The Vigilant

File photo

A comprehensive report examines the hypothesis that the "level of arousal" affects an individual's performance

by Tom Griffiths, Ed.D.
Special to Aquatics International

The first of two parts.

When I began my aquatics career way back in the 1970s at the University of Maryland, I was intrigued by the *Inverted U Hypothesis* of sports psychology.

In fact, I spent the first decade of my career showing how the Inverted U explains panic in novice scuba divers. When we stressed scuba divers with too many underwater tasks, the performance on a timed U.S. Navy pipe puzzle test dropped significantly.

The findings supported a basic tenet of the Inverted U: As stress and arousal increase, performance decreases. Generally, the Inverted U Hypothesis deals with levels of arousal, specifically psychological arousal, anxiety or excitement.

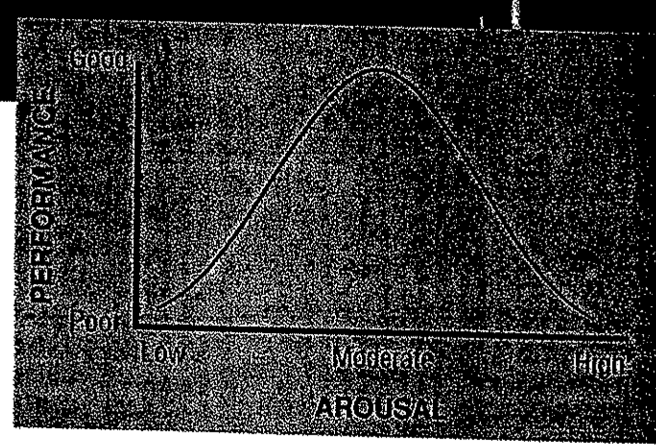
Since the early 1900s, we have known there is an optimal level of psychological arousal for different physical and mental tasks.

In 1908, the Yerkes-Dodson Law graphically showed that very high and very low levels of arousal could be used to predict poor performances. Simply stated, *moderate* levels of arousal produce the best performances in most cases, and this has been proven to be the case in competitive sports as well. *Excessively high* levels of arousal produce catastrophic performances, panic and "choking," whereas *very low* levels of arousal lead to lackadaisical, unmotivated performances.

For optimal performances in many motor skills and vigilance tasks, there is a happy medium level of arousal.

Since the inception of the Yerkes-Dodson Law, thousands of articles and books have been written on controlling excessive arousal and anxiety for optimal or peak performance.

Staying focused and relaxed in a stressful environment is an important component of success. Whether we're talking about competitive swimming, diving, football, basketball or golf, a little bit of nervousness is helpful, but too much can quickly lead to choking. In the water-safety venue, we have known for years that for lifeguards, a moderate number of swimmers and/or activities produce the best vigilance. But both very slow days and very busy days can lead to poor lifeguarding performance and less vigilance.



Lifeguards as athletes

While sports psychologists and psychophysiologists have dealt primarily with overarousal and high anxiety in athletes, many lifeguards and their supervisors grapple with low levels of arousal — that is, long periods of uneventful surveillance without any hint of "potential drowners."

Certainly, low levels of arousal are not the norm for most ocean guards or lifeguards at busy waterparks with many and varied stimuli — except on the occasional slow day. But for

The Inverted U Lifeguard

the thousands of guards scanning the "boring" rectangular pools in this country (schools, parks, neighborhoods, hotels and community centers), this is a huge problem.

The key to effective lifeguarding is constant vigilance, but vigilance is difficult to maintain in an uneventful setting. Monotony leads to boredom, which, in turn, leads to a lack of vigilance, one of the biggest problems in lifeguarding today.

Jeff Ellis & Associates, a lifeguard training organization and aquatic safety consulting firm in Kingwood, Texas, performed approximately 500 tests in 90 pools last summer. Even though Ellis lifeguards are comprehensively trained in the "10/20 Patron Protection Rule" — 10 seconds to detect someone in distress and an additional 20 seconds because it is possible for someone to drown in as little as 30 seconds — the average response time to a lifelike manikin placed on the bottom of the facility was 1 minute 14 seconds. (It must be mentioned that the 10/20 rule has been emphasized for victim recognition and response at, or near, the surface.)

In this case study, the manikin was placed directly on the bottom of the pool. Although Ellis guards have a reputation for being vigilant and for strictly adhering to the 10/20 rule, the lifeguards in this study who appeared to be scanning (an ongoing surveillance process by lifeguards to monitor people in their coverage area) were apparently concentrating on the surface.

