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Can the eTemp Performance Sensor Reliably Measure Mean Skin Temperature During Exercise?

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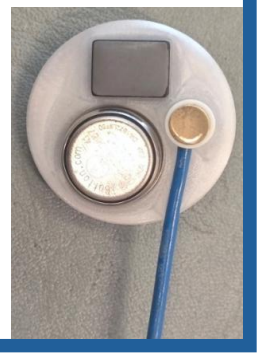
Background & Aim

- Accurate skin temperature measurement during exercise is challenging due to sweating, movement and heat flux [1,2]
- Wearable sensors are increasingly used but require validation under dynamic physiological conditions

Aim: To assess agreement between the eTemp Performance sensor and a standard wired reference (Physitemp SST-1) for measuring mean skin temperature during rest, exercise and recovery.

Methods

- Simultaneous measurement using:
  - eTemp Performance sensor
  