

Study: The effect of a CoreControl RTX on recovery and performance in hot and humid conditions.

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Introduction

In situations where physical performance is limited by elevations in core temperature, extraction of excess heat from the body core should enhance performance capacity [1]. The rapid thermal exchange device (CoreControl RTX, AVAcore Technologies, Ann Arbor, MI) aims to achieve this via the combined application of sub-atmospheric pressure and a heat sink to the palm of the hand [1,2]. However, the optimal operation and scope of RTX implementation during exercise and recovery are yet to be determined. Therefore, this study aims to further investigate the effect of the RTX on physiological parameters and performance in hot and humid conditions. It is hypothesised that use of the RTX during two separate passive recovery periods will reduce physiological strain facilitating improved performance in subsequent cycling bouts in hot and humid conditions.

Methods

Using a random, crossover design, nine moderately trained male team sport athletes (24.8 ± 4.4 yrs, 78.4 ± 9.3 kg, $\dot{V}O_{2\max} = 43.2 \pm 6.8$ mL.kg⁻¹.min⁻¹) participated in two separate experimental trials on a cycle ergometer in a hot and humid environment chamber (33°C, 62% RH). Each trial consisted of a brief warm-up followed by 15 minutes cycling at 70% work max (W_{\max}) (Preload) before five minutes of recovery (Recovery 1). Subjects then completed a second 15 minute cycling bout at 70% W_{\max} (Steady State) followed by ten minutes of recovery (Recovery 2) and finally a ten minute time-trial. During both Recovery 1 and Recovery 2 subjects used either the CoreControl RTX device (15°C) or no intervention (CON). Tympanic temperature (T_{TY}), mean skin temperature (\bar{T}_{sk}), heart rate (HR), sweat rate, blood lactate ([BLa⁻]), rating of perceived exertion (RPE), thermal sensation (ThS), thermal comfort (ThC), work and power output were measured throughout both trials. Bonferroni adjusted paired t-tests were used to evaluate the effect of the RTX. Significance was set at $p < 0.05$. Effect sizes were calculated using Cohen's d.

Results

In the RTX trial there was a significant reduction in T_{TY} following Recovery 2 compared to the CON trial ($37.5 \pm 0.3^{\circ}\text{C}$ vs $37.7 \pm 0.4^{\circ}\text{C}$, $d = 0.54$). Additionally, HR was lower during both Recovery 1 (107 ± 5 bpm vs 114 ± 13 bpm, $d = 0.74$) and Recovery 2 (115 ± 9 bpm vs 123 ± 13 bpm, $d = 0.68$) and \bar{T}_{sk} was lower following the Steady State ($36.06 \pm 0.51^{\circ}\text{C}$ vs $36.26 \pm 0.47^{\circ}\text{C}$, $d = 0.43$) and Recovery 2 ($36.07 \pm 0.42^{\circ}\text{C}$ vs $36.29 \pm 0.42^{\circ}\text{C}$, $d = 0.53$) in the RTX trial. There were no differences in sweat rate, [BLa⁻], RPE, ThS or ThC between trials. In the Time-trial, subjects performed significantly more work (134.0 ± 9.6 kJ vs 126.8 ± 18.6 kJ, $d = 0.48$) and had a greater mean power output (223.3 ± 16.0 W vs 211.3 ± 31.0 W, $d = 0.49$) in the RTX trial compared to the CON trial.

Discussion/Conclusion

These results suggest that a heat sink temperature of 15°C in a vacuum facilitates a significant thermal gradient whilst simultaneously limiting reflex vasoconstriction in the palm. This enables sufficient palmar blood flow for effective heat transfer, minimising thermal strain during recovery. Potentially the RTX is an effective ergogenic aid for exercise performance in hot and humid conditions when used during recovery periods.

References

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2. Hsu, A.R., Hagobian, T.A. et al. (2005) *Canadian Journal of Applied Physiology*. 30(1): 87-104