SWIMMER SURVIVAL IN DROWNING SITUATIONS?

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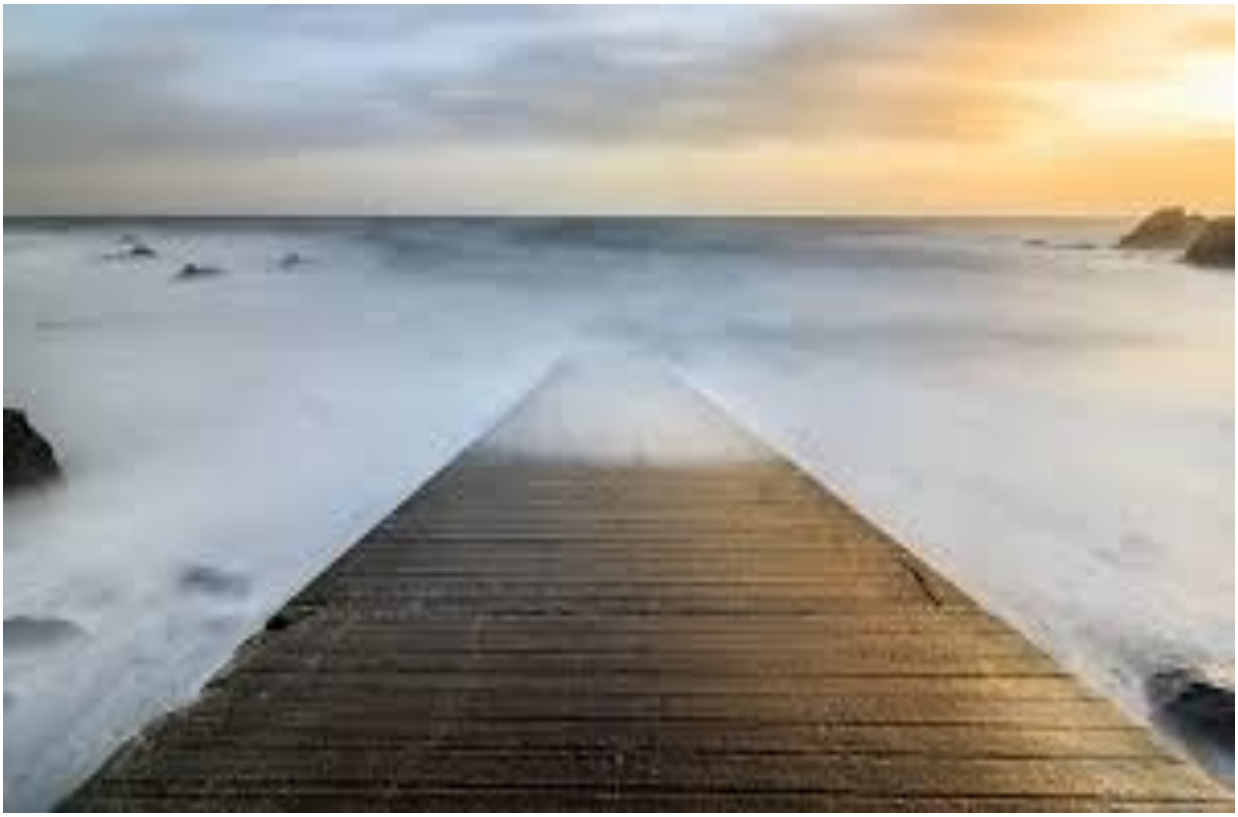
INTRODUCTION

At the age of twelve I spent a summer with cousins in a small fishing village on Ireland's south coast. One evening I went down alone to the boat slip to watch the fishing boats return and to get some fish for dinner from my uncle. While standing on the slipway a fisherman accidentally knocked me into deep water. I could not swim and immediately realised that I could die. As I fell time slowed down. I clearly heard a voice inside of my mind say "Pinch your nose and hold your breath. The fishermen know you are in the water and will save you." I pinched my nose and held my breath before entering the water and sinking below the surface. I experienced no feeling of panic; I was confident that I would be rescued. As I sank, I looked up at the sky thinking that this must be what fish see. I saw the hull of a boat move towards me and suddenly I was pulled up to the surface by my hair. I was helped into the boat and landed on the slip. The emergency was over. I was unharmed both physically and mentally.

