International Journal of Aquatic Research and Education

Volume 3 | Number 4 Article 8

11-1-2009

Under What Circumstances Do People Drown? Encoding the Fourth Component of the 4W Model

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Recommended Citation

Avramidis, Stathis; Butterly, Ronald; and Llewellyn, David (2009) "Under What Circumstances Do People Drown? Encoding the Fourth Component of the 4W Model," *International Journal of Aquatic Research and Education*: Vol. 3 : No. 4 , Article 8.
DOI: 10.25035/ijare.03.04.08
Available at: https://scholarworks.bgsu.edu/ijare/vol3/iss4/8

International Journal of Aquatic Research and Education, 2009, 3, 406-421

Under What Circumstances Do People Drown? Encoding the Fourth Component of the 4W Model

Stathis Avramidis, Ronald Butterly, and David Llewellyn

The aim of the current study was to identify under what circumstances people drown using the 4W model (Avramidis, Butterly, Llewellyn, 2007). We used qualitative content analysis to analyze drowning incident videos (n = 41), and semistructured interviews of those involved in drowning incidents (n = 34). Results confirmed that drowning incidents can occur at any time of day, although most likely during daylight, and during any season of the year, with summer most common. We observed that drowning can occur after engaging in just about any form of human activity that is on, near, above or under the surface of a liquid (mainly water). Drownings with serious consequences often result when rescue and personal protective equipment is either absent or has insufficient quality. Almost any risky aquatic-related activity that doesn't comply with appropriate safety procedures might lead to drowning. In response to drowning, we noted that a wide variety of rescue techniques might be used. ***Keywords***: lifesaving, lifeguarding, drowning, water safety, rescue.

Drowning is a leading cause of death worldwide and a social and health problem worldwide (Avramidis & Butterly, 2008; World Health Organization, n.d.). Because of this, a number of models have been used or proposed in the past to understand why or how people drown and to suggest preventative measures. Some of the models and strategies for preventing drowning include the R.I.D. factor of drowning (Pia, 1984), the 5 min scanning strategy (Griffiths, 2000), the C-zones of the Connolly framework (Connolly, 2004, 2008) and the 4W model of drowning (Avramidis, Butterly & Llewellyn, 2007).

According to the 4W model, a drowning incident can occur due to causes that can be categorized into four discrete interrelated factors: rescuer characteristics, casualty characteristics, and location and temporal/environmental circumstances (Avramidis, Butterly & Llewellyn, 2007, 2009a, 2009b, 2009c). The following paragraphs discuss the fourth component of the 4W model of drowning, or in other words, the circumstances under which a drowning incident might occur (e.g., the interrelationship between casualty, rescuer, and equipment involved in the aquatic activity, the risk as a physical demand of aquatic activity, the presence

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Table 1 Circumstances of Occurrence of a Drowning Incident

Under Whatever Circumstances	Sub-Scales
Interrelationship among casualty and equipment	Wet and dry suit
	Casual clothes
	Personal flotation device
	Quality of materials
	Lifeguard detection systems
	Other lifeguard equipment
Risk as physical demand of the activity	Presence or absence of others
	Time of occurrence
	Weekend -Weekday
	Month
	Vacancy-Holiday
The type of activity	Scuba diving equipment
	Water birth
	Water baby programs
	Transportation

Note. Taken from Avramidis, Butterly, and Llewellyn (2007).

or absence of others, the time of occurrence, and finally the type of the activity; see Table 1.

The use of appropriate equipment is vital for the survival of both casualty and rescuer. Firefighters, police, and military services are commonly seen to improvise rescues in flooded water wearing their typical uniforms and apparel. One could wonder what the reaction would be if firefighters were to attack a fire wearing wetsuits or if police made arrests in lifejackets instead of bullet-proof vests (Ray, 2006). A number of items of equipment, therefore, interrelate with the casualty and the rescuer to enhance or prevent drowning. The first type of appropriate equipment for making rescues is the use of wet or dry suits. People entering cold water during the abandonment of a ship or while rescuing others face a number of dangers (e.g., inhalation of water, the possibility of laryngeal spasm causing simply asphyxiation, or drowning) that can be overcome if they are dry next to the skin, having prepared themselves by wearing a sensible amount of clothing including an outside layer that is both windproof and waterproof, such as a well-designed survival suit (Cross, n.d.). Second, a personal flotation device (PFD) assists the person to remain at the surface without great effort and therefore should be worn during aquatic activities at all times. In many cases people who drowned during boating activities were not wearing a PFD properly or not wearing one at all (Morbidity and Mortality Weekly Report, 2001; Newman, Diekema, Shubkin, Klein, & Quan, 1998; Quan, Bennett, Cummings, Trusty, & Treser, 1998; Treser, Trusty, & Yang, 1987; United States Coast Guard, 2001). Third, casual clothes should be worn under the lifejacket by people entering cold water who should float and remain still rather than swimming around (Keatinge, 1978) because even

