Cold Open Water Swimming – Key Danger Signs & Safety Measures

The following are key aspects that will confront open water swimmers in cold water. It is to inform.[1] It addresses the effects of temperature upon the swimmer, but not weather, sea-state or currents.

Create your own strategies in mitigation. Take the advice of others, but always be responsible for your own safety. Set yourself limits, not targets.

What is cold water? Every swimmer is different, every swim is different. Cold water is complex and its effects upon the human body are complex. 'Cold' water is a relative term. It is not formulaic – to the human body any water below 36c (96.8'f) will induce body cooling without exercise. English cross-Channel swimmers regularly endure 14 -21 hours in 16c (60.8'f) without a wetsuit, but only having undertaken ~18 months training. At 8c (46.4'f) the body's skin pain receptors start to be stimulated and whilst the act of energetic swimming can create heat, it will only slow the onset of the effects of the cold and hypothermia. Regular swimming can reduce or delay some of the effects of cold water. Ultimately though, you cannot beat the laws of thermodynamics. A very few highly experienced swimmers can endure temperatures ~1c (33.8'f) for 30 minutes without a wetsuit. However, on exiting the water they require to undertake a very prompt re-warming regime.

Swimming solo vs swimming with a buddy / group. A swimmer's mental capacity reduces as they get colder, especially their ability to self-monitor. This is similar to getting drunk, where the subject is progressively less aware of their actions and surroundings. However, their capacity to monitor others is less impaired. Therefore, swimming with a buddy is safer AS LONG AS YOU EACH TAKES NOTICE OF WHAT THE OTHER SAYS. If one says that she believes the other needs to leave the water, they both do get out. If you swim solo, set a realistic limit to your swim and get out by or before that limit.

Swim responsibly. Across the world, for every 8 people who have been rescued by non-professional rescuers, 10 rescuers have died. (Yes, more rescuers die than swimmers rescued). It is human nature to try and rescue someone in distress; if you get into distress without a buddy and without a plan, you are more likely to cause someone else's death than your own. Most drownings occur within 6 yards of safety.

Do swimmers die of hypothermia? Surprisingly the human body will not start to become hypothermic until after 15 minutes, but there are other dangerous aspects before true hypothermia sets in. While swimmers may die of hypothermia, they are more likely to drown due to many other reasons in cold water:

- **Cold water shock. Can be fatal**. Involuntary gasp response when suddenly immersed in cold water. The gasp is a large intake to the lungs, regardless of whether the head

[1] Compiled after more than nine years year-round wild, open water and distance swimming in UK coastal waters. Additionally, the extensive research undertaken by the University of Portsmouth Extreme Environment Labs and similar research Journal articles have been used to better understand the science behind cold water swimming

is under the water. One gasp is sufficient to cause primary drowning, or induce secondary drowning. Can be mitigated by regular swimming, gradual immersion and use of wetsuit.

- **Cardiac arrhythmia. Can be fatal.** Rapid immersion causes the sending of two contradictory stimuli to the heart – one saying speed-up (fight or flight), the other saying slow-down (mammalian response to being in cold water / under water). The result is effectively a heart attack. Can be mitigated by regular swimming and gradual immersion and use of wetsuit.
- **Swimming Induced Pulmonary Oedema (SIPO, syn SIPE). Can be fatal.** A not-fully understood physiologically induced release of fluid into the lungs that can occur at any time but is most commonly seen during the first 10 minutes of a swim event. It is a form of secondary drowning. Symptoms are a feeling of not being able to drag in enough air when breathing. Highly motivated swimmers may try and 'swim-through' the distress but this is not an effective cure. Immediate action should be to cease swimming and adopt a vertical position in the water followed by recovery into a boat or slowly to shore. An upright seated position assists relieving of symptoms. Risk of SIPO may be <u>increased</u> by anxiety, pre-race tension and over-hydration prior to entering the water. Urinating when in the water may <u>reduce the likelihood</u> SIPO.
- **Loss of muscle strength and control. Can be fatal.** Muscles and muscle control becomes progressively less effective. (Early signs are ineffective dexterity and slurred speech as jaw muscles are affected). Ultimately arms and shoulder muscles deteriorate to a point where they feel like anvils and the swimmer ceases to be able to swim. As they approach this point a skins swimmer will swim in a progressively more vertical position as though climbing a ladder. A wetsuited swimmer will be unable to propel or maintain a stable position in the water (i.e. unable to prevent rolling). Swimmer will be unable to help themselves even if conscious.
- **Loss of self-awareness. Can be fatal.** On some occasions the brain can be compromised by the cold more quickly than arm muscles. Very experienced swimmers have been known to swim into unconsciousness.
- **A feeling of warmth and wellbeing**. **Can lead to severe hypothermia.** The body attenuates heat and pain receptors in cold water. The body still recognises that it is in cold water and subsequently protects the core by reducing blood flow to the skin and extremities. However, there is a point at which the cold receptors stop recognising the cold, and the blood is allowed to flow back to the extremities, thereby significantly accelerating body heat loss.
- **Inexperience. Can be fatal to swimmer and companions**. There is often an assumption by newcomers to OW swimming that guts and fitness will overcome cold and swimming 'a long way'. They are sadly very wrong.
- **Bravado and challenging others**. **Can be fatal to swimmer and less assertive swimmers.** A swimmer should never encourage or entice another swimmer to go further / longer than they have previous done so unless they are very familiar with that swimmer and their abilities.

