

28th ECSS Anniversary Congress, Paris/France, 4-7 July 2023

Effect of heat acclimation when existing training load remains constant – a pilot study within international triathletes

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INTRODUCTION:

The acute nature of the induction and decay of heat acclimation (HA) adaptations often necessitates that HA is conducted in the weeks immediately preceding a competition, potentially interfering with a planned training taper. Therefore, we investigated the effect of a mixed active and passive heat acclimation protocol, during the 3 weeks prior to the 2022 U23 Triathlon World Championships, when the planned external training load was maintained.

METHODS:

Six international triathletes (3 male, 3 female) completed eight heat acclimation sessions (5 active: running/cycling, 3 passive: hot water immersion [HWI]), across two weeks. To maintain the external training load, outdoor high-intensity training sessions were supplemented by 30-50 min HWI, whilst low-intensity cycling/running sessions were relocated to be completed in a hot environment (thermostatically controlled chamber). HWI sessions were designed to achieve and subsequently maintain, a core temperature of 38.5°C. A standardized 30-min run was completed in the hot environment (35°C, 60%) on days 1, 5, and 8, whilst hematological monitoring was conducted on 6 out of 13 days. Body temperature was monitored throughout all sessions using gastrointestinal pills (BodyCap, France) and sweat concentration was measured in duplicate at the sites of the upper arm and upper back on days 1, 5, and 8.

RESULTS:

Compared with Day 1, there were changes in exercising core temperature (Day 8: $-0.27 \pm 0.45^\circ\text{C}$, $p < 0.05$), finishing heart rate (Day 8: $-26 \pm 21 \text{ b} \cdot \text{min}^{-1}$, $p < 0.03$), and sweat sodium concentration (upper arm Day 5: -33% , $p < 0.02$; upper back Day 5: -33% , $p < 0.01$; Day 8: -27% , $p = 0.04$). There was no statistical difference in plasma volume (Day 5: $+2.6 \pm 10\%$; Day 8: $+2.4 \pm 7.8\%$; both $p > 0.05$) whilst sweat potassium concentration increased (upper arm Day 8: $+39\%$, $p = 0.01$; upper back Day 8: $+61\%$, $p < 0.01$). Throughout the training period, no trends were evident for increases in cortisol (C), testosterone (T), C:T ratio, urea, platelets (all $\Delta < 20\%$), or white blood cell count ($\Delta < 28\%$). Similarly, there were no changes in athlete perceptions of training demands, muscle soreness, sleep quality, or appetite (all $p > 0.05$).

CONCLUSION:

A mixed active and passive heat acclimation protocol, implemented without altering the existing training programme volume, reveals various markers of heat adaptation, with no apparent detrimental effects on athlete health or training stress markers.

Topic: Coaching

Presentation Oral

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