

Assessing the Most Effective Heat Adaptation Method for Endurance Performance in the Heat: A Systematic Review and Meta-Analysis

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ABSTRACT

The consequences of increasing global warming and the globalization of elite sport have produced increased exposure to episodes of extreme heat for athletes at major sporting events. Heat acclimatization and acclimation (HA) are widely used heat mitigation strategies that aim to help athletes combat the effects of heat-stress on athletic performance and susceptibility to exertional-heat illness. **PURPOSE:** To assess and quantify the effect of different HA methods on the magnitude of performance and physiological adaptations in endurance trained athletes **METHODS:** A literature search was conducted in PubMed, SPORTDiscus, Scopus, and Cochrane-Library, with data from 23 studies gathered for analysis. Subgroup analysis determined differences in adaptations between controlled intensity, controlled hyperthermia, passive heating, self-paced (acclimatization), and self-regulated (acclimation). **RESULTS:** Collectively, HA had a significant, *moderately* beneficial effect on improving time-trial performance in the heat (Hedges' $g = 0.72$ [0.42-1.03], $p < 0.05$). Self-paced (acclimatization) elicited greatest improvement in time-trial performance (Hedges' $g = 1.40$ [0.82-1.97], $p < 0.05$) Furthermore, heat acclimatization generated the greatest reductions in mean heart rate during endurance exercise in the heat (Hedges' $g = 0.71$ [0.22-1.19], $p < 0.05$). **CONCLUSION:** Heat acclimatization appears to be favorable for decreasing mean heart rate and improving time-trial performance in the heat. These findings are relevant for athletes and their supports teams when implanting HA protocol proximal to competition to reduce the magnitude of heat-mediated performance decrements.