- **Exhaustion. Can lead to distress if unprepared.** Swimming in cold water requires significantly more energy. Oxygen intake increases massively in cold water. Expect to feel breathless if you swim hard. Ease back on the throttle by 10%.

Key safety measures for cold water swimming:

- Swim with others if you can. If solo, tell somewhere where you are swimming and when you will next contact them.
- Wearing a wetsuit significantly improves your safety, but not everyone wants to. (It is NOT a sign of weakness to wear a wetsuit). Neoprene shoes and gloves – ditto.
- Wear a good bright swim hat to conserve heat and improve visibility. If only swimming heads-up you could use a woolly hat.
- Get in slowly – 3 minutes from toes wet to head-in is a good yard-stick.
- Swim parallel to shore, preferably in shallow water. Wait for warmer conditions before you swim out to sea!
- Use a tow-float (*aka swim-buoy*). If properly worn they very rarely interfere with your stroke. They make you very visible to other swimmers, boats and rescue services. They are also useful as a rescue aid. (*Note from Karen: attach a lifeguard whistle to this*)
- Have a plan – how will you get a casualty ashore? Then what?
- If your buddy seems concerned about you, get out.
- Recognise whether you are 'under-par' due to lack of sleep, no recent meal or illness. These can seriously affect your wellbeing in the water.
- Be honest to yourself and others about your abilities.
- Unless you are training for an ice-mile, save your sprints, racing and endurance swims for the summer and the pool. Enjoy the cold water as an experience.

