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The effects of pre-cooling on core temperatures and physiological indicators in blind marathon runners using ice slurry ingestion - A case study of Japanese elite athletes

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INTRODUCTION:
The Tokyo 2020 Games were held in a hot environment, and blind marathon runners, such as athletes in other events, needed to prepare for the heat during the event. Although body cooling strategies to control excessive increases in core body temperature are extremely important to ensure safety and high exercise performance in hot environments, the thermoregulatory responses and effects of body cooling in visually impaired marathoners in hot environments remain unclear. The purpose of this study was to investigate the effects of pre-cooling with ice slurry ingestion on the core temperatures and physiological and subjective indicators in blind marathon runners during outdoor distance running in hot environments.
METHODS:
Four elite blind marathon runners (2 males and 2 females; age, 41 ± 17 years; height, 158.2 ± 9.0 cm; weight, 49.4 ± 7.8 kg; T11–T12 classes), aiming to compete in the Tokyo 2020 Games, participated in this study before the Games. During the training camp in early September 2019 (Wet Bulb Globe Temperature (WBGT), 29.9 ± 1.4), two 15–30 km running sessions were performed. All runners ingested 7.5 g kg −1 of ice slurry (ICE), or an ambient temperature sports drink (CON) during the 30-minute warm-up before running. The two conditions, ICE and CON, were performed in a crossover fashion, with the two runs spaced three days apart. Core body temperature (gastrointestinal temperature, Tgi), skin temperature (Tsk), and heart rate (HR) were measured before warm-up (Pre), after pre-cooling (Post Pre-cooling), at the start, and at the 5, 10, 15, 20, 25, and 30 km distance points. Body weight (used to calculate sweat loss and dehydration rate) was measured before and after running. An effect size (Cohens d) was calculated to indicate the degree of difference in each physiological index between the two groups. The standard effect size was set as small (0.20), medium (0.50), and large (0.80).
RESULTS:
The average time per kilometer was similar in both conditions (ICE, 0:04:30 ± 0:00:42; CON, 0:04:33 ± 0:00:39; d = 0.07). The decrease in Tgi from Pre to Post Pre-cooling was greater for the ICE group than that for the CON group (ICE, Δ-0.86 ± 0.2 ; CON, Δ0.05 ± 0.4 ; d = 2.88). However, the difference in Tgi between the two groups disappeared at the 5-km mark from the start of the race. The other physiological parameters, such as Tsk, HR, total water intake volume, total sweat loss, and dehydration rate, were similar in both conditions.
CONCLUSION:
The results of this study showed that pre-cooling by ice slurry ingestion decreased core temperature, but had little effect on the skin temperature, HR, or dehydration rate of blind marathon runners. The difference in the core temperatures between the CON and ICE groups observed during precooling disappeared at the 5-km mark of the run. Therefore, in addition to pre-cooling, it would be necessary to consider the introduction of cooling during marathon races.

Topic: Physiology

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