

SINGAPORE SPORT & PERFORMANCE CONFERENCE 2022

**From Youth to Elite Sport:
Harnessing Potential and the Pursuit of Excellence**

2nd - 4th November 2022

Organised by



SINGAPORE SPORT & PERFORMANCE CONFERENCE 2022

From Youth to Elite Sport: Harnessing Potential and the Pursuit of Excellence

Efficacy of isothermic conditioning over
conventional heat acclimatisation and interval
training in tropical native males

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Programme

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Impact of heat on exercise and health



IAAF World Championships 2019



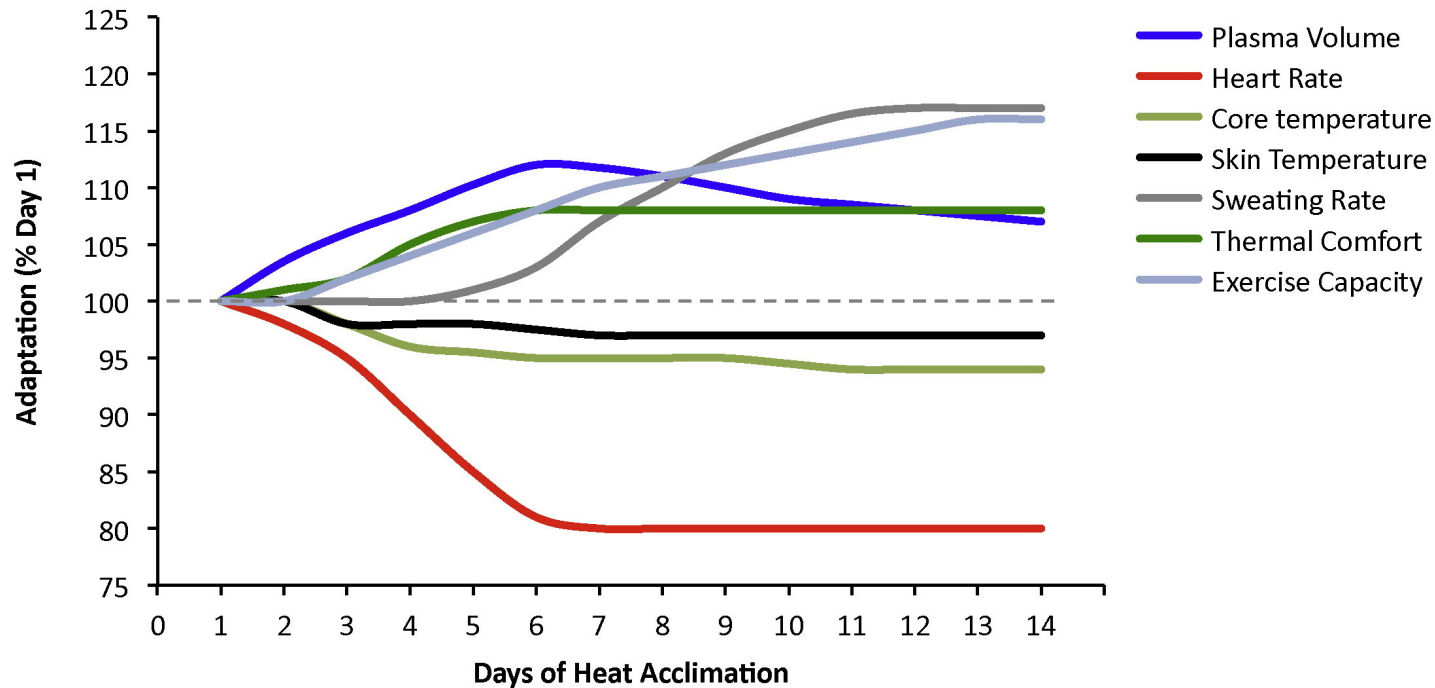
Tokyo Olympics 2020

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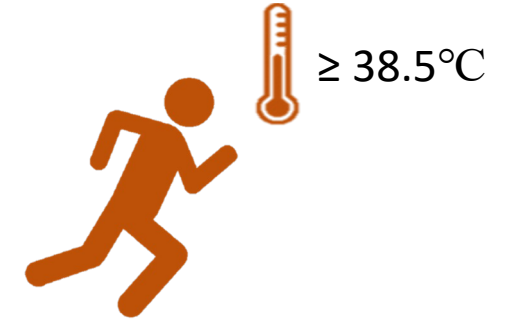
Muted heat adaptations in tropical natives

