

Faster ruck marches with alternate work/rest cycles result in similar heat strain as Army heat stress guidance

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Introduction

- Military personnel complete ruck marches in the heat, resulting in substantial heat strain
- Work/Rest (W/R) cycles mitigate heat strain by allowing for dedicated time for cooling and rehydration
- Adjusting W/R cycles to reach the destination quicker, by reducing rest time or extending work duration before resting, would provide military planning flexibility

Purpose

Test the efficacy of Army heat stress guidance in mitigating heat strain during prolonged ruck marching, and compare thermoregulatory responses to three faster Work/Rest (W/R) cycles

Methods

- 16 participants (age: 24±4 y, VO_{2max}: 40.9±7.0 mL/kg/min)
- Four 7.7 km treadmill ruck marches to W/R cycles (Table 1) wearing 30% body mass rucksack in a hot environment (40°C, 31% RH, 30°C WBGT)
- Consumed a carbohydrate-electrolyte beverage *ad libitum*
- Heat strain and hydration across W/R cycles were assessed with mixed model ANOVA

Table 1. Description of Work/Rest (W/R) cycles.

W/R cycle	Duration	Notes
30/30 min	210 min	Army Heat Stress Guidance
40/30 min	180 min	Longer work, same rest
30/20 min	180 min	Same work, shorter rest
20/12 min	180 min	Shorter work, shorter rest

