HOW TO STAY COOL IN THE HEAT OF THE TOKYO PARALYMPIC GAMES?

AN ATHLETE GUIDE

DR MARK HAYES, DR NEIL MAXWELL & PROFESSOR NICK WEBBORN

INTERNATIONAL PARALYMPIC COMMITTEE
WHY SHOULD I CONSIDER COOLING BEFORE (PRE) OR DURING (PER) EXERCISE?

1. Cooling has been shown to improve sports performance in the heat

2. Cooling can improve how comfortable you feel eat for improved decision making

3. Cooling is beneficial to athletes with a disability but different methods may be required

4. Cooling can reduce the risk of heat illness
WHAT ARE THE COOLING ESSENTIALS I NEED TO CONSIDER?

- Decide by trial which cooling method/s work best for you.
- Decide on what sites on the body you can easily target.
- Decide on whether you plan to use internal (fluids/slushies) or external cooling or ideally a combination of both.
- Think practical – what works in your sport environment, and with your equipment.
WHERE CAN I COOL? POSSIBLE TARGET SITES

- Head and neck cooling
- Chest/Trunk - external
- Internal
- Hands and forearms
- Thigh
- Feet
WHAT PRACTICAL METHODS CAN I USE TO COOL?

Considerations

1. Your level of disability/impairment
2. Constraints of your sport – rules, timing, breaks
3. Will it work with my equipment – e.g. push gloves, prosthetic
4. How effective is the cooling method for you
5. What is available at your competition venue e.g. ice, freezer

Lots of methods - what will work for you?
Test and Practice - Test and Practice - Test and Practice
## HOW TO COOL (EXTERNAL): HEAD/NECK
### PRE-COOLING

<table>
<thead>
<tr>
<th>Method</th>
<th>Dose</th>
<th>Duration</th>
<th>Time</th>
<th>Considerations</th>
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<tbody>
<tr>
<td>Ice-Hood</td>
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<tr>
<td>Neck Collar</td>
<td></td>
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<tr>
<td>Cold, Wet Towels</td>
<td>Frozen Ice pack (0°C)</td>
<td>10-20 min</td>
<td>Before, During &amp;/or After Warm up &amp; Event</td>
<td>• Cold-induced Freezing Injury e.g. ice burn&lt;br&gt;• Dry clothes and towel required&lt;br&gt;• Potential to mask heat illness symptoms.</td>
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<td>Water douse</td>
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**Alternate Methods**
- External: Forearm & Hand Cooling, Fan-Mist Spray
- Internal: Ice-Slurry
## HOW TO COOL (EXTERNAL): FACE PRE-COOLING

<table>
<thead>
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<th>Considerations</th>
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</thead>
<tbody>
<tr>
<td>Fan &amp;/or Mist Spray</td>
<td>10-20°C Water</td>
<td>Free-Use</td>
<td>Before, During &amp;/or After Warm up &amp; Event</td>
<td>• Dry clothes and towel required&lt;br&gt;• Clean, drinkable water</td>
</tr>
<tr>
<td></td>
<td>500mL</td>
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<tr>
<td>Alternate Methods</td>
<td>External: Forearm &amp; Hand Cooling, Fan-Mist Spray&lt;br&gt;Internal: Ice-Slurry</td>
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# How To Cool: Whole- & Partial-Body Pre-Cooling

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</table>
| Whole- Body          | 15-25°C       | 10-20 min| Before or After Warm up & Event | • Possibly no visible reduction in T\textsubscript{CORE} until after the cooling has finished (i.e. an ‘afterdrop’).  
• The guide should be the duration of cooling rather than for a specific decline in T\textsubscript{CORE} due to the likelihood of an afterdrop.  
• Watch for ‘overshoot’ in SCI athlete  
• Change of clothes/dry towel required |
| Partial-Body (Lower-Leg) (Whole-Leg) | 15-25°C       | 15-30 min|                           |                                                                                                     |

