Heat & Perception: Impact & Implications

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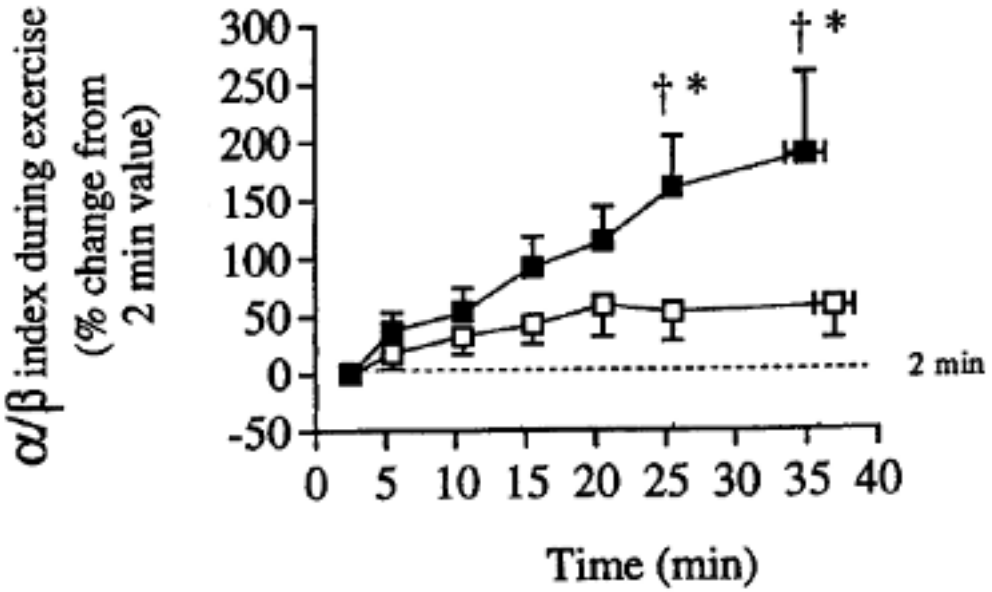
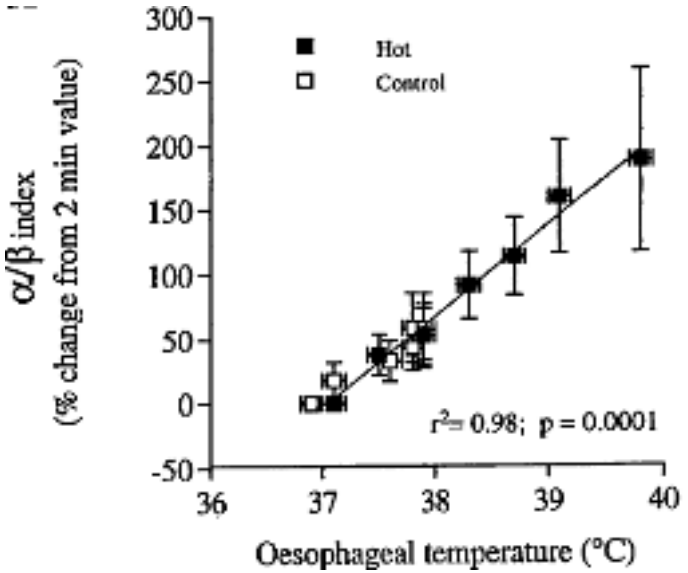
CorVos/PezCyclingNews