The results of this Ellis study detected a problem in their scanning process that they are now attempting to remedy. The problem of vigilance is not exclusively a lifeguarding phenomenon, but also afflicts pilots, automobile drivers and other surveillance personnel.

Flying and driving

Much has been written and researched on high states of arousal, but very little has been conducted on low levels of arousal and boredom — and even less has been written about lifeguard vigilance.

At low levels of arousal during any surveillance task, it is almost impossible to maintain attention, concentration and vigilance for extended periods of time. Most of what we know about lifeguard vigilance must be inferred from research results compiled in other fields of study.

During WWII, studies on vigilance and sustained attention began out of necessity. The Royal Air Force commissioned psychologist Norman Mackworth to study a dangerous phenomenon: Airborne radar operators were missing important blips on their screens after short periods while performing this simple surveillance task.

It was thought that if radar operators could so easily miss ▶

About the author

Tom Griffiths, Ed.D., a member of the Aquatics International *Advisory Board, is Penn State University's director of aquatics and safety officer in State College, Pa. He will chair an international task force on scanning at the World Congress on Drowning, June 26-28 in Amsterdam, the Netherlands. He can be reached at* tjg4@psu.edu.

Also contributing to this article were Dave Yukelson, Ph.D., a sports psychologist in intercollegiate athletics at Penn State, and Jeffrey Ratner, a pulmonologist with the Geisinger Medical Group in State College, Pa.

Water Safety Products Inc.

Wearing a visor and carrying water help keep a lifeguard cool, but heat is still her enemy. Studies show that performance declines in hotter weather.

German submarines on their screens, control tower personnel, airport security (and lifeguards, in our case) might be experiencing the same problems while on duty. Numerous studies confirmed that half of the reduced vigilance was occurring during the first 30 minutes on watch, but sometimes it began as early as 15 minutes into surveillance.

Another aspect of these studies deals with the complexity or difficulty of the task being performed. For optimal performance, a higher level of arousal or activation is needed for simple tasks, and a lower level of arousal is needed for more difficult tasks.

Scientists then learned that some physiological strategies could be used to increase vigilance. Mild physical exercise, sensory stimulation and even changes in environmental temperatures may increase the attentiveness of individuals performing simple surveillance tasks.

A study in Paris in 1992, using nuclear station control room operators, found improvements in vigilance when operators worked in teams of two and alternated between active and passive surveillance, with frequent changes in activities. In his 1970 book *Vigilance and Attention*, Mackworth found that frequent short breaks and even changes in activities may lead to increased vigilance.

Other studies found the more noncritical signals that observers must examine over a long period of time, the less likely they are to detect the critical signs. Vigilance actually increased with the frequency of critical signals detected, and as noncritical signs decreased.

Brain stimuli

Many lifeguards have appreciated the fact that any movement and mild exercise during surveillance tasks can stimulate the muscles and increase blood flow, which oxygenates the brain.

The explanation for this phenomenon is quite complex. Specifically, human attention requires stimulation of two major areas of the brain to function properly, according to Drs. Fred Plum and Jerome Posner in their neurophysiology text *The Diagnosis of Stupor and Coma* of 1972: *The Ascending Reticular Activation System (ARAS)* in the upper brain stem and areas of the cerebral cortex.

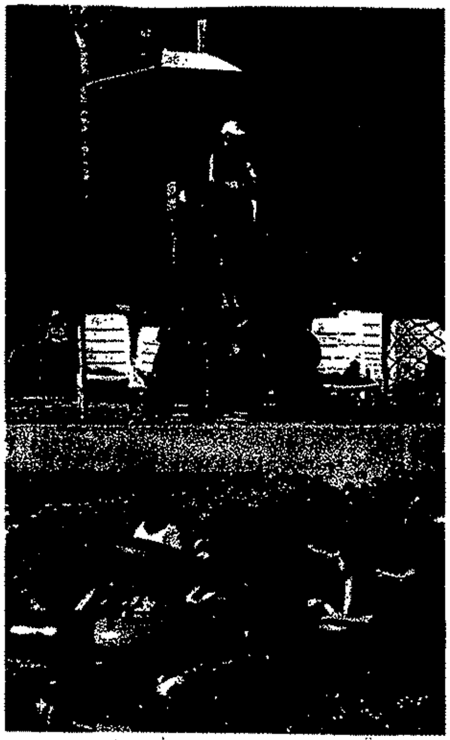
The ARAS receives additional pathways from, and is stimulated by, every major somatic (organ) and every sensory (nerve) pathway. Simply stated, visual stimuli — as well as stimuli from our muscle groups, centers from respiration and increased sympathetic tone from even minimal exertion — all feed into the ARAS. This area then primes the brain cortex for stimulus reception that, in turn, focuses this arousal energy for heightened arousal.

