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Stathis Avramidis

Leeds Metropolitan University, elagreece@gmail.com

Ronald Butterly

Leeds Metropolitan University

David Llewellyn

University of Cambridge

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RESEARCH

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Who Drowns? Encoding the Second Component of the 4W Model

Stathis Avramidis, Ronald Butterly, and David Llewellyn

The aim of the current study was to identify the casualty characteristics that contribute to drowning according to the 4W model (Avramidis, Butterly, & Llewellyn, 2007, 2009). Qualitative content analysis was used to analyze drowning incident videos ($n = 41$) and semistructured interviews of those involved in drowning incidents ($n = 34$). Results confirm that human activity in, on, and around an aquatic environment can lead to drowning, regardless of the casualty's type, gender, age, ethnicity, and area of residence. Males far outnumbered females as drowning victims. Younger persons were more likely to drown than were adults. Due to socioeconomic differences, Black people in our sample were likely to drown more often, while Whites who drowned were engaged in aquatic activities that lower socioeconomic individuals likely cannot afford or have access to. Nonswimmers, casualties who have lost consciousness, and nonresidents to specific aquatic environments also were the ones in the highest danger.

Drowning is a leading cause of accidental death worldwide and a social and health problem that can produce a series of serious consequences. For example, while some researchers argue that survival after drowning may cause near-death experiences resulting in profound positive changes on the persons' life (Holden, 2008), others link drowning with a variety of negative physical and psychological implications, such as post traumatic stress disorder (Alonzo, 2000; Bouwer & Stein, 1997; Chemtob et al., 1998; Goleman, 1995; Hidalgo & Davidson, 2000; Howsepian, 1998). Especially when the surviving drowned person is a child, the traumatic incident may evoke very strong and enduring emotions (Meyer, Theodorou, & Bergn, 2006; Shannon, 1991).

An aquatic emergency can result in huge health care costs for hospitalization and therapeutic rehabilitation for a drowning casualty who survives (Ellis & Trent, 1995; Walters, Fraser, & Alleyne 1993). In the USA, the annual cost of care per year in a chronic care facility for an impaired survivor of a drowning event was approximately \$100,000 in the early 1990s (American Academy of Pediatrics, 1993) but has undoubtedly expanded dramatically in the subsequent 15–20 years. Of course, a fatal drowning causes psychological pain for the family and friends of a lost one (Triantafillou, 2000). A pediatric water-submersion injury is a devastating situation that impacts all family members (parents, siblings, grandparents).

Stathis Avramidis and Ron Butterly are with Leeds Metropolitan University, Faculty of Sport and Education in Leeds, UK. David Llewellyn is with the University of Cambridge in Cambridge, UK.

The occurrence of such an event often alters family functioning and the ability to carry on after the crisis. Ninety percent of marriages break up within 5 years of the death of a child (Borta, 1991).

According to the 4W model (Avramidis, Butterly, & Llewellyn, 2007) a drowning incident can occur due to several causes that can be categorized into four discrete interrelated factors: rescuer characteristics, casualty characteristics, location, and circumstances. The 4W model was proposed as a theoretical and practical mechanism for understanding drowning. We have previously described the first “W,” or “Who 1,” associated with characteristics, experience, and other factors associated with rescuers (Avramidis, Butterly, & Llewellyn, 2009). The current article examines the second “W” or “Who 2” qualities and characteristics associated with those casualties who suffer drowning.

Since drownings often lead to profound negative consequences on individuals, family groups, and the society in general, it is important and significant to investigate “who” is most likely to be a drowning victim. Further, we should examine whether certain age groups are more vulnerable than others, the degree to which one sex is more likely to drown than the other, whether there are specific occupations that are more at risk, and whether we can foresee certain kinds of risky human behavior that lead to drowning and its negative consequences.