Hyperthermia & Arousal



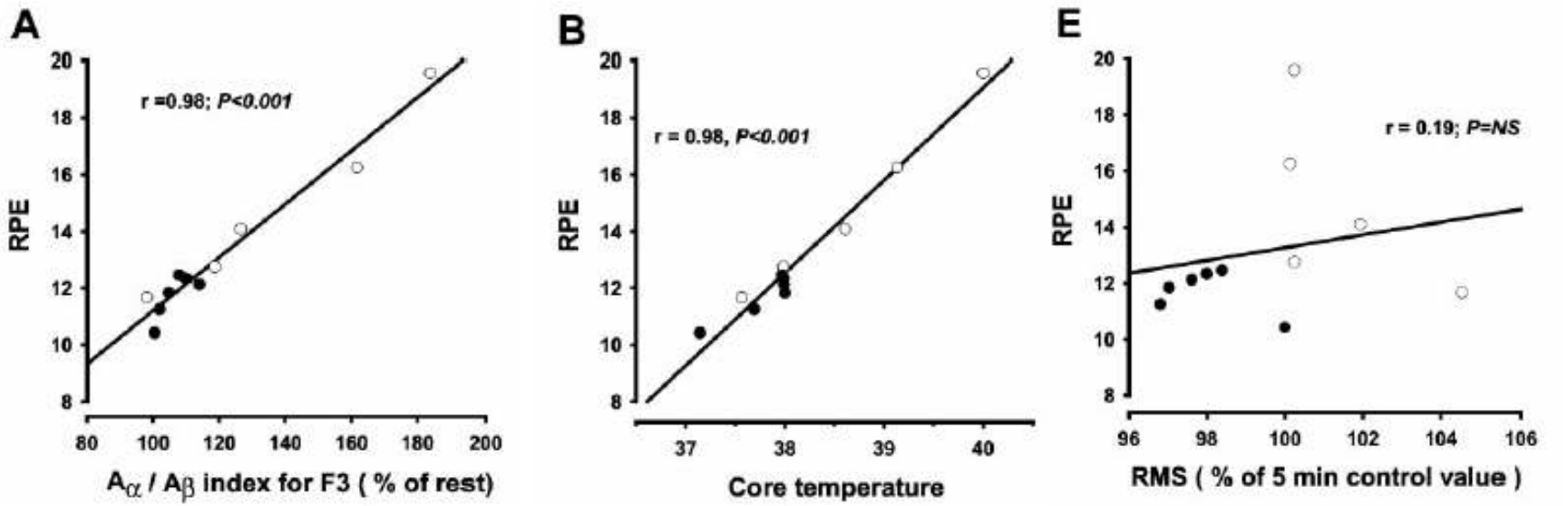


- 1 h cycling in 19°C or 42°C
- ↑α/β EEG ratio = ↓ "arousal"

Nielsen et al. 2001

What Affects RPE?

