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Most heat illness is preventable. Greater awareness by commanders at all levels, clearer recognition of heat illness symptoms and better planning of higher risk activities can significantly reduce the risk of heat illnesses. Giving the right first aid and getting a quick evacuation to medical care can be the difference between life and death.

Heat illness happens in the UK as well as in warm climates. The weather doesn’t have to be hot if personnel are: exercising hard, carrying heavy loads or wearing protective clothing.

Heat illness can lead to individuals being downgraded and medically discharged.

Commanders have a duty to ensure risk is as low as reasonably practicable (ALARP).

**Definition**

Heat illness is a condition in those individuals who become unwell as a result of a rise in core body temperature.

**How does it happen?**

Heat illness occurs due to a rise in core temperature that is not matched by heat loss.

Body temperature rises when running, or marching carrying heavy loads or wearing protective clothing. Bodies also get hot from high air temperature, direct sunshine or heat reflecting off buildings and other surfaces.

Heat is lost mainly through sweating. Usually, this helps the body to cool down and continue to function efficiently. In humid conditions, sweating is ineffective in dissipating heat and if too many clothes (or the wrong sort of clothes) are worn the body may retain more heat than it should.

If more heat is gained than lost, core temperature rises too much, which may lead to heat illness.

Members of the Armed Forces are more at risk from heat illness resulting from:
- High intensity physical training
- Exposure to hot climates
- Having to wear protective clothing (e.g. Body armour, CBRN, fire retardant or impermeable clothing)
- Environmental conditions. This should be measured using the Wet Bulb Globe Temperature (WBGT) Index, which takes into account temperature, humidity and wind speed. See page 8.
- Work intensity. The type, intensity, duration of the task and the inclusion of rest periods should all be considered.
- Water intake. Water intake is to be encouraged throughout any activity. Assuming normal hydration (indicated by a lack of thirst and by pale yellow urine):
  - Minimum of 1/2 litre of water should be drunk 2 hours before a high risk activity
  - A further 1/3 litre 15 mins prior to the task
  - On completion 1 litre should be drunk over then next 1-2 hours.
- Clothing, equipment and additional load.
- Acclimatisation. Continuous exposure to heat and exercise in hot conditions will result in physiological adaptations to improve heat loss, particularly increased sweat rate and earlier onset of sweating.

**Risk Factors**

Key to the prevention of heat illness is an awareness of the risk factors and a thorough risk assessment by commanders. This risk assessment should consider the following:

- **Individual factors.** Personnel are at greater risk of heat illness if they are:
  - Tired
  - Hungry
  - Thirsty (dehydrated)
  - Unfit
  - Overweight
  - A smoker
  - Hung-over

- Environmental conditions.

- **Work intensity.** The type, intensity, duration of the task and the inclusion of rest periods should all be considered.

- **Water intake.** Water intake is to be encouraged throughout any activity. Assuming normal hydration (indicated by a lack of thirst and by pale yellow urine):
  - Minimum of 1/2 litre of water should be drunk 2 hours before a high risk activity
  - A further 1/3 litre 15 mins prior to the task
  - On completion 1 litre should be drunk over then next 1-2 hours.

- **Clothing, equipment and additional load.**

- **Acclimatisation.** Continuous exposure to heat and exercise in hot conditions will result in physiological adaptations to improve heat loss, particularly increased sweat rate and earlier onset of sweating.

**HEAT STORAGE = HEAT GAINED - HEAT LOST**
• Casualty evacuation chain and availability of first aid responders

Commanders at all levels must be familiar with the Armed Forces Policy on Climatic Illness and Injury (JSP 539)

Recognition and response

When in a hot environment; or whilst wearing protective clothing (or any combination of these) an individual should be presumed to have heat illness if they experience or show any of the following:

• Agitation
• Nausea or vomiting
• Staggering or loss of coordination
• Cramps
• Disturbed vision
• Confusion
• Collapse or loss of consciousness
• Dizziness

Particular responsibilities for Commanders are:

• Conduct a risk assessment and continually review this
• Allow for acclimatisation, even in the UK
• Monitor WBGT Index
• Keep individuals in the shade where possible
• Observe work/rest cycles
• Identify high risk groups/individuals
• Monitor, encourage and supervise: food and fluid intake
• Teach early recognition of heat illness symptoms
• Encourage individuals to speak up if feeling unwell
• Recognise the cumulative effect of dehydration and exercising on sequential hot days
• Have a contingency plan for emergencies, including cooling and evacuation
• Consider re-timing or cancelling events if conditions warrant it.

