

## Optimising heat adaptations in tropical natives: a comparison of three field feasible training programmes.

Shawn Chee Chong Tan [ORCID iD](#)<sup>1,2</sup>, Ivan Cherh Chiet Low [ORCID iD](#)<sup>1,2</sup>, Louisa Si Xian Lim<sup>1,2</sup>, Wee Hon Ang<sup>3</sup>, Jason Kai Wei Lee [ORCID iD](#)<sup>1,2,4,5,6,7</sup>

<sup>1</sup>Department of Physiology, Yong Loo Lin School of Medicine, National University of Singapore, Singapore, Singapore. <sup>2</sup>Human Potential Translational Research Programme, Yong Loo Lin School of Medicine, National University of Singapore, Singapore, Singapore. <sup>3</sup>Combat Protection and Performance Programme, Defence Medical and Environmental Research Institute, DSO National Laboratories, Singapore, Singapore. <sup>4</sup>Global Asia Institute, National University of Singapore, Singapore, Singapore. <sup>5</sup>The N.1 Institute for Health, National University of Singapore, Singapore, Singapore. <sup>6</sup>Institute for Digital Medicine, Yong Loo Lin School of Medicine, National University of Singapore, Singapore, Singapore. <sup>7</sup>Singapore Institute for Clinical Sciences, Agency for Science, Technology and Research (A\*STAR), Singapore, Singapore

SHAWN CHEE CHONG TAN

 [0000-0001-9970-6780](#)

IVAN CHERH CHIET LOW

 [0000-0003-2735-395X](#)

JASON KAI WEI LEE

 [0000-0003-4042-795X](#)

### Abstract

**Introduction:** Conventional heat acclimatisation (CHA) confers muted physiological benefits in tropical natives[1]. Isothermic conditioning (IC) enhances thermal stimulus through prolonged elevation above a target core temperature[2] while aerobic conditioning (AC) can function as a time-efficient alternative to CHA[3]. Thus, we compared the effectiveness of a CHA, IC and AC programme in inducing physiological adaptations in tropical natives.

**Methods:** Fifty-one untrained males (age:25±2years, 2.4-km run time:13.2±0.9min) donned military Full Battle Order attire and performed a treadmill heat stress test (HST) in an environmental chamber ( $T_{db}$ :29.9±0.5°C, RH:70±3%). HSTs were conducted before and after two weeks of CHA (n=17, ten sessions), IC (n=17, ten sessions) or AC (n=17, six sessions). Gastrointestinal temperature ( $T_{gi}$ ), heart rate (HR), mean skin temperature ( $T_{sk}$ ), physiological strain index (PSI) and thigh-predicted sweat [ $Na^+$ ] were analysed by two-factor mixed design ANOVA with statistical significance set at 0.05.

**Results:** Improvements to mean exercise  $T_{gi}$  (-0.2±0.3°C;  $P<0.01$ ), PSI (-0.4±0.6;  $P<0.05$ ) and thigh-predicted sweat [ $Na^+$ ] (-9±8mmol/L;  $P<0.001$ ) were observed in IC but not CHA and AC (all  $P>0.05$ ). IC elicited a greater attenuation in mean exercise HR and thigh-predicted sweat [ $Na^+$ ] relative to CHA (both  $P<0.05$ ). Physiological adaptations were similar between CHA and AC (all  $P>0.05$ ).

**Conclusion:** IC induced a more complete heat-adapted phenotype relative to CHA and AC. AC serves as a time-efficient alternative to CHA.

### References:

- 1.Lee, et al., J Therm Biol, 2012. **37**.
- 2.Gibson, et al., J Therm Biol, 2015. **49-50**.
- 3.Charlot, et al., Frontiers in Physiology, 2017. **8**.

### Student Research?

Doctoral