A number of studies have investigated the fitness, abilities, age, sex, and other characteristics of drowning victims. Research has shown that even physically fit and competent swimmers can drown (e.g., Athlitiki Iho, 1996; Eleftherotipia, 1996; Hitas, 1996a, 1996b). Several types of disabilities and conditions such as epilepsy (Lip & Brodie, 1992; Osamura, Fushiki, Yoshioka, Yamanaka, & Mizuta, 1997; Saxena & Ang, 1993; Schmidt, Guggolz, & du Bois, 1991; Schmidt & Madea, 1995), autism (Sibert et al., 2002), Angelman syndrome (Ishmael, Begleiter, & Butler, 2002), Roman-Ward syndrome (Ishmael et al., 2002), cerebral palsy, Down syndrome, multiple handicaps (Shinaberger, Anderson, & Kraus, 1990), and even pregnancy (Ronsmans & Khat, 1999) have been linked with drowning. People of all age groups have been found to be involved in drowning incidents (e.g., McGee, Krug, & Peden 2002; Royal Society for the Prevention of Accidents, 2001; Uchiyama, Tanaka, Ishii, Ikemi, & Osaka 2002). Although males are much more likely to be victims, both genders have been involved in drowning incidents (e.g., Alexe, Dessypris, & Petridou, 2002; Dunn & Gulbis, 1976; World Health Organization, n.d.). In terms of ethnicity, the drowning rate among Blacks is 2–3 times higher than among Whites in the USA (Campbell, 1991; Kizer, 1983; Palinkas, 1985).

Persons of both high and low socioeconomic backgrounds can drown for different reasons. Certain high-risk recreational activities (e.g., scuba diving, sailing, windsurfing, boating) require that participants have a higher socioeconomic background to be able to buy, maintain, and rent the necessary equipment as well as travel to the area where the recreational activity is located (Schrader & Wann, 1999). On the other hand, ethnic minority groups generally have higher drowning death rates, possibly due to differences in opportunities to learn to swim (as cited in World Health Organization, n.d.).

In terms of demographic area of residence, people from rural areas were twice or three times more likely to drown than urban dwellers (e.g., Alexe et al., 2002; Verweij & Bierens, 2002). Interestingly, the number, type, and age of family members seem to relate to the incidence of drowning (e.g., Ahmed, Rahman, &

van Ginneken, 1999; Byard, de Koning, Blackbourne, Nadeau, & Krous 2001; Kaufman, 2005). Certain occupations might be more prone to risk of drowning due to the nature of the work (e.g., stunt men and seamen; Piët, 1987; Rafnsson, Gunnar, & Dottir, 1993; Bravo 2, 2007).

Drowning can occur due to personal behavioral problems or traits, such as risk-taking behaviors like drug or alcohol consumption (Franks, Golden, Hampton, & Tipton, 1997; Kee, Petersen, & Rockpool, 1998; Mackie, 1978), hyperventilation exercises (Griffiths & Griffiths, 1995), suicide and homicide (Cantor & Hill, 1990; Golgney, 2002; Kolmos & Bach, 1987; Water Safety New Zealand, 2002). Other behavioral problems and traits can be the unintentional water activity (e.g., unplanned immersion; Bennet, Quan, & Williams, 2002; Patterson & Beerman, 2002) and religious beliefs (e.g., some religions demand the swimmer to remain fully clothed, including wearing turbans or other head covering that can be heavy in the water and get entangled around the feet, arms, and necks, while some religions do not allow a casualty to be saved or get a blood transfusion from a rescuer of another religion; Jenkins, 2006).

If we consider all the previously described causes of drowning, it seems that there is a crucial need to more fully understand “who” is most likely to drown to avoid the tragedy and negative consequences associated with drowning. As part of the current study, we have conducted an extensive review of the drowning incident literature (Avramidis, 2004) to identify the factors, qualities, and characteristics associated with drowning victims and casualties. Based upon this literature review, we conducted two studies to investigate who is most likely to drown (see below). The methodology (participants, apparatus, and procedures) of both studies was consistent with a previously-described study (e.g., Avramidis, Butterly, & Llewellyn, 2007, 2009).

The casualty characteristics that contribute to drowning are the following: physical water fitness, disability or medical problems, age, gender, ethnicity, socioeconomic background, area of residence, number and type of family members, occupation, and casualty behaviors.

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 relations that would not otherwise be available for fatal or nonfatal traumatic drowning events. These visual narratives ranged in length from 30 to 720 s ($M = 345.0$, $SD = 2.8$).

