

Drowning Deaths From Unsupervised Breath Holding: Separating Necessary Training From Unwarranted Risk

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In 2011, 2 healthy, young men died in a public pool in New York City while performing breath-holding exercises. This prompted the New York City Department of Health and Mental Hygiene to conduct an investigation into drowning events that involved potentially dangerous voluntary behaviors. They identified 16 cases that occurred in New York state from 1988 to 2011 and recently published a summary of what they termed dangerous underwater breath-holding behaviors in the Centers for Disease Control and Prevention's (CDC) Morbidity and Mortality Weekly Report.¹ Of the 16 cases, four were fatal. Of note three of the four fatalities, including the two that caused the initiation of the study, were associated with the military.

On the morning of July 13, 2011 two young men conducted physical training at an outdoor pool operated by the City of New York. One was an Air Force recruit hoping to join Air Force Special Operations and the other had hopes of one day becoming a member of the Navy Sea, Air, and Land (SEAL) teams. They performed exercises both outside and in the pool and then conducted intentional hyperventilating with underwater breath holding. Despite the presence of two lifeguards and at least 20 other swimmers, they were both found underwater and died.^{2,3}

The other military-related fatality in the CDC report was a 17-year-old lifeguard who died a week after being found beneath the surface of a 4-foot deep Young Men's Christian Association pool in Long Island in February 2008. He was aspiring to become a Navy SEAL and was practicing hyperventilation and breath holding on his own.⁴

All three of these aspiring military recruits drowned after performing intentional hyperventilation and underwater breath holding. Hyperventilation is commonly performed before breath-holding exercises in an attempt to reduce the partial pressure of carbon dioxide in the blood. This is done to reduce chemoreceptor stimulation to delay the drive to breathe caused by hypercapnia. This potentially allows the diver to remain underwater longer without the feeling of distress caused by hypercapnia. However, intentional hyperventilation is considered a dangerous activity as it may delay the desire to surface without increasing the partial pressure of oxygen or the ability to remain underwater. Therefore, swimmers may not feel the need to surface until after they have reached dangerous oxygenation levels. This may result

in shallow water blackout where the swimmer loses consciousness before surfacing or surface blackout where the swimmer loses consciousness shortly after surfacing but while still in the water.

Although underwater breath holding is an activity that may at times seem like a low-risk childhood activity, its risks are becoming more apparent. The risk involved in this activity is of special importance to the military, as many military dive courses require breath holding as a portion of their curriculum. For instance the Army's Combat Diver Qualification Course (CDQC) requires comfort with underwater activities such as ditching and donning of equipment, knot tying, drownproofing with lightly bound ankles and wrists, and 50 m underwater swims.⁵ These skills are similar to the Aquatic Adaptability Evolutions required of students at the Naval Diving and Salvage Training Center. Many of these courses expect quick progression of skills and have low pass rates. Therefore, many motivated students attempt to develop these skills prior to reporting, often without formal supervision.

Breath holding exercises are not just a danger to trainees. This was unfortunately made evident when two fully trained Navy SEALs drowned as a result of breath-holding exercises at the Naval Special Warfare Group 2 Combat Swimmer Training Facility at Joint Expeditionary Base Little Creek-Fort Story, Virginia in April 2015. The two SEALs were performing breath-holding exercises despite rules prohibiting them during nonofficial workouts and despite having been verbally warned not to. They were discovered at the bottom of the pool and both died as a result.⁶

A review of the Navy Safety Center's accident reports for Fiscal Years 2009 to 2015 identified four additional deaths while breath holding. In 2013, a Navy SEAL drowned while spearfishing on a training free dive in Hawaii, a sailor died when he became tangled in a rope spearfishing in San Diego, and a sailor drowned while breath holding on a training dive in Guam.⁷ In 2014, another sailor drowned while breath holding for spearfishing in Guam.⁷ It is suspected the hyperventilation was performed during some of these accidents.