**Alternate Methods**  
External: Ice-Vest & Cold, Wet Towels  
Internal: Ice-Slurry

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**Caution in SCI Over-cooling**
# HOW TO COOL (EXTERNAL): HEAD/NECK PRE-COOLING

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<tr>
<td>Hand-Cooler</td>
<td>Frozen Ice pack (0°C)</td>
<td>10-20 min</td>
<td>Before, During &amp;/or After Warm up &amp; Event</td>
<td>• No direct skin contact to avoid cold-induced Freezing Injury e.g. ice burn</td>
</tr>
<tr>
<td>Ice-Packs</td>
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<td></td>
<td>• Reduction in manual dexterity</td>
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<tr>
<td>Ice-Pops</td>
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<tr>
<td>RTX Body Cooler</td>
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</tbody>
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**Alternate Methods**
- External: Forearm & Hand Cooling, Fan-Mist Spray
- Internal: Ice-Slurry
## HOW TO COOL (EXTERNAL): TORSO PRE-COOlING

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<tr>
<td>Ice-Vest</td>
<td>Frozen Ice pack (0°C)</td>
<td>10-20 min</td>
<td>Before, During &amp;/or After</td>
<td>• Cold-induced Freezing Injury e.g. ice burn</td>
</tr>
<tr>
<td>Cold, Wet Towels</td>
<td></td>
<td></td>
<td>Warm up &amp; Event</td>
<td>• Vests need to be tight fitting so that they maximise surface contact area and cooling impulse</td>
</tr>
<tr>
<td>Ice packs</td>
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</tbody>
</table>

**Alternate Methods**

- External: Forearm & Hand Cooling, Fan-Mist Spray
- Internal: Ice-Slurry
# HOW TO COOL (EXTERNAL): FOREARM/FEET PRE-COOLING

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<tr>
<td>Forearm-Cooler</td>
<td>Frozen pack (0°C)</td>
<td>10-20 min</td>
<td>Before, During &amp;/or After Warm up &amp; Event</td>
<td>• Cold-induced Freezing Injury e.g. ice burn</td>
</tr>
<tr>
<td>Forearm/ Foot Immersion</td>
<td>15-25°C</td>
<td></td>
<td></td>
<td>• Dry clothes and towel required</td>
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<tr>
<td>Liquid-gel insoles</td>
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**Alternate Methods**

External: Forearm & Hand Cooling, Fan-Mist Spray

Internal: Ice-Slurry
## HOW TO COOL (EXTERNAL): FOREARM/FEET

### PRE-COOLING

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<tr>
<td>Ice-slurry</td>
<td>~7g/kg of body mass 0°C</td>
<td>10-20 min</td>
<td>Before, During &amp;/or After Warm up &amp; Event</td>
<td>• $T_{\text{CORE}}$ reduced by 0.2-0.6°C</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Individual responses</td>
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<td></td>
<td>• Mild Gastrointestinal issues</td>
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<td></td>
<td>• Elevated urination issues</td>
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<td></td>
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<td></td>
<td></td>
<td>• Ice ingestion alone increases likelihood of sphenopalatine ganglioneuralgia ('brain freeze') &amp; choking risk</td>
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<td></td>
<td>• Mixing liquid and crushed ice (i.e. slurry/slushy) is more suitable.</td>
</tr>
<tr>
<td>Cold Drinks</td>
<td>500mL 5-15°C</td>
<td>(ad libitum)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alternate Methods</td>
<td>External: Ice-Vest &amp; Cold, Wet Towels</td>
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<tr>
<td></td>
<td>Internal: Ice-Pop</td>
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**Images:**
- [Ice slurry](image1)
- [Cold drinks](image2)
- [Water bottle](image3)
WHICH COOLING METHODS ARE BEST?

The most feasible may not be the most effective and vice versa, so plan your cooling strategy ahead of your competition.

(Bongers et al., 2013; 2017)
POTENCY OF PRE-COOLING

Mixture of methods appear to be the most effective strategy to enhance performance

(Bongers et al., 2013; 2017)
DOES PRE & PER-COOLING HELP PARALYMPIC ATHLETES?