DOI: 10.25035/ijare.03.04.08

Olympic level swimmers could not swim much more than 10 min in water temperature of 10°C fully clothed (e.g., British Defense, 1990). Finally, although lifeguards are the primary unit in the operation of protective and rescue services, their effectiveness is significantly increased by the availability and the quality use of certain types of equipment. For example, lifeguard detection systems that sound the alarm when they see someone in danger of drowning (e.g., artificial intelligence systems, scientifically designed to provide backup during moments of boredom or distraction and capable in detecting casualties when the lifeguards fail in doing so; Boeglin, 2008; Marks, 2001; Vitoria & Hardy, 2008), fiber fins that enable lifeguards to maintain the same velocity from the beginning to the end of each rescue (e.g., Abraldes et al., 2007), and rescue tubes that, despite the apparent benefit of their use during the rescue, increase water resistance when they are positioned across the rescuer's chest (and therefore an emphasis must been given to also how these equipment are used; Leclerc, 2007), are some of the equipment that are interrelated with the lifeguard.

Apart of the use of the appropriate equipment, it seems that also the quality of the equipment that is used within an aquatic environment by the potential victims might play a vital role in terms of drowning. For example subsistence fishermen are predominantly found in the poor countries around the world and use equipment that is minimal (Dorp, Knape, & Bierens, 2003). Also abalone divers, who dive with hooker lines and compressors on boats for catching sea harvest, often use poor equipment, where, for example, the compressor's exhaust pipe is beside the air inlet pipe. Carbon monoxide when compressed to 1–10 atmospheres increases in solubility and even 0.1% in the air sent to a diver can be fatal within 10 min (Manock, 1973). Finally, in commercial diving fatalities, the rare accidents that do occur are often due to equipment malfunctions or unsafe work practices (Caruso, 2006). Although there is not enough evidence to support the claim that the quality of materials might lead to drowning, it is clearly important to research this variable further.

The presence of risk in the physical demands of aquatic activities is another contributing factor that might lead to drowning. For example, sailing in rough weather with no communicated travel plan is a very risky activity; two people were lost overboard from a sailing yacht, lost their life in the water (Marine Accident Investigation Branch, 1996). A second example of risk in aquatic activities is attempting to rescue others without having appropriate lifesaving skills (e.g., A.S.T., 2003). For example, in New Zealand it was reported that 55 people had lost their life trying to save others between 1983 and 2002 (Water Safety New Zealand, 2002).

The presence or absence of others seems to play a role in drowning incidents. It has been reported that drowning incidents usually occur when people are unattended. Quan, Gore, Wentz, Allen, and Novack (1989) found in a survey that 89% of all drowning victims (n = 199) were unsupervised. Similarly, others have argued that the chances of drowning at a beach protected by lifeguards trained under United States Lifesaving Association standards is less than one in 18 million (Branche et al., 2001) underlying the importance of the lifeguard presence. Contrary findings, however, show that drowning incidents can occur even where lifeguards are on duty (Royal Life Saving Society Australia, 1998, 1999, 2000, 2001a). One possible reason for that was proposed by an evidence-based observational study that examined several thousands of drowning incidents that occurred each summer at Orchard Beach (U.S.A.), revealing that people drown even in the presence of others. These drowning apparently were due to the inability of bystanders, and occasionally lifeguards, to recognize a casualty's drowning response behaviors (Pia, 1970). The presence of bystanders, lifeguards, or parents can play a vital role in drowning prevention, but those individuals must be able to recognize a casualty's drowning behavioral patterns. Thus must also consciously and constantly supervise the swimmers.