Results

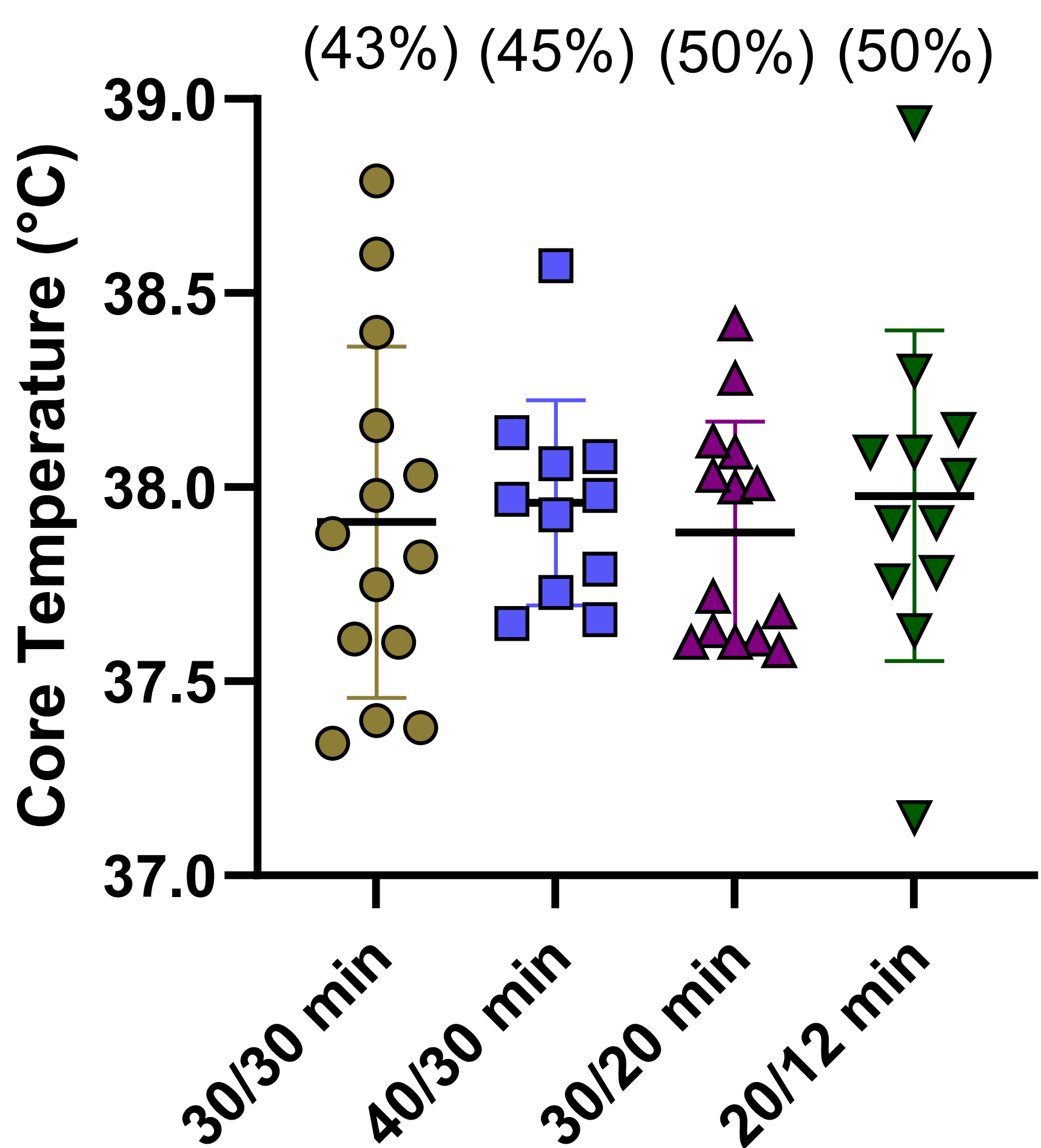


Figure 1. Peak core temperature across four W/R cycles. Participants with core temperature >38°C in parentheses.

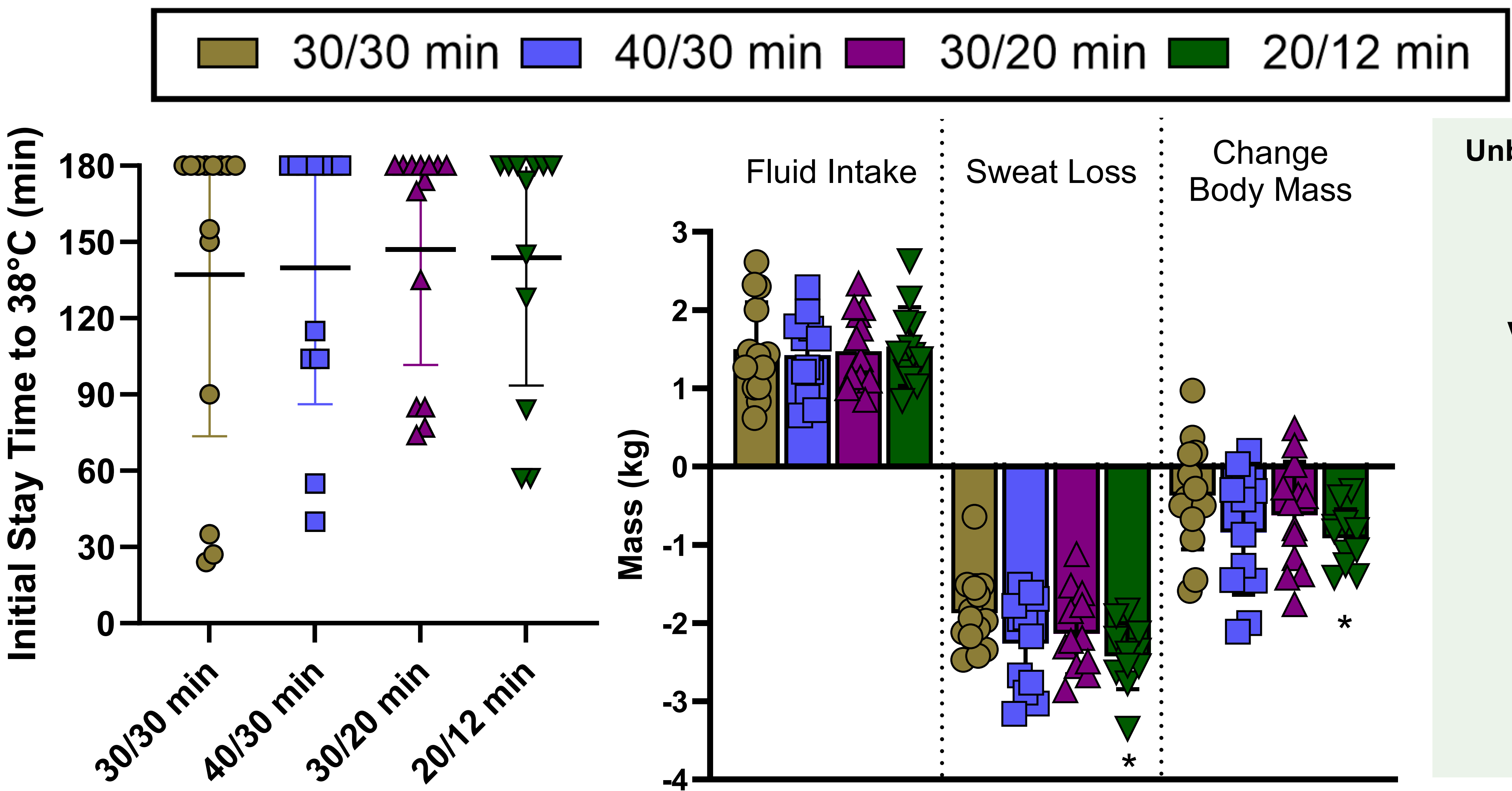


Figure 2. Initial stay time of 38°C across four W/R cycles.