The prefrontal cortex of the dominant right hemisphere helps maintain attention, and the parietal cortex plays a role in shifting attention. These zones with their limbic connections are the attentional gate or environmental monitor for sensory stimulation back to the thalamic portion of the brain.

It is important to understand that this complicated and sophisticated input/feedback system requires the individual to be well-rested and not overly stimulated so he or she can maintain a higher level of vigilance.

This explanation also helps to illustrate why the increased movement, respiration and heart rate of the lifeguard serves to stimulate the neurological pathways for improved attention and concentration.

— I.G.



When it comes to lifeguard vigilance, very busy water can be every bit as counterproductive as near-empty water.

This is of vital importance to lifeguards, particularly those working at traditional, simple swimming pools.

Heat is an enemy

Temperature also can have a negative effect on vigilance. Mackworth found that when temperatures rose above 84 degrees Fahrenheit, a noticeable decline in performance occurs.

This is double trouble for lifeguards because as the temperature climbs higher, attendance at pools usually increases. Therefore, dipping into the water while rotating to a new position or using a water-misting bottle when stationary may help to keep lifeguards cool and more attentive. Shade and the consumption of cold water also may help lifeguards remain alert when the weather is warm.

Although studies involving automobile drivers may not be as sophisticated as those cited here, the results are similar to the pilot studies. According to the AAA Foundation for Traffic Study, results published on its Web site indicate a disproportionate number of automobile fatalities are caused by falling asleep under the monotonous driving conditions on straight, smooth and nonwinding roads.

Fewer accidents caused by sleep or drowsiness occur on windy, curvy, "dangerous" roads. Why? Those long, straight, boring roads do not provide enough variety, stimuli or arousal. Sounds a bit like lifeguarding, doesn't it?

It is logical, then, to theorize that ocean and waterpark guards tend to be more vigilant than traditional pool guards. Even pool guards claim to be more vigilant when they are busy.

The AAA also found from surveying thousands of drivers that the most effective ways to overcome driving boredom are to rotate drivers, talk with someone in the vehicle, sing, pull off the road to exercise and wash the face with cold water. It should be emphasized that no behavioral countermeasures in these studies were as effective as sleep, either before a road trip or at a rest stop during a trip. ●

Part 2 next month will take a closer look at scanning, and also ways in which lifeguards can maintain vigilance even in the most uneventful of situations.