Immediate Treatment Action:

**Symptoms:** agitation, nausea, vomiting, cramps, disturbed vision, dizziness, confusion

Or

**Signs:** staggering, loss of coordination, collapse, loss of consciousness

STOP ACTIVITY

- Lie the casualty down in the shade
- Elevate feet if conscious
- Strip casualty to underwear
- Sponge or spray casualty with cool water and fan the skin

Is the casualty conscious?

**YES**

Give water to drink

**NO**

Evacuate to medical care as quickly as possible

Place the casualty in the recovery (3/4 prone) position
**WBGT index threshold values.**

The threshold values indicate the maximum permitted continuous work intensity for Service personnel at a given environmental temperature (WBGT). They are valid for one hour exposures with a minimum of 30 minutes rest after the activity. They apply to personnel wearing a single layer uniform with sleeves rolled up and without helmets.

For personnel who cannot pass their mandatory fitness tests the WBGT threshold values should be lowered. There is little difference in heat tolerance between men and women of equal physical fitness. Adherence to the guidance will minimise the risk of heat illness to 95% of normal, healthy personnel. Despite preventive measures, heat illness can still occur, and all personnel should remain vigilant to this risk.

**Acclimatisation.**

The table below is divided into un-acclimatised and acclimatised groups. An individual is considered to be partially acclimatised (by approximately 75%) if they have undertaken regular exercise for longer than 8 days in the same environmental conditions as the proposed activity. Full acclimatisation will require 15 days or longer. All UK based activities are classed as unacclimatised.

The time taken to partially and fully acclimatise is extended if arrival in the hot climate has included a substantial period of travel or crossing multiple time-zones. Living or working in air-conditioned accommodation also slows the development of acclimatisation. Individuals returning to a hot climate from cooler environments (other areas of operation within same theatre, courses or leave including R&R) will have lost acclimatisation.

<table>
<thead>
<tr>
<th>WBGT Index Threshold (Max) Values (JSP 539: Table 2A.1)</th>
<th>Maximum Work Rate (not to be exceeded)</th>
<th>WBGT Index Threshold Values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Acclimatised</td>
</tr>
<tr>
<td>1</td>
<td>Low. For example, lying, guard duty.</td>
<td>34</td>
</tr>
<tr>
<td>2</td>
<td>Medium. For example, marching 3.6 kph (2.3 mph) with a 30 kg load.</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>High. For example, marching 5.6 kph (3.5 mph) with a 20 kg load, patrolling, digging, field assaults.</td>
<td>27</td>
</tr>
<tr>
<td>4</td>
<td>Very High. For example, marching 8kph (5 mph) with no load, marching 5.6 kph (3.5 mph) with a 30 kg load. This equates to the Army Basic Combat Fitness Test.</td>
<td>25</td>
</tr>
<tr>
<td>5</td>
<td>Extreme. For example, running in sports kit; speed marching at 9.7 kph (6mph) with a 15kg load.</td>
<td>20</td>
</tr>
</tbody>
</table>
## Commanders Heat Illness Risk Assessment Checklist

