agreed on the content of learn – to – swim.

In this editorial, we share ideologically the approach that safety (drowning prevention) always comes first. It is of paramount importance to place the focus on swimming skills considered essential in drowning prevention.

Stallman, Junge and Blixt (2008) identified the main causes of drowning (once in the water) and discussed the relationship between these causes and what children should learn at an early level. They found that there is some consensus on three basic principles, yielding essential skills whose mastery in various scenarios and conditions, together with a broad aquatic repertoire, could culminate in a definition of knowing how to swim. To survive in open water, in surf, or at low temperatures, one requires repeated practice in such conditions (Langerdorfer, 2015; Quan et al., 2015).

Table 1

*Basic Principles of Water Safety*

Basic principles

- To develop equal comfort and efficiency both at the surface and under water;
- To develop equal comfort and efficiency both in the prone and supine positions;
- To otherwise develop a broad motor repertoire in the aquatic environment.

By this logic, some argue that children should develop a broad, all-around aquatic motor repertoire, practicing swimming skills under various conditions, indoor, outdoor, clothed, with waves, etc., not limited only to the practice of swimming strokes, but improving their aquatic literacy through the practice of other related competencies (Langendorfer & Bruya, 1995).

### Water Competence

The concept of water competence was launched in 1995 by Langendorfer and Bruya. They emphasized both a broad repertoire of physical skills as well as knowledge and values. Moran (2014) adapted this to drowning prevention, defining it as “the sum of all personal aquatic movements that help prevent drowning, as well as the associated water safety knowledge, attitudes, and behavior that facilitate safety in, on and around the water”.

In 2011 at the World Conference on Drowning Prevention, an International Working Group was formed to further develop the concept of water competence. At the WCDP 2013, in Potsdam, a workshop was conducted and a preliminary report was presented to the Drowning Prevention Commission, ILSF, and cooperation was launched.

The advent of the concept of “water competence” has opened the door for a revival of the interest in the development of a broad repertoire of physical aquatic skills and of the integration of both cognitive and afferent competencies. It also shifts the focus from “defining swimming” to a broader and more inclusive notion of which competencies can contribute to making people less susceptible to the risk of drowning. The aims of the International Working Group have been to further develop the concept of water competence and to disseminate it. The specific objectives have been to a) define water competence, b) support each recommended competency with research evidence showing its protective value, and c) to identify areas needing further research.

The title chosen for this project reflects the shift of emphasis over time from defining swimming or swimming skill to identifying what should be taught and to support the recommended competencies with research evidence. This has not been done before, mostly because such research evidence has only become available in the past 10-15 years. The document is entitled, “From Swimming Skill to Water Competence: Towards a More Inclusive Drowning Prevention Future”.

Table 2  
*Water competencies and drowning prevention*

Water competencies			
	Safe entry		
1	a) Entry into water b) Surface and level off	9	Clothed water competencies
2	Breath control Integrated and effective breathing	10	Open water competencies
3	Stationary surface competencies a) Float front and back b) Tread water	11	Knowledge of local hazards
4	Water orientation competencies a) Roll from front to back, back to front b) Turn, L & R, on Front & Back	12	Coping with risk a) Recognize and avoid risk b) Judgment of risk and action
5	Swimming competencies a) Swim on the front b) Swim on the back	13	Assess personal competency
6	Underwater competencies a) Surface dive b) Swim underwater	14	Recognize/assist a drowning person
7	Safe exit		
8	Use of personal flotation devices (PFDs)	15	Water Safety Attitudes & values

Table 2 above, lists the competencies identified as essential, as supported by research evidence showing protective value (Stallman, Moran, Langerdorfer, & Quan, in Press). It will appear soon in the International Journal of Aquatic Research and Education.

Water competence is a much more comprehensive and inclusive concept than 'swimming skill', since it also includes both cognitive and afferent competencies (Moran et al., 2012; Stallman et al., in Press), making it especially relevant in the prevention of drowning. Brenner, Moran, Stallman, Gilchrist, and McVan (2006, p. 116) recommended that “swimming ability be promoted as a necessary component of water competence, but with the understanding that swimming ability alone is [often] not sufficient to prevent drowning”. Nevertheless, as mentioned before drowning is a complex and difficult research phenomenon, as is its prevention. The concept of water competence is a living concept and still in development (Quan et al., 2015).

Please keep yourself water safe!

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Nothing to declare

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