SWIMMING CANADA NATATION

SHALLOW WATER BLACKOUT (SWB)

There are approximately 140,000 deaths annually to drowning worldwide. Although there are no hard statistics for SWB, it is estimated by a number of sources that SWB is responsible for up to 20% of all drownings. As well it is thought that nearly all drownings or near drownings by advanced or elite swimmers is the result of SWB.

Described for a number of years by the US Naval center and the training of Navy Seals and Divers, SWB is now coming to the forefront for prevention by a number of groups including USA Swimming, the American Red Cross as well as a number of European and Australian Swimming Associations.

What is it?

SWB is a term describing loss of consciousness arising from oxygen deprivation brought about by voluntary or involuntary hyperventilation. In swimming voluntary hyperventilation occurs when a swimmer intentionally over-breathes or hyperventilates. Involuntary hyperventilation can occur as a result of stress and physical exertion during a workout that pushes the swimmer beyond his/her maximum aerobic capacity (VO2 max). This results in blowing off carbon dioxide (CO2) and essentially lowering serum or blood CO2. What happens next is a cascade of physiological events that can end up in a devastating result for a swimmer.

Lowering serum CO2 causes the following physiological responses:

- Constriction or narrowing of blood vessels in the brain
- Reduced respiratory drive and impaired involuntary reflex for breathing

When a swimmer has exercise-induced hypoxia and is asked to breath hold under the combination of reduced oxygen to the brain and impaired involuntary breathing reflex, loss of consciousness in water can occur with devastating results.

In most near drownings it is estimated that the critical time for a successful rescue or resuscitation occurs within 6 to 8 minutes from the beginning of the event. With SWB the critical time period for a successful resuscitation appears to be much shorter. A number of case reports of witnessed SWB indicate that a successful resuscitation needs to begin within 2 minute of the event occurring. The reason for this is not completely understood, however it can be speculated that brain hypoxia has occurred for many minutes before the blackout. Once the blackout has occurred irreversible brain damage proceeds more rapidly.

The Use of Hypoxic Training in Competitive Aquatic Sports.

Coaches in aquatic sports have used hypoxic training techniques for years. Commonly know as “lung busters”, “over / under”, “under water kick drills” and “Tennessee Turns” many drills have used hypoxic training to try to improve a swimmers breath holding ability and perhaps the anaerobic threshold. These drills have only shown to have dogmatic evidence to support this belief. There are no well-controlled exercise physiological studies to support the use of these drills to improve a swimmers performance. Furthermore they may actually be putting the swimmers at high risk for harm or even death.

It appears that underwater drills preceded by hyperventilation or exhaustion place the swimmer at a higher risk of SWB than do surface hypoxic drills. Most case reports of SWB occur with the swimmer being completely submerged. Extending the breathing pattern on the surface of the water, although not without risk, appears to be a safer form of hypoxic training. The reason for this is that the swimmer is able to take a breath at his or her discretion. In this circumstance aquatic staff, coaches or team members can more quickly recognize any loss of consciousness on the surface.

Hypoxic Training – On the Surface Recommendations

Caution that any drills that require breathing on a restricted schedule should occur on the surface of the water and only in a training program of experienced swimmers in good physical condition with proper supervision and instruction.

With observant lifeguards and coaches, it is unlikely that death would result should a swimmer lose consciousness while swimming on the surface of the water. However, aspiration of water could result in hospitalization. Policies and procedures and are needed to help reduce the risk of a SWB.

Common risk reduction strategies include:

- Lifeguards required.
- Prohibit voluntary hyperventilation.
- Structure practice so as to minimize involuntary hyperventilation immediately prior to a hypoxic set.
- Encourage swimmers to breathe as needed.
- Allow adequate time for recovery, which will vary from swimmer to swimmer.

Hypoxic Training - Underwater Drills

Common underwater activities that can lead to SWB include repeated underwater swims or kicking drills as well as stationary breath holding competitions for time. In both instances, the nature of the risk is clear: possible death. Even with successful resuscitation, complications including hypoxic brain damage and respiratory infection can occur.

Following many recent deaths of competent swimmers, including swim team members, it cannot be said that the risk of SWB is improbable. Far too many young adults have died because of SWB, and the industry, media and general public has become increasingly aware of the real and present dangers of underwater swimming drills.

With time, if underwater breath holding activities are allowed to occur it is likely that a swimmer will suffer a hypoxic blackout. Given that underwater breath holding activities resulting in SWB have led to death, the evaluation of the severity of this risk is catastrophic. Organizations would be well advised to eliminate the risk all together through a ban on underwater drills in all but a carefully and closely regulated environment.

In some cases the Coaches or Club may feel that underwater drills are necessary for skill improvements. If this this case the following risk reduction strategies should be in place:

- Instructor/coaches need additional experience and training before considering underwater drills.

- When swimming underwater, instruct swimmers to surface and breathe when necessary. Never resist the urge to breathe.
- Only allow one breath prior to submersion. SWB is closely linked to hyperventilation.
- Only allow underwater drills at the start of a workout when swimmers are not close to their maximum aerobic capacity (VO2 max).
- Only allow a distance of one length, one time. No repeats or challenges to see who can swim the greatest distance underwater.
- Allow adequate time for recovery, which will vary from swimmer to swimmer. A rule of thumb is to require a two-minute recovery time before attempting another underwater swim.

Competitive programs should follow a risk management approach to addressing safety and liability concerns presented by hypoxic blackout. This entails evaluating the nature of the risk before selecting a risk aversion or risk management strategy. This also requires distinguishing between underwater drills and those conducted on the surface of the water. As both drills can lead to SWB, an evaluation must be made as to the likelihood or frequency of SWB resulting from such drills as well as the possible severity of such occurrence.

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