**Key Reference:** (JSP 539 - Annex 2A Appx 1)

<table>
<thead>
<tr>
<th>Ser</th>
<th>Risk Factor</th>
<th>Question</th>
<th>Results</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Activity (Work rate)</td>
<td>Ensure all personnel are rested and recovered. see Table page 8,</td>
<td>What is the intensity of activity?</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>High</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Very High</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Extreme</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Duration of activity</td>
<td></td>
<td>What is the planned duration of the activity?</td>
<td>&lt;30 mins</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>&lt;1 hr</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>&lt;2 hrs</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>&gt;4 hrs</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Environmental conditions</td>
<td>Establish WBGT threshold value for the personnel undertaking the task. see Table page 8,</td>
<td>Does the WBGT threshold value exceed the advised value?</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Dress for activity</td>
<td>Is PPE or equipment that may significantly reduce heat loss being worn or used?</td>
<td>Yes</td>
<td>Can the dress state be modified to prevent heat gain and improve heat loss? Where this is not possible then the WBGT threshold value should be reduced by 5ºC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Individual Risk Factors</td>
<td>Are any of the participants in the activity subject to the individual risk factors detailed in JSP 539 Para 209?</td>
<td>Yes</td>
<td>Consider these risk factors on an individual basis and across the group as a whole.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Preparatory education</td>
<td>Are participants sufficiently briefed on heat illness?</td>
<td>Yes</td>
<td>Knowledge of risk factors, signs and symptoms will encourage early identification.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Water intake</td>
<td>Has sufficient drinking water been planned for?</td>
<td>Yes</td>
<td>Dehydration can occur rapidly and will increase the risk of heat illness.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Acclimatisation</td>
<td>Are the participants acclimatised?</td>
<td>Yes</td>
<td>Un-acclimatised participants are at greater risk.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mixed</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Casualty response</td>
<td>Is there adequate medical support and a robust evacuation plan for the activity?</td>
<td>Yes</td>
<td>Time is critical in the response to heat illness.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>
Cold Injuries

Classification.

Cold injuries occur as a result of the exposure of cold/wet and cold/dry conditions on the body and are classified as follows:

Hypothermia occurs due to low core body temperature. This may be mild, moderate or severe and can be due to:

- **Immersion.** Caused by severe cold stress; often rapid. *e.g. a sailor washed overboard.*
- **Exhaustion.** Caused by a combination of wind and wet conditions with moderately low temperature. *e.g. usually found in mountaineers or hill walkers.*
- **Urban.** Where the cold is relatively mild but prolonged. *e.g. most common in the elderly and malnourished.*

Non-Freezing Cold Injury (NFCI) is the most common cold injury in land operations and exercise. It is a serious injury and is neither an illness nor a weakness. It can lead to serious disability for the sufferer and could lead to a medical discharge.

It can also affect the immediate operational effectiveness of your unit and yet it is entirely preventable. The main cause is allowing feet or hands to remain wet and cold for long periods.

NFCI causes numbness which does not go away; persistent numbness on rewarming following exposure to the cold is NOT normal and must be addressed. Other symptoms are pain and pins and needles.

Freezing Cold Injury (FCI) is a significant cause of disability. Parts of the body most prone to freezing are the extremities and exposed areas - face, fingers, toes, heels and soles of the feet.

There are two types of FCI:

- **Frost nip.** Where people recover fully within 30 mins of re-warming of the injured part.
- **Frost bite.** Which goes deeper and causes longer lasting damage.

How does it happen?

Control of human body temperature is dependent on the balance of heat production and the rate of heat loss. The rate of heat loss through convection and conduction depends on the temperature difference between skin and the environment.

Air movement over the body known as ‘wind chill’ increases both types of heat loss.

Risk Factors.

The key to the prevention of cold injuries is the commander’s awareness of the risk that their personnel are being exposed to.

- **Individual factors.** Personnel are at greater risk of cold injury if they are:
  - Of an African-Caribbean ethnicity
  - Unwell or Unfit
  - Inactive or static
  - Dehydrated - cold weather increases respiratory and urine fluid loss
  - Poorly fed - i.e. in a negative energy balance e.g. resting adult male energy requirements increase from 2500 kcal (at room temp) to 5000 kcal at -20°C
  - Have a past history of cold-related problems
  - Current smoker

- **Environmental conditions.** Particular care is needed during outdoor training when the still air temperature (SAT) is less than 5°C. *Great care required below -5°C.*
• **Wind chill index.** Skin temperature can be affected by even moderate wind speeds and the index shown helps calculate the equivalent still air temperature in terms of its effect on the rate of cooling:

<table>
<thead>
<tr>
<th>SAT (ºC)</th>
<th>Equivalent chill temperature (ºC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>-1 -7 -12 -18 -23 -29 -34 -40 -46</td>
</tr>
</tbody>
</table>

---

**Danger - risk of cold injury**
- Increasing danger, flesh may freeze within one minute.
- Greater danger, flesh may freeze within 30 seconds.