Unexpectedly falling fully clothed into deep water is a common cause of drowning. In a 2018 Irish murder trial, involving a drowning death, the judge defined a non-swimmer as someone unable to help save themselves in deep water. I believe that had I been alone I would have died. I was surprised at how time had slowed down and at the voice inside of my mind. It seems that these are common experiences in life threatening situations but where did the lifesaving information come from? Using a computer metaphor, we appear capable of caching survival knowledge and experience in our memories which we can access in dangerous situations. I had not attended any lifesaving classes, but I assume that I had unconsciously heard this advice given and had stored it in my survival memory cache. In this case it protected me from inhaling water. I did not gasp from cold shock. I had spent many hours that summer playing on the beach in shallow water and must have become habituated to the cold water. My mouth was unprotected when I entered the water and I would surely remember choking on water had I experienced an immersion gasp. Time does not actually slow down. Instead our mental processing capacity changes to a faster mode.

Panic, arising from feeling helpless, causes people to die within their minds well before their bodies die. If a drowning person has belief and hope of survival, I believe it delays the onset of panic. I was given a clear survival plan: pinch my nose, hold my breath, and wait for rescue. In this case it worked. I believe that, if we can give swimmers evidence-based survival plans for common drowning events, they will store them in their survival caches until they are needed and can then access the knowledge and delay the onset of panic.



Drowning is defined as experiencing difficulty breathing in water. You don't have to die to drown. If you survive a drowning event you will still have drowned. There are four possible physical outcomes to a drowning event – you can survive without any injury, you can survive with some temporary injury, you can survive with long-term injury, or you can die. A drowned casualty can be removed from water alive and then die some hours, days, or weeks later. These outcomes do not include any psychological injury a survivor might suffer which can include a fear of water, post-traumatic stress disorder, and survivor guilt if others died in the event. Surviving a drowning event is not cost free. Knowing what to do if you find yourself drowning greatly increases your survival chances and reduces the price you will pay doing so. According to available statistics, the majority of those who die by drowning in developed countries can swim. Investigating police officers are often told in two out of three drowning deaths that the person who died could swim.

Swimmers die by drowning because they do not know how not to drown. They try to solve the wrong problem first. That is they try to get out of the water first. If you fall into deep water and can exit the water within seconds – do so. You can then deal with any breathing problems on land. When I say that swimmers try to solve the wrong problem first I'm talking about when they cannot exit the water immediately. Many drowning persons immediately start swimming as fast as they can to an exit place in an attempt to save themselves. They try to get out of the water first. This can be a deadly mistake. If you cannot exit the water within seconds you have to sort out your breathing and buoyancy situations before you should think of swimming to safety.

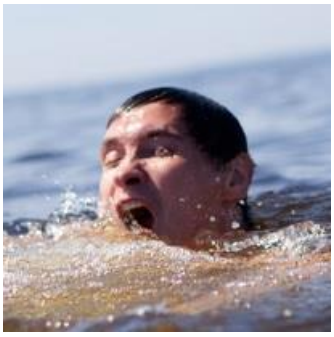
Drowning is a process. It is a series of linked steps. The first steps are having trouble breathing and struggling to stay on top of the water. Breathing problems can result in an inability to replace the oxygen used in supporting oneself in the water. When you double your swimming speed or effort in staying afloat, you quadruple your oxygen use. Fast swimming results in fast oxygen depletion in a situation where you cannot replace it. If you swim, when you cannot replace the oxygen used, you risk experiencing Sudden Total Swim Failure. Your muscles will cramp and suddenly stop working. When frightened we tense up and exhale thereby losing much of the natural buoyancy in our bodies that helps keep us on top of water. We submerge, are unable to breathe underwater, and fall unconscious. To stay alive in water we must remain on top of the water and be able to breathe regularly. These are the first problems to be solved in drowning situations.