Conventional heat acclimatisation

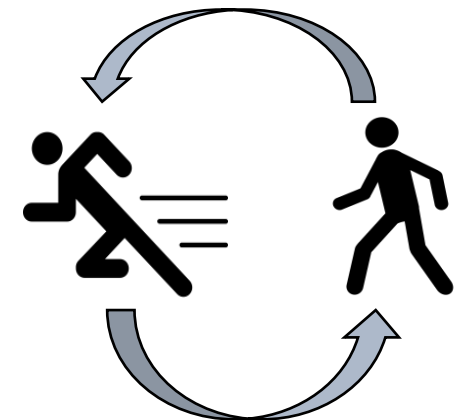


Périard et al. (2015). *Scand. J. Med. Sci. Sports.* 2015; 25: 20-38.

Muted adaptations in tropical natives (Lee et al. 2012)



Isothermic conditioning



Interval training

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Study aims

Primary aim:

Compare the effectiveness of a **conventional heat acclimatisation (CHA)** programme, an **isothermic conditioning (IC)** programme and an **interval training (IT)** programme in their capacity to confer physiological benefits in tropical male natives.

Secondary aim:

Compare the ability of the **three training programmes** to elicit work tolerance improvements in tropical male natives.

Participant demographics

Participants: 51 healthy tropical native males

	Age (years)	BMI	Body fat (%)	2.4 km time (mins)
CHA (n=17)	25 (2)	24.2 (2.5)	20 (5)	13.2 (0.9)
IC (n=17)	25 (2)	23.5 (4.1)	19 (5)	13.3 (1.0)
IT (n=17)	25 (2)	23.1 (2.8)	19 (4)	13.1 (0.8)
p-value	0.924	0.625	0.871	0.908

