

HYPERTHERMIA INDUCED FATIGUE DURING A SOCCER GAME

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Keywords: match analysis, hyperthermia, central fatigue.

Introduction

Environmental heat stress has an impact on performance during prolonged exercise. However, is it unknown to what degree high intensity exercise parameters, muscle and core temperatures during a soccer game are affected by heat compared to normal environmental temperature. Thus, the purpose of the study was to examine the effect of extreme heat stress on high intense exercise performance and body temperatures during a soccer game.

Method

17 elite male soccer players (age: 26.6±1.2 yrs., height: 1.84±0.01 cm; body mass: 80.1±1.6 kg) from Scandinavia took part in the study. Two experimental games were played separated by six days at normal environmental temperatures (~22°C; control game; CON) and in hyperthermic conditions (~42°C, environmental heat stress game; EHS). The activity pattern was assessed during the games by the multiple-camera approach (Randers et al., 2010). Core and muscle temperature was measured and venous blood samples were drawn before and after the games.

Results & Discussion

Total distance covered was 10.3±0.2 km in CON, which was further ($P<0.05$) than in EHS (9.6±0.2 km). High intensity running and sprinting was also higher ($P<0.05$) in CON (2.2±0.2 and 0.24±0.03 km, respectively) compared to EHS (1.7±0.1 and 0.20±0.02 km, respectively). No statistical difference was between peak speed, number or length of sprints between the CON and EHS games (32.1±0.4 vs. 33.2±0.4 km/h, 12.3±1.2 vs. 10.7±0.8, 19.9±0.8 vs. 19.6±0.7 m, respectively). Muscle and core temperatures were higher after EHS (40.3±0.1 and 39.5±0.1 °C, respectively) than after CON (39.2±0.1 and 38.3±0.1 °C, respectively). Blood lactate concentrations were higher ($P<0.05$) after EHS than CON (4.9±0.5 vs. 3.3±0.4 mmol·L⁻¹, respectively), despite less amount of intense running. Total distance covered was correlated ($r=0.85$; $P<0.05$) to the increase in core temperature in the EHS game providing a relationship between work rate and elevated core temperature. Absolute core temperature was additionally correlated ($r=0.53$; $P<0.05$) to total distance covered. However, the decline in work rate from CON to EHS was not related to absolute core temperature level, indicating an individual heat tolerance threshold.

Conclusion

Environmental heat stress reduces the work rate markedly during a soccer game in comparison to normal conditions, with concomitant elevation in body temperatures and altered metabolic response. Fatigue during a soccer game in the heat may be caused by hyperthermia, but players appear to have individual heat tolerance thresholds.

References

1. Randers, M.B. et al. (2010). *J Sport Sci*, 28(2): 171-182.