



## Underwater Swimming and Hypoxic Blackout

3 February, 2005

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On 22 September 2002, a sixteen year old boy died as a result of suffering hypoxic blackout produced from hyperventilation following breath holding.

The tragic incident occurred in a backyard pool when several teenagers were testing themselves as to the maximum distance each could swim underwater.

I wish to draw to the attention of all members of the school community, the dangers associated with hypoxic blackout following hyperventilation and breath holding for the purpose of underwater swimming.

Every year there are a number of previously healthy young swimmers found dead, drowned, in backyard pools and in sheltered waterways, often at a depth in which they could have stood up.

There are a number of causes for this, ranging from epileptic fits to abnormal heart rhythms. One of the most common and most preventable causes is hyperventilation leading to hypoxic blackout. Hyperventilation means breathing at an abnormally rapid rate, resulting in an increased loss of carbon dioxide. Hypoxic means lack of oxygen.

The information attached with this memorandum about hypoxic blackout will serve as a reference for schools in alerting students and staff to the dangers of hypoxic blackout.

I seek the cooperation of principals in incorporating this information in swimming and water safety education programs, swimming training materials for teachers, coaches and students and the relevant areas of the Personal Development, Health and Physical Education KLA.

The new *PDHPE Years 7-10 Syllabus* provides a number of opportunities for teachers to raise awareness of the dangers of breath-holding and hypoxic blackout. When students explore risk taking and personal safety in the context of aquatic activities, teachers are asked to provide opportunities for discussion on hypoxic blackout and the dangers of breath holding in a water environment.

For further information, please contact David Power, Manager, School Sport Unit, on telephone number (02) 9707 6910.

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**DEPUTY DIRECTOR-GENERAL**

**SCHOOLS**

3 February 2005

### **HYPOXIC BLACKOUT and DROWNING**

#### **Why is this information so important?**

Every year there are a number of previously healthy young swimmers found dead, drowned, in backyard pools and in sheltered waterways – often at a depth in which they could have stood up! There are a number of causes for this, ranging from epilepsy (fits) to abnormal heart rhythms.

This Fact Sheet deals with one of the most common and preventable causes of these types of death - hyperventilation leading to hypoxic blackout.

- *Hyperventilation* means over breathing (more than normal or needed).
- *Hypoxic* means inadequate oxygen.

## The physiology of breath-holding

It is not difficult for a good swimmer to hold his breath and swim underwater for a minute or so. This is possible because there is oxygen available in the lungs and in the blood stream. If the blood oxygen level drops to about half the normal level, the swimmer will lose consciousness without any warning. Then, survival depends on rescue by others.

Fortunately, nature has given us a safety mechanism which usually prevents this happening. As oxygen is used by the body, carbon dioxide is produced. If a swimmer is breath-holding, the carbon dioxide builds up quickly and this produces an inescapable urge to breathe, the so-called "breath-hold breaking point". This happens before the oxygen level drops to dangerous (hypoxic) levels. The swimmer surfaces and breathes. The reduction in oxygen levels is then corrected before loss of consciousness occurs.

## What are the dangers of breath-holding?

This safety mechanism can be delayed or by-passed by taking deep breaths (hyperventilating) before breath-holding and submerging. This hyperventilation removes carbon dioxide from the body. Without a build-up of carbon dioxide the safety mechanism is not triggered and the length of time that a swimmer can hold their breath can be extended - but only by the swimmer becoming more hypoxic. Swimmers may simply slow down and lose consciousness. In ensuing breaths water, rather than oxygen, enters the lungs and the swimmer drowns.

Some children test these limits by hyperventilating before breath-hold diving to prolong their underwater endurance or swimming distance. This can often be linked to competitions to see how far or how long they can swim underwater (usually in swimming pools). The depth of water is irrelevant. Usually the children that die this way are the best of swimmers and the technique of hyperventilation is used to extend their time underwater. Hypoxic blackout also accounts for 20% of snorkeling deaths in Australia (all ages) and almost all of the snorkeling deaths in young, fit males.

## How do I incorporate this message into my teaching?

The new *PDHPE Years 7-10 syllabus* provides a number of opportunities for teachers to raise awareness of the dangers of breath-holding and hypoxic blackout. When students explore risk taking and personal safety in the context of aquatic activities, provide opportunities for discussion of hypoxic blackout and the dangers of breath-holding in a water environment.

However you choose to incorporate this issue into your program, remember this key message:

*To avoid death from hypoxic blackout, do NOT hyperventilate before underwater swimming. Take ONE breath in, and then submerge. Nature will then protect you.*

Reference: *Diving Medicine for Scuba Divers* by Edmonds, McKenzie and Thomas