Apparatus and Procedures. The authors observed the videos using a JVC television (CM31720–003) and a Panasonic videocassette recorder (AG-MD830). We watched videos and reduced data using NVIVO software (QSR, 2002) to perform appropriate qualitative analysis. One of the first things established was the length

of each video narrative, because the aquatic emergencies were usually on video cassettes that contained other audiovisual narratives; therefore, it was not always clear when each narrative started and ended. This had to be defined to guarantee reliable and objective measurements during the two independent observations. The reset time button of the VCR was pressed as soon as the first visual or audio message related to the aquatic emergency appeared on the screen. For example, in some videos, the audio narrative started before the actual visual portion, and in other cases, the visual video started before the audio narrative. In all cases, the actual start point of the video was determined to be the appearance of the very first visual scene or audio narrative on the video. In cases in which the video was connected with transition effects (e.g., fade in) with the next or preceding video segment on the tape, the starting and finishing points were when the whole scene covered the whole TV screen.

As soon as the start and end points of the video were established, we watched the videotapes in real time, so that we could get overall impressions of the aquatic emergency and take rough notes. We then noted the objective and subjective content of the video. Objective content was defined as the observations of audio or visual information on which every person watching the video would agree (e.g., the type of rescue a lifeguard did, the aquatic environment in which the drowning occurred, what persons said). We avoided recording unsupported assumptions and editorial comments. (An example of an objective description is "Mr. L.H. was immersed in the river. Mrs. L. McD was shouting to him to hold on to the collar of the dog that approached to rescue him." We avoided reporting that Mr. L.H. could not hear Mrs. L. McD because he was deaf or saying that the dog that rescued him was a Newfoundland unless those things were confirmed as facts on the video.) We defined subjective content of records as the responsive interpretations of the psychosocial dynamics of the scene. Subjective content might be information that could vary depending upon the number of times that the researcher observed the video or could be influenced by their age, gender, or personal history. (An example of subjective content might have included different interpretations persons might have drawn, such as "After being saved by the dog, Mr. L.H. was very scared" or "After being saved by the dog, Mr. L.H. appeared to be depressed." A researcher's observations could therefore be influenced by his or her own age, gender, personal experiences, and number of times viewing the video.) The researcher could misunderstand what was being observed, resulting in mistaken interpretations of the situation (Gratton & Jones, 2004).

To minimize observer bias, we observed each video twice during a period of 3 months. Any information that was common across each observation was recorded and saved as the final narrative. During the two independent observations, each story was transcribed twice, first to analyze all the audio messages in the video and second to describe what could actually be seen. This ensured that enough information about each story would be available for analysis instead of relying completely on the narrator's comments. Finally, each aquatic emergency narrative was divided into manageable sections (30 s long) so specific observations could be precisely located in the transcribed text. NVIVO also allowed the notation of the exact location of the coded text in the transcribed narrative by document number, paragraph, and line (Rich & Chalfen, 1999). Because the participants of the current study were the casualties shown in the videos, they had no direct com-

munication with the researcher, and therefore threats to reliability such as participant error and participant bias were not present (Gratton & Jones, 2004).

Once the transcriptions were complete, they were converted into Rich Text Format (.rtf) files and imported into the software NVivo. Nvivo and all the procedures that are required for making a project, creating a proxy document (with video data), making and managing nodes (codes), and reporting the results were used as instrumentation of the content analysis following the guidelines of the manufacturers (QSR, 2002). *Node* is the word that NVIVO uses for “code” and it is intended to represent anything that project users may wish to refer to (Neuen-dorf, 2001). A data collection instrument (coding tree) was developed for describing different behaviors (Coleman, Stevenson, & Wilson, 2000) based on factors that were found in the literature review and seemed to contribute to a drowning incident, such as physical water fitness, disability or medical problems, age, gender, ethnicity, socio-economic background, area of residence, number and type of family members, occupation, and casualty behaviors.

Study 2

Participants. Using a combination of snowball and convenient sampling methods (Patton, 1990), we conducted semistructured interviews with 30 male (age 16–65 years, $M = 28.4$, $SD = 11.3$) and 4 female participants (age 19–65 years, $M = 37.5$, $SD = 19.5$) who were water safety or aquatic professionals (e.g., lifeguards, lifesavers, scuba divers, and athletes of aquatic sports) from Greece ($n = 25$, 71.4%), the United Kingdom ($n = 2$, 5.7%), the United States ($n = 1$, 2.8%), and Cyprus ($n = 6$, 17.1%). Participants were selected if they had witnessed and could describe a drowning-related incident above the surface of the sea ($n = 23$, 67.6%), under the surface of the sea ($n = 5$, 14.7%), in a lake ($n = 2$, 5.9%), or in swimming pool or water park ($n = 4$, 11.8%).