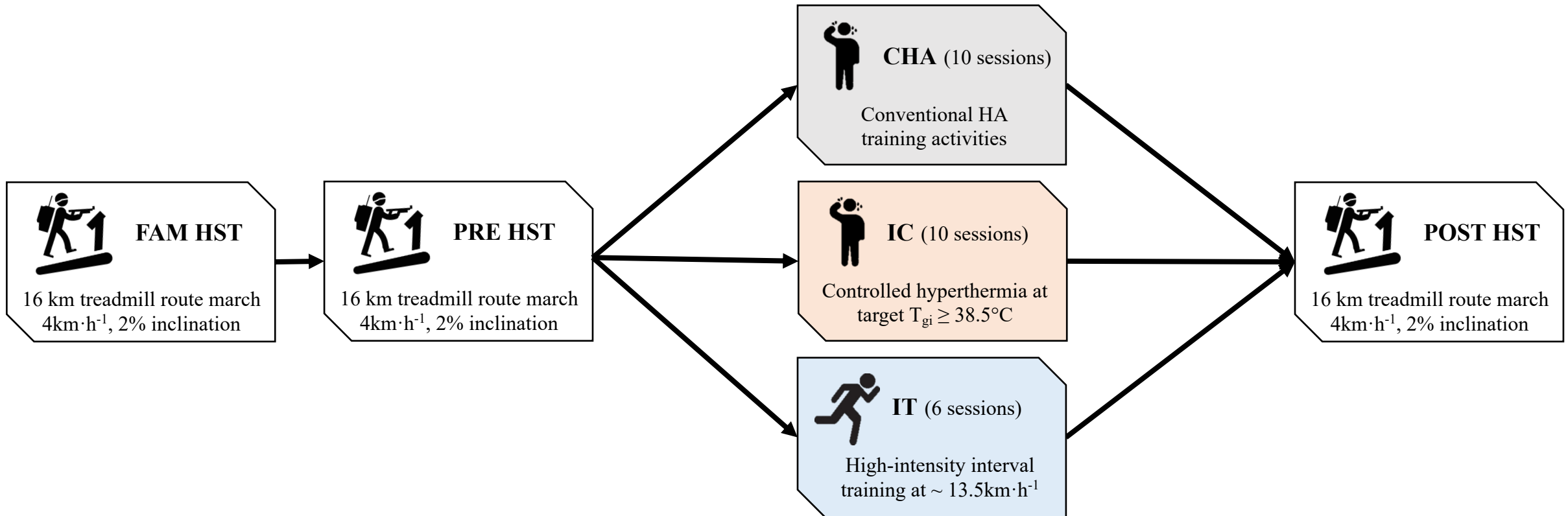
Study design

Week 1

Week 2

Week 3 - 4

Week 5



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Heat stress test (HST)

Conducted in a **controlled environmental chamber**



Environmental conditions:

Dry bulb temperature (T_{db}): $29.9 \pm 0.5^\circ\text{C}$

Relative humidity (RH): $70 \pm 3\%$

Wet-bulb globe temperature ($WBGT_{in}$):
 $27.0 \pm 0.7^\circ\text{C}$



Attire and trial load: 22 kg military load



Trial:

Maximum 16-km treadmill route march

Training programmes

Conducted **outdoors** under **warm and humid conditions**:

T_{db} : $27.9 \pm 0.6^\circ\text{C}$, RH: $79 \pm 3\%$, WBGT: $26.2 \pm 0.4^\circ\text{C}$, wind speed:
 $0.9 \pm 0.4 \text{ m/s}$