1 h cycling in 18°C or 40°C

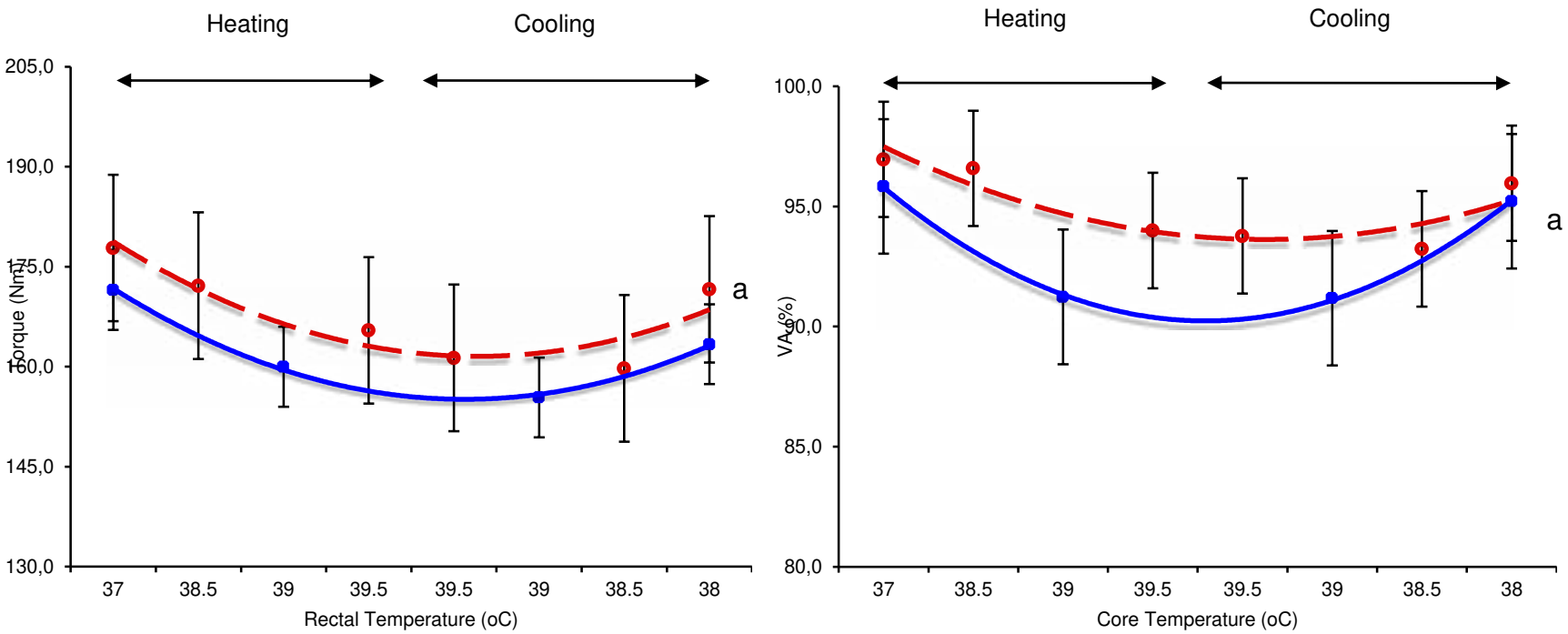


RPE best predicted by "arousal" or T_{core}

No relation to muscle activity

Nybo & Nielsen 2001

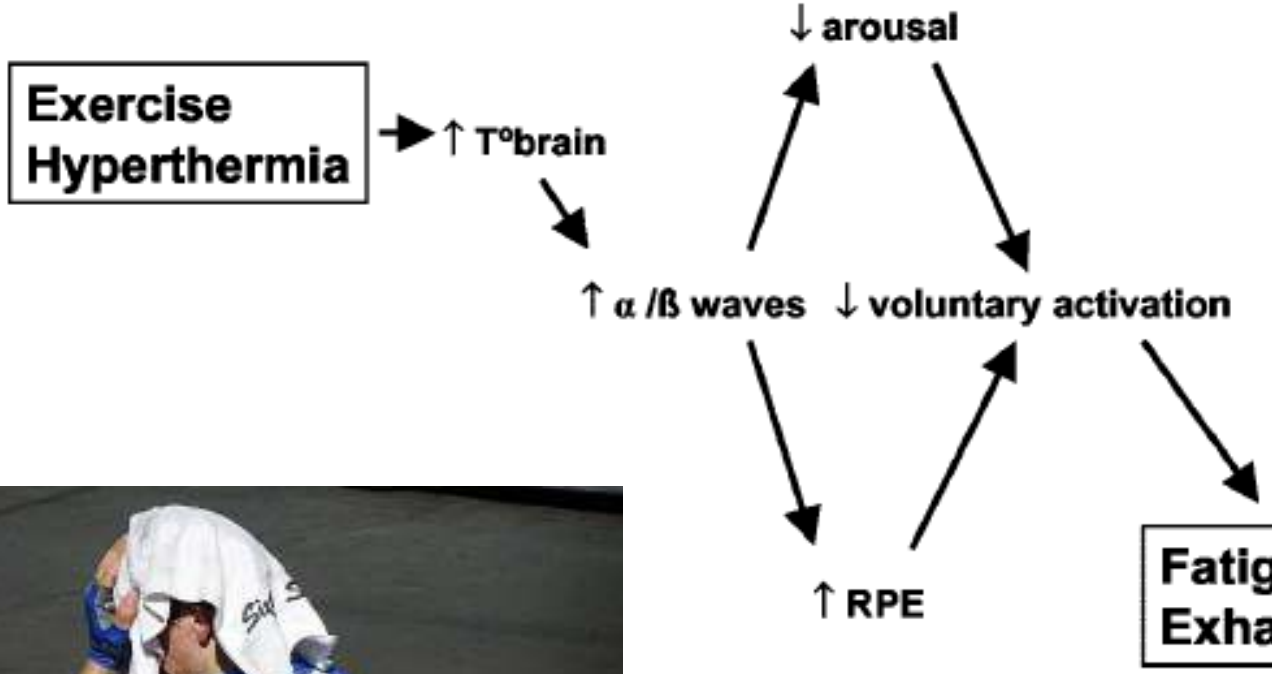
Neuromuscular Impairment



- ↓ Force & voluntary activation with ↑ T_{core}
  - T_{core} direct effect
  - Progressive changes
  - independent of T_{skin}

