Rowing in cold water conditions – Taking sensible precautions

{Please note that a shorter précis of this document is also available as essential reading for all members. This longer version is essential reading for all coaches and members who act as rescuers}

Introduction

Cold can pose a risk to rowers all the year through. When rowing in winter, the cold can adversely affect individuals even if it is dry. Rain and wind (or a wet rower exposed to the wind) can produce significant body heat loss in much milder temperatures.

Hypothermia is when the body core temperature is reduced to 35°C or below (normal core body temperature is 37°C) and is a serious, possibly fatal condition.

The onset of hypothermia may be insidious and, as the body core temperature gradually falls, the early stages can go unnoticed by both the victim and those around them. Vigilance is required to spot the early signs, as once it is obvious someone has a problem it may have already reached the life-threatening stage.

In contrast, immersion in cold water is an obvious event, which should immediately raise awareness of the risk of hypothermia. The rate of onset of hypothermia in water is affected by several factors and is thus variable from person to person. It may occur quite rapidly. Because of these variable factors, tables showing survival times at defined water temperature can be misleading.

In **cold water** immersion, you cannot get warmer by physical activity at any stage. The opposite is true – any body movement increases heat loss and makes you colder, hastening the onset of hypothermia. This is because cold water conducts heat away from the body more efficiently - 25 to 30 times faster than in air at the same temperature.

- Make sure your boat is fully buoyant, and in good order. Consider taking something in the boat to bail out cold water following a bad wash.

- Know and understand local collision avoidance and navigation rules.

- In low light conditions try to wear white/reflective clothing. No member may row club boats in bad light (including fog) or dark conditions. When phoning *Woolwich Radio/PLA (0208 855 0315)* before an outing members must abide by any instructions in this regard.

- Know and understand local hazards in the water. Remember, once you are in cold water your life is at risk.

- Whenever possible **stay in your boat** if you are swamped (wellington boats can be useful to bail out water from the boat) and try to get as much of your body out of the cold water.

- There is much you can do to take sensible precautions. You have to accept that it may actually happen to you – it won't always be someone else who falls into cold water.

Background

- **But I can swim, won't that help?**

Your ability to swim and stay afloat in warm water actually bears no relationship to your ability to swim in cold water.

Why is this? Apart from the effect of waves and current, your ability to swim, or just to stay afloat, is affected by several things e.g. the state you're in before immersion, cold shock, "swimming failure" and hypothermia . All of these can be controlled or mitigated to some degree – so get the knowledge and be prepared.

- **How cold is *cold*?**

Water temperatures below 26.5°C (80°F) will have an adverse effect on survival.

Inland water is generally colder than the sea.

Most inland water in the UK probably remains at temperatures below 10°C throughout most of the year.

i) Mild hypothermia

Physical

- Shivering becomes vigorous and uncontrollable.
- Loss of fine movement control and numbness; can't grip hold of things effectively.
- General co-ordination starts to deteriorate.
- Speech may be slurred.
- The heart rate increases (associated with shivering).
- Breathing rate increases (associated with shivering).
- Metabolic rate goes up as the body burns more energy to produce heat.
- Urine production increases, as a greater proportion of blood volume remains central. This can lead to dehydration.

Mental

- Gradual onset of confusion and reduced ability to perform simple mental tasks e.g. remember a list of words, simple calculations, work out best action for rescue.
- Becoming emotionally flat.

Practical effects

- At this stage action must be taken to get out of the cold environment and to prevent further heat loss, as trying to keep warm by physical activity becomes less and less effective.
- In cold water, life is now endangered especially if not wearing a lifejacket (i.e. a PFD which will keep the wearer afloat, self righting to keep the nose and mouth clear of the water).
- Making the right survival decisions becomes more difficult.
- Holding onto something becomes harder, as hands become more and more useless.

- Swim failure is an increasing possibility

ii) Moderate hypothermia

Physical

- Shivering reduces and stops.
- Muscles become more and more rigid.
- Lack of co-ordination may cause stumbling.
- Speech slowed and slurred.
- Heart rate slows and the heart muscle becomes irritable, so that the slightest movement can trigger possibly life threatening rhythm irregularities.
- Breathing rate slows and less oxygen gets to the tissues (which further reduces heat production).
- The cough reflex is impaired so that an immersed person is more likely to breathe in (aspirate) water.
- Metabolic rate slows and lactic acid accumulates.

Mental

- Becoming drowsy and more confused.
- Amnesia.
- Apathy.
- Reduced awareness of surroundings and predicament, possibly resulting in bizarre dissociated behaviour.