Apparatus and Procedures. A Sanyo M-1110C audiotape recorder and 2-hr Maxell cassettes were used to record the interviews. Institutional ethical approval was first obtained to conduct the semistructured interviews to investigate the factors involved in drowning incidents in which these professionals were involved. All the people interviewed were involved directly in the drowning incidents they described. A snowball or chain sampling method was used to locate information-rich critical cases and key informants who either viewed the footage or discussed their own experience (Patton, 1990). An information sheet was distributed to potential participants before the interviews explaining the nature and objectives of the study. We obtained voluntary informed consent before conducting each interview (Gratton & Jones, 2004).

Interviews were conducted using a semistructured interview outline, which included points relating to each of the 4W model factors of interest (i.e., the rescuer, the casualty, the location, and the circumstances). Confidentiality was maintained throughout, and individuals were not identifiable from the raw data (Patton, 1990). As required by human subjects procedures, all hard copies were kept in a locked cabinet, and electronic data were password protected. Data were transcribed and entered into NVIVO for indexing and qualitative content analysis (Wengraf, 2001). The procedures adopted were consistent with those used in Study 1.

Results

The results of the two studies show that casualties of both sexes and age groups experienced drowning incidents. In terms of sex, males (56, 75%) far outnumber females (19, 25%). In terms of age, casualties of all age groups were reported to be involved in drowning incidents. In the content analysis study, youths younger than 16 years old (19, 40.42%), middle aged persons between 16–40 years old (23, 48.94%), and people 41 years and older (5, 10.64%) were all victims of drowning. The frequency of drowning based on age group was measured in a sample of 47 casualties. In some cases, the age of multiple victims was reported (e.g., father and son drowned together), while in others, no age was reported because there were too many victims and it was impossible to establish their ages (e.g., the evacuation from a burning, sinking ship with 150 survivors). In the second study with the interviews drowning incidents were reported for youths younger than 19 years old (11, 31.42%), middle aged between 20–40 years old (16, 45.71%), and people 41 years of age or older (5, 14.28%). In the rest of the cases (3, 8.57%), those interviewed could not tell the victim's age.

In terms of ethnicity, both ethnic groups that we examined in our two studies, White (63, 84%) and people of color (12, 16%), were found to be involved in drowning incidents. In terms of area of residence, the current study showed the nonresidents to an area (22, 29.3%) were in danger more often than local residents (15, 20%).

In terms of casualty type, all types of swimmers and persons of different health characteristics were reported to be involved in drowning incidents. The ones in the greatest danger were nonswimmers (16, 21.3%). The next largest incidence type was unconscious casualties (15, 20%). People who could swim but were weak or tired swimmers (11, 14.6%), or those who had been injured during an aquatic activity (5, 6.6%) also experienced difficulties. Finally, multiple victims (28, 37.3%) experienced drowning situations in which the same or different combinations of casualty types were involved.

Discussion

Gender

The existing literature identified that although both sexes experience drowning, males far outnumber females (Alexe, Dessypris, & Petridou, 2002; Sabatini & Andreana, 2002; WHO, n.d.). The video and interview studies supported these findings but more importantly, they helped to understand how and why this happened. Males were more likely to be involved in a drowning episode because they were more inclined to risk-taking behavior, more frequently exposed themselves to the aquatic environment where immersion was possible, and were also more likely to consume alcohol or drugs. Males also were more likely to swim, irrespective of their capabilities, without taking the necessary safety precautions (e.g., use of personal flotation device, wet suit, etc.). Females in the examined sample were far less likely to exhibit risk-taking behavior; those who did were usually under the influence of a group of males.

Age

Casualties of all age groups were reported to be involved in drowning incidents in the literature. The video and interview studies showed that drowning could be attributed to different parameters for people in different age groups. Children were in danger when participating in activities that involved risk due to their immature or less well developed coordination, skills, and perception. Older children were in danger because they overestimated their physical abilities. Adolescents and adults younger than 25 years were at risk because their peer group considered their risky behavior as normal, and their attitudes and beliefs demonstrated a lack of awareness or concern about risk, their familial engagement in risk behaviors, and their lack of skills to resist unexpected aquatic engagement.