8 males with SCI
28 min intermittent sprint arm cranking protocol
Three heat stress trials in 32°C 50% RH
(a) No cooling control
(b) 20 min precooling with ice vest
(c) Cooling during exercise (ice vest worn in exercise)

Pre & per-cooling can:
- reduce core body temperature
- reduce heart rate
- reduce how hard exercise feels
- reduce how hot athletes feel
- improve exercise performance

Effects of two cooling strategies on thermoregulatory responses of tetraplegic athletes during repeated intermittent exercise in the heat

N. Webborn,1,2 M. J. Price,3 P. C. Castle,1 and V. L. Goosey-Tolfrey2,4
WHEN TO COOL

**Before**
- Internal
- External
- 20 min
- Until end of w/up

**During (if possible)**
- Internal
- External
- Maximum duration possible

**During breaks (sport specific)**
- Internal
- External
- Maximum duration possible

Internal – Ice Slurry / Cold Drinks
External – Chosen method - tested and available

Don’t forget recovery afterwards!
AN EXAMPLE STRATEGY FOR A TEAM-BASED SPORT

**PRE game**
- 20 min with cooling / ice vest
- 500 ml ice slurry consumed at 10, 20 and 30 min (160 ml x 3)

**During**
- Immediate Cooling:
  - ice towel / ice vest / hand cooling

**During breaks**
- 250 ml ice slurry consumed at 0 and 5 min (2 x 125 ml)
AN APPLIED EXAMPLE OF HOW TO COOL

**7:20 PM – Warm-Up**
- Physical warm-up (~15 min)
- Technical warm-up (~15 min)
- Players drink ~100 mL ice-slurry ad libitum every 5 min
- Handheld mist spray
- Cold, wet towels

**8:00 PM – Game Starts**
- Break between quarters (2 min)
  - Drink ice-slurry / cold fluids
  - High powered fans with misting spray
  - Handheld mist spray available
  - Half time break (10 min)
    - Wear ice vests
    - Use cold towels
    - Drink ice-slurry / cold fluids
    - High powered fans with misting spray
    - Handheld mist spray available
  - Substitutes (throughout game):
    - Wear ice vests
    - Use cold towels
    - Drink ice-slurry / cold fluids
    - High powered fans with misting spray on bench

**9:15 PM – Game Ends**
- Drink ice-slurry / cold fluids
- Handheld mist spray
- Cold, wet towels
- Ice-bath available
- Implement recovery protocols

**6:30 PM – Arrive**
- Team-Talk
- Players change and wear ice vests
- Drink ~350 mL ice-slurry
- Taping and strapping, usual pre-match routines
- Possible mist spray in order to wet skin*

*Determined by humidity

Gibson et al (2020)
SPECIFIC COOLING CONSIDERATIONS FOR PARALYMPIC ATHLETES

1. **External cooling methods** (e.g. ice vests) - rely on direct contact with a large skin surface area – might be difficult with equipment or use in a sports wheelchair. Consider different options e.g. misting and fanning, ice towels etc.

2. **Ice slurries** can reduce sweat rate and slow heat loss but can be effective in humid conditions like Tokyo.

3. **Too much fluid too quickly** can cause gut discomfort or a need for frequent visits to the toilet. Keep a steady pace of drinking that you have practiced.

4. **Hand Cooling**, while effective at reducing heat, can reduce function and grip, or be difficult for glove wearers. Focus on cooling non-active body parts.

RESOURCES THAT SUPPORTED THIS PRESENTATION


Acknowledgements:

We would like to acknowledge the following students for their contribution to the material in this PowerPoint Presentation:

• Abigail McConnell
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• Luke Row
• Evie Winterton

IT SHOULD NOT BE A MATTER OF IF I WILL USE COOLING, BUT MORE WHAT COOLING WILL I USE IN TOKYO!
THANK YOU