Practical effects

- This is a very serious life-threatening situation.
- Body core temperature decreases more rapidly, so symptoms worsen more quickly.
- The will and practical ability to self-rescue both ebb away.
- In water the increased risk of aspiration may start a downward spiral to drowning.
- In water, without a lifejacket, decreasing consciousness makes drowning highly likely.

iii) Severe hypothermia

Physical

- Heart rate drops so that the circulation does not meet metabolic demand.
- Breathing becomes more shallow and erratic.
- Pupils dilate.
- Blood thickens.
- Gross metabolic disturbances and organ failure.

Mental

- Unconscious

Practical effects

- In cold water with no lifejacket you are probably dead by drowning.
- Wearing a lifejacket buys added survival time even when unconscious, by keeping the nose and mouth out of the water. However aspiration from spray and waves is still likely.

At this stage the unconscious victim may appear dead, but this can be misleading. Death from hypothermia cannot be diagnosed until the victim has been rewarmed.

How should I prepare myself physically and mentally to survive in cold water?

1) Don't boat when you are not feeling 100% well

You are probably already aware that rowing when you are ill, fatigued, or affected by alcohol or "recreational" drugs means you will not perform well. It also means that you are more likely to get into trouble, and will be less able to cope with it when it happens.

2) Have a realistic idea of what you can do

"How hard can it be? If I capsize, I will right my boat and get back in – or swim it to the shore. If my boat sinks I'll hold onto it until I'm rescued. If I'm close to the shore I'll just swim for it – I can manage a few metres. It is only other people who get into trouble."

You'd only be human to have had these thoughts. But in cold water these manoeuvres are much harder than you imagine.

For example, you may have practised the "capsize drill" in a warm swimming pool, but performing this in a cold river or lake is completely different. In cold conditions the effort involved in righting the boat will hasten hypothermia and significantly reduce your survival time – and by the time you've done this your chances of being able to climb into the boat will be hampered by reduced grip strength and limb stiffness. It may be better instead to just pull yourself onto the upturned hull to get as much of your body core out of the water and await rescue.

Practice the capsize drill; use the opportunity to practice holding onto the boat to use it as a float, so you know what that feels like. Remember that a buoyant single offers much more support than a non-buoyant eight, which when swamped will "float" just submerged in the water.

3) Wear the right kit

Rowing kit has to be a compromise between what will keep you comfortable when rowing in the boat, and what will help prevent heat loss when in the water. Here are some pointers:

- Several layers of light clothing will help trap a layer of water (and possibly some air), thus reducing heat loss.

- A layer of breathable but waterproof fabric will be much more efficient at trapping a layer of air and water.

- 50% of heat loss is from the head. A waterproof hood stowed in a garment collar, which can be quickly pulled out with one hand, would be of benefit. If this is bright and reflective it would also help potential rescuers to see you in the water.

- Clothing should be close fitting, to reduce the risk of it being caught on equipment etc., and to reduce drag if you need to move about in the water.

- The World Rowing Federation 'FISA' recommends the universal use of lifejackets when boating on water below 10°C (FISA Minimum Guidelines for the Safe Practice of Rowing, Dec 2005)

4) ***Plan your own rescue***

- Before each outing take a moment to think through how you would be rescued or self rescue if you ended up in the water at this time, from this boat, with these people and in this location? If you already have a mental picture of what would be the best thing to do if it does happen, then after the normal initial panic you will quickly feel more in control – and this is crucial to increasing your chance of survival.

- This is akin to personal "risk assessment": For example, ask yourself is this boat fully buoyant and in good order? Is there a safety launch in attendance? If so, will it be of any use? Is the rest of the crew safety aware? Will there be someone around to summon help if necessary. What are the banks like – could you climb out? Is it just too cold to risk it in this particular location? If going out alone (not recommended) does someone know you're on the water and know when to expect you back?

- Metal coaching launches are not at all suitable for use as safety / rescue boats. It is often difficult to pull rowers out of the water onto a launch, especially a metal monohull-type, when the launch itself may capsize as the weight of the rower and rescuer acts on one side. The launch may become unstable or unbalanced with additional passengers on board, especially in windy or choppy conditions. Many rowers mistakenly believe that any accompanying launch will be able to rescue them if necessary, and may therefore wrongly count the launch as part of their personal safety assessment and plan.

The Hazards of Cold Water Immersion – and how to cope with them

1) <u>Cold Shock (max risk at 1- 5 minutes in the water)</u>

Cold shock is an increased respiratory response to cold water immersion. At first there is an involuntary gasp (indrawing of breath) which is followed by hyperventilation (rapid and disordered breathing). There is usually an associated degree of disorientation, so for a few moments you may not be sure which way is up, or where you are in relation to the boat, the bank etc.

The severity of the effects of cold shock are proportional to reduction in water temperature, with the maximum effect being at 10 – 15°C. Ability to breath is proportionally reduced the colder the water.

Cold shock only lasts for approx 1 – 3 minutes.

How do I cope with it?

