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ORIGINAL RESEARCH

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Identification of Critical Events by Lifeguards, Instructors, and Non-Lifeguards

Lyndsey K. Lanagan-Leitzel

Lifeguards are instructed to respond both to dangerous behavior and to distress/drowning events. Variability in lifeguard effectiveness may result from variability in how individual lifeguards define what events are important to monitor ("critical events"). The variability in defining critical events was examined in the current study by presenting videos of normal aquatic activity to lifeguards ($N = 17$), lifeguard instructors ($N = 10$), non-lifeguards ($N = 20$), and students enrolled in a lifeguarding course ($N = 12$). Participants were asked to identify the events that they thought were important for a lifeguard to monitor and provide an explanation as to why they were critical. All participant groups (instructors included) had very few events that were consistently reported, and many of the events that the instructors or lifeguards reported were also well-reported by non-lifeguards. These results suggest that there is a lack of agreement in the identification of critical events.

Despite the effectiveness of lifeguards (Branche & Stewart, 2001; United States Lifesaving Association, 2009), people still drown in lifeguarded facilities (Pelletier & Gilchrist, 2011). In June 2011, 36-year-old Marie Joseph submerged in a public swimming pool in Fall River, Massachusetts and never resurfaced. Her body was discovered by teenagers two days later. This scenario is thankfully rare, but it highlights the difficulty faced by lifeguards. The pool came under heavy criticism because the water was cloudy, which obscured the body at the bottom, and nobody noticed this woman's disappearance. Lifeguards perform their job so well that a missed drowning is a major news story because it is so rare.

Parents are ultimately responsible for their children, but prior research has shown that they do not pay adequate attention to them. Parents report believing that swim lessons will help their children avoid drowning (Moran & Stanley, 2006) and tend to underestimate the risk of drowning (Moran, 2009). In one study, as many as 24% of children were found to be unsupervised as parents sunbathed or talked to other people on the beach or on their cell phones (Moran, 2010), and in another, as many as 29% of caregivers reported inadequate supervision (Moran, 2009). Low levels of caregiver supervision have been documented with older children playing with others as opposed to younger children playing alone (Petrass, Blitvich, & Finch, 2011). With the lack of parental supervision, the lifeguard may be the

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child's only protection against drowning, although increasingly, parents need to be reminded that "lifeguards are not babysitters" (Scarr, Chellew, & Franklin, 2007).

Lifeguards, regardless of which textbook is used in their education (American Red Cross, 1995, 2007; Ellis & Associates, 2007; United States Lifesaving Association, 2003; White, 2006), are instructed to look for a specific set of behaviors that are thought to accompany drowning or distress. The most dangerous set of behaviors are splashing, frequent submersion, and a lack of progress through the water, such as what might occur during the instinctive drowning response (Pia, 1974). Lifeguards must also be vigilant for behaviors that indicate that a patron is distressed or soon may become so—a patron who is moving slowly due to weakness, physical condition, or fatigue, or who is moving into water that is beyond their skill level. A quick response to a drowning event will ensure that the patron does not experience serious injury from their incident, and a quick response to distress will ensure that the patron is rescued before they begin to drown. This is why lifeguards are admonished to notice a drowning incident as quickly as possible (in even as few as 10 s; Ellis and Associates, 2007) and perform a necessary rescue as quickly as possible.

One problem with these definitions is that the behaviors described are not always indicative of drowning or distress—splashing and submersion happen very frequently in an aquatic environment, and even strong swimmers will slow down or stop eventually. An overreliance on these particular behaviors can result in surveillance that is haphazard and incomplete. The lifeguard may not be very effective as patrons with more subdued behavior may be ignored.

A second problem with these definitions of potential drowning behaviors is that lifeguards are also responsible for preventing aquatic injury in addition to preventing drowning (American Red Cross, 1995, 2007; Ellis & Associates, 2007; United States Lifesaving Association, 2003; White, 2006). Thus, lifeguards are responsible for stopping children from jumping onto other children in a pool and warning patrons not to go outside the swim area in a lake or ocean. To accomplish this, their attention must focus on many things other than splashing, submersion, and swimming speed and be flexible enough to accommodate challenges posed by environmental conditions (e.g., weather, presence of boats).