Research indicates that the majority of those who experience a drowning event unexpectedly fall fully clothed into deep water. Outside of tropical locations the water is going to be cold. When cold water touches our faces we immediately inhale in what is called a Gasp Reflex. The majority cannot stop this reflex induced inhaling of water, but we can prepare for it. When you feel yourself falling you should tightly cover your mouth with the sideways palm of one hand and pinch your nose closed. Then, when you enter the water you will suck in the skin on the palm of your hand and not water. If water enters your throat a second reflex may happen. Your vocal cords can close to protect your lungs. In stopping water from entering your lungs the vocal cord closing reflex (Reflex Glottic Closure) also stops air entering your lungs. Placing a hand sideways over the mouth to stop inhaling water also reduces the likelihood of the vocal cords closing. There is a third physiological effect associated with drowning in cold water. Humans are land animals with inbuilt protection reflexes, such as those mentioned, that have evolved over millennia to help keep us alive *on land.* Cold water immersion triggers other physiological reflexes that can conflict with our land evolved ones. For example, a land reflex speeds up our heartbeat rate while a cold induced reflex slows the rate down. This Autonomic Conflict, where the heartbeat rate is being told to speed up and slow at the one time, places great short-term strain on a heart. It can result in a heart attack in individuals with pre-existing damaged hearts. For this reason, persons with known heart damage should avoid entering cold water and may explain some drowning deaths of known swimmers. The conflict is short lived and not something a swimmer can control during an immersion. It must be endured.

Swimming skill level does not play any role in surviving the first phase of drowning because that phase is governed by the Gasp Reflex, the Reflex Glottic Closure, and Autonomic Conflict. Therefore it is important for all, swimmers and non-swimmers, to wear lifejackets when boating. If your breathing stops because you have inhaled water or have suffered cardiac arrhythmia, you can quickly fall unconscious and will need a lifejacket to keep you on top of the water. Always wear a lifejacket when boating. Do not bring one and then sit on it (or worse yet, pack it away somewhere inaccessible). You will

not be able to put it on when struggling to breathe. In the event of not having a lifejacket on you should float on your back. Kick your legs slowly and wave your hands out and back slowly to steady yourself on top of the water. Then cough hard to clear water out of your airway. If wind is blowing spray into your face turn your body so that the spray hits the back of your head. If necessary put one hand over your mouth to keep the spray out.

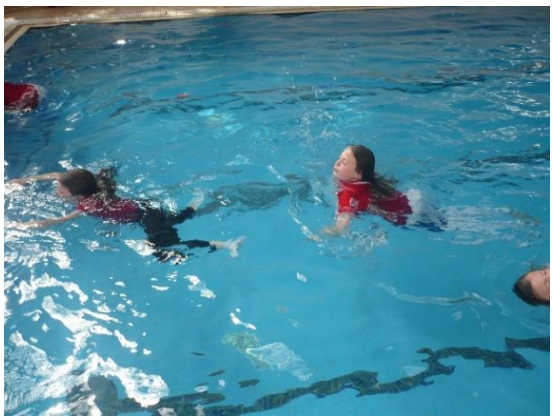
Your initial breathing will be fast and shallow. It will feel like you cannot 'catch your breath' but, with difficulty, you can. You want your breathing to be as slow and deep as possible. You will have to consciously slow down your breathing. This will not be easy and will take some minutes to achieve. There is a proven method for doing this. Stop breathing for a slow count of four, breathe in slowly for four, hold your breath for four, slowly breathe out for four, hold your breath for four and start all over again. You will struggle at first but if you keep trying it you will succeed. During this breathing control time your body will adjust to being in cold water. It is important that you continue floating until your breathing slows down and your body becomes used to the cold. Being in very cold water is painful. This is a physical fact. While you are struggling to slow down your breathing you will also most likely have a cold induced sharp pain in your head and possibly in your chest. It is important to understand that the pain is caused by the cold, lasts only for a very short time, and there is nothing a swimmer can do to stop it. We can only endure it. The key survival tasks for swimmers in the first immersion minutes are to stay on top of the water floating, to slow down and deepen your breathing, and to ignore the cold pain. Once your body adjusts to the cold the pain will ease.



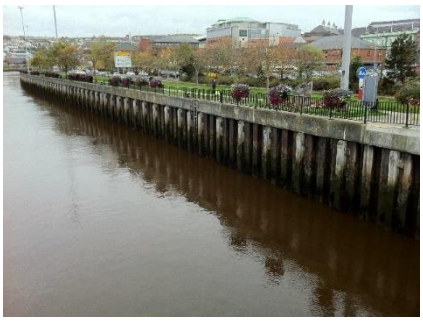
Here is an important psychological fact. Once you are floating on top of the water and have control of your breathing you have stopped drowning. You are still in trouble; you still need to get out of the water but have now regained control of your body and have bought yourself time to think about what to do next. This may involve swimming but if you have fallen out of a boat it can mean waiting to be rescued by others in the boat or climbing up onto an overturned boat and waiting for rescue. This is a stop and think time. If the swim is not short think carefully about 'swimming to safety' as many swimming attempts are unsuccessful and end in the death of the swimmer.