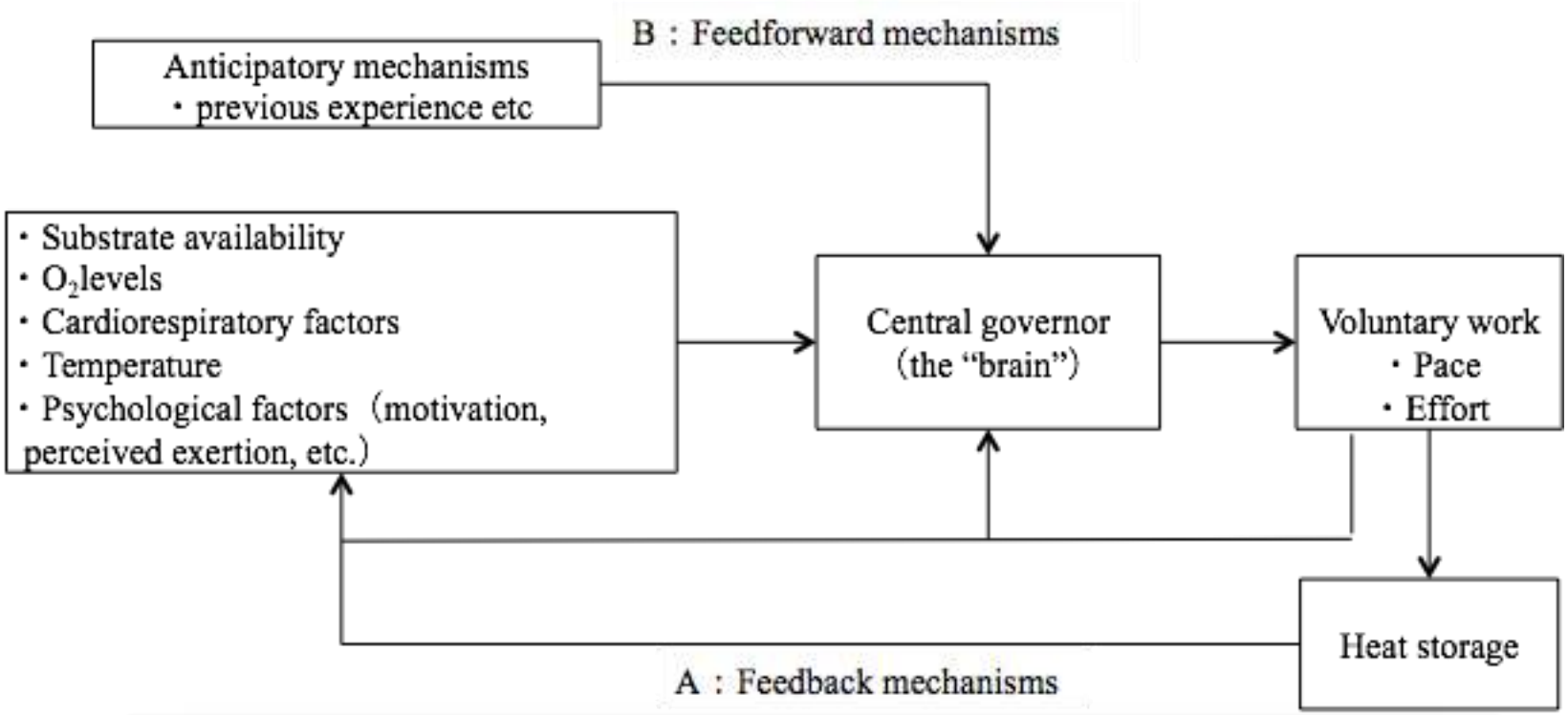
Morrison et al. 2004
Thomas et al. 2006

Multi-factorial Fatigue



Cheung & Sleivert 2004

Central Governor/Psychobiological



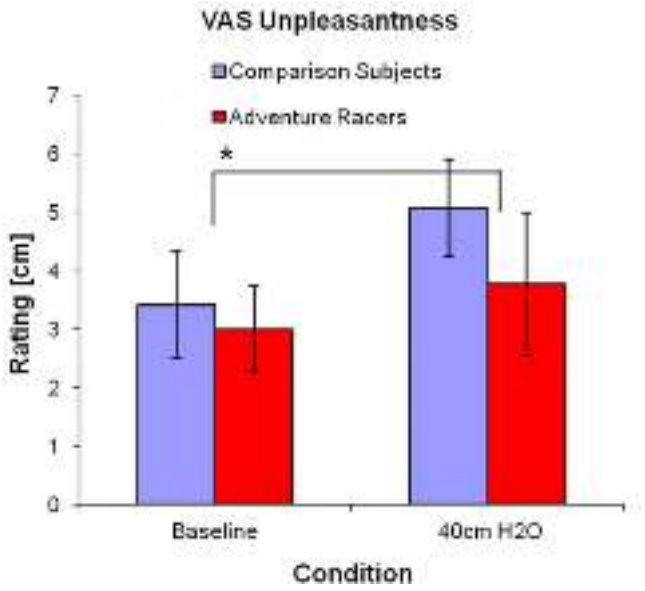
Physiological feedforward and feedback

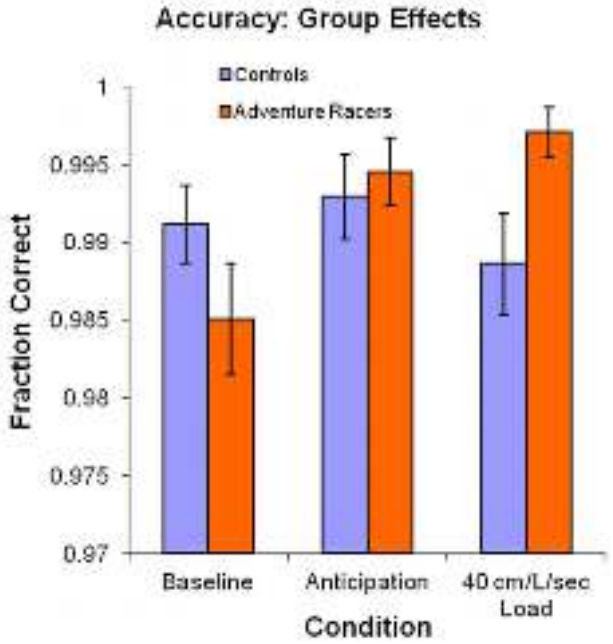
Perceived effort

Past experience

Motivation

Fitness & Performance Under Stress





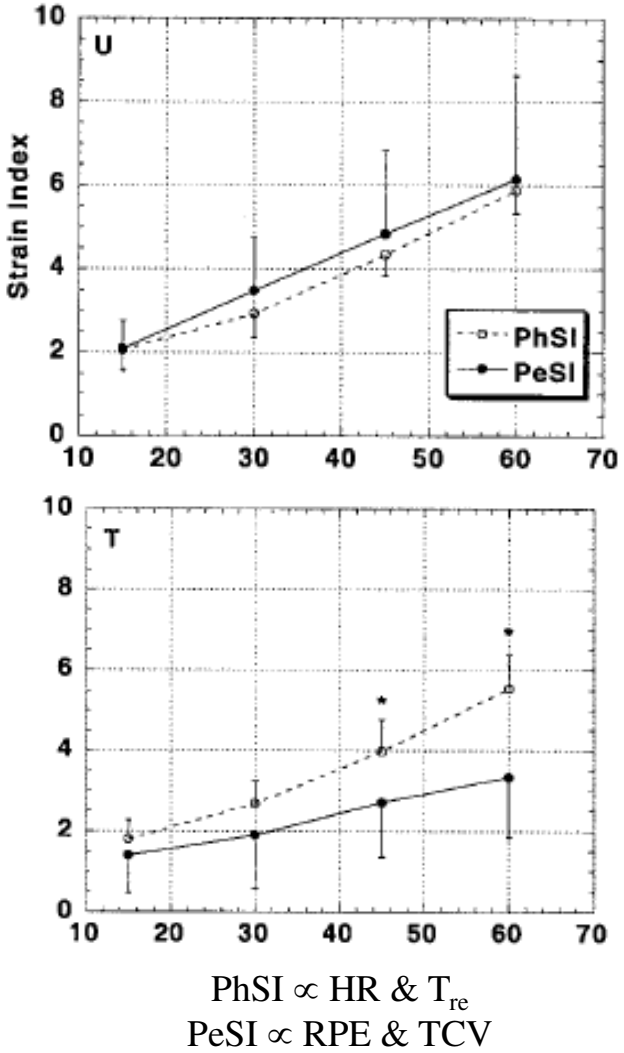
