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Reaction to Hunsucker and Davison's "Vision and Signal Detection"

Tom Griffiths

I read with interest the technical paper on lifeguard vision and signal detection authored by Dr. John Hunsucker and Scott Davison. It should be understood that I have seen and heard similar versions of this presentation by "Dr. John" numerous times, and each time I attend his lecture, I learn something new. Having spent 3 decades as a professor of mathematics and engineering at the University of Houston, certainly he is more than qualified to author an article such as this.

I whole-heartedly agree with the authors that very little preventive lifeguard practice and protocol is based on adequate science and experimental research. Most lifeguarding protocols are based on the experience of others in the field who often have developed their strategies and procedures through volunteer water-safety committees. Although some very valuable lifeguarding practices have originated in this fashion, most are based more on personal opinion than on scientific evidence. Unfortunately, when research such as this comes along, many in the water-safety world criticize it for not being "peer reviewed."

It must be emphasized that, until now, with the publication of *IJARE,* relatively little, if any, water-safety "research" has been truly peer reviewed by qualified scientific reviewers. Committee review and approval of a water-safety concept is not the same as, nor does it begin to approach, the scrutiny of a peer-reviewed hypothesis. It should be noted that many water-safety professionals who claim to have conducted research really have simply observed and not scientifically or statistically analyzed data. Conversely, Dr. Hunsucker's area of expertise was engineering before he concentrated on aquatics, and he is well versed in experimental design. Based on his academic credentials, he is more than qualified to conduct research in the area of lifeguarding and water safety, and his education, training, and experience make him well suited to address vision through the engineering of the eye.

What is refreshing and enlightening about this vision and signal-detection article is that it is based primarily on previously conducted research in related fields of study and not aquatics. The article is devoted to the *science* of seeing rather than the *art* of seeing. This is truly an interdisciplinary approach to lifeguarding that is critically needed.

Although the article does provide valuable and significant information for lifeguards and lifeguard instructors and supervisors, the reader must be cautioned that

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The author is the Director of Aquatics and Safety Officer for Athletics at Penn State University, University Park, PA 16802. **Editor's Note**: Dr. Tom Griffiths was invited to provide a "reaction" to the Hunsucker and Davison paper based on his expertise and numerous presentations and publications relating to visual surveillance and scanning techniques in lifeguarding.

it does not include the psychological aspects of vision and perceptions. As in other similar areas of study, I believe that psychology is just as important as physiology. As the cognitive psychologists repeatedly have stated, there is a significant difference between *seeing* and *perceiving*. Numerous accidents occur not because the object was not *seen* but rather because it was not *perceived*. For example, drivers who talk on their cell phones while driving *see* as much as when they are driving and not using the cell phone, but they *perceive* less and therefore have a higher chance for accidents.

Conspicuous in this article is the lack of description of the exact methodology of how the visual-scanning data were collected. These specific data would have added greater scientific credibility to the article, although, of course, this would have lengthened it at the same time.

More specifically, the Hunsucker and Davison article deals with specific scanning strategies and compares the efficiency of different patterns in detecting signals. Although the different scanning strategies and their efficiency and effectiveness should be addressed in all lifeguard-training programs, specific scanning strategies have been shunned by many in favor of a generic sweeping pattern that purports to look at everything. Too often this generic scanning sweep ends up having the lifeguard actually perceive very little of importance to the safety of swimmers. Other than lifeguarding, I know of no other surveillance agencies or personnel who recommend a general visual sweeping pattern without specified schemes, strategies, or organizational patterns to help track individuals.

I personally do not agree with statements in the article such as "anything less than 100% efficiency in signal detection is unacceptable" or "this scan is 100% effective" because when it comes to lifeguarding, particularly with immature teenage lifeguards on duty, no such guarantees are possible in reality. I think it is important to understand that visual surveillance often produces two types of what has been called "body blindness." One type is called visual body blindness, which results from visual obstructions caused by reflection, refraction, glare, surface disturbance, and physical obstructions from the water. The other type is called perceptual body blindness, which has been studied by psychologists around the world who have explained why people in general miss the most obvious visual cues. This same body of research can and should also be used to explain and illustrate why parents and lifeguards often miss human bodies lying motionless on the bottom of crystal-clear swimming pools. People, including lifeguards, see what they expect to see. Although our eyes might see much, our brains actually might perceive very little because only a small percentage of what we see is actually encoded. Because of this combination of physical and psychological visual impairments, few people can ever be 100% effective in detecting all potentially important observable cues, particularly in lifeguarding where light and water mingle and mix. Having stated this criticism, this work by Hunsucker and Davison certainly can teach lifeguards and trainers to scan more effectively and makes a significant and positive addition to our field.

Hunsucker and Davison accurately illustrate the blind spot directly in front of and below lifeguards seated in elevated lifeguard chairs. Although this physical blind spot does in fact exist, it is important to examine the several explanations of why it occurs. The orbital sockets in the skull place the eyes in a recessed position behind the zygomatic arches (also known as the cheekbones). Therefore a blind

spot naturally exists because the bones of the cheeks create a physical obstruction for the eyes by destroying the line of sight forward and downward from the stationary head. This anatomical structure is one explanation for why everyone has a blind spot in front of them and why we cannot see our own feet if we look directly forward. I think most lifeguards would better appreciate this fact if they actually knew the blind spot existed and why it was there.

In summary, I do believe the Hunsucker and Davison article provides and contrasts a series of very worthwhile scanning patterns and strategies that should be experimented with by real lifeguards on duty under a variety of conditions. I hope this article encourages others, including the main aquatic and lifeguarding agencies, to attempt their own scientific investigations of the scanning process. It is clear that lifeguards need a system or a strategy of their own to employ while on duty so that they can detect drowning victims more effectively while increasing their vigilance and reducing the effects of boredom at the same time. I have never subscribed to the notion that simply conducting a general visual sweep of a zone of coverage can remain effective for long, particularly without employing a scanning methodology with demonstrated effectiveness. Looking for potential drowning victims is not the same as "finding Waldo."

Scholarly works such as this article by Hunsucker and Davison, with its wide variety of scanning strategies, although not perfect should be encouraged instead of criticized because of the lack of research conducted in our field. I find it very unfortunate that potentially valuable field tests like the "dummy drops" conducted by Ellis and Associates and Poseidon Technologies are routinely dismissed because those performing these experiments are "for profit." Likewise, it is distressing that the "5-minute scanning strategy" often has been criticized for being "spurious research" even though the research for the technique was conducted by tenured faculty members at the University of Maryland, East Carolina University, and Penn State University and involved samples totaling over 10,000 lifeguards.

The aquatics field needs to encourage more high-quality research, not merely criticize and dismiss it. We need to accept and embrace new concepts and ideas, especially those with support from empirical research. As a field, we need to stop being so protective, territorial, and parochial with respect to our traditional procedures and come together in a unified attempt to reduce drowning deaths. The Hunsucker and Davison article's attempt to study effective lifeguarding scanning strategies based on visual neurophysiology and engineering principles is definitely a step in the right direction. Let's keep it up.