# Heat acclimatization does/does not improve exercise performance in a cool condition: Relevance for sprint performance

**Article** *in* The Journal of Physiology · April 2016

Impact Factor: 5.04



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## Heat acclimatization does/does not improve exercise performance in a cool condition: relevance for sprint performance

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Heat acclimatization/acclimation not only markedly improves endurance performance (Minson & Cotter, 2016; Nybo & Lundby, 2016), but also single- and repeated/intermittent-sprint performance in hot environments (Girard *et al.* 2015), with possible transfer to sport-specific game behaviour in team-sports (Brocherie *et al.* 2015*a*). However, as for endurance, the effectiveness of 'heat training' to improve sprint performance is not clear-cut in the literature. For instance, even if an acclimation period (4 × 30–45 min at 30°C) induced a 33% increase in intermittent distance run, increased thermal comfort and lower rectal temperature in female players, when compared with their non-acclimatized teammates, the sprinting speed and repeated 15 m sprint percentage decrement remained similar in hot conditions (Sunderland *et al.* 2008). Conversely, a 10 day acclimation period resulted in a 2% increase in peak power output during a 40 min intermittent-sprint protocol in the heat (Castle *et al.* 2011). Whatever the exercise (i.e. single-, repeated/intermittent-sprint or endurance), such equivocal findings may relate to myriad confounding factors (e.g. training characteristics (athletes type and level, exercise mode, duration and intensity), body composition, clothing and/or weather variables; for details, see Brocherie *et al.* 2014, 2015*b*; Racinais *et al.* 2015) that, alone or in combination, would influence the magnitude of heat-related effects on exercise performance in cooler conditions. That said, in the absence of available study with sprint tests conducted in cool conditions after 'heat training', the superior efficiency of heat acclimatization/acclimation to improve sprint performance in hot *vs.* cool environments is simply unproven.

### Competing interests

None declared.

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## Heat acclimatization in trained athletes benefited from training in the heat in terms of improving exercise endurance time in a cool environment

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In a study conducted by Chen *et al.* (2013), after heat acclimation the experimental group (EXP) exhibits a reduction in maximal heart rate (HR) and an increase in maximal oxygen pulse during maximal leg cycle exercise to exhaustion in the thermoneutral (cool) condition. These resulted in a gain of 6.6% and 4.6%, respectively, on endurance exercise performance time of the EXP in the hot and thermoneutral conditions. The possible mechanism is that when exercise intensity reaches a critical threshold level skin blood flow in the active limbs starts to dramatically increase via the activation of the sympathetic active vasodilatation system to help dissipate heat (Kenney *et al.* 2012). Redistribution of skin blood flow from the skin to exercising muscle in the active limbs after heat acclimatization provides the capability for the EXP to increase their endurance time in the hot and cool environment.

After heat acclimatization, the athletes significantly increased maximal $O_2$ pulse (10.4% and 6.4%, respectively, $P < 0.05$) during maximal leg exercise in the hot and thermoneutral conditions. According to Wasserman *et al.* (2012), when exercise work rate reaches a critical intensity level, $O_2$ pulse increases primarily because of an increasing (arterial – mixed venous) $O_2$ difference. For this, we speculate that after heat acclimatization, active tissue receives adequate arterial blood perfusion during vigorous exercise in the hot and thermoneutral condition. Based on Chen *et al.* (2013)'s study, we support the argument that the effect of heat acclimatization can induce a training effect of improving exercise performance in a cool environment.

### Competing interests

None declared.

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