IT

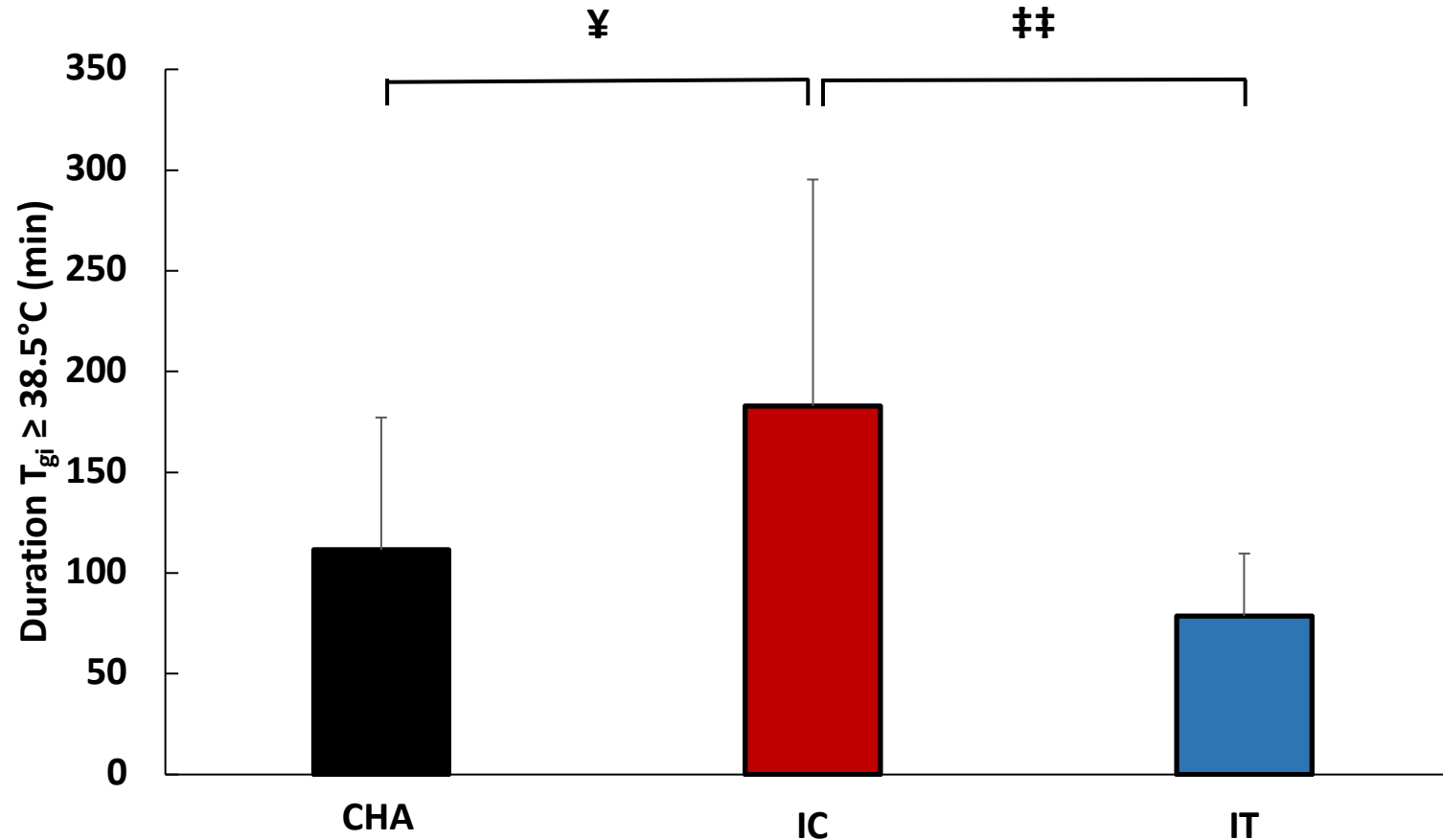


Each training session:

- i) 10 sets of high-intensity IT exercise
 - 60-s running intervals at 13.5 km/h
 - 60-s walk at 5.4 km/h (active recovery)

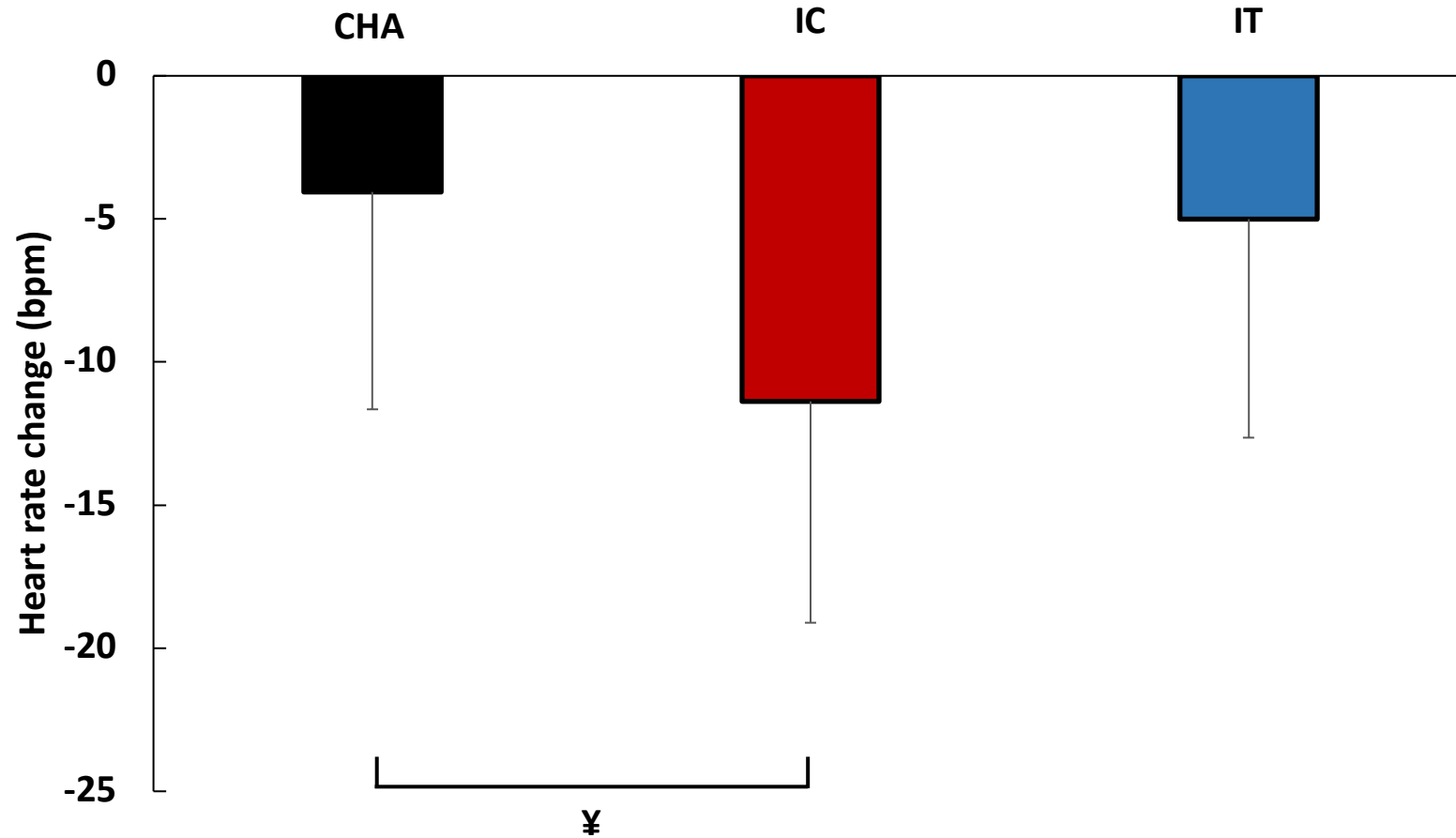
Training load increased in second week.