For those first crucial few minutes just completely concentrate on not drowning! It may sound too simplistic, but if you are expecting the cold shock response, and you understand it will soon pass, then you have a better chance of surviving it.

If the first involuntary gasp takes place when your face in is the water, then you will get a lungful of water instead of air.

After your breathing begins to settle, and you get your bearings you will then have time to assess the situation and decide what is best to do for rescue.

2) <u>Swimming Failure (risk increasing with time in the water)</u>

Your ability to swim is reduced in cold water. The colder the water the more your swimming deteriorates. This effect takes hold long before there is significant cooling of the body core, so is not due to core hypothermia.

Swimming stroke length is decreased and stroke rate is increased – so the stroke becomes less and less efficient, and more exhausting. The swim angle is increased, i.e. your body lies more upright in the water, so forward progress with each stroke is reduced. It becomes more and more difficult to straighten the limbs and to co-ordinate swimming movements. The fingers splay and start to flex. These effects are thought to be due to local cooling of the limb muscles.

Rescue by swimming should be a last resort measure only.

3) <u>Hypothermia</u>

a) What is it?

Hypothermia is defined as body core temperature below 35°C (normal body temperature is 37°C). The body tries to **generate more heat** by shivering, which may start when the core temperature is only 1°C below normal (i.e. at 36°C). As hypothermia develops (at 35°C) the shivering becomes intense and can no longer be stopped voluntarily. However as core temperature reduces to around 33°C shivering is no longer effective, so it reduces and stops.
This is an important sign indicating the person is in imminent danger.
Body heat loss then accelerates.

The body loses heat in water 25 – 30 times faster than in air.

The rate of heat loss is dependent on several factors:

- Temperature differential – how much hotter your body is compared to the water.
- Clothing insulation.
- Body fat thickness – inbuilt insulation.
- Ratio of body mass to surface area – the bulkier you are, the better you retain heat.

- Physical activity – movement draws warm blood out of the body core and into the muscles of the limbs, where heat loss is more rapid. Treading water or swimming increases the rate of heat loss by approx 40%.

- Body posture in the water – some parts of the body lose heat faster than others i.e. the head (50% of heat loss), neck, armpits, chest and groin.

- Physical fitness.

- Diet prior to immersion.

- As the core body temperature cools usually the first obvious effect is on the brain. A person may become confused, unable to remember things and will become drowsy and ultimately unconscious. At first the heart rate slows, but then the heart muscle becomes irritable, and dangerous disturbances of rhythm may occur. Less oxygen gets to the body tissues. Urine production increases, leading to loss of blood volume and thickening of the blood. The airway protective cough reflex becomes impaired – so there is an increased risk of water getting into the lungs.

- Hypothermia can kill even after the victim has been rescued from the water. Before core hypothermia sets in there are the more immediate effects of local cooling of the limbs to contend with. This reduces grip strength and manual dexterity, and reduces the ability to feel with the fingers. This effect can occur very soon after immersion, and may severely hamper survival actions, such as clinging to the boat.

b) How can I reduce the risk?

- Once you have recovered from the cold shock effect and have got your bearings, <u>the most important priority is to get as much of your body as you can out of the water as quickly as possible, and then to cover your head,</u> which accounts for 50% of body heat loss.

- You could pull yourself onto your (possibly upturned) boat, or onto any other likely nearby object in the water. If this is not possible, then hold onto anything which floats and will give you some support – this will usually be the boat. If you are unable to get out of the water then the next priority is to stay as still as possible in the water, with your back to the waves to avoid water inhalation.

- If you are wearing a Personal Flotation Device (PFD) then you will probably be able to adopt the Heat Escape Lessening Posture – basically the "foetal position" – cross your arms across your chest, keeping the elbows close to your sides, and then draw the knees up to the chest. This gives added protection to the body areas of high heat loss i.e. armpits, groin and chest.

- Don't waste energy trying to right the boat if you are able to just climb onto the upturned hull – that is unless you are certain of very quick success. Remember in cold conditions the effort involved will be huge and will use precious energy and promote body heat loss. Having succeeded you will then need enough energy left to climb back into the boat, and by this time your hands and arms and legs will be numb, stiff and painful.

- The decision to swim for self- rescue must be the last resort when there is a fast flowing tide.

4) Dry drowning (risk from immediate, to any time after immersion)

Unfortunately sometimes instead of the sequence described as cold shock there may be a sudden reflex closing of the airway due to muscle spasm. No water can enter the lungs, but neither can air.

It is thought to be an automatic shock reflex due to cold water hitting the back of the nose or throat. It may happen the instant you hit the water.

How can I avoid it?

Dry drowning is more likely to occur if you enter the water feet first – which allows water to get up the nose. It is also more likely if you are tense and mentally unprepared – i.e. you weren't expecting to be immersed.