If you decide that you must swim to safety, you should swim breaststroke slowly keeping your head out of the water. If there is wind-blown water spray stay on your back to avoid facing into the spray. Swim backstroke with your arms in the water so that the spray hits the back of your head instead of your face. If you swim into spray you cannot avoid inhaling water droplets. Do not swim face down front crawl as keeping your head in very cold water will slow your breathing and circulation to unconscious levels due to stimulation of the vagus nerves in our neck. After your body has adjusted to the cold the distance you have to swim to safety is less important than how you will exit the water. You should think about where it is easiest to exit the water and not the shortest distance to land. It will make little difference to your survival outcome if you swim a little further to an easy exit point. You want to avoid having to climb up or to pull yourself up out of the water. Your physical condition will be fragile. You should swim to a shallow easy exit point if possible. If you find yourself in surf you can turn yourself into a ball while holding your breath and the surf may bring you into shallow water.

Bathing drownings, where a person in swimwear gets into difficulty on a beach or in a river, are more frequent in summer months, but people drown all year round. In non-bathing drownings those in trouble are usually wearing street clothing and footwear. Sports footwear is usually buoyant and will help keep your feet on top of the water. Don't try to remove clothing. In the first drowning phase air may be trapped inside the cloth fibres which helps with buoyancy and insulation against the cold. In later phases, clothing acts as important insulation as well as being able to hold pockets of air that aid flotation. Removing clothing uses oxygen you need to stay conscious. Wet clothing may impair your swimming a bit, but you should not swim at this time anyway. If you kick your legs slowly to assist floating on your back, pants or jeans will not be a hindrance. Wet clothing is heavy out of water but has no weight in water. In the first drowning phase you should not remove clothing as they may get stuck half-on, half-off, thereby preventing you from moving your arms or legs.



There is a condition I call the First Time Problem. Some pool swimmers are overwhelmed by the number of new experiences they must deal with following an unexpected clothed fall into cold open water. Reducing the number of new swimming experiences that a drowning casualty has to deal with will help improve their survival chances. Most people know bits about survival. To use a computer metaphor, we all have within our minds a cache of survival knowledge and experiences which we can draw on in times of crisis. Our aim is to improve a swimmer's survival chances by putting good proven information into the public domain and suggesting practical experiences that can be undertaken safely and added to a swimmer's survival cache. These include putting your hand flat sideways over your mouth and pinching your nose to protect against inhaling water during the gasp reflex, not trying to remove clothing, floating, slowing down breathing, and knowing that the pain and will pass quickly. Swimmers should practice floating and swimming in clothing in safe shallow open water with a rescuer on hand to help. Experiment with different strokes while wearing street clothing to find a way of swimming easily. If you lift a wet clothed arm out of the water, as you would do in front crawl, the weight of the wet clothing becomes a hampering factor, whereas keeping the arms underwater, as in breaststroke or survival backstroke, is much easier. Practice swimming backstroke with the arms underwater as a protection against wind spray.



Most bodies recovered after a drowning event are found close to land. Some die because they cannot swim the distance to safety. Others die because when they reach land they cannot exit the water and succumb to fatigue. I call it the Exit Problem. At the start of a drowning event the hormone adrenalin/epinephrine is released into our blood giving us extra strength and endurance. Sometimes the adrenalin allows swimmers to overcome a lack of oxygen but the impact of adrenalin lasts for only a short time. This is followed by a condition called Post Rescue Collapse. Swimmers should be aware that they will be fatigued when they reach land or some place of support and should therefore look for an easy place to exit the water. An early effect of cold injury is a loss of grip strength in our hands and fingers. We lose the ability to hold onto things like ladders. Rescuers should avoid heating the swimmer as this forces the body to circulate the heat. The focus should be on just stopping them from getting colder. Keep them flat, in a head down Recovery Position. If they have collapsed call an ambulance rather than bundling them into a car. If the swimmer stops breathing rescuers should be aware that Compression Only CPR is unsuitable for drowned casualties. In drowning breathing stops first and a heart may continue working until all or most oxygen in the blood is used up. Compressions without ventilation circulates oxygen depleted blood. Full ventilation CPR should be performed on drowned casualties starting with between two and five full inflations before starting compressions and regular inflations during compressions at a rate of 2 inflations after 30 compressions.