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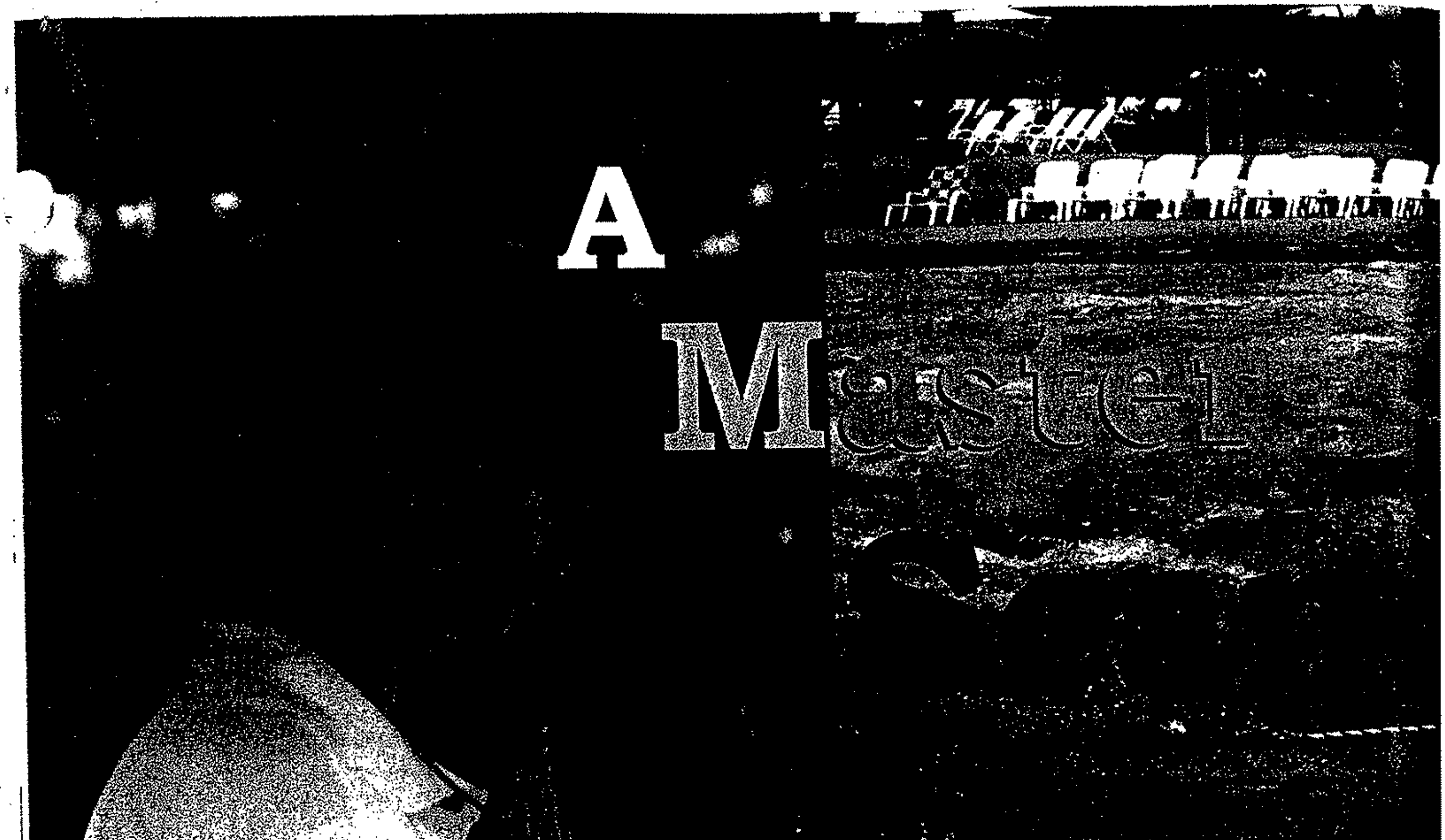
A Master



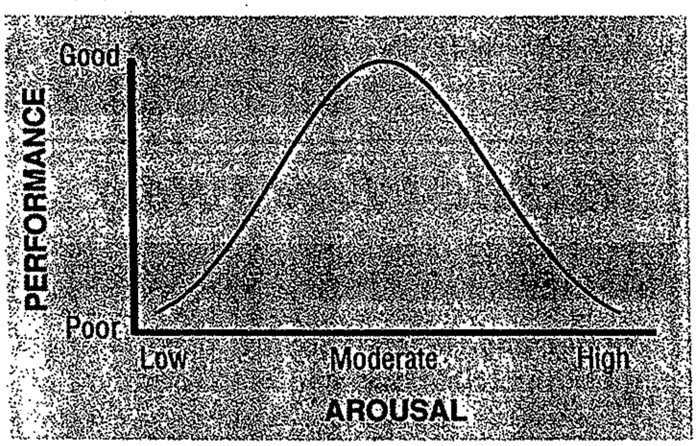
by Tom Griffiths, Ed.D.
Special to Aquatics International

This is the second of two parts. The first installment appeared in the May 2002 issue.

Playing baseball is, in many ways, a lot like lifeguarding. Although the game can be very exciting and the outcome can be decided in just seconds, there are long stretches of inactivity for many players, particularly outfielders. This can lead to a lack of vigilance that can adversely affect performance, one of the basic tenets of the *Inverted U Hypothesis.*

We often think of baseball players as being superstitious and, while they may claim to be superstitious, their daily rituals are actually focusing tools that remind them to keep active both mentally and physically in what is an important yet boring game for many of the participants. All the seemingly unimportant and even silly routines they follow remind them to stay on their toes. Warming up between innings, tapping the glove, repeatedly talking nonsense to others, stretching and jogging in the field are all mechanisms to keep them alert and vigilant because the next ball might be coming their way.

