Effects of Forearm Cooling on Thermal Responses During Intermittent Exercise in the Heat

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Intermittent forearm cooling has been examined in the warfighter and firefighter populations, suggesting improvements in thermoregulation and performance. However, there is a lack of data demonstrating the effects of intermittent forearm cooling in the athletic population. **PURPOSE:** To determine the effects of intermittent forearm cooling during exercise in the heat on rectal temperature, esophageal temperature, heart rate, sweat rate, perceptual measures, and post-exercise perceptual variables. **METHODS:** Twelve college-aged males (mean ± SD; age, 25 ± 4 y; VO_2 max, 57 ± 6 mL/kg/min; body mass, 74 ± 13 kg; height, 178 ± 9 cm) performed intermittent running on a treadmill in the heat (35°C, 50% RH). Exercise included six, 20-minute bouts, with 3-minute rest periods in between each bout. Subjects completed two trials, one with forearm immersion (FAI) in ice water (15°C) and one with seated rest (CON) during the break periods. Following the last bout of exercise, subjects completed a performance battery designed which included a reaction test, broad jump, grip strength, sprint test, and 1.61 km time trial. Dependent t-tests were utilized to assess differences in rectal temperature (T_{rec}), esophageal temperature (T_{esop}) heart rate (HR), sweat rate (SWR), perceptual measures, and performance variables between FAI and CON trials. **RESULTS:** No differences in end T_{rec} or HR were observed between trials or performance battery. During the exercise bouts, cooling trials resulted in significantly lower SWR (n = 12, FAI: 0.98 ± 0.3 L/hr, CON: 1.13 ± 0.4 L/hr, p = 0.023) and lower thirst sensation (n = 12, FAI: 3 ± 1, CON: 3 ± 2, p = 0.002). During the performance battery, differences were observed in grip strength (n = 12, FAI: 43 ± 5 kg/m^2, CON: 38 ± 6 kg/m^2, p = 0.000) and the 1.61 km time trial (n = 11, FAI: 9:29 ± 3:38 mins CON: 10:18 ± 4:06 mins p = 0.047). Prior to the 1.61 km time trial, thermal sensation (n = 11, FAI: 4 ± 1, CON 6 ± 1, p = 0.005) and fatigue (n = 11, FAI: 4 ± 2, CON: 5 ± 2, p = 0.045) were lower in FAI when compared to CON. **CONCLUSION:** Forearm cooling during exercise in the heat showed lower sweat rate and esophageal temperature. This study suggests that forearm cooling may delay end-exercise fatigue and perceived thermal strain in those that participate in long-duration activities.