Of course any accident is unexpected (though most are avoidable!) but unless you are actually thrown into the water (e.g. by catching a crab) you will usually have a few seconds warning that immersion is going to happen. Use that moment to mentally take control – you know what to do to maximise survival, so now is the time to put it in to action.

If possible take a deep breath in, pinch your nose with your fingers to close the nostrils, keep your mouth closed and enter the water gently by rolling in, rather than feet first. Avoid jumping into cold water.

As described in the Cold Shock section, once immersed concentrate on keeping your face out of the water and keep your back to the waves to avoid getting spray into your nose and throat.

5) Post- rescue collapse (risk on or shortly after rescue)

a) Hypothermia produces profound disruption of normal body function, and this doesn't revert to normal the minute a victim is rescued from the cold water.

b) Once in shelter get those affected to rest and take food (fuel to increase body heat production) and non-alcoholic, caffeine-free drinks (to correct any dehydration). Alcohol dilates blood vessels in the extremities and promotes further heat loss. Caffeine is a cardiac stimulant, and may increase the risk of heart rhythm disturbance.
Keep watch for, and warn victims to report any signs of a drop in blood pressure. This may occur if the blood vessels to the extremities open up too quickly. The first sign would be feeling faint or dizzy. If affected get the victim to lie down and temporarily remove a layer or two. If symptoms persist in spite of this, call for an ambulance for transfer to hospital.

c) The haemodynamics of the body are impaired and there may be dehydration. If a victim has been in the water for any length of time there may be circulatory collapse as they are removed from the water. The heart becomes very prone to disruption of the normal rhythm (arrhythmia). Even passive movement may precipitate a fatal arrhythmia.

- Once sheltered, limit the victim's physical activity, and make them lie down.
- If the victim has reached warm dry shelter, remove any wet outer clothing and wrap in dry layers and a thermal blanket.
- If the victim is still outside, do not remove wet clothing. Quickly wrap in extra layers and a thermal blanket.
- DO NOT attempt to actively warm the victim i.e. do not rub or massage muscles, do not apply direct external heat, especially to the extremities. Active rewarming should only be done in hospital as dangerous side effects may occur.
- If medical assistance is significantly delayed, then body to body contact is relatively safe and can be very effective.

At the earliest opportunity, call for an emergency ambulance to transfer the victim to hospital. **Hypothermia? - Hospital!**

d) The unconscious hypothermic victim:

i) At the earliest opportunity telephone for an emergency **ambulance**.

ii) **Monitor vital signs**. If there is a pulse and breathing, even if very slow or faint, do not commence CPR. Keep the victim horizontal and do not move them unnecessarily. If you have witnessed the circumstances leading to unconsciousness and are certain there has been no head or neck injury, gently place in the recovery position. Otherwise assume injury may be present and keep the head and neck stabilised, but protect the airway. As above, shield from rain and wind and wrap up. Observe closely.

iii) In hypothermia the heart muscle is very irritable and chest compressions (cardiac massage) can precipitate potentially fatal rhythm disturbance, so do **not** commence chest compressions until you are sure the heart is not active:

iv) Hypothermia slows the heart rate considerably, so check the **carotid** (neck) **pulse** for a full minute or more. Even if there is no palpable pulse, the cold heart is still considered to be active if there are any other signs of life – an occasional breath, any movement or sound, an audible heartbeat on listening to the chest.

v) If **no sign of respiration**, commence mouth-to-mouth breathing. If there is no sign of heart activity also commence chest compressions.

vi) **Mouth to mouth** breathing is safe, and may help to slightly rewarm the victim's body core by provision of warm humidified air.

vii) If the unconscious victim has been found face down in the water and there is no respiration, assume cold water near-drowning and commence **CPR** straight away. Always assume **survival is possible**. Continue CPR until you hand over to the paramedics.

e) Inappropriate warming may result in opening up the blood vessels to the extremities, drawing the warmer blood away from the core, and taking the colder stagnant blood from the extremities back into the core.

f) A victim who has been in cold water for any length of time should be lifted out in the horizontal position to prevent circulatory collapse.They should be treated with the

utmost gentleness to avoid precipitating a cardiac arrhythmia. They should be kept as still as possible.

g) Prevent further heat loss by applying insulating blankets (or improvise with whatever is available) and carefully move to a warm environment. Urgent removal to hospital is vital, as the treatment of hypothermia is complex.

h) Victims who are shivering, but who are rational and showing no other signs of hypothermia may just need removal of wet clothes, wrapping up and a warm environment. They should avoid activity until full recovery.

i) All other victims should be made to lie down, keep still and be wrapped up while awaiting transfer to hospital for full examination.

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With acknowledgement to Jane Blockley, formerly with Poplar Rowing Club. This guidance is based upon guidance she produced in 2005 and 2006.