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Generally, humans are excellent at maintaining a relatively constant body temperature of approximately 37°C, despite being in an environment where temperature is constantly changing. Occasionally we encounter conditions which challenge our system and push body temperature outside of its normal range. One of these situations occurs during exercise when the air temperature exceeds 30°C and relative humidity surpasses 60%. These conditions limit the body's ability to dissipate heat through evaporation, which is the main method of heat dissipation in hot climates. When more heat is produced by working muscles than can be dissipated to the environment core temperature increases. It is often necessary to decrease exercise intensity or to change the pacing strategy to continue exercising while minimizing the risk of hyperthermia. It is well accepted that exercise performance is impaired in the heat, and that hyperthermia accelerates fatigue. It has been proposed that a critical core temperature of approximately 40°C is associated with this decrease in performance. When core temperature increases, one's ability to recruit muscle is impaired, and the fuel muscles rely on changes to predominantly carbohydrates (increased lactic acid production). Strategies that delay the increase in core temperature are likely to enhance performance by offering an element of thermal protection, allowing a person to do more work before temperature becomes a limiting factor. Other potential benefits of cooling include decreased heart rate and cardiovascular strain and reduced fluid loss and dehydration due to the delayed onset of sweating. Many of these benefits are similar to heat acclimatization but without the 7-14 day adaptation period. There are several methods of cooling available, some more practical than others depending on the sport.

Cooling Method	Advantages	Disadvantages
Ice Baths	<ul style="list-style-type: none">Extremely efficient at removing heat	<ul style="list-style-type: none">Difficult to secure ice sourceNot efficient for large groups
Cold Showers	<ul style="list-style-type: none">Simple, no special equipment requiredCan control water temperature for comfort or intermittent cooling	<ul style="list-style-type: none">Less continuous contact of body surface area with cold waterEffectiveness depends on water temperature
Mist Fan	<ul style="list-style-type: none">Cool multiple athletes at the same timeCan be used during warm up on trainer	<ul style="list-style-type: none">Less efficient at heat removalMay be difficult to co-ordinate
Ice Vests	<ul style="list-style-type: none">ComfortableMobile coolingCan be used during training and warm-up	<ul style="list-style-type: none">Inability to access to freezer space and freezing ice packsCooling limited body surface area = less efficient at removing heat
Hand Cooling	<ul style="list-style-type: none">Efficient Heat ExtractionSimple set up	<ul style="list-style-type: none">Only extracts heat once the body has heatedAthletes generally must be stationaryNot optimal for sports requiring hands

Recommendations

- Pre-cooling has been shown to enhance performance in events lasting from 1 minute up to 1 hour
- Reduce warm-up duration and intensity in hot conditions to minimize heat gain
- Pre-cooling allows for a competition warm-up without a significant rise in temperature
- When selecting location of cooling it is generally recommended to avoid cooling over-active muscles; muscles work optimally when temperature is slightly elevated
- While wearing an ice vest, keep it on during the warm-up to prevent core temperature from rising prior to your event
- Pre-cooling durations of 45-60 minutes are optimal
- If continuous cooling is not tolerable or causes shivering (which increases heat production), intermittent cooling could be used as a second option
- Experiment with pre-cooling well in advance of your event to determine which strategy works best for you

For more information on pre-cooling, consult your Canadian Sport Centre Pacific Physiologist.

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