Ethnicity

All examined ethnicities were found to be involved in drowning incidents in the literature (Mael, 1995). The video and interview studies supported this finding but, more importantly, helped in the understanding of how and why this happened. In these two studies, nonWhites drowned because they were less likely to be proficient at swimming, participating only in swimming activities near the shore in water just deeper than their height. On the other hand, most of the examined recreational activities in the two samples were more expensive than simply swimming or bathing (e.g., sailing, scuba diving, skin diving, fishing, yachting). In the cases of elite or expensive aquatic activities, the drowning victims were always White. This means that in the examined sample, ethnicity was related to socioeconomic differences.

Casualty Type

All examined casualty types and even top aquatic athletes were involved in drowning incidents in the literature (Athlitiki Iho, 1996; Gilchrist, Sacks, & Branche, 2002; Hitas, 1996a, 1996b). The video and interview analyses supported this finding and helped in understanding how and why this happened. First, although there was no clear evidence that drowning rates were higher in poor swimmers, in our studies, people who found themselves in aquatic difficulties were, indeed, more likely to be nonswimmers and unconscious victims. Nonswimmers drowned because they fell unintentionally into the water while engaged in nonaquatic activities (e.g., walking on frozen lakes, driving in flood water) or because they swam on sloping beaches and suddenly found themselves out of their depth. Others often inclined to drown were people who fell into unconsciousness while engaged in aquatic activities due to a heart attack, hypoxia, hypothermia, or engagement in sporting activities (e.g., sailing, snorkeling) and swimming in shallow water.

Second, swimming ability did not guarantee immunity from drowning in any of the two sampled studies. Drowning did not correspond with reported swimming ability, which means that superiority in physiological parameters developed through regular swimming training could not guarantee survival for the sampled victims. They experienced a drowning incident because they spent more time in the water, engaged in risky activities, consumed alcohol or drugs, overestimated their swimming abilities, and developed rapid hypothermia after they were submerged in cold water that changed the physiological parameters of their body.

Finally, multiple victims of the same type or combination of casualty types were also in danger in the video and interview analyses. This was evident in various emergencies where people experienced an unintentional submersion (e.g., shipwreck, airplane ditching, flooding) or as part of voluntary participation in an activity above or near the water through risk-taking behavior (e.g., a group of people initiating a bungee jump from a bridge).

Area of Residence

The review of the existing literature identified that although people drown regardless of their area of residence, nonresidents drown slightly more often than did locals. In the same review study, epidemiological research showed that ocean drowning was more likely for people who lived inland or who were tourists (Alexe et al., 2002; Bjerregaard, 1990; Mackie, 2006). In the videos and interviews of the present sample, people visiting aquatic environments while residing in other areas of the same country or in a different country were involved in a drowning incident because they were unaware of the dangers of the specific aquatic environment and because they initiated risky activities. Therefore part of the problem of those drowning incidents could be attributed to the unfamiliarity with the specific characteristics of the aquatic environment. On the other hand, the reason why locals were involved in drowning incidents was attributed to two reasons: first, they had more frequent exposure to the aquatic environment, and second, this high exposure made them underestimate possible aquatic dangers by overestimating their capabilities for dealing with them.

Conclusions

Further research is required to replicate and confirm the current findings. The current findings are subject to a number of different sources of potential bias, including the fact that the results were drawn from a convenience sample. 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. The lack of an inferential statistical analysis of our data may have masked differences or lack of differences.

Despite the limitations, these findings may have important implications for aquatic professionals as well as the general public. They identify the potentially important characteristics that drowning victims are likely to possess. The present findings suggest the importance of water safety awareness for every person regardless of sex, age, ethnicity, swimming skill, health status, and area of residence. Those persons at greatest risk of drowning, and who therefore need additional aquatic education and modification of behaviors, are the nonresidents new to an aquatic area or males, especially younger than five or between 14–25 years who either know how to swim and overestimate their ability or don't know how to swim. Each group is in danger for quite different reasons as described earlier.

Local authorities and aquatic professionals, therefore, have a responsibility to make funding and education available where possible for additional educational initiatives like drowning prevention campaigns, leaflets, and lectures in an attempt

to minimize the number of drowning incidents. Greater education for aquatic professionals and the general public alike may provide an important method for reducing the incidence of drowning.

The study found that human activity in, on, above, or around an aquatic environment can lead to drowning, regardless of the casualty's type, gender, age, ethnicity, socioeconomic status, and area of residence. Consistent with the existing literature, our studies supported that although casualties of both sexes experience drowning incidents, males far outnumber females. Persons younger than five years are the more likely to drown as are adolescent and young adult males.

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