One way that lifeguards could manage the task of surveillance is to search not for specific behaviors but for *critical events*. A critical event would be a specific event used by each individual lifeguard to determine attentional priority in a scene. It is most likely that lifeguards would determine these critical events using their textbook knowledge of drowning behaviors that are reinforced with their job experience (e.g., extended submersion time, ineffectively flailing arms) as well as behaviors that typically result in injury and occur frequently in their facility (e.g., running and jumping in, horseplay involving climbing on other swimmers) and behaviors expressly forbidden by their employer (e.g., straying from the designated swim area). Using these critical events, lifeguards would be able to quickly dismiss as safe the child waving her arms to say "pass me the ball" and quickly respond to the child flailing her arms because she has stepped into water over her head.

Variability in how lifeguards define these critical events may be one explanation for why many drowning incidents go unnoticed. A lifeguard whose definition of a critical event involves extended submersion may miss or be delayed in responding to a person who has flailing arms but is otherwise above the surface of the water. Another lifeguard whose definition of a critical event involves lack of motion or slow progress through the water would readily notice a floating body but might miss or be delayed in responding to a surface struggle. Research has already determined that responses are highly variable among submersion incidents, such as those that occur during mannequin audits (Brener & Oostman, 2002), so it is likely that lifeguards may differ dramatically in how they define what they are looking for.

Recent research has shown that lifeguard monitoring of critical events is not much better than that of non-lifeguards (Lanagan-Leitzel & Moore, 2010). One lifeguard researcher and one lifeguard supervisor indicated which events in several videos of people swimming were critical for a lifeguard to monitor. Lifeguards and non-lifeguards, some of whom were given special instructions on the instinctive drowning response and passive drowning behaviors drawn from American Red Cross (1995), watched these videos while an eye-tracker camera recorded their eye position. The lifeguards only looked at an average of 54% of the critical events that had been identified by the two experts. The non-lifeguards who were given instructions on drowning behaviors looked at 49.2% of the critical events—statistically indistinguishable from the lifeguards. Even non-lifeguards, who were instructed to look at whatever they wanted to, managed to look at 41.4% of the critical events. These results suggest that lifeguards are not always looking at the events that they should.

There are several explanations for Lanagan-Leitzel and Moore's (2010) results. One explanation is that the lifeguards knew what events they were supposed to be monitoring, but they did not actually monitor them. The study used videos instead of monitoring real people in real time, which precluded the necessity of rescue. This may have prompted participants to assume that every patron was safe and therefore not monitor them at a level that they typically would. Another more troubling explanation is that the lifeguards' ideas of what events were critical to monitor did not match the ideas of the two lifeguard experts consulted. This explanation is more problematic because it suggests a failure to communicate and/or learn expectations during the training and certification process and to follow them while guarding.

The current study examined what events are identified as "critical for a lifeguard to monitor" by lifeguard instructors, certified lifeguards, lifeguarding students (before and after surveillance instruction), and non-lifeguards. Due to the variability of lifeguard performance reported by Lanagan-Leitzel and Moore (2010), I expected that there would be a large amount of variability in the identification of these events, at least among the lifeguards and non-lifeguards. I anticipated that the lifeguard instructors, by virtue of their added training and experience teaching aquatic safety, would have a higher rate of agreement in identifying these events. One flaw with Lanagan-Leitzel and Moore's (2010) method was that the stimulus videos were very short (i.e., 30 s in length), which may have been an insufficient amount of time to ascertain patron strengths and weaknesses to discern critical events. To provide participants with ample time to determine patron strength, new videos that were two minutes in length were used in this study. Although using videos precludes the necessity of rescue and may encourage lifeguards to be less attentive than they might otherwise be, it was important that all participants experience the same events to determine whether they report the same events as critical.