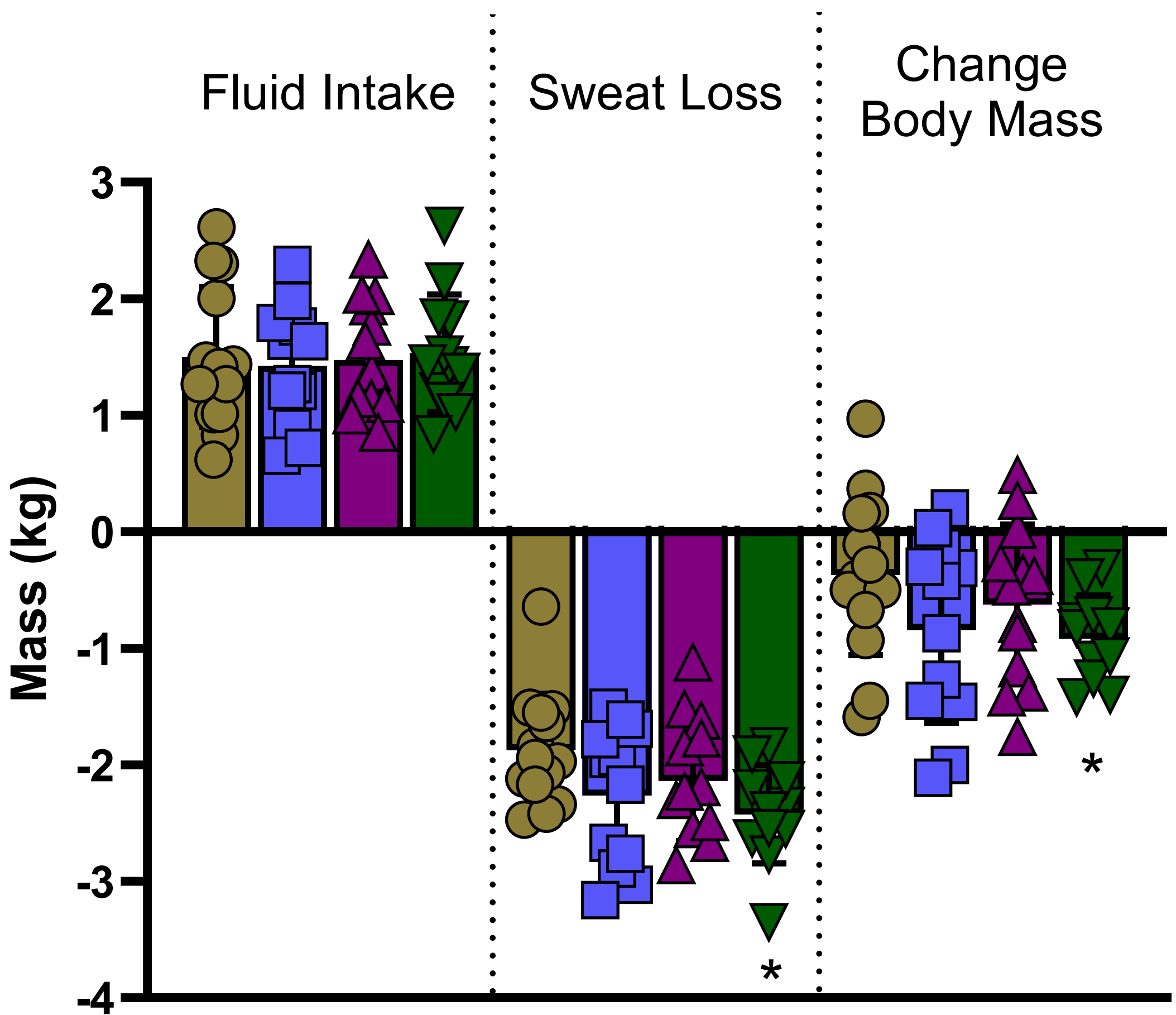


Figure 3. Water balance across four W/R cycles. *p<0.05 from 30/30 min W/R cycle.