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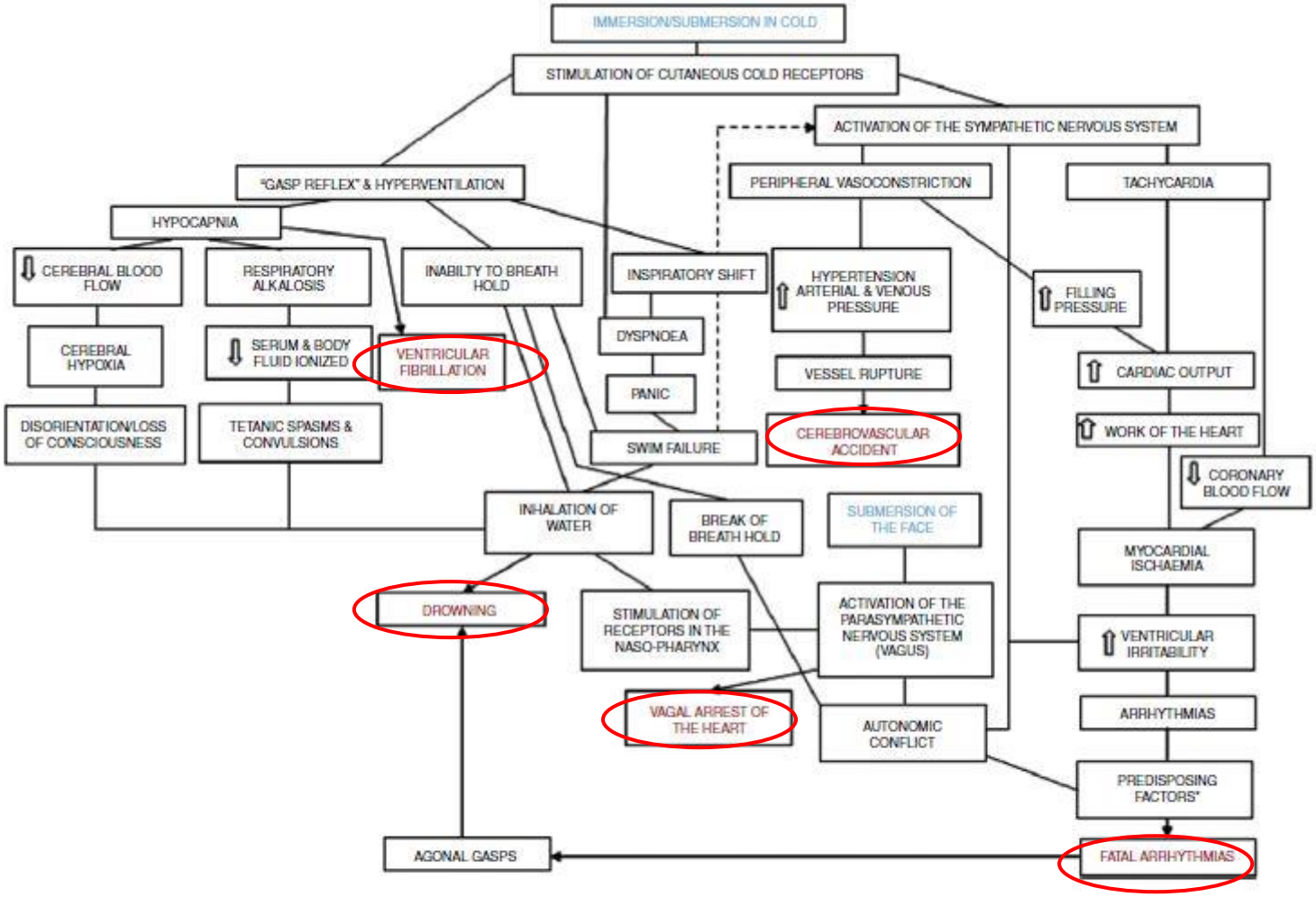
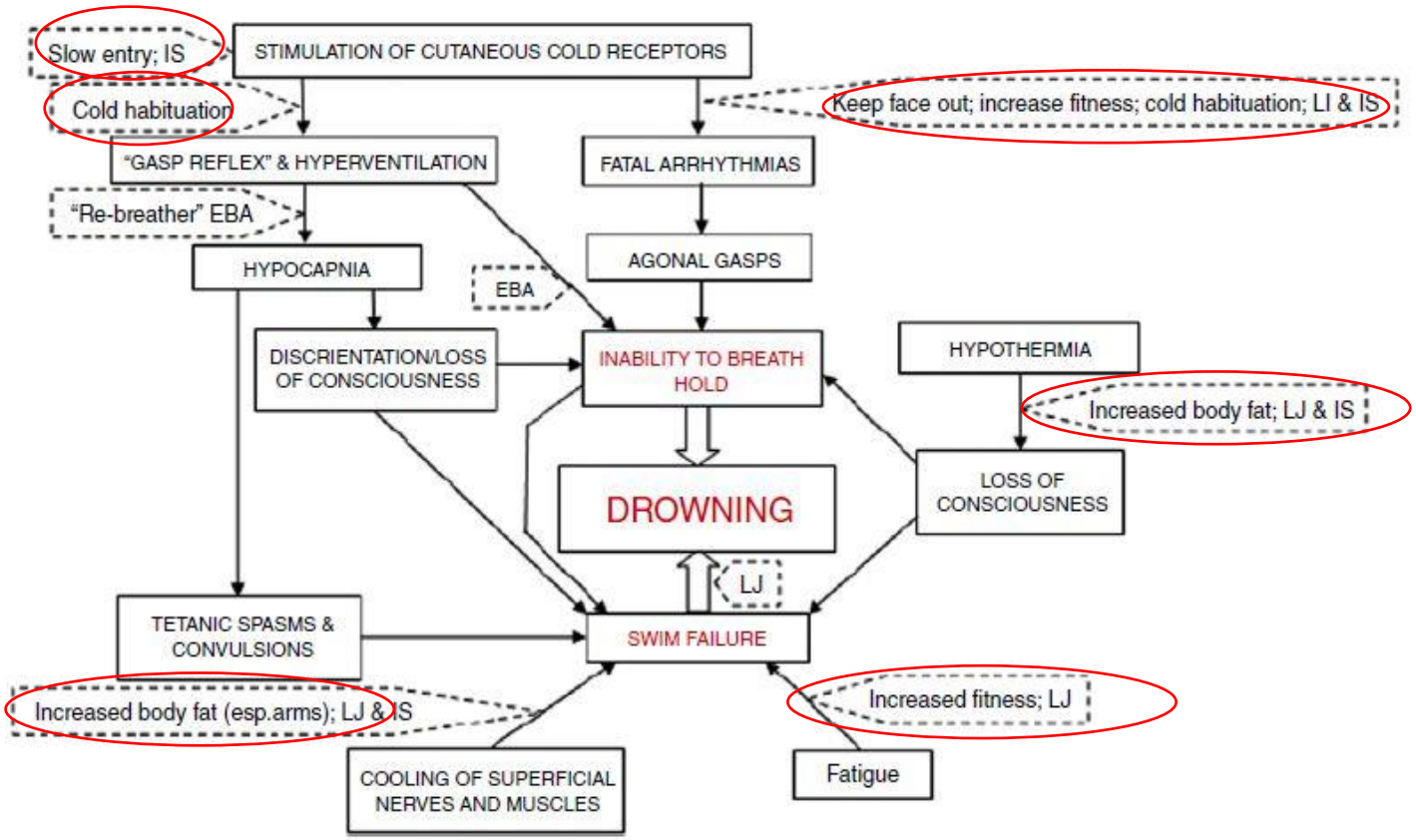