To be effective, however, these routines must be purposeful and systematic, specifically designed to help the athlete direct his energy and focus to the task at hand. Likewise, the positive self-talk that many athletes use could be incorporated by lifeguards to sustain



The trick for many lifeguards is to create mental and physical drills while on duty, as well as mentally rehearse rescues so they do not miss important cues.

Why, when, how

Most water-safety experts agree that constant, vigilant supervision is the primary duty of all lifeguards to prevent accidents. But in reality, vigilance is, by human nature, very difficult to maintain, particularly when the visual tasks required by lifeguards and others become boring, repetitive and routine.

Scanning is of paramount importance while maintaining vigilance, but there is no consensus in our field of exactly what scanning is and how it should be performed. In the past couple of decades, three exciting models have been proposed to keep the scanning process vigilant. While not all three specifically deal with the process of scanning, they relate well to the vital scanning process.

First, aquatic safety consultant Frank Pia developed his RID Factor (Recognition, Intrusion, Distraction), which deals mostly with victim recognition and why attention should not be diverted from the water. Pia noted how subtly and suddenly people can drown and then explained the instinctive drowning process in detail. One important result of his work is the realization that a victim may remain on the surface for a very short time.

His work reinforces *why* lifeguards must maintain vigilant scanning.

Then Ellis & Associates, the Houston lifeguard training organization and safety consulting firm, developed its "10/20 Patron Protection Rule," which covers primarily scanning and response times: 10 seconds to detect someone in distress and an additional 20 seconds to render assistance. Ellis preaches this rule because it is possible for a patron to drown in as little as 30 seconds.

P.J. Fenner expanded this time frame to 30/120 for his Surf Lifesavers in Australia. The work of Ellis alludes to the *when* of scanning.

Finally, I developed The Five-Minute Scanning Strategy, which addresses the physiology and psychology of an active scanning process and utilizes the research findings on vigilance. The system calls for safety checks and significant posture, position and eye pattern changes along with counting the patrons (when possible) every five minutes. I also recommend mental rehearsal drills, and their focus: Lifeguards may want to use predetermined cue words or positive self-talk every five minutes to help maintain focus.

While not everyone plays baseball, most of us drive cars, and that analogy certainly may be appropriate as well. At boring facilities on slow days, lifeguarding is like sitting in a car that is idling. Certainly, sitting in an idling car for hours on end would lead to boredom and inattentiveness. If an accident should occur while on duty, that lifeguard must put the pedal to the metal, zero to 60 mph in seconds flat. If the lifeguard is not mentally and physically prepared, slow and/or inappropriate action may take place and the lifeguard may even become injured during the course of the rescue because his body is not warmed up.

Waterpark and ocean guards often are mentally more ready to make a rescue because their environments are more stimulating and even entertaining. The trick for many underaroused lifeguards is to create mental and physical drills while on duty, as well as mentally rehearse rescues so they do not miss important cues and are physically able to respond safely and appropriately when an emergency occurs.

About the author

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verbal cues and mental focusing skills as a part of this strategy. I consider the Five-Minute Scan to be the *how* of scanning.

All three of these paradigms are closely related and have something important to offer water-safety professionals. Together, the three models can be adapted to rectify the human factors that make vigilance difficult.

RID Factor: The WHY of Scanning
10/20 Patron Protection Rule: The WHEN of Scanning
The Five-Minute Scanning Strategy: The HOW of Scanning