Total thermal stimulus (training)



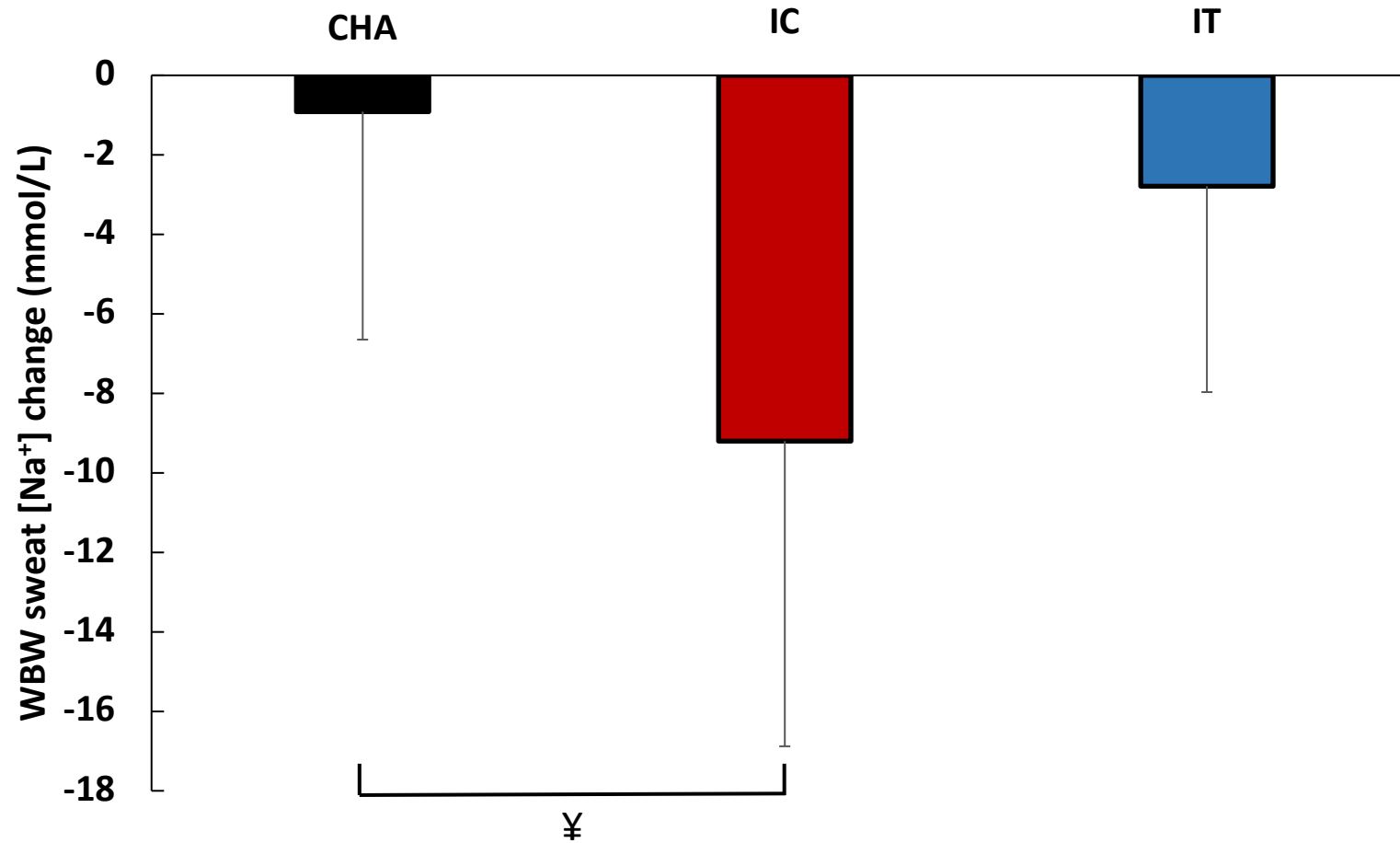
¥ significant difference **CHA** and **IC**
‡ significant difference between **IC** and **IT**