NS unpleasant sensations

↑ accuracy

- Elite adventure racers vs control
  - Aversive breathing stimulus
  - Cognitive testing
  - fMRI

Paulus et al. 2012

Effect of Fitness on Thermal Perception

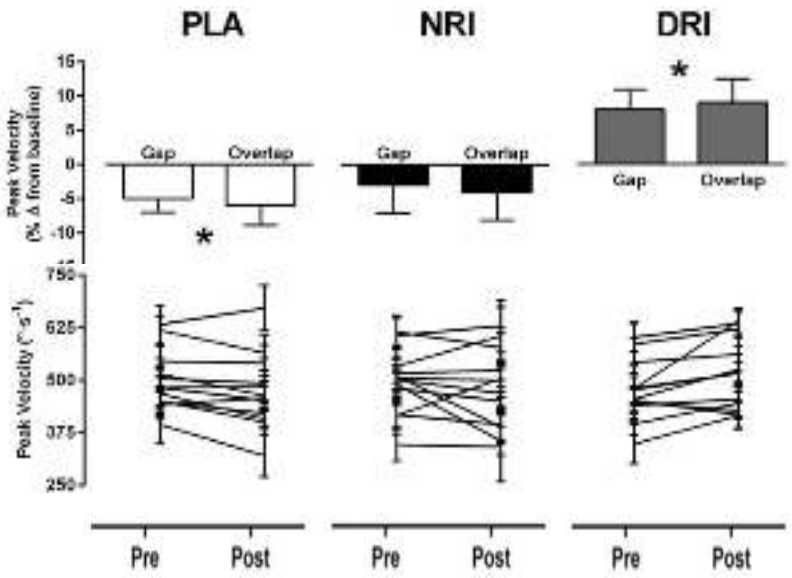


PhSI ∝ HR & T_{re}
PeSI ∝ RPE & TCV

- Untrained (U: 43.6mL) vs Trained (T: 59.0mL)
  - 40°C, 30%RH, 3.5 km/h
- Close matching Pe/Ph in U
- ↓ PeSI in T
  - NS HR/RPE
  - ↓ TC
- Experience & habituation?