Method

Participants

A total of 59 participants completed this study. Ten of these were lifeguard instructors recruited through the Connecticut Chapter of the American Red Cross (four females and six males, with an average age of 31.6 years and an average lifeguarding experience of 15.1 years, ranging from 3 to 41 years). Lifeguard instructors were paid $15 for their participation. The rest of the participants were students at Eastern Connecticut State University. Twelve were students enrolled in Eastern's lifeguarding course in Spring 2010 or Spring 2011 (seven males and five females, with an average age of 22.6 years). They participated both at the beginning of the semester and again at the end of the semester in exchange for extra credit within that course. Seventeen participants were certified lifeguards recruited through the Psychology Department or through word-of-mouth (one male and 16 females, with an average age of 20.1 years and an average lifeguard experience of 2.5 years). They received either $10 or research credit for participation. The final 20 participants (six males and 14 females, with an average age of 20.9 years) had never been lifeguards and participated for research credit (*non-lifeguards*).

Stimuli

All participants watched 20 videos (each two minutes in length) of normal aquatic activity at five locations around Connecticut (two ocean beaches, two lakes, and the indoor campus pool). Four videos were created from each of the five locations and were selected to include as many patrons and as much varied activity as possible. The videos were recorded using a Sony HandyCam model DCR-SR47 attached to a tripod that was set at the shore of the water or on the deck of the pool. The camera was stationary during each video clip. The videos were shown to lifeguard instructors using Windows Media Player on a Dell laptop (the author traveled to them) and were shown to all other participants using Matlab with the Psychophysics Toolbox libraries (Brainard, 1997; Pelli, 1997) on a Dell desktop computer in the author's campus laboratory.

Procedure

Participants were asked to identify events that they thought were "critical for a lifeguard to monitor." The instructions were intentionally left vague so as to determine what events were serious enough to warrant lifeguard attention in the different groups of participants. Participants watched each video clip, indicating to the author (lifeguard instructors) or clicking on (all other participants) which events were critical to monitor. Participants then provided an explanation of why the event was critical to monitor. After providing this explanation, the video clip continued until the end or until another event was identified. Each time a participant clicked on an event, the computer recorded the timestamp as well as the spatial (x,y) coordinates of the click to allow for identifying the event to which they were referring. Participants were given a self-paced break after each video clip to rest as needed.

Results

After all data were collected, each reported event was verified to ensure there were no duplicates. Participants reported 323 different events in the videos. A total of 173 of these were discrete events that had a clear beginning and end within the video clip and were typically of short duration (e.g., a boy throwing a rock, a girl doing an underwater handstand). A total of 91 events continued throughout the video clip without stopping (e.g., a group of boys playing with a swim divider rope). The remaining 59 "events" were comments supplied by participants about the video clips that were not specific to a particular event (e.g., "too many waves").

Number of Events Reported

Each participant group had a large variability in the number of events reported. There were large differences among the groups in the average number of events reported, $F(4,70) = 5.534$, $p = .001$. The instructors reported an average of 52.9 ± 8.70 events each (range: 25–121). For the instructors, there was no correlation between the number of years of lifeguard experience and the number of events reported ($r = .112$, *ns*). The lifeguards reported an average of 25.2 ± 3.99 events each (range: 0–57). The difference between the instructors and the lifeguards was significant, $t(25) = 3.294$, $p = .003$). The students enrolled in the lifeguarding course reported an average of 16.3 ± 3.39 events (range: 7–50) at the beginning of the semester and 18.7 ± 6.17 events (range: 7–85) at the end of the semester, a difference that was not significant, $t(11) = 0.755$, *ns*. The nonlifeguards reported an average of 29.6 ± 4.97 events each (range: 0–74), which did not differ significantly from the certified lifeguards, $t(35) = 0.677$, *ns*.