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- **Work intensity.** Inactivity in open areas exposed to the wind may make an individual vulnerable. Additionally, the sweating produced after periods of exertion and the diversion of blood to the muscles and skin, away from the body core, may lead to excessive cooling thus predisposing further to cold related problems.

- **Clothing and equipment.** Inappropriate clothing and equipment (or lack of training in their correct use) will increase the risk of cold related injuries. Suitable clothing advice can be found in JSP 768.
  - Prevention of immersion hypothermia depends on wearing adequate waterproof clothing which stops the ingress of water.
  - Prevention of exhaustion hypothermia requires the correct use of clothing and equipment.

- **Footwear.**
  - Boots should not be laced tightly in cold conditions.
  - Socks should be changed when wet.
  - Dirty old or compressed socks don’t work well.
  - Feet should be inspected regularly.

- **Hand protection.** Hand protection should be available when SAT falls below +5ºC, and mandatory below -5ºC. Spare gloves should be carried as wet hand wear may result in injury.

- **Sleeping systems.** Sleeping bags (suitably rated for the temperature range to be encountered) must be kept dry and insulated matting used as insulation.

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**Particular responsibilities for Commanders are:**
- Conduct a risk assessment and continually review this
- Ensure all personnel are adequately briefed and prepared
- Ensure adequate shelter
- Ensure adequate food and water intake, warm where possible
- Ensure standing orders and instructions regarding training restrictions are well understood by all
- Ensure the activity has an appropriate level of medical cover, and that a clear and efficient means of evacuation is agreed in the event of an emergency
- Consider retiming, amending or cancelling if conditions warrant it
Hypothermia.
Hypothermia occurs when the core body temperature drops below 35°C, a fall below 32°C is a life threatening emergency. (Normal core body temperature is 37°C). It is a high risk in cold and wet conditions.

- **Initial signs:**
  - Feeling very cold
  - Stiffness, tiredness
  - Violent shivering
  - Increased heart rate
  - Irrational behaviour

- **Later signs:** (core temp <32°C)
  - Probably not shivering
  - Stiff limbs - rigid joints
  - Confusion or loss of consciousness

Immediate actions.
The most important immediate action is to get the person under cover, stop them getting any colder and replace wet clothing with dry. Once under cover:
- Start to re-warm SLOWLY
- Add layers
- Give warming food and drink (but NOT alcohol)
- Place the casualty in a sleeping bag and treat as a stretcher case
- Urgently evacuate (concurrent discussions with medical staff)

Non-Freezing Cold Injury (NFCI).
If an individual has numbness, pain and or pins and needles in hands or feet, ensure they report it at the earliest opportunity. NFCI can occur in temperatures that are not particularly cold if there are other risk factors such as: damp / wet conditions or immobility are present.

Immediate actions.
If individuals get hands or feet wet. Make sure they:
- Dry them as soon as they can
- Change into any dry socks and / or gloves
- Use foot powder
- Wriggle their toes and fingers to keep them warm

Commanders should conduct foot inspections at regular intervals during exercises.

For FCI and NFCI: DO NOT use any artificial heat, hot water or stoves. This will make the injury worse.

Recognition and response

If they have to stand still for long periods:
- Order 10 mins of step ups or marching on the spot to keep the circulation going

If exercise is not possible (with help if required):
- Remove wet boots and socks and / or gloves
- Gently re-warm their feet/hands
- Try to get their feet into a dry sleeping bag - they should then massage them gently
- Change into dry kit as soon as possible
- Check for symptoms in others
Freezing cold injury (FCI).