A contemporary view of the initial responses to immersion and submersion in cold water ('cold shock')
Based on: Tipton (1989); Datta & Tipton (2006); Tipton *et al.* (2010); Shattock & Tipton (2012). *Predisposing factors include channelopathies, atherosclerosis, long QT syndrome, myocardial hypertrophy and ischaemic heart disease. Reproduced with permission, from Tipton (2016*a*).

Figure 1 - The complexities of cold water shock on the body. (Tipton, Collier, Massey, Corbett, & Harper M, 2017)



The 'physiological pathways to drowning' after immersion or submersion in cold water, with possible interventions for partial mitigation (dashed)
Abbreviations: EBA, emergency breathing aid; IS, immersion suit; and LJ, lifejacket. Reproduced with permission, from Tipton (2016*b*).

Figure 2 – Interventions / Mitigations to cold water shock and drowning. (Tipton, Collier, Massey, Corbett, & Harper M, 2017)

Further reading:

Bowes, H., Elgin, C., Tipton, M., & Barwood, M. (2016). Swim performance and thermoregulatory effects of wearing clothing in a simulated cold-water survival situation. *European journal of applied physiology, 116*, 759–767. doi:10.1007/s00421-015-3306-6

Connolly, J. (2014). Drowning: the first time problem. *International Journal of Aquatic Research and Education, 8*(1), Article 7. doi:10.25035/ijare.08.01.07

Dow, J., Giesbrecht, G. G., Danzl, D. F., Brugger, H., Sagalyn, E. B., Walpoth, B., . . . Grissom, C. K. (2019). Wilderness Medical Society Clinical Practice Guidelines for the Out-of-Hospital Evaluation and Treatment of Accidental Hypothermia: 2019 Update. *WILDERNESS & ENVIRONMENTAL MEDICINE*, S47-S69. doi:https://doi.org/10.1016/j.wem.2019.10.002.

GIESBRECHT, G. G. (2001). Prehospital treatment of hypothermia. *Wilderness and Environmental Medicine, 12*, 24-13.

Moon, R., Martina, S., Peacher, D., Potter, J., Wester, T., Cherry, A., . . . Freiberger, J. (2016, January). *Swimming-Induced Pulmonary Edema - Pathophysiology and Risk Reduction With Sildenafil.* doi:10.1161/CIRCULATIONAHA.115.019464

Shattock, M. J., & Tipton, M. (2012, April). 'Autonomic conflict': a different way to die during cold water immersion. *Journal of Physiology, 590*(14), 3219–3230. doi:10.1113/jphysiol.2012.229864

Smith, R., Omerod, J., & Sabharwal, N. (2018). Swimming-induced pulmonary edema: current perspectives. *Open Access Journal of Sports Medicine, 9*, 131–137.

Sport England. (2019, May 28). *Swim England Open Water hub*. Retrieved January 2, 2020, from Swim England: https://www.swimming.org/openwater/open-water-swimming-rise/

Stallman, R. K., Moran, K., Quan, L., & Langendorfer, S. (2017). From Swimming Skill to Water Competence: Towards a More Inclusive Drowning Prevention Future. *International Journal of Aquatic Research and Education, 10*(2), Art 3. doi:10.25035/ijare.10.02.03

Tipton, M., & Bradford, C. (2014, June 11). Moving in extreme environments: open water swimming in cold and warm water. *Extreme physiology and medicine, 3*(12), 11 pages.

Tipton, M., Collier, N., Massey, M., Corbett, J., & Harper M. (2017). Cold water immersion: kill or cure? *Experimental Physchology, 102*(11), 1335-1335. doi:DOI: 10.1113/EP086283

Tipton, M., Eglin, C., Genniser, M., & Golden, F. (1999, August 21). Immersion deaths and deterioration in swimming performance in cold water. *The Lancet, 354*, 626-629. doi:doi.org/10.1016/S0140-6736(99)07273-6

Water Incident Database (WAID). (2018). *WAID Reports and data.* Retrieved January 2, 2012, from National water safety forum: https://www.nationalwatersafety.org.uk/waid/reports-and-data/