The category of time as a possible risk factor for drowning can be divided into four categories. The first category is the time of the day when drowning might occur. A retrospective study ($n = 90$, ages less than 12 years old, between 01/1991–12/2000) of children admitted at hospitals with the diagnosis of drowning, revealed that the time with the highest incidence of drowning was 12–6 p.m. (Tapadinhas, Anselmo, Rocha, Barros, & Maio, 2002). A study that examined noncommercial water transport (boating) fatalities from 1980 to 1984 ($n = 24$) found that the time of occurrence was during afternoon in 15 (or 65.2%) of the cases (Copeland, 1986).

The second time category is the day of the week. Not surprisingly, drowning rates are higher during weekend days compared with weekdays (Moler, 1993; Pearn, Nixon, & Wilkey, 1976; Royal Life Saving Society Australia, 2001a). An interesting statistic showed that most of the Australian male drownings occurred on public holidays, while females drowned on a school holiday (Australian Water Safety Council & University of New South Wales, 2000).

The third time category is the month of the year. Drowning deaths exhibit a seasonal pattern in most parts of the world (Avramidis & Butterly, 2008; Becker & Weng, 1998). While drowning seems to be more prevalent in warmer climates year round, the drowning rates in temperate and colder climates occur mainly during the warmer summer months (i.e., June, July, August in the Northern Hemisphere and December, January, February in the Southern Hemisphere; see Manolios & Mackie, 1988; Royal Society for the Prevention of Accidents, 2001).

The fourth category involving time is whether the person was on vacation/holiday or not while engaged in the aquatic activity. Drowning deaths have been reported during national celebrations (e.g., Lambropoulos, 2003), school and public holidays (Royal Life Saving Society Australia, 2001b), or tourist holidays (Mackie, 1999).

Certain types of aquatic activities produce a higher incidence of drowning. One such aquatic activity is scuba diving (see Elliot & van Hulst, 2006; Lawrence, 1996; Zwingelberg, Green, & Powers, 1986). A second unusual risky aquatic activity is when women give birth in the water. Of course, four drowning case studies of infants are not enough to prove that water birth is a dangerous technique that should be avoided because it may lead to drowning. Nevertheless, it emphasizes the need for safety if it is offered routinely (Nguyern, Kuschel, Teele, & Spooner, 2002). A third risk factor related to types of aquatic activity is the means of transportation. Ships and airplanes were found to be problematic and unsafe, especially when vessels were overcrowded (such as refugee boats). Shipwrecks produce large numbers of drownings annually (Boesten, 2006; World Health Organization, n.d.), while the submersion and immersion accidents following water-related aircraft crashes in Alaska have been reported to be particularly fre-

DOI: 10.25035/ijare.03.04.08

quent. There may be one crash a day in areas with a high volume of traffic. This usually has been attributed to inclement weather (Nemiroff, 2006, 2008).

Taking the above identified factors together it is clearly vital to be able to answer such questions as "under what circumstances is a drowning incident likely to occur?" and "why would it be important to know the circumstances surrounding the occurrence of drowning?" First, by knowing the circumstances under which drowning occurs, local authorities and the aquatic safety professionals (e.g., lifeguards and other rescue services) should be able to proactively employ procedures and regulations to avoid possible aquatic emergencies that might arise in aquatic areas during those circumstances. Second, the lifesaving and lifeguard organizations should be able to use the information to update their curricula and better prepare aquatic safety professionals in terms of prevention and rescue. Finally, by knowing the dangers, the general public should be able to be educated to avoid certain behaviors that can lead to drowning. To address these questions, two studies were undertaken to investigate under what circumstances people are more likely to drown. The methodology (participants, apparatus, and procedures) of both studies was consistent with previously-published studies (e.g., Avramidis, Butterly, & Llewellyn, 2007, 2009a, 2009b, 2009c).

Method—Study 1

Data Sources

We used a criterion-sampling method (Patton, 1990) to obtain drowning-incident videos (N = 41) that were freely available in the public domain (BBC1, 2000, 2001, 2002; ITV, 2001; Mega Channel, 2001, 2002a, 2002b; Pia, 1970; Royal National Lifeboat Institution, 1994; Twenty First Century Films Production, 1998; Waga News, 2001). This method facilitated the identification of variables and their relationships that otherwise might not be available for fatal or nonfatal traumatic drownings. These visual narratives ranged in length from 30 to 720 s (M = 345.0, SD = 2.8).

