

**Safety Tip of the Month – July 2008**  
**VSI Safety Committee**  
**“Hypoxic Training and Hyperventilation”**

Swimmers love contests. Their favorite is to see who can swim the farthest underwater. Recently, Michael swam about 40 yards underwater before surfacing. The Coach keeps teasing Michael about “quitting” 10 yards from the end and telling Michael that he can make the entire 50 yards. Michael and some other boys are ready to try it. Coach tells Michael to take “a lot” of deep breaths before diving in so that he can “build up the oxygen in his blood.” Michael inhales deeply about 10 times. He feels a little dizzy, but dives in and starts to swim underwater. He turns and starts back. Suddenly Coach notices that Michael is just lying on the bottom, not moving. He jumps in and pulls Michael to the surface. What did Coach do that was dangerous?

Coach thought he was engaging his swimmers in a fun and challenging activity, but actually he was endangering them. Teaching the swimmers to hyperventilate before submerging was particularly risky. Contests to see who can swim underwater the farthest are very dangerous and should never take place.

Think smart! Leave the long underwater swims to the scuba divers. Do NOT let your swimmers take a chance with zealous underwater swimming contests.

Hyperventilation (rapid deep breathing) before prolonged underwater swimming is a dangerous practice that may result in drowning. Hyperventilation does not increase the amount of oxygen or allow the swimmer to hold his breath longer; it lowers the carbon dioxide level in the body. This is risky because the drive to breathe is controlled by the amount of carbon dioxide in the blood. When a person hyperventilates and then swims underwater, the carbon dioxide level in the blood can drop to a point where the swimmer passes out before the brain signals that it is time to breathe. Then, when the person finally does take a breath instinctively, water rushes in and the drowning process begins. There is a difference; however, between having swimmers hold their breath while swimming under water versus an extended breathing pattern while swimming on the surface. There is no evidence that swimming without oxygen necessarily trains the anaerobic system; however, extending the breathing pattern while swimming on the surface may improve oxygen management capacity. This training technique of extending the breathing pattern should be monitored carefully and swimmers should be instructed to breathe when necessary. To prevent hyperventilation, have swimmers take only one, or at the most, two deep breaths before beginning hypoxic training. Hypoxic training (breathing on a restricted schedule) may be used safely in a training program of experienced swimmers in good physical condition with proper supervision and instruction. The number of repeats of hypoxic swimming should be limited. Adequate time for recovery will vary from swimmer to swimmer.

Forced, prolonged underwater swimming should be discouraged. Furthermore, aggressive hyperventilation should not be attempted before any long underwater swim, since this will greatly elevate the risk of Shallow Water Blackout (see VSI February 2006 safety tip about shallow water blackout) and possible death. During practice and competitive swim meets, swimmers should not be permitted to swim underwater past the 15 meter mark. Such maximum underwater distance guidelines were incorporated into the USA Swimming Rules to minimize the incidence of Shallow Water Blackout. Even if the lane lines are not marked at the 15 meter threshold, coaches should strongly discourage longer continuous underwater distances by any swimmer.