Event Agreement

Specific events were examined to determine if they were frequently reported by any participant group. The highest rate of agreement was seen among the lifeguard instructors (as seen by the leftward shift of the black solid line in Figure 1), but surprisingly there were no events identified by every lifeguard instructor. Only five events were identified by 90% of the lifeguard instructors. Only 14 events were identified by at least 70% of the lifeguard instructors. The lifeguards did not agree with each other any better than the non-lifeguards or the students in the lifeguarding course.

Top-Reported Events

The 14 events reported by at least 70% of the lifeguard instructors were highly reported by the other participants as well. These events included a child who was repeatedly submerging near a swim area divider in a lake, a boy who did several back flips off his friend's shoulders, and an elderly swimmer who was swimming slowly (see Table 1). Some events were not well-reported by the lifeguards despite being identified by the instructors. For example, in one of the video clips, a toddler has a hard time standing as the ocean waves crash into him. Although his father is

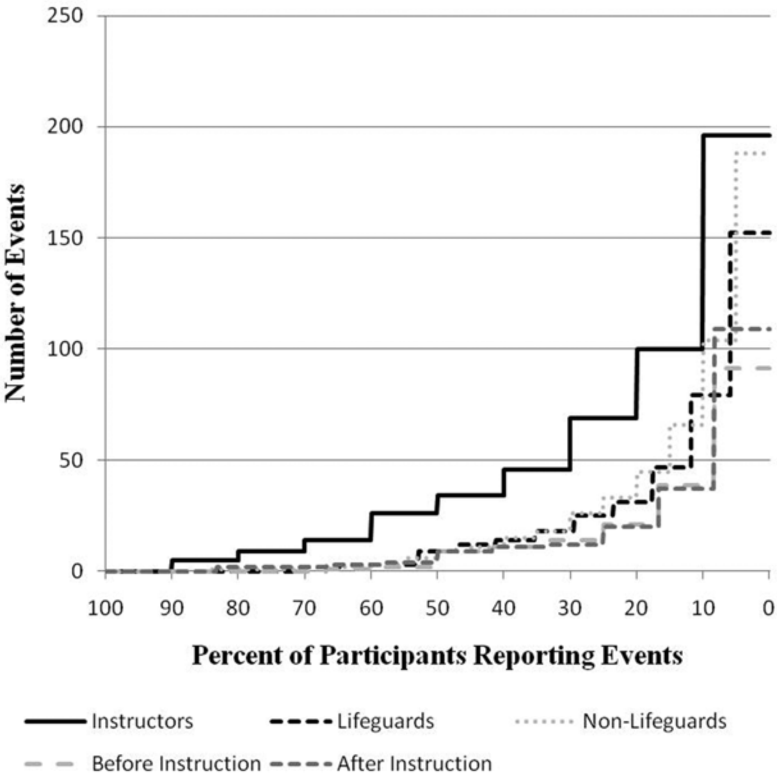

Figure 1 — Cumulative frequency distribution of the number of agreed events per participant group. Lifeguard instructors had a higher rate of agreement than the other groups, as can be seen by the leftward shift of the solid black line.

near him, the boy fell down face-first into the water. Eighty percent of instructors identified this event, and only one lifeguard identified it. In contrast, 58% of the students at the end of the lifeguarding course and 45% of the non-lifeguards identified this same event. It is possible that the lifeguards assumed that the presence of the father was enough to ensure the child would not drown.

Another event that was well-reported by instructors but not reported by other participants occurred when two boys in one of the ocean video clips began to race toward a buoy. Connecticut's ocean beaches, which border Long Island Sound, typically have very large swim areas that extend a considerable distance from the shore. In fact, in the videos, it was difficult to see people who were that far out because they were so small in the picture. Their swim race began with a lot of splashing, but with all the other swimming activity in the video, this may have been missed by the majority of participants or misinterpreted as a splashing fight.