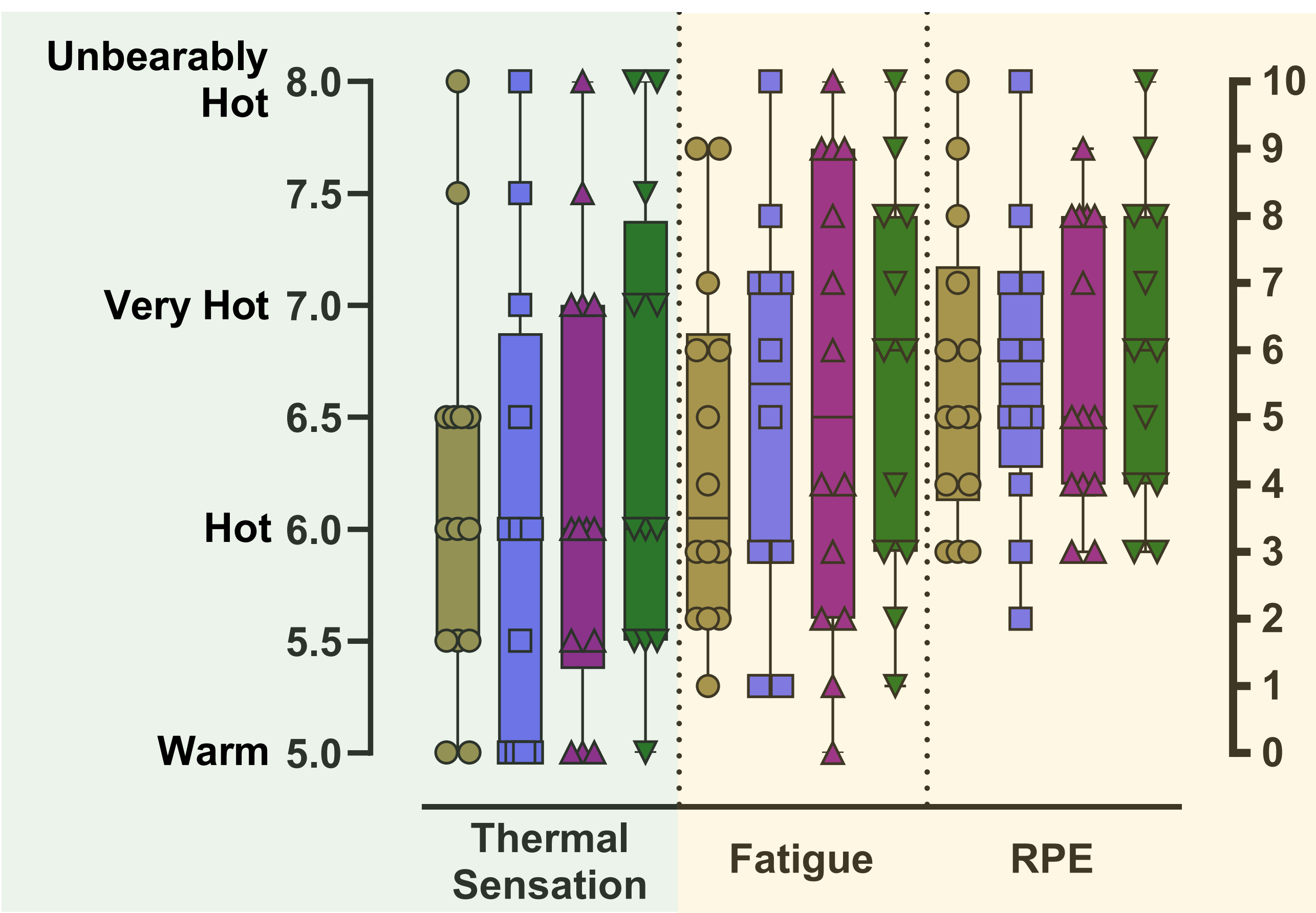


Figure 4. End of rucking perceptions across four W/R cycles. Left y-axis = thermal sensation. Right y-axis = Fatigue and Rating of Perceived Exertion (RPE).

Conclusion

All W/R cycles resulted in ≥43% of participants exceeding a core temperature of 38°C, although the duration of excessive hyperthermia was minimal
Exceeding Army heat stress guidance with a 30-min faster ruck march did not exacerbate heat strain or perceptions when fluids were readily available