Apparatus and Procedures

As previously-reported (Avramidis et al., 2009, 2009a, 2009b, 2009c), the authors observed the videos on standard equipment and software (QSR, 2002) to perform appropriate qualitative analyses. Because it was not always clear when each narrative started and ended, we had to define the length of each video narrative using reliable and objective measures during two independent observations. The exact procedures have been reported earlier. To deal with the various disadvantages and bias, the objective and subjective audio and visual content of the video were observed without unsupported assumptions and editorial comments. The audio-visual content was transcribed twice within a period of three months. This text was inserted into the computer software NVIVO for content analysis. A number of codes were identified within the text. Finally, frequencies were measured.

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Results—Study 1

Table 2 summarizes the results of the first study regarding circumstances associated with the video records of drownings.

Table 2 The Frequencies of the Variables That Constitute the Factor 'Whatever Circumstances' in the Examined Sample (n = 41)

Under Whatever Circumstances	Frequencies
Rescue Type	
Reach	4, 10.5%
Throw	5, 13%
Wade	8, 21%
Row	6, 15.8%
Swim and Tow	10, 26.3%
Air rescue	2, 5.3%
Combination	3, 7.9%
Interrelationship among Casualty and Equipment	
Wet and dry suit	3, 7.34%
Casual clothes	9, 21.9%
Personal flotation device	12, 29.3%
Quality of materials	8, 19.5%
Lifeguard/rescue equipment	11, 26.8%
Risk as Physical Demand of the Activity	
Presence or absence of others	12, 29.3%
Time of occurrence	Day: 40, 97.6%; night 1, 2.4%
Season	Winter 5, 36%; Autumn 2, 14%; Spring 1, 7%; Summer 6, 43%
The Type of Activity	
Swimming	26, 63.4%
Yachting/cruising	5, 12.2%
Other aquatic activity (diving, snorkeling, stunt)	2, 4.8%
Driving	3, 7.3%
Air/space travel	3, 7.3%
Walking on frozen lake	2, 4.9%

DOI: 10.25035/ijare.03.04.08

All types of rescue were initiated utilizing various types of equipment to assist the drowning casualties. More precisely, single rescues were classified as reach (*n* = 4, 10.5%), throw (*n* = 5, 13%), wade (*n* = 8, 21%), row (*n* = 6, 15.8%), swim and tow (*n* = 10, 26.3%), air rescue (*n* = 2, 5.3%), or combinations (*n* = 3, 7.9%). Each of these types of rescues were initiated using quality materials (e.g., buoyant rings, *n* = 8, 19.5%), personal flotation devices (*n* = 12, 29.3%), lifeguard/rescue aids (e.g., power boat, scuba diving equipment, rope, rocket thrusters, *n* = 11, 26.8%), or wet/dry suits used by either the casualty or the rescuer (*n* = 3, 7.34%) for saving someone's life.

Incidents occurred in all seasons of the year and at any time of the day. Most incidents occurred during the summer (*n* = 6, 43%) and the winter (*n* = 5, 36%), with less during the autumn (*n* = 2, 14%) and in limited cases during the spring (*n* = 1, 7%). Nearly all the incidents occurred during the daylight hours (*n* = 40, 97.6%). Only one incident took part during the night (*n* = 1, 2.4%). Obviously, there is a sample bias since it is less likely to have obtained video records in the dark.

The types of activities in which the casualties were involved varied. People experienced a drowning incident or an aquatic emergency that could lead to drowning while they were swimming (*n* = 26, 63.4%), doing other aquatic activities (e.g., diving, snorkeling, stunt; *n* = 2, 4.8%) driving (*n* = 3, 7.3%), yachting/cruising (*n* = 5, 12.2%), air/space travel (*n* = 3, 7.3%), and walking on a frozen lake (*n* = 2, 4.9%).

Other circumstances leading to a drowning incident involved the type of clothing that the casualty was wearing and whether the incident occurred in the presence of others. It was found that in some cases the casualties fell into the water while wearing casual clothes (*n* = 9, 21.9%) and in the presence of others (*n* = 12, 29.3%).

Method—Study 2

Participants

A combination of convenience and snowball sampling (Patton, 1990) located participants who were water safety or aquatic professionals (e.g., lifeguards, lifesavers, scuba divers, and athletes of aquatic sports (30 males and 4 females) who could describe a drowning episode (see Table 3).