Tikuisis et al. 2002

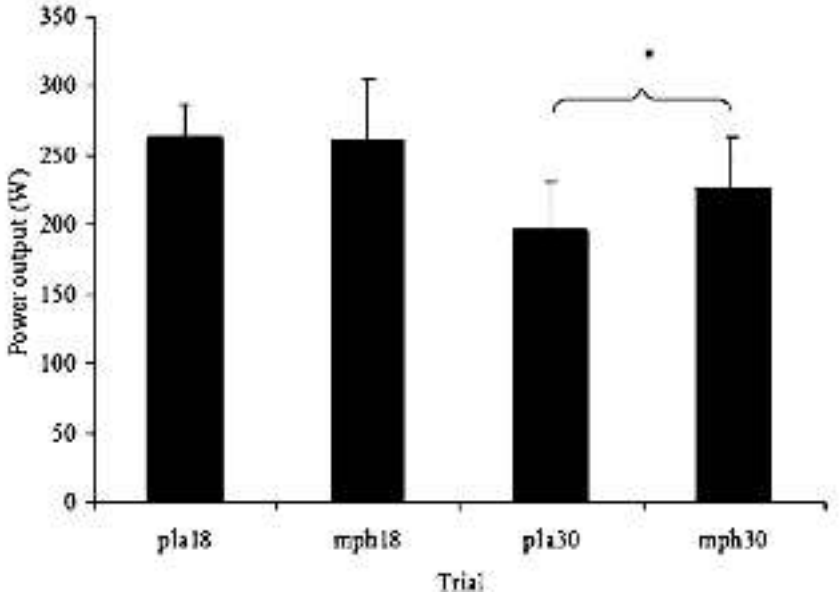
Dopamine & Central Fatigue

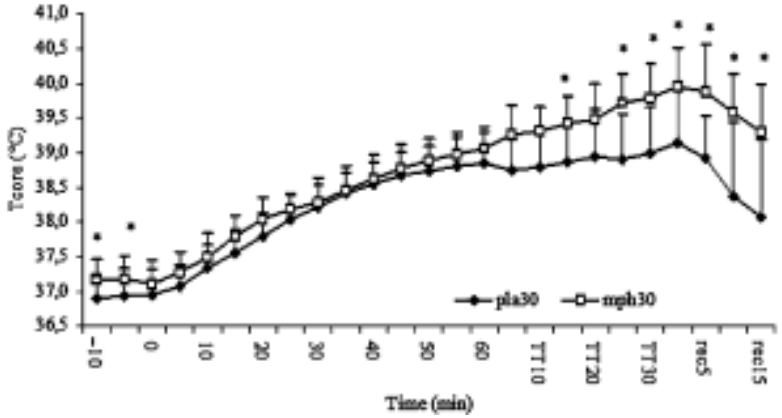


- 3 h continuous cycling
  - 0.7 CHO/kg/h
  - 18°C
- Reboxetine (8 mg)
- Ritalin (40 mg)
- Eye movements tested
  - Non-locomotor
- Peak eye velocity maintained/enhanced
- "Quality" / accuracy NS w exercise/drugs

Connell et al. 2017

Effect of Dopamine





- 20 mg Ritalin
- 18 or 30°C
  - 60 min, 55% W_{max}
  - Set work TT (30 min, 75% W_{max})
- Ritalin in heat
  - ↑ Power output
  - ↑ Core temp
  - ↓ Thermal discomfort

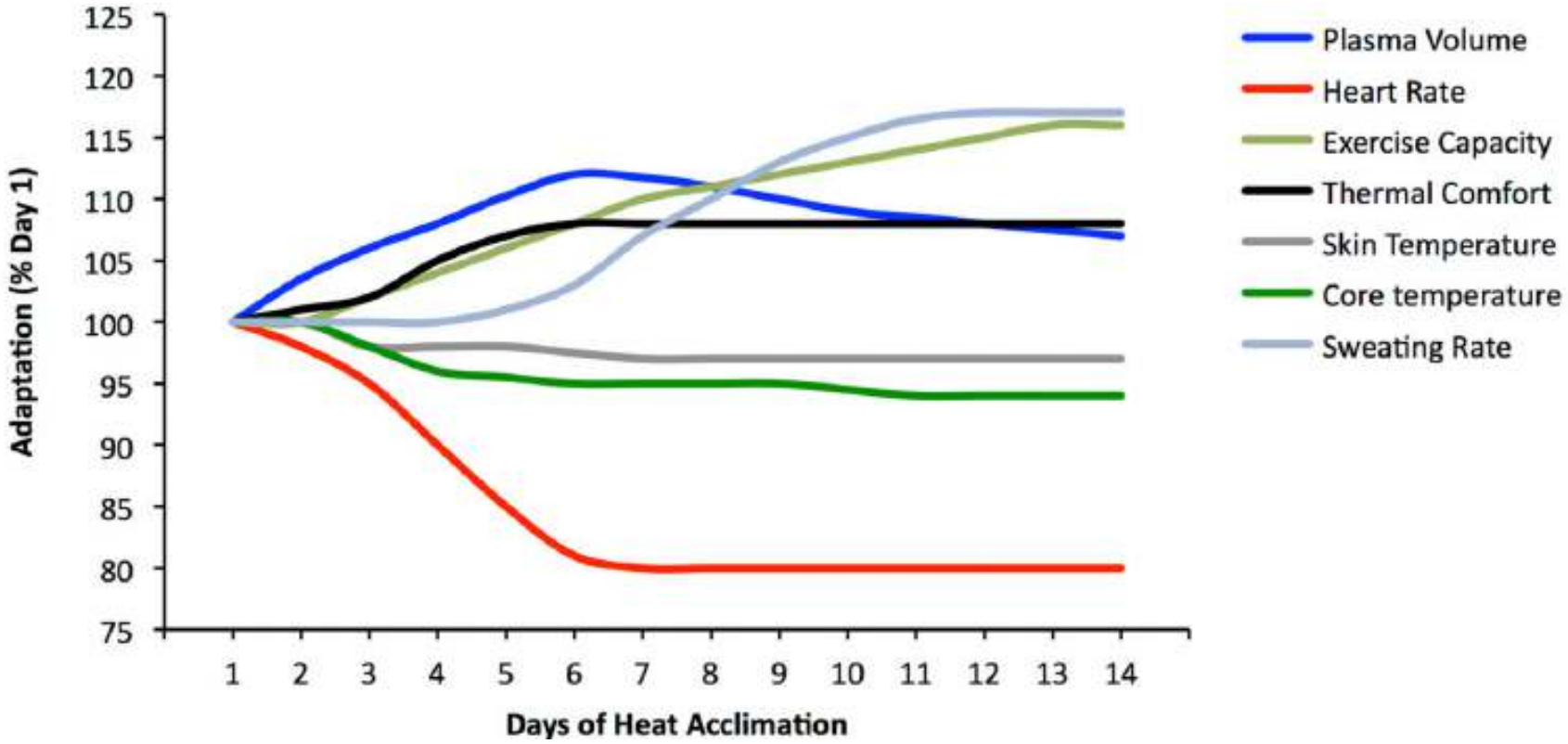
Roelands et al. 2008

Heat Adaptation & Perception

- Thermal sensation
  - NS resting
  - Small ↓ mean & iso-time
- Large ↓ RPE
- ?? Cognition ??

