**Heat Acclimation attenuates physiological strain in acute normobaric hypoxia**

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**Introduction**

Heat acclimation (HA) attenuates physiological strain in hot, humid conditions with evidence supporting HA as an intervention to improve exercise capacity in both temperate and hot conditions. Emerging hypotheses also support reductions in physiological strain and exercise capacity at altitude following thermal interventions. The aim of this study was to determine whether HA reduced the physiological strain in acute normobaric hypoxia.

**Methods**

Sixteen males (age 24 ± 5 yr, mass 74.6 ± 6.3 kg, V̇O2peak 4.27 ± 0.63 L.min-1) completed ten, 90 min sessions of HA (40°C/40% relative humidity (RH)) or exercise training (EX; 20°C/40% RH) on cycle ergometers. HA or EX were preceded (HYP1) and proceeded (HYP2) by a normobaric hypoxic exposure (FiO2 = 0.12; 10 min of rest, 10 min cycling at 40%V̇O2peak, 10 min cycling at 65%V̇O2peak) with measurement of heart rate (HR), and calculation of stroke volume (SV), cardiac output (Q) and respiratory exchange ratio (RER) utilising online metabolic gas exchange. Plasma volume (PV) and haemoglobin mass (Hbmass) were measured utilising the oCOR-method.

**Results**

HA reduced resting rectal temperature (Trec; Day1 37.0 ± 0.2°C; Day10 36.5 ± 0.3°C; p<0.001), HR (Day1 74 ± 13 b.min-1; Day10 56 ± 8 b.min-1; p<0.001) and increased PV (+15.4 ± 9.2%; p<0.001). No changes in resting Trec (Day1 37.0 ± 0.3°C; Day10 36.9 ± 0.3°C; p=0.522), HR (Day1 68 ± 14 b.min-1; Day10 66 ± 9 b.min-1; p=0.398), or PV (+1.8 ± 5.0%; p=0.622) were observed following EX. No change (p>0.05) was observed in Hbmass following HA (Pre 869 ± 92 g; Post 869 ± 96 g), or EX (Pre 865 ± 110 g; Post 857 ± 126 g).

SV in hypoxia was greater at rest (HYP1 74.9 ± 15.3 mL; HYP2 83.5 ± 16.8 mL;p=0.002), 40%V̇O2peak (HYP1 113.5 ± 15.1 mL; HYP2 121.2 ± 9.9 mL;p=0.049) and 65%V̇O2peak (HYP1 107.6 ± 12.6 mL; HYP2 119.4 ± 7.8 mL;p<0.001) following HA, but was unchanged after EX (p>0.05). HR in hypoxia was lower (HYP1 168 ± 14 b.min-1; HYP2 158 ± 13 b.min-1;p=0.001) and oxygen saturation higher (HYP1 73 ± 3%; HYP2 76 ± 3%;p=0.006) at 65%V̇O2peak following HA, but not EX (p>0.05). Q in hypoxia was unchanged in EX or HA (p>0.05). RER reduced at rest in hypoxia (HYP1 0.96 ± 0.07; HYP2 0.90 ± 0.06;p=0.045) following HA, but not EX (p>0.05).

**Discussion**

HA is an effective intervention for reducing physiological strain associated with acute normobaric hypoxia, in part through HA derived PV expansion improving cardiac efficiency. Further research is required to determine the benefits of cross-acclimation across a spectrum of simulated and actual altitudes, whilst implementing different work prescription, including performance trials.

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