Apparatus and Procedures

The same methodological procedure as in the previous study (that examined observation of video recorded rescues) and past published work (Avramidis et al., 2007, 2009a, 2009b, 2009c) was followed. Anonymity and confidentiality were maintained. The participants got a participant information sheet and signed an informed consent form. The semistructured interview schedule included open-ended questions. The interview was transcribed and inserted into the computer software NVIVO for content analysis.

Table 3 Demographic Information of the Participants in the Interview (*n* = 34)

Gender	30 males (age 16–65 years, M = 28.4, SD = 11.3)
	4 female (age 19–65 years, M = 37.5, SD = 19.5)
Nationality	Greece (n = 25, 71.4%)
	United Kingdom (n = 2, 5.7%)
	United States (n = 1, 2.8%)
	Cyprus (n = 6, 17.1%)
Place of Reported Drowning	Sea (above the water surface; n = 23, 67.6%)
	Sea (under the surface of the water surface; n = 5, 14.7%)
	Lake (n = 2, 5.9%)
	Swimming pool or water park (n = 4, 11.8%)

Results—Study 2

Table 4 summarizes the results of the second study with respect to the circumstances under which drowning occurred.

All types of rescue were used for assisting the drowning casualties using various types of equipment. Single rescues included categories such as reach (*n* = 1, 3.2%), wade (*n* = 2, 6.4%), row (*n* = 4, 13%), swim with aid (*n* = 3, 9.7%), swim and tow (*n* = 17, 54.8), or their combination (*n* = 4, 13%). During those rescues quality materials (e.g., scuba diving gear ; *n* = 1, 3%), personal flotation devices (*n* = 2, 5.9%), lifeguard/rescue aids (e.g., binoculars, oxygen, whistle, pocket mask, jet ski, power boat, scuba diving equipment, rescue can, or rescue tube; *n* = 12, 35.3%), or wet/dry suits (*n* = 4, 11.8%) were used by either the casualty or the rescuer.

Incidents occurred at any season of the year and at any time of the day. First, most of the drowning incidents occurred during the summer (*n* = 23, 76.7%), while one-tenth of the cases occurred during the autumn (*n* = 3, 10%) and the winter (*n* = 3, 10%) but only very occasionally during the spring (*n* = 1, 3.3%). Second, although the most frequent time of occurrence within a day was between 10:00–18:00 (*n* = 21, 72.4%), a few drowning incidents also occurred between 18:00–02:00 (*n* = 2, 6.9%) and 02:00–10:00 (*n* = 6, 20.7%). Third, the aquatic emergencies occurred either while people were on holidays (*n* = 13, 54.2%) or during normal working days (*n* = 11, 45.8%). Finally, in most of the cases the casualties experienced drowning in the presence of others (*n* = 22, 64.7%).

The types of activities in which the casualties were involved varied widely. People experienced a drowning incident or an aquatic emergency that could lead to drowning while they were swimming (*n* = 16, 51.6%), sailing (*n* = 1, 3.2%), doing other aquatic activities (scuba diving, snorkeling, jumping into the water, fishing, walking or playing in the water; *n* = 13, 42%), and while walking on frozen lakes (*n* = 1, 3.2%).

DOI: 10.25035/ijare.03.04.08

Table 4 Frequencies of the Variables that Constitute the Factor "Whatever Circumstances" in the Examined Sample (n = 34).

Under Whatever Circumstances	Frequencies
Rescue Type	
Reach	1, 3.2%
Wade	2, 6.4%
Row	4, 13%
Swim with aid	3, 9.7%
Swim and tow	17, 54.8%
Combination	4, 13%
Interrelationship among Casualty and Equipment	
Wet and dry suit	4, 11.8%
Personal flotation device	2, 5.9%
Quality of materials	1, 3%
Lifeguard/rescue equipment	12, 35.3%
Risk as Physical Demand of the Activity	
Presence of others	22, 64.7%
Time of occurrence	10:00–18:00 21, 72.4%; 18:00–02:00 2, 6.9%; 02:00–10:00 6, 20.7%
Day	Weekend 16, 57.14%; Weekday 12, 42.86%
Season	Winter 3, 10%; Autumn 3, 10%; Spring 1, 3.3%; Summer 23, 76.7%
Holiday	13, 54.2%
Normal Day	11, 45.8%
The Type of Activity	
Swimming	16, 51.6%
Sailing	1, 3.2%
Other Aquatic activity (scuba diving, snorkeling, jumping into the water, fishing, walking or playing in the water)	13, 42%
Walking on frozen lake	1, 3.2%