Tyler et al 2016

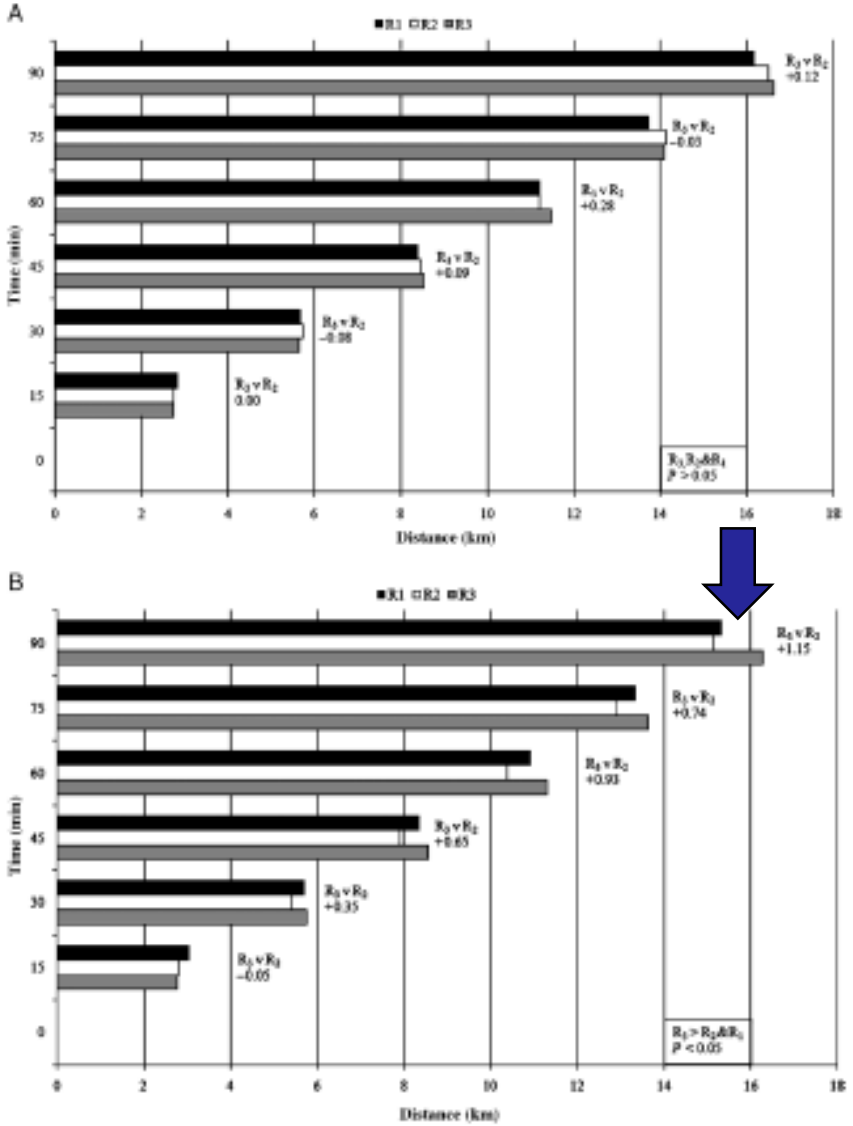
Heat Adaptation Timeline



Periard et al 2015

Psychological Skills Training

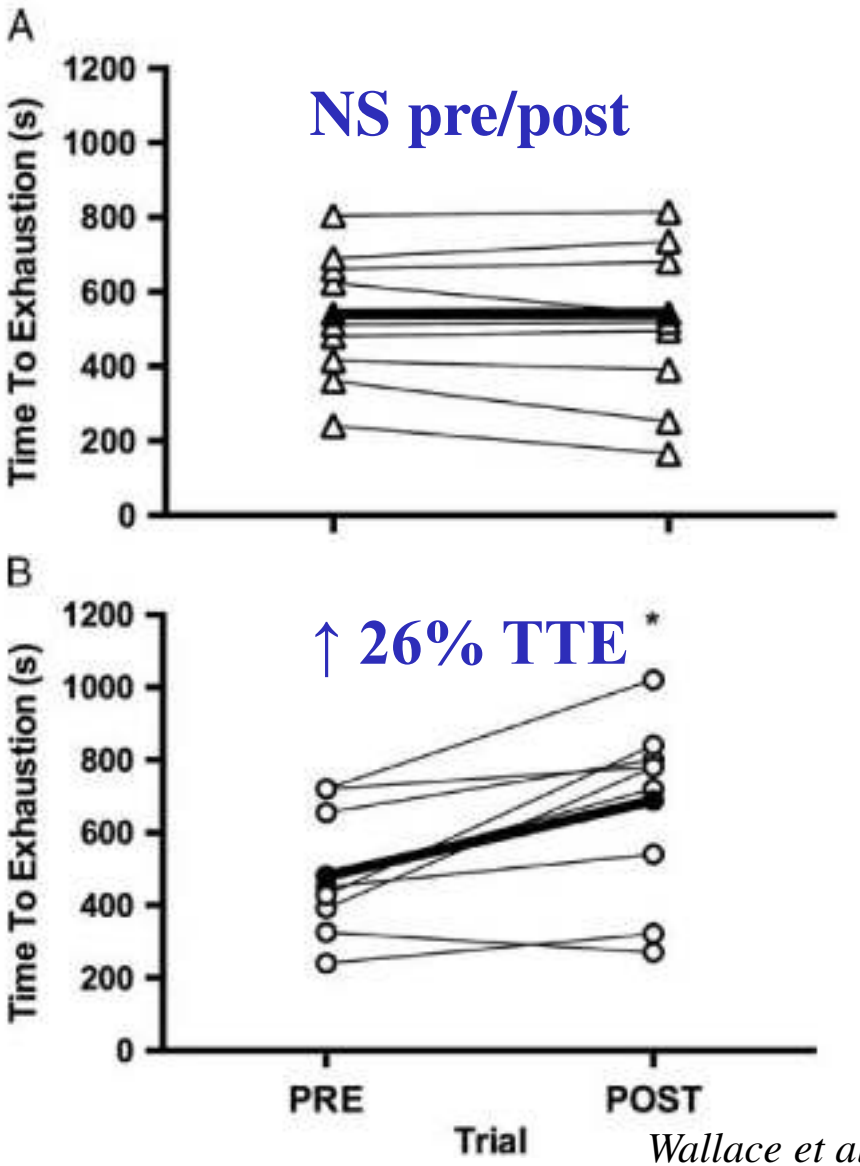
- Trained runners in heat
  - 30°C, 40% RH
  - 90 min self-paced TT
- PST 4x1h
  - Goal setting
  - Arousal regulation
  - Visualization
  - Positive self-talk
- NS CON
- ↑ 1.15 km PST
- NS T_{au}, T_{sk}, SR, RPE



Barwood et al 2008

Motivational Skills Training