Cardiovascular strain lowered (HST)



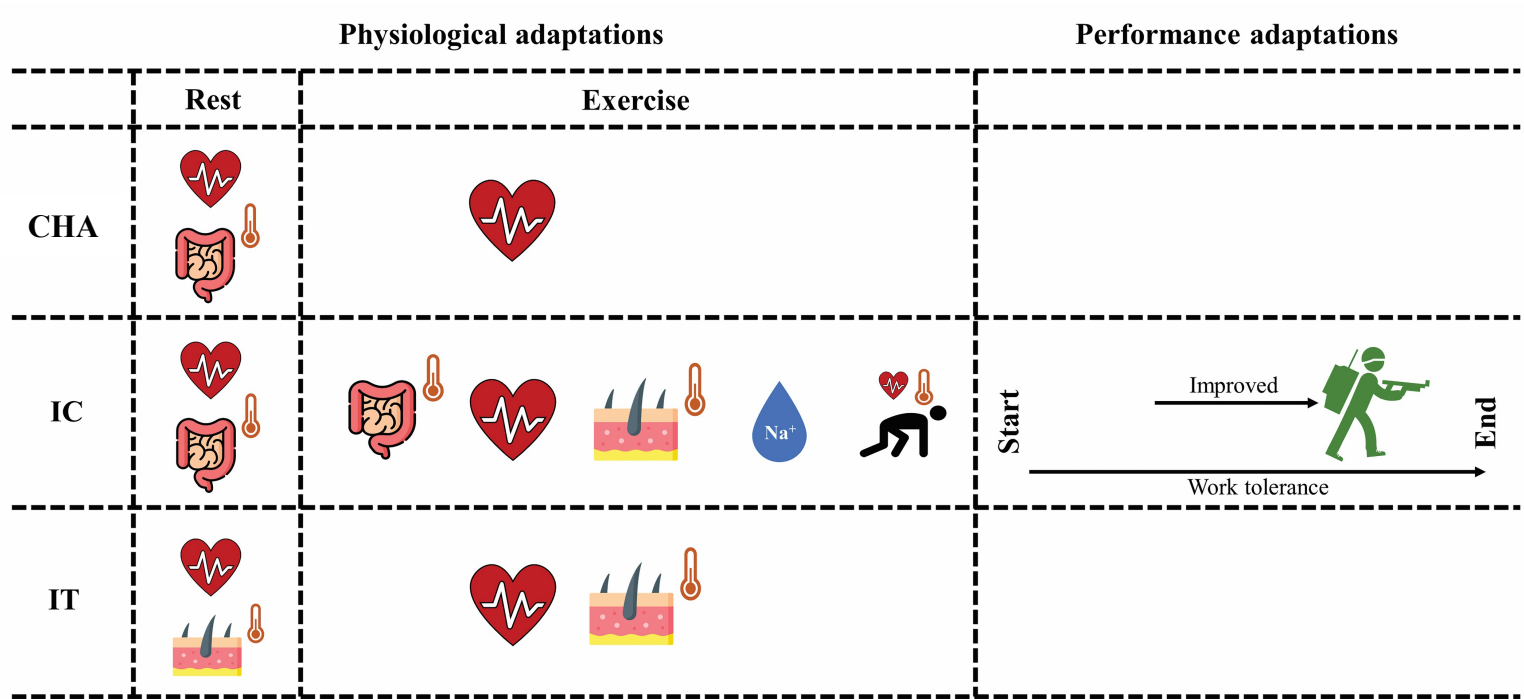
¥ significant difference between CHA and IC