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Discussion

Rescue Type

The most commonly used type of rescue in our two studies was the swim and tow. For the rescues that occurred in the 1970s in Pia's video collection, which was included in the sample, this is understandable because most of the incidents occurred in shallow water. Land based rescues like the reach rescue, wade rescue, and throw rescue were also used by either professional lifeguards and emergency services or amateur lifesavers. This finding was very encouraging as those types of rescue are recommended as the safest because they don't require body contact and the rescuer can remain out of the water (Avramidis & Avramidou, 2008). A row rescue and a swim with aid rescue were used in surprisingly few cases, which either means that rescues in long distance were rare or that rescuers were appropriately equipped only occasionally. All major agencies who train lifeguards strongly recommend the use of aids such as rescue tubes or cans, so this finding means either that lifeguards are ignoring their training or our sample was biased in some fashion.

More complicated rescues like air rescue or even a combination of the previous methods was used for saving multiple victims. This underlines the importance of maintaining an ocean rescue plan even for spaceships and their crews that splashdown in the ocean (Idris, 2006). Adding the frequencies of the safe types of rescue (e.g., reach, wade, throw) and given the fact that most of the "swim and tow" rescues occurred in Pia's video close to the beach, it can be assumed that apart from complex aquatic activities (e.g., air-, space-, balloon-travel, shipwrecks), at least one third of the emergencies took place very close to the shore and is in agreement with other information about the location of most drownings. This means that the lifeguard presence can play a vital role in preventing such incidents.

Interaction Between Casualty and Equipment

Although not stated in previous research, it was found that the quality of materials that were used during a rescue either by the rescuer or the casualty was related to the outcome of the drowning incidents in one out of ten reported cases. During the aquatic emergencies, either rescuers or casualties wore wet and dry suits, an indication that at least occasionally they were well prepared or that the activity was not just swimming across the beach but a more complex one (e.g., scuba diving, spear-gun fishing, snorkeling, underwater search and rescue, searching for gold across a river). PFDs were worn in nearly one fifth of the cases, which underlines their importance in safety and usefulness in every activity that takes part near the water. Casualties or rescuers wore casual clothes during some emergencies, an indication that the person had fallen unintentionally into the water. An exception to this was those cases where the lifeguards, professionally clothed, had to jump into the water in their official uniform without taking time to disrobe.

DOI: 10.25035/ijare.03.04.08

Risk as Physical Demand of Aquatic Activity

This study shows that a drowning incident might occur even in the presence of others. This is a twofold situation; first, it is discouraging to know that people might be in danger while supervised or accompanied by others. Second, it is encouraging because some of those “others” might let someone know about the emergency and therefore, stop a drowning incident become fatal. On the other hand, in some cases children were observed in difficulties having jumped into the water from a rock after taking off their armbands while their mother was sunbathing nearby and other bathers were swimming around. Therefore, it is important that children are supervised at all times. Specifically in one case, the mother was sunbathing, and an old man, theoretically trained in lifesaving, saved them from drowning when they started being immersed.

Weekend vs. Weekday

Drowning incidents occur at any time of the week. According to some studies, drowning rates are higher during the weekend compared with weekdays (Moler, 1993; Pearn et al., 1976). A similar conclusion came out from another study that found that accidents in childhood occurred most frequently on Saturdays (Royal Lifesaving Society, Australia, 2001a). In the second study of the present research ($n = 34$), where it was possible to examine the day of occurrence, it was found that there was only a slight difference within weekends and weekdays. This contradiction in the findings might be because the previous studies examined mainly young children (e.g., Pearn et al., 1976, $n = 111$) who usually have the chance to visit a beach or a swimming pool only on weekends, while in this study nearly 60% of the examined people were adults who can visit an aquatic area at any time (≥20 years old, 21, 59.99%). This means that although drowning usually occurs in weekends, because it is the days that most people don’t work and visit the aquatic areas, in reality drowning might happen at any day of the week. An unspecified sample of casualties whose demographics were not possible to be established would give a clearer explanation of when people drown more often.