One event, a young boy jumping in shallow lake water, was not well-reported by the instructors (30%) but was well-reported by the lifeguards (52.9%), non-

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Table 1 Identification of Events Most Identified by Instructors

Group	Lifeguards[a]	Before Instruction[b]	After Instruction[b]	Non-Lifeguards[c]
Events Identified by 90% of Instructors				
Kid submerging alone by swim area divider	70.6%	50%	50%	85%
Boy standing on shoulders, back flip into water (1)[d]	52.9%	58.3%	83.3%	50%
Swimmers far out in ocean	47.1%	50%	50%	40%
Very weak/elderly swimmer (1)[e]	64.7%	33.3%	50%	35%
Very weak/elderly swimmer (2)[e]	52.9%	25%	25%	50%
Events Identified by 80% of Instructors				
Kids submerging in deep water and playing with swim area divider	70.6%	66.7%	83.3%	70%
Toddler falls down in ocean	5.9%	16.7%	58.3%	45%
Man outside swim area divider	35.3%	25%	0%	25%
Two boys race toward ocean buoy	0%	0%	16.7%	5%
Events Identified by 70% of Instructors				
People far out	29.4%	50%	50%	35%
Kid riding on another's back	29.4%	16.7%	50%	40%
Boat too close to swim area	11.8%	8.3%	41.7%	55%
Boy standing on shoulders, back flip into water (2)[d]	11.8%	33.3%	25%	5%
Boy standing on shoulders, back flip into water (3)[d]	0%	0%	0%	0%

[a]Percentages are based on a sample size of 17 lifeguards.

[b]Percentages are based on a sample size of 12 students in the lifeguarding course.

[c]Percentages are based on a sample size of 20 non-lifeguards.

[d]These were three separate events by the same group of people within the same video clip. Participants were told that if an event was repeated that they did not have to continuously report it. They were encouraged to report it again if it had become more serious. This appears to be what the instructors had done but the other participants did not.

[e]This swimmer was in two different videos, so it is treated as two different events.

lifeguards (60%), and students in the lifeguarding course (50% at the beginning and end of the semester). In this event, the boy repeatedly belly-flopped and attempted to perform a handstand in the shallow part of the swimming area while two young girls stood near him. The lifeguards described the incident as "too shallow to dive," "he could land on a sharp object," and "he could hit his head." Even one non-lifeguard noted that "jumping face down can cause concussions." It is unclear why this event was not reported more frequently by the instructors.

Event Categories

Each event was scrutinized to determine what features were present that could attract a lifeguard's attention. Participant explanations were scrutinized to determine what these categories were. Not surprisingly, the categories that emerged were ones that are consistent with the behaviors that lifeguards are taught to look for in the various training manuals that are currently used in training programs (American Red Cross, 1995, 2007; Ellis & Associates, 2007; United States Lifesaving Association, 2003; White, 2006). Each event was categorized by up to three of the 12 identified categories. A total of 124 events could only be classified into one category, while 176 could be classified into two categories, and 23 could be classified into three. The categories that emerged from the explanations focused on instinctive drowning response behaviors (submersion, splashing), patron weakness indicators (young child, water depth, weakness), physical danger warnings (bad water conditions, horseplay, vehicle presence), problems with unattended children, an obstructed view, a new person entering the scene, or a general comment.

Submersion was the most common category (*N* = 70 events total). Patrons in the ocean and lakes frequently went underwater or seemed to disappear behind the waves. The video clips also portrayed many unattended children (*N* = 66 events total). Similar to Moran (2010), children were frequently playing alone with little adult supervision, and many participants identified these children as critical for a lifeguard to monitor. Swimmer weakness (*N* = 62 events total) and water depth (*N* = 61 events total) also were frequently reported due to the increased risk for drowning among swimmers who are weak (identified here by moving slowly, having an odd swim stroke, or stopping to catch one's breath) or in water beyond their skill level. Horseplay was also very common—a total of 59 events were identified that had a component of horseplay. Patrons threw rocks, sat on shoulders, rode on other's backs, performed back flips, hung onto other's necks, etc. It is important for a lifeguard to monitor these events to ensure that no physical injury results from such actions.

