Heart adaptation is protective against heat illness however its role in heat syncpe, due to reflex mechanisms, has not been conclusively established. The aim of this study was to evaluate if heat acclimation (HA) was protective against heat syncpe and to ascertain underlying physiological mechanisms.

Method 22 (17 males, 5 females) endurance trained cyclists were randomised to either 8 days of mixed active and passive HA (HEAT) or temperate exercise (CONTROL). Prior to, and following, the interventions participants underwent a HUT with graded lower body negative pressure (LBNP) continued until presyncope with measurement of cardiovascular parameters. Heat stress testing was performed to determine physiological and perceptual measures of HA.

Results There was a significant increase in orthostatic tolerance (OT), as measured by HUT/LBNP, in the HEAT group (pre-intervention: 28±9 mins, post-intervention: 40±7 mins) compared to CONTROL (pre-intervention: 30±8 mins, post-intervention: 33±5 mins) ($p=0.0116$). Heat acclimation resulted in a significantly reduced peak and mean rectal and skin temperature ($p<0.0141$), peak heart rate ($p<0.0033$), thermal comfort ($p<0.0411$) and rating of perceived exertion ($p<0.0251$). There was a significantly increased plasma volume in the HEAT group in comparison to CONTROL ($p=0.0293$).

Conclusions Heat adaptation causes improvements in OT and is likely to be beneficial in patients with heat exacerbated reflex syncope. Heat acclimation mediated PV expansion is the likely predominant physiological mechanism underlying improved OT. These data offer opportunities to improve health and wellbeing of service personnel with economic, logistical and reputational benefits for the UK Armed Forces.