Sweat electrolyte changes (HST)




¥ significant difference between CHA and IC

Heat-adapted phenotype (HST)




Field-based **IC** conferred a more complete heat-adapted phenotype ←


Physiological parameter improved:

 = Heart rate

 = Sweat [Na⁺]

 = Physiological Strain Index

 = Gastrointestinal temperature

 = Skin temperature

Tan et al. (2022). *Med Sci Sports Exerc*, Online ahead of print.

Magnitude of heat adaptations

Parameter	Tyler et al. (2016)	Present study		
		CHA	IC	IT
<i>Resting:</i>				
Heart rate	-0.54 [-0.78, -0.31]	-0.51	-0.75	-0.48
T_{gi}	-0.65 [-0.84, -0.47]	-0.45	-0.77	-0.26
<i>Exercise:</i>				
Heart rate	-0.87 [-1.11, -0.64]	-0.31	-0.77	-0.43
T_{core}	-0.51 [-0.77, -0.26]	-0.33	-0.68	-0.24
T_{sk}	-0.85 [-1.22, -0.48]	-0.27	-0.37	-0.37
Sweat [Na^+]	-0.94 [-1.26, -0.62]	-0.06	-0.66	-0.26
Sweat rate	0.95 [0.67, 1.24]	0.10	0.03	-0.07
Exercise capacity	0.84 [0.63, 1.04]	0.36	0.52	0.25

*Values presented as Hedges' g [95% Confidence Interval].

Tyler et al. (2016). Sports Med, 46:1699–1724

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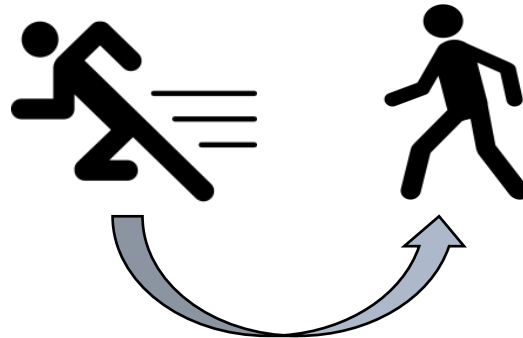
Key takeaways



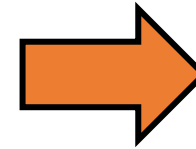
$\geq 38.5^{\circ}\text{C}$



Isothermic conditioning



Interval training



Acknowledgements

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Research published in Medicine & Science in Sports & Exercise:

https://journals.lww.com/acsm-msse/Abstract/9900/Efficacy_of_Isothermic_Conditioning_over.70.aspx

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