The FASEB Journal / Volume 34, Issue S1

Physiology

Skin Temperature Response to a 1 km Swim Performed in Normal and Cold-Water

Mason Lentz, Megan Fell, Kristina Ahlers, Samantha Clementson, Kathryn Frie, Bruce D. Johnson, Michael F. Harrison, Ted Wilson

First published:18 April 2020
https://doi.org/10.1096/fasebj.2020.34.s1.06475

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Abstract

Cold-water swimming is a recreational activity that may become a future Winter Olympic event. However, unintentional cold-water exposure can lead to hypothermia or death. Changes in body temperature are known to diminish swimming performance in persons experiencing hypothermia, although thermal changes during recreational exposure are not well characterized. This study examined skin temperature responses to a one-kilometer swim in normal and cold-water. Competitive swimmers (2 male and 2 female; age 44±17 years; BMI 24±2) completed a one-kilometer swim (22 laps × 75 foot lengths) under free-living indoor (25.5°C water and 25.0°C air) and cold outdoor (10.9°C water and 6.5°C) conditions. Skin temperature was determined with a digital infrared camera on the center of right palm, cubital fossa of arm, lateral aspect of pectoral muscle, cheek, and average of the four locations at 8.7±1.7 minutes before the swim (pre), then 0.6±0.2 and 6.4±2.1 minutes after the swim. Data (mean±SD) was analyzed with repeated measures ANOVA with significance if $P<0.05$. Swimmers completed the indoor and outdoor swim events in 20.7±1.7 and 21.8±1.1 minutes respectively. Average indoor skin temperature at −8.7, +0.6 and +6.4 minutes was 94.0±1.7, 85.3±1.9, and 88.1±2.2°C. Average outdoor skin temperature at −8.7, +0.6 and +6.4 minutes was 83.0±3.6, 53.5±2.3, and 67.7±2.0°C. At all times average outdoor skin temperature was lower than indoor, with the lowest temperature 0.6 minutes post-swim. Palm indoor temperature at −8.7, +0.6 and +6.4 minutes was 91.6±3.9, 83.1±0.5, and 87.3±5.0°C. Palm outdoor temperature at −8.7, +0.6 and +6.4 minutes was 75.1±7.9, 47.4±2.7, and 58.1±2.7°C. At all times outdoor palm temperature was lower than indoor, with the lowest temperature 0.6 minutes post-swim. Similar thermal responses were observed in the cheek, cubital fossa and pectoral locations. While time to complete the indoor and outdoor one km swims were similar, swimming in cold water was associated with delayed rewarming in the palm and cheek relative to cubital fossa and pectoral muscle.