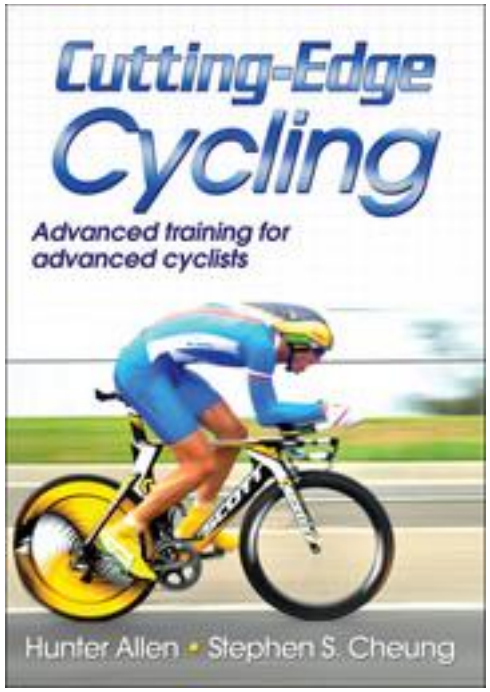
- 30 min pre-load
- TTE @80% PPO
- Cognitive testing
- 2 weeks MST / CON

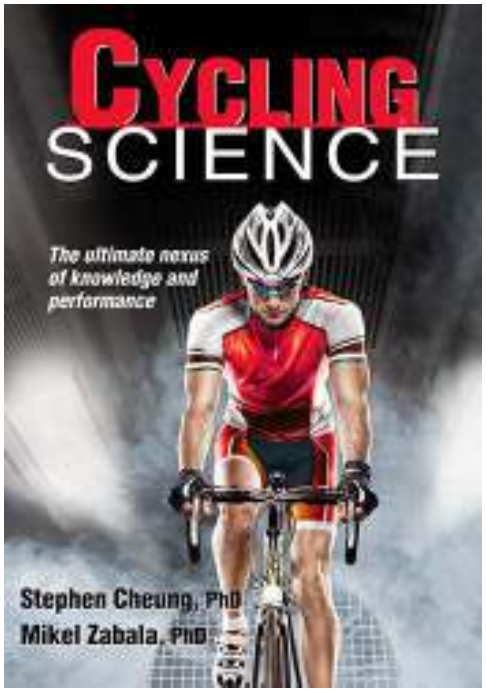


Wallace et al 2017

Heat = ↑ discomfort = ↑ effort

- Heat adaptation
  - Not just physiological benefits
- Use heat selectively
  - Race simulations
- Motivational Skills Training
  - Physical benefit
  - Cognitive benefit





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