**Supplementary table 1. Overview of study characteristics**

| Study | Exercise protocol | Type of Cooling | Method of Cooling | Change in exercise performance | Change in temperature | Ambient conditions | Conclusion |
|---|---|---|---|---|---|---|---|
| Arngrimsson et al. 2004(11) | 5-km running time trial | Precooling | Cooling vest during warm-up | 1.3% improvement in time trial performance | Trec 0.2°C↓<br>Tskin 1.8°C↓ | 32°C<br>50% rh | Cooling vest improved 5-km run performance |
| Burdon et al. 2013(43) | 90 minute steady state exercise (60% of $VO_2$ max), 4 kJ/kg self-paced time trial | Precooling | Ice slurry ingestion (-1°C), 25 gr every 5 minutes during steady state exercise | 10.5% improvement in time trial performance | No differences in Tc or Tskin | 32°C<br>40% rh | Ice slurry ingestion improved exercise performance |
| Byrne et al. 2011(37) | Self-paced 30 min cycling time trial | Precooling | Cold water ingestion (2°C) 3x300 ml | 2.8% improvement in covered distance | Reduced Trec until 25 minutes of exercise | 32°C<br>60% rh | Precooling enhances exercise performance |
| Castle et al. 2006(18) | Intermittent cycling sprints: Twenty 2-min periods | Precooling | 20 min of cooling with:<br>(a) Ice vest (10.7°C)<br>(b) Cold water immersion (17.8°C)<br>(c) Ice packs covering upper legs (-16°C) | Increased peak power output for last sprint over penultimate<br>No differences in peak power output or work done<br>4% increase in peak power output and an improved work done during each sprint | Reduced Tskin until sprint 4<br>Reduced Tskin during whole protocol<br>Reduced Tskin until sprint 4 | 34°C<br>52% rh<br>34°C<br>52% rh<br>34°C<br>52% rh | Leg cooling offering a more ergogenic effect on the peak power output than upper body or whole body cooling |
| Cotter et al. 2000(19) | 20 min cycling (65% of $VO_2$ max), 15 min self-paced time trial | Precooling | Ice vest and cold air exposure (3°C) | 16% improvement in mean power output | Trec 0.5°C↓ | 35°C<br>60% rh | Precooling improved endurance exercise performance |
| Duffield et al 2003(20) | 80 minute intermittent, repeat sprint cycling exercise | Precooling | Ice cooling jacket (5 min before exercise) and during recovery periods | No improvement of performance | No differences in Tc and Tskin | 30°C<br>60% rh | Ice vest cooling did not improve performance |

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|---|---|---|---|---|---|---|---|
| Siegel et al. 2012(31) | Running until exhaustion at first ventilator threshold | Precooling | 30 min of cooling with:<br>(a) 7.5 g/kg of ice slurry ingestion (-1°C)<br>(b) Cold water immersion (24°C) | 12.8% improvement in time to exhaustion<br>21.6% improvement in time to exhaustion | Trec 0.43°C ↓ prior to exercise<br>Trec 0.25°C↓ prior to exercise | 34°C<br>55% rh<br>34°C<br>55% rh | Ice ingestion and cold water immersion increased total time to exhaustion |
| Skein et al. 2012 (41) | 50 min intermittent sprint exercise | Precooling | Cold water immersion (10°C) | No difference in total distance covered | Mean Tc 0.57°C↓ during exercise | 31°C<br>33% rh | Precooling did not improve performance |
| Stanley et al. 2010(32) | 75 min cycling at 60% of peak power output + 0.75x30 min performance trial | Precooling | 1 liter in 50 min of -0.8°C ice or 18.4°C fluid | No changes in performance time trial | Tc 0.4°C↓ prior to exercise | 34°C<br>60% rh | No effects of precooling on exercise performance |
| Stevens et al. 2013(42) | Simulated Olympic distance triathlon (self-paced 10 km running time trial) | Precooling | Ice slurry ingestion (< 1°C) | 2.5% improvement in 10 km time trial finishing time | Lower intragastric temperature till 1.5 km | 34°C<br>25% rh | Ice slurry ingestion improved 10 km running performance |
| Tyler et al. 2010(35) | **Study A:** 75 min running 60% of $VO_2$ max and a 15 min self-paced time trial<br>**Study B:** 15 min running time trial | Cooling during exercise | Neck collar (-80°C, left in ambient conditions for 5 min before use) | **Study A:** 5.9% improvement of covered distance during time trial<br>**Study B:** no difference in distance covered between trials | **Study A:** no difference in neck Tskin<br>**Study B:** Neck Tskin is lower in cooling condition | 30°C<br>50% rh<br>30°C<br>50% rh | Cooling the neck can improve exercise performance in a hot environment. |
| Tyler et al. 2011a(33) | 90 min preloaded running trial (75 min 60% of $VO_2$ max and 15 min self-paced | Cooling during exercise | Neck collar (-80°C, left in ambient conditions for 10 min before use) | 7.0% improvement in time trial performance | Neck temperature is reduced by wearing a neck collar | 30°C<br>53% rh | Neck cooling improved time trial performance |
| Tyler et al. 2011b(34) | Running at 70% of $VO_2$ until exhaustion | Cooling during exercise | Neck collar (-80°C, left in ambient conditions for 5 min before use) | 13.5% improvement of exercise time until exhaustion | Neck Tskin is reduced<br>Trec= 0.43↑ | 32°C<br>53% rh | Cooling the neck increased the time until exhaustion |

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|---|---|---|---|---|---|---|---|
| Ückert et al. 2007(36) | Incremental running test | Precooling | Cooling vest (0-5°C) for 20 min | 7.3% improvement in running time | Tc and Tskin 0.2°C and 0.8°C↓ at start exercise | 30-32°C 50% rh | Precooling improved running performance |

**Tc** = core body temperature; **Tskin** = skin temperature; **Trec** = rectal temperature; **Ttymp** = tympanic temperature; **Teso** = esophageal temperature; **$VO_2$ max** = maximal oxygen consumption; **rh** = relative humidity