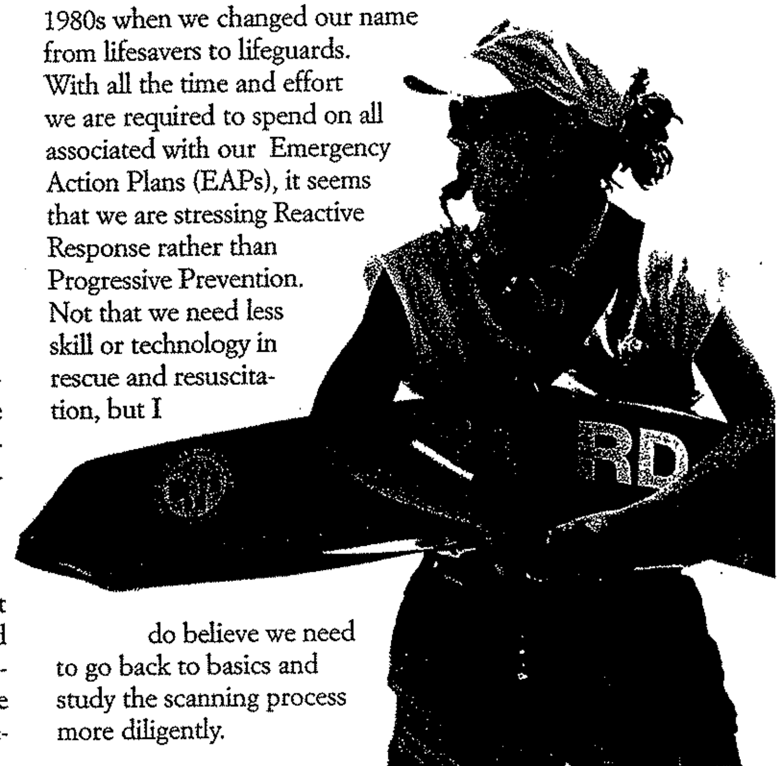
Collectively, the main concepts of these three paradigms help to construct a water-safety model that I call Progressive Prevention of Lifeguarding, as opposed to Reactive Response.

Reactive Response vs. Progressive Prevention

In recent years, with new technologies and advances available to water-safety personnel, many good protocols have been added to lifeguard training, particularly in the medical/science areas. Lifeguards now can use CPR, deliver oxygen, use Automated External Defibrillators (AEDs), backboard victims and use bag valve masks, all while protecting themselves from blood-borne pathogens.

These very positive and necessary advances not only protect lifeguards, but also increase the success rates of rescues and resuscitation efforts. With these advances come some disadvantages, however. These new devices and technologies take time to learn, become familiar with and be assimilated by all lifeguards. In addition, these new skills and technologies must be incorporated into in-service training. One of my fears is that our training scales are being tipped to the rescue and resuscitation side rather than the prevention side.

Remember, it was only back in the 1980s when we changed our name from lifesavers to lifeguards. With all the time and effort we are required to spend on all associated with our Emergency Action Plans (EAPs), it seems that we are stressing Reactive Response rather than Progressive Prevention. Not that we need less skill or technology in rescue and resuscitation, but I do believe we need to go back to basics and study the scanning process more diligently.



The future of scanning

It is time to reconsider the scanning process in a concise yet comprehensive way. As normal human beings, many lifeguards have not been able maintain vigilance. As a result, we now have a whole new computer-based technology that has been introduced to aquatics as "the lifeguard's third eye."

Underwater TV cameras and computers now are being manufactured to assist lifeguards with their scanning, particularly in boring, rectangular pools. Although lifeguards are trained to scan, rescue and resuscitate, we still discover too many motionless bodies at the bottom of guarded facilities. And, let's face it, this technology will be more vigilant than lifeguards because it cannot and will not succumb to environmental conditions that produce low levels of arousal and vigilance in humans.

To reduce drownings with lifeguards on duty, our profession needs to systematically study what happens to lifeguards at low levels of arousal and how to maintain moderate levels of arousal in lifeguards. Before we can do that, we need to refine the definition of the scanning process. I submit that lifeguard scanning is more than just the physical process requiring constant eye and head movement around the aquatic facility. When we attempt to define scanning processes, we should agree that lifeguard scanning must be an interactive process that includes physical, mental and psychological aspects.

The act of scanning is easy, but the process of scanning and remaining vigilant is a comprehensive and vitally important task. Research must be conducted on how to get lifeguards to maintain vigilance after long hours of boredom and tedium. One of the first steps toward achieving this goal is to define lifeguard scanning more succinctly and then systematically study individual components. As we examine the components of scanning, I believe the Inverted U Hypothesis must be applied.

Although instinctively and intuitively we realize that many physical and psychological tricks can be used to increase vigilance, careful study of the cause and effects of these scanning tips is important. We must study the psychophysiology of lifeguarding so that vigilance is increased.

All variables — those that are physical, mental and psychophysiological — should be measured along with the effectiveness of scanning while on duty. Then, and only then, will we know how to scan more effectively and efficiently. Producing this in a controlled setting is difficult enough, but measuring these variables in the real world of lifeguards is even more difficult. We need to comprehensively study what we believe to be intuitively and instinctively correct. That is the challenge for the 21st century. All the technology in the world won't bring back the lifeless body of a child that went unnoticed by an inattentive lifeguard. ●

For references and further reading, visit us online. www.aquaticsintl.com