The military diving community is full of members who have volunteered for dangerous missions and who train hard in preparation. The qualifying courses to enter this community often require people to push their boundaries. It is expected that preparation for these courses will therefore be pushing boundaries as well. This is not unique to diving courses. It is expected that new military recruits will work

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to maximize their physical fitness before attending basic training, that students will develop their land navigation and ruck marching abilities before courses such as Ranger School, or practice obstacle course events before a course like Air Assault School. Often this training is performed with little or no formal supervision and carries inherent risk. Much of this risk is warranted in order to have military members that are capable of achieving difficult tasks. Both the Navy's Operational Risk Management and the Army's Composite Risk Management programs are designed to assist leaders in identifying which training risks are warranted and in eliminating those that are unnecessary. However, the unofficial nature of much of the breath-holding training that is done makes it difficult to fully apply these tools.

There are ways to reduce dangerous breath holding, even when it is performed in unofficial training. Perhaps the most effective way is to change the entrance requirements of these courses and what is expected of trainees at the start of courses. This has been the tactic of Basic Underwater Demolition/SEAL training which has posted notification that breath-holding practicing is highly discouraged and is not needed in preparation.^{8,9} The Army's CDQC course has made some changes in this direction by incorporating its prescuba course into the actual course. Before this, units were responsible for running pre-CDQC training weeks to prepare their soldiers for the course. While making this training centralized may have been done to reduce the demands on units, an additional benefit of it is that it allows for centralized supervision of this training. While Although centralized training may help insure that training conditions are performed under safe conditions, the low pass rate and expectation that students will be quickly proficient in underwater skills, including the 50-m underwater swim,⁵ means that trainees will most likely continue to practice these skills before attending.

In addition to adjusting entrance expectations, effective mentorship can help to reduce dangerous activities among trainees. Online, this would involve discouraging intentional hyperventilation and breath holding in unsupervised conditions. Although this has been done on the official online forum of the Navy SEALs⁹ there are other online forums in which dive qualified special operators recommend that potential trainees attempt hyperventilation to improve breath-holding abilities.¹⁰ The military diving community should take an active role in discouraging these activities online especially since many recruits will not have proper mentorship and may turn to the internet for information. Responsible mentorship also needs to be provided by those interacting directly with trainees such as Special Operations recruiters, Reserve Officers' Training Corps instructors, noncommissioned officers, dive certified individuals, and medical officers performing dive screening/physical entrance exams.

Another potential means to reduce dangerous behavior would be to ban unsupervised breath holding at military

pools. This is a tactic that was been taken by the Redwoods Group which insures many Young Men's Christian Association's¹¹ and that has been taken at many military pools. However, if this is not combined with proper mentorship and expectations of trainees then this may result in trainees just doing these activities at other locations, perhaps with less supervision. When breath-holding training is required, it should be performed in a formal setting, with supervision from someone not engaging in the training. Military leaders should perform formal safety evaluations utilizing Operational Risk Management or Army's Composite Risk Management to ensure that an appropriate level of risk is being taken. As has been demonstrated in prior drownings, training in a buddy team or being in a pool with multiple other swimmers and lifeguards does not ensure safety. Training must be supervised by someone who is not participating in the training, who is dedicated solely to safety for the iterations, and familiar with the exercises being performed and the danger of shallow water blackout.

Although underwater breath holding has often been viewed in the past as a low-risk childhood activity, the dangers of shallow water blackout are becoming more widely recognized. This danger is increased when intentional hyperventilation is involved. This is an issue that is not just military related, as the author discovered when his civilian scuba instructor taught hyperventilation before breath holding as a "cool trick" instead of as an activity that deserves respect due to its dangers. However, the military's unique mission and training requirements makes the benefits and risks of breath holding training of increased importance. Also, while the CDC report identifies breath holding as a male-dominated activity (13 out of 16 reported events), the military may experience different demographics as even more military specialties open up to women. Although serving as an Army helicopter pilot, the author saw firsthand that preparing for a combat mission often requires training that carries as much risk as the actual mission. Although an amount of risk is necessary to prepare military members to accomplish difficult tasks, conditions must be set in a way that reasonably minimizes risk in order to protect those willing to serve.

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