Of the 124 events classified into only one category, the top categories were general comment (*N* = 23), swimmer weakness (*N* = 16), submersion (*N* = 14), horseplay (*N* = 13), and water depth (*N* = 12). The comments ranged from "mask hinders breathing" to "people swimming in [to shore]" and "whistle was blown." The top combinations of two categories were unattended children submerging (*N* = 14), waves obstructing whether a patron was submerged or not (*N* = 13), unattended children committing horseplay (*N* = 12), and comments about having an obstructed view (*N* = 13). The top combinations of three categories were an obstructed view of submersion in deep water (*N* = 3), horseplay with submersion in deep water (*N* = 2), and unattended weak children in deep water (*N* = 2).

Events containing one critical feature or behavior are important to monitor, but what about events containing multiple features? It seems logical that if a child frantically waving her arms draws a lifeguard's attention, then a child who is frequently submerging while also frantically waving her arms should draw a lifeguard's attention even more. Events that were characterized by three categories indeed were reported at a significantly higher rate (M = 10.8 participants per event) than events characterized by two categories (M = 6.0 participants per event) and events characterized by a single category, M = 4.2 participants per event; $F(2, 221) = 4.948$, $p = .008$.

Discussion

This study reveals that experienced lifeguard instructors, lifeguards, and non-lifeguards do not identify the same events as critical for a lifeguard to monitor. The failure of participants, especially lifeguards, to report the same events suggests that either each person's definition of what s/he is looking for is different from what others are looking for or our current lifeguard training is ineffective, perhaps even counterproductive, in developing observation and scanning skills of critical events. This is particularly problematic because it suggests that lifeguard effectiveness is highly variable—a drowning incident may be readily noticed by one lifeguard but go unnoticed by another. Worse yet, it is likely that an individual lifeguard's effectiveness may be highly variable, with decreased detection during periods of high heat, fatigue, or boredom (e.g., Mackworth, 1950). What the training manuals (American Red Cross, 1995, 2007; Ellis & Associates, 2007; United States Lifesaving Association, 2003; White, 2006) attempt to do is identify those specific behaviors that often precede or accompany injury or drowning (a.k.a., critical events) and encourage lifeguards to look for those behaviors to guide their search. Although many of the events identified were explained in terms of these behaviors, lifeguards in this study inconsistently reported events involving these behaviors.

The instructors tended to agree on more events than the lifeguards did. This is not terribly surprising given the instructors' additional education and training in water safety (because they were certified lifeguarding instructors), but also because of the number of years of lifeguard experience that they had (an average of 15.1 years that ranged from 3 to 41 years). The lifeguards participating in the study were college students who were young and had relatively very little work experience (2.5 years on average) but likely were similar to the general lifeguard population. The level of variability seen in the lifeguard group was consistent with the monitoring variability seen in Lanagan-Leitzel and Moore (2010): one lifeguard (a female with three years of summer lifeguarding experience) watched all the videos and declared that there was nothing critical for a lifeguard to monitor. Another (a female with five years of summer lifeguarding experience) identified 57 different events. This variability likely contributes to inconsistent responses by lifeguards and is problematic if consistent responses are required in the field.

Another explanation of the variable performance seen in this study is that participants may have had differing definitions of what constituted a "critical" event. Some participants adopted a more conservative criterion and pointed out only those events that were very serious, while others adopted a more liberal criterion and pointed out practically every event. This can be seen in the wide range of the number of events reported: students in the lifeguarding course reported 7–85 events, lifeguards reported 0–57 events, instructors reported 25–121 events, and non-lifeguards reported 0–74 events. Participants were not asked to rate the severity of the events, so future research will have to determine whether participants are only highly variable in identifying the events or whether they also differ in how serious they perceive them to be.

