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# Relevance of Work Intensity in Hot Environments: Duration of Continuous Work Until Critical Core Temperature

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Occupational heat-exposure guidelines primarily focus on environmental conditions. We examined how work intensity and ambient temperature influence the time required to reach a critical core temperature 38 °C.

## Objectives

- Quantify the time required to reach a critical core temperature 38 °C during moderate and heavy work.
- Compare the combined effects of work intensity and ambient temperature on thermal strain.
- Evaluate cumulative thermal and cardiovascular strain during repeated work bouts.

## Methods

- 14 healthy adults
- 20 °C | 30 °C | 40 °C (RH 35 %)
- Ergometer exercise, moderate (33 % $VO_2$max) and heavy load (50 % $VO_2$max)
- 3 work bouts with recovery periods

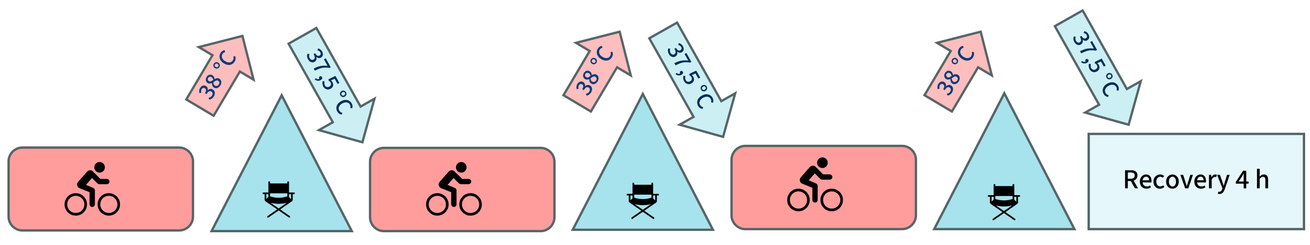



Fig.1. Study design and experimental protocol.

## Results

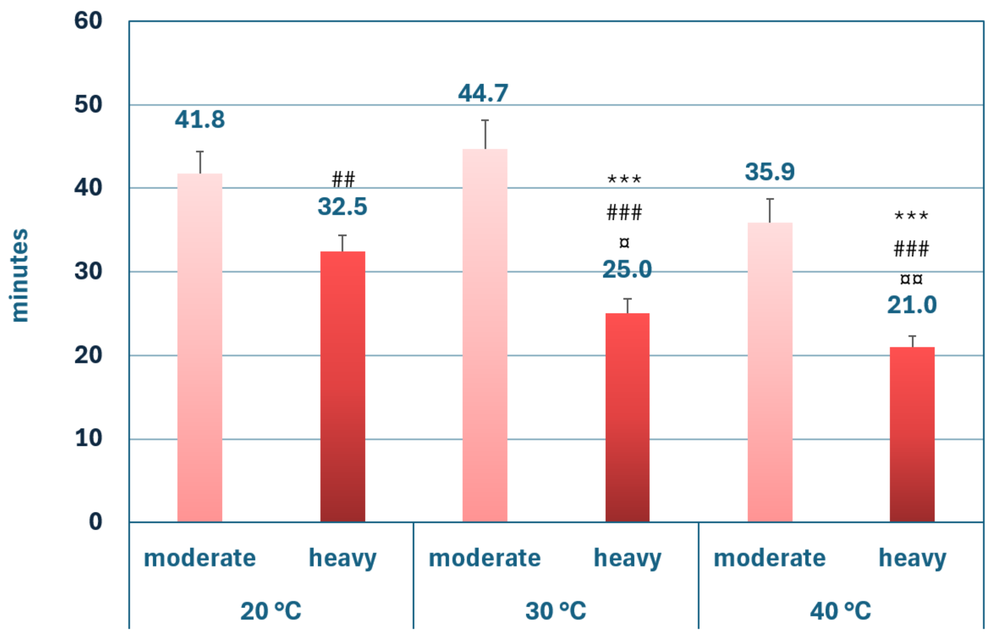



Fig.2. Time to reach a core temperature of 38.0°C during moderate and heavy work at 20, 30 and 40°C (mean ± SE).
*** p < 0.001 compared with moderate work at 20 °C;
# p < 0.05, ## p < 0.01 compared with moderate work at 30 °C;
¤ p < 0.05, ¤¤ p < 0.01 compared with moderate work at 40 °C.

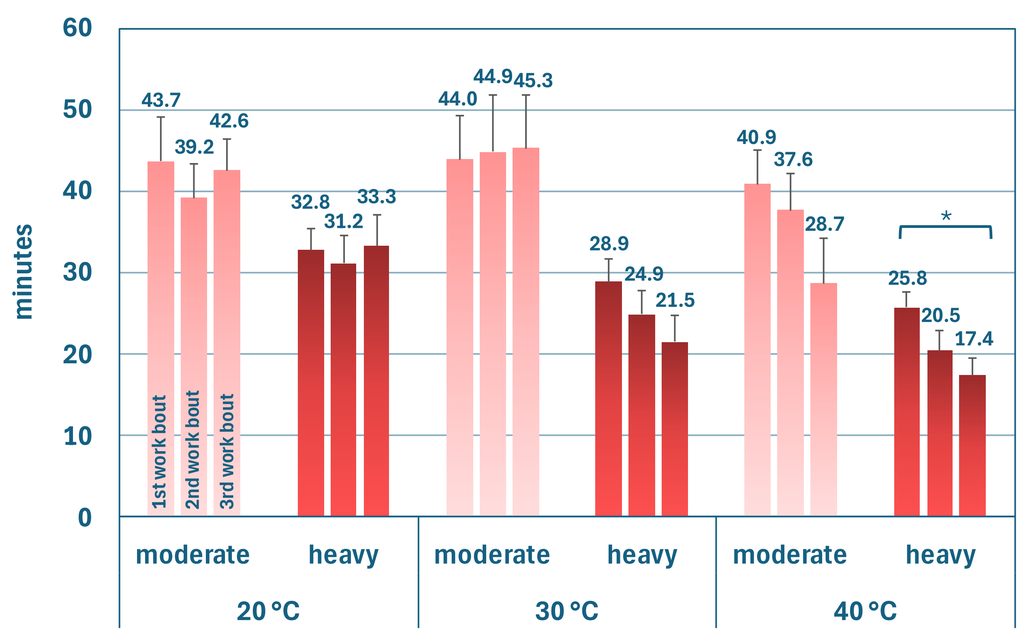



Fig.3. Time to reach a core temperature of 38.0°C across three successive work bouts (mean ± SE).. * p < 0.05, difference between the first and third work bout during heavy work at 40 °C.

- Heavy work reduced time to Tc 38 °C from 41 to 26 min on average.
- Heart rate increased with ambient temperature, with higher HR at 40 °C than at 20 °C during both work intensities and than at 30 °C during moderate work.

## Key findings

- Heat increased physiological strain
- Higher workload accelerated heat strain
- Repeated heat exposure reduced heat tolerance