Season

Although people are more likely to drown during the summer, an incident might occur at any season. According to Becker and Weng (1998), deaths exhibit a seasonal pattern in most parts of the world; people drown mostly at the beginning of the summer and drownings carrying on during the warm months (Tapadinhas et al., 2002). In the U.S. generally, 60% of all drownings occur in the summer months (Moler, 1993). Similarly, in the present sample ($n = 75$), summer was the season of the year in 29 (38.6%) out of 44 (66%) of the known drowning incidents, followed by winter (8, 10.6%), autumn (5, 6.6%), and spring (2, 2.6%). Due to the methodological procedure that was followed in the content analysis, an unspecified sample of 31 cases (41.3%) was present.

Holiday/Normal Day

People drowned almost equally during holidays or normal days. Australian male drownings tended to occur on public holidays while females tended to drown on a school holiday (Australian Water Safety Council & University of New South Wales, 2000). The findings of the current study were similar; although people (n = 34) drowned more often while on holidays generally (13, 38.2%), the cases where a drowning incident occurred during a normal day were not much less (11, 32.3%). This shows that people can be in danger at any time. There was an unspecified sample where the date of occurrence could not be found because some of the analyzed videos didn't provide audio or visual information about the day (10, 29.5%).

The Type of Activity

The present study shows that although swimming is the most common recreational aquatic activity leading to drowning, the involvement in other aquatic activities might also lead to a fatality. From those activities some were well established in the literature while some others were not. As argued by Jonkman (2006), flash flood incidents were car-related; some of the victims sampled presently were driving in flood water. Boat related incidents such as in sailing, yachting, and cruising, also walking on frozen lakes and other aquatic activities (diving, snorkeling, performing stunts, scuba diving, jumping into the water, fishing, walking, or playing in the water) led to drowning. These findings were similar to the findings of others (Elliot & van Hulst, 2006; Mackie, 1999; Zwingelberg, Green, & Powers, 1986). In some areas like Alaska, it is not uncommon to have even an air crash per day leading to immersion/submersion accident and drowning fatality when the wreckage is not floating (Nemiroff, 2006). Similar emergencies were found in this study agreeing with the previous author (air plane, balloon and space ship travel). In the air crash of Comoros islands some people survived because the wreckage was floating. The same happened in the Apollo 13 spaceship and in the emergency of the flying balloon that was described in another video narrative.

Time of Occurrence

Nearly all aquatic emergencies of the first study occurred during the day and only occasionally during the night. As stated previously in this research, however, this happened because the incidents occurred while people were present at the scene and able to video record the emergency situation or in the case of the interviews, when the lifeguards were on duty. Using a different breakdown in the second study, it was found that incidents occurred mainly during the lifeguard duty between 10:00–18:00; this agrees with the work of Greensher (1984), who stated that the main occurrence was between 3–6 p.m. in the U.S. The rest of the incidents occurred between 18:00–02:00 and 02:00–10:00. This finding show that a person can be in danger at any time. Finally, there was a small sample where the interviewees could not say when exactly the incident occurred.

The above findings are subject to a number of different sources of potential bias. For example, those interviewed may struggle to remember specific details about the drowning incident, and their perceptions are likely to have been influenced by the stressful nature of the situation. Considerable time may also have passed between the drowning incident and the interview (Avramidis et al., 2007, 2009a, 2009b, 2009c). Due to the nature of the methodological procedure, in some variables the sample was unspecified and therefore, some research questions could not be fully answered.

DOI: 10.25035/ijare.03.04.08

The most important finding of the present research is the fact that anyone can be in danger of drowning regardless of the circumstances of occurrence. This study proved that activities that take part near (e.g., driving), in (e.g., swimming, snorkeling, sailing, yachting, cruising), on (e.g., walking on frozen lake), under (e.g., scuba diving, diving), or above (e.g., air flight with airplane, balloon, parachute, bungee, and space ship mission) an aquatic environment might lead to drowning. Therefore, the lifesaving organizations, the local authorities, the water safety professionals, and the general public should be aware and prepared for the unexpected while engaging themselves in activities that seem to be nonaquatic but take place above or near the water.

Conclusions

Based on the findings of the current study we concluded that a drowning incident can occur at any time, although during the afternoons in warmer weather was most likely. Our data also led us to conclude that drowning can occur while persons are engaging in virtually any human activity that takes place in, on, near, above, or under the surface of the water. We noted that the absence of rescue and personal protective equipment seemed to play a role in many incidents. We also warned that any risky activity that doesn't comply with the safety procedures can lead to drowning that require a wide variety of types of rescue.

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DOI: 10.25035/ijare.03.04.08