

Effects of warm up on thermoregulation and repeated-sprint performance in hot conditions

Bishop, David ¹ and Maxwell, Neil ²

¹ The School of Human Movement and Exercise Science, The University of Western Australia

² The University of Brighton, Chelsea School, UK.

Introduction

Warm up is a widely accepted practice preceding nearly every athletic event. However, while active warm up has been reported to improve long-term (> 5 min) performance, active warm up may have a detrimental effect if it causes a significant decrease in heat-storage capacity and the earlier attainment of a high rectal temperature (T_r). The purpose of the present study was to determine the effects of an active warm up on thermoregulatory responses and repeated-sprint performance in hot, ambient conditions.

Methods

Eight male, team-sport athletes (mean \pm SD: age: 23.4 ± 6.2 y, mass: 76.8 ± 7.7 kg, VO_{2max} : 59.9 ± 8.0 mL \cdot kg⁻¹ \cdot min⁻¹) performed a repeated sprint test (RST) for 36 min in hot ambient conditions (35.5 ± 0.6 °C, RH $48.7 \pm 3.4\%$) after no warm up (WUP 0), 10-min warm up (WUP 10) or 20-min warm up (WUP 20). Based on a motion analysis of international men's field hockey (2), the RST was designed to mimic one half of a typical team-sport game. The protocol was divided into \sim 2-min blocks consisting of a 4-s sprint, 100 s active recovery (35% VO_{2max}) and 20 s passive rest. On two occasions during the 36-min protocol, there was a repeated-sprint bout (RSB) comprising five, 2-s sprints, where the active recovery between successive sprints was \sim 20 s.

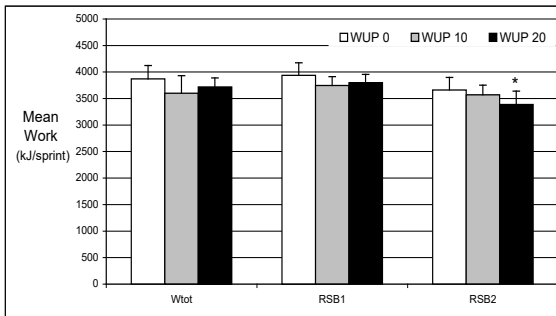


Fig 1. Mean work (kJ \cdot sprint⁻¹) during the RST.
* significantly different from RSB1 ($P < 0.05$)

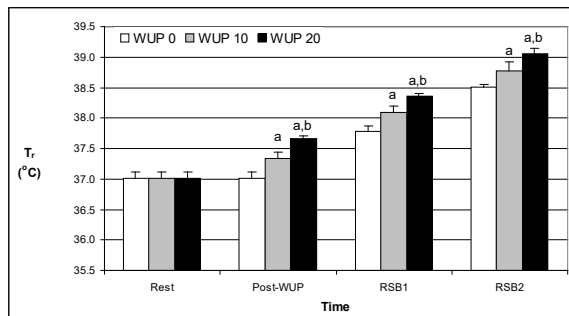


Fig 2. T_r (°C) during the RST.
a: > WUP 0; b: > WUP 10; ($P < 0.05$)

Results

There were no significant differences between conditions for mean work (kJ \cdot sprint⁻¹; Fig 1.), peak power (W) or work decrement (%) during the RST. However, the mean work performed was significantly less in RSB2 than RSB1 for WUP 20 only ($P < 0.05$). While blood lactate concentration was significantly higher after active warm up (WUP 20 = WUP 10 > WUP 0; $P < 0.05$), there were no significant differences between conditions following either RSB. T_r was also significantly higher after active warm up (WUP 20 > WUP 10 > WUP 0; $P < 0.05$) and these differences were maintained throughout the RST (Fig 2).

Discussion

Although active warm up resulted in a greater increase in T_r , it did not affect repeated-sprint performance in the heat in trained team-sport athletes. Despite similar changes in T_r , it has previously been reported that active warm up decreases intermittent exercise time to exhaustion in healthy males (1). However, the test used did not simulate team-sport performance and nor were the subjects team-sport athletes. It therefore appears that small increases in T_r do not affect repeated-sprint performance in trained team-sport athletes. However, as active warm up did not improve repeated-sprint performance (< 40 min), team sport athletes may be able to minimise changes in T_r (and the likelihood of heat illness) by avoiding excessive warm up when exercising in the heat.

References

1. Gregson, W., et al. (2002). *J. Sp. Sci.*, 20(1): 49-50.
2. Spencer, et al. (2002). *J. Sci. Med. Sport.* 5(4; Suppl): 102.