

Inter-individual variation in the adaptive response to heat acclimation; impact on temperate performance

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Introduction: Typical heat acclimation (HA) responses are well characterised at the cohort level, however, individual data demonstrate considerable heterogeneity. Recent research suggests that HA indices are independent and not influenced by aerobic capacity, previous HA or thermal dose. However, some baseline responses may be useful in estimating the potential benefits that an individual may obtain from HA. It remains to be established whether the extent of individual HA will translate to aspects of individual endurance performance and thermophysiological indices in temperate conditions, and if these can be related to any prior variables.

Method: 17 males ($\text{VO}_{2\text{max}}=58.8[8.4] \text{ mL}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$) undertook 10-days HA (exercise + heat-stress [40°C, 50% RH]). Adaptation was assessed by heat stress tests (HST; 60 minutes cycling, 35% peak power output), and performance was assessed by a graded exercise test and 30 minute work done trial (22°C, 50% RH), pre- and post-HA (within-participant repeated-measures design). The controlled hyperthermia (CH) protocol for HA was used (90 minutes 40°C, 50% RH, rectal temperature 38.5°C). Nine of the participants had previously undertaken a HA programme (3 to 18 months washout).

Results: At the group level HA was evident (hypervolemia, reduced rectal [T_{re}] and body temperature, reduced heart rate and increased sweating during HST; $P<0.05$). However there was notable inter-individual variation in the range of adaptive responses. These data have already established that aerobic capacity does not influence the degree of HA, however it has not yet been determined whether the magnitude of an individual's HA response influences temperate endurance performance and associated changes in thermophysiological variables. Full data analysis is not yet complete and it is proposed that comparisons will be made to advance the evidence from Corbett et al. (2018) with considerations for previous HA and thermal dose.