The lifeguard instructors, while performing "better" in terms of more agreement on events, were nevertheless variable among themselves and did not have perfect interindividual agreement on any single event. Unlike the lifeguards, this group had a wide range in the number of years since they completed their first lifeguard certification test, from three years to 41 years, and there was no significant correlation between the number of years since lifeguard training and the number of events reported. It is possible that their instruction, which occurred through many different sources, taught them to focus on different behaviors and events within the scene. It is likely that lifeguards first certified in the 1960s, 1970s, or 1980s experienced very different instruction than lifeguards certified today, and it is unclear how much of the variability in the instructors' performance is due to those differing standards. It is troubling that there were zero events that every instructor deemed important to monitor. Perhaps this interindividual variability seen among the instructors illustrates differences in interpretation that are transmitted to their students during instruction.

The non-lifeguards did surprisingly well at identifying many of the events that the lifeguard instructors had identified. They were especially good at identifying events where young children were performing dangerous activities, such as repeated submerging, horseplay, or going too far from shore. This finding suggests that there is some level of lifeguard knowledge and observation skill possessed by non-lifeguards, and that lifeguard instruction might do well to build upon this knowledge instead of reteaching it. Lifeguard instruction might be able to focus instead on other events or behaviors that the students are unlikely to identify as "critical events" when they begin their training.

The results of this study suggest that lifeguards are not consistently identifying events that may be critical for them to monitor. It is possible that they internalize the list of behaviors that exist in the training manuals (American Red Cross, 1995, 2007; Ellis & Associates, 2007; United States Lifesaving Association, 2003; White, 2006) but may not recognize or act on them. It is also possible that knowing what to look for and maintaining consistent observational or scanning skills comes with work experience as lifeguards monitor real people in real situations. Because each lifeguard will have had different experiences, this might contribute to varied performance.

It is important to note that this study did not compare performance to measures of lifeguard effectiveness; it is unknown whether a lack of reporting critical events in this study was related to a lack of ability to notice them in the field. Future research will have to determine this. It is also unclear whether having a larger group of lifeguards with more lifeguard experience, instead of college students, would change the results. Lifelong full-time professional lifeguards may know more and have better surveillance skills than those who are relatively inexperienced, part-time lifeguards.

One prominent limitation of this study was the relative homogeneity of the lifeguard sample. Only one of the 17 lifeguards was male and all lifeguards reported five or fewer years of experience as a lifeguard. Only seven reported experience with lake and/or ocean beaches, yet the majority of the video clips used in this study were lake or ocean beaches. Although four of the 20 video clips were recorded in a pool facility, this facility had low attendance on each of the days that filming took place. Reporting of events was more thorough in these clips, but it is unclear if this was because of greater expertise in pool monitoring or because there were fewer events to monitor than in the ocean or lake video clips. In addition, it is unclear whether the low reporting of critical events by lifeguards overall was due to a failure to notice the events or due to their relative inexperience with the ocean and lake environments that appeared in the majority of the video clips. Future research will have to examine the effect of experience in a specific aquatic environment upon successful detection of critical events within that environment compared with other environments.

The outcomes of this study open up a number of questions for future research. For example, future research should examine whether lifeguard monitoring improves with experience. Although the current study found no correlation between the number of years of lifeguard experience and the number of critical events identified by the lifeguard instructors, it is unclear if this means that the instructors did not improve as they gained experience. Only a longitudinal study, examining how monitoring changes over time, can examine this question. Future research should also seek to develop ways to assist lifeguard instructors in teaching their students what events are critical to monitor as well as developing their actual surveillance and observation skills. The rarity of capturing actual drowning events on tape makes it difficult to practice the surveillance component of lifeguarding. Modern technology using virtual reality or computerized video games could be adapted to create scenarios to enable this surveillance practice. Using these technologies, a lifeguard could be exposed to several scenarios to determine if s/he notices a preprogrammed critical event. If not, no life is in danger and the lifeguard can be made aware of his/her mistake. This technology could also allow researchers to more easily determine what aspects of the scene attract the lifeguard's attention and under what circumstances critical events are missed. Another logical next study might be to use the current videos to explicitly test whether a trained group improves their identification of critical events better than a control group. Information gained from virtual studies and training studies has the potential to greatly improve current methods of lifeguard instruction, particularly the identification of critical events and development of surveillance, scanning, and observational skills.

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