- **Early signs (frost nip):**
  - The affected part feels cold and is painful to touch
  - A tingling sensation followed by numbness
  - No feeling when the affected part is moved
  - Skin looks mottled — white and pink

- **Later signs (frost bite):**
  - No feeling in the affected part
  - Skin white and waxy-looking
  - A clear line between white and pink skin
  - After re-warming, skin may appear bruised and blistered

**Immediate actions.**

- Get into shelter
- Remain sheltered until evacuation can be arranged
- Protect the affected part
- Do NOT re-warm if there is any danger of re-freezing
- Do NOT apply direct heat (heater), or rub the frozen part in an attempt to thaw
- Do NOT allow the casualty to smoke or take alcohol
- Do NOT use skin ointments (e.g. Deep Heat)
- Do NOT allow the casualty to use the limb when re-warmed

Once frostbite is suspected /evident, you must treat the casualty as a case for evacuation. If the casualty is going to be re-exposed to the cold, you must not re-warm until they are in the hands of medically trained personnel.
# Commanders’ Cold Injury Risk Assessment Checklist

**Key Reference**: (JSP 539 - Annex 3B)

<table>
<thead>
<tr>
<th>Ser</th>
<th>Risk Factor</th>
<th>Question</th>
<th>Results</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Activity</td>
<td>Is shelter available for static periods?</td>
<td>Yes</td>
<td>Risk of CI is increased when static, particularly if this follows a period of arduous activity.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Can long static periods be avoided?</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Can immersion be avoided?</td>
<td>Yes</td>
<td>Immersion/wet clothing greatly increases risk of CI.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Are there plans to allow changing into dry clothes after immersion?</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Duration of activity</td>
<td>Can rest periods be incorporated (in shelter)?</td>
<td>Yes</td>
<td>Exhaustion increases CI risk.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>曾 is training able to be carried out in warmer / more sheltered conditions?</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Environmental conditions</td>
<td>Has accurate weather forecast been obtained?</td>
<td>Yes</td>
<td>Risk of CI increases when SAT is below minus 5°C. Windy / wet conditions greatly increase risk.</td>
</tr>
<tr>
<td></td>
<td>- see Page 14</td>
<td>Has wind chill factor been taken into account?</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Can training be carried out in warmer / more sheltered conditions?</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Supervision</td>
<td>Are DS and training staff adequately trained and competent?</td>
<td>Yes</td>
<td>Trainers and DS provide a vital means of preventing CI / early detection of CI.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Is the medical support plan adequate?</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Preparation / Education</td>
<td>Have all troops received a presentation on CI or watched the training video?</td>
<td>Yes</td>
<td>Knowledge of risk factors, signs and symptoms should enable avoidance of CI and aid early identification.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Have Commander's and Individual guides been issued?</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Water Intake</td>
<td>Is there adequate safe water available throughout the intended activity?</td>
<td>Yes</td>
<td>Dehydration can occur rapidly in cold conditions.</td>
</tr>
<tr>
<td>7</td>
<td>Food intake</td>
<td>Have increased calorific needs been considered?</td>
<td>Yes</td>
<td>Energy requirements increase in cold conditions.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Has alcohol been avoided for 48 hours prior to activity?</td>
<td>No</td>
<td>Alcohol increases susceptibility to CI.</td>
</tr>
<tr>
<td>8</td>
<td>Dress &amp; Equipment</td>
<td>Is correct clothing/sleeping system issued?</td>
<td>Yes</td>
<td>Correct clothing and equipment will reduce CI risk.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Do all troops have spare dry clothes?</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Predisposing Factors</td>
<td>Can the activity be postponed until personnel have rested?</td>
<td>Yes</td>
<td>Lack of: sleep; food; fluids; poor fitness; and illness all predispose to CI. Those with previous CI are at greater risk.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Have personnel been provided with food and water prior to undertaking the activity?</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Have unfit/ill people been excluded from the activity?</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Have previous Cold Injuries been declared to, and investigated by, medical staff?</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>
Commander’s Notes
Points of Contact:
SO1 Occ Med HQSG
Coltman House
DMS Whittington
WS14 9PY
Tel: 94422 (01543 43) 4673.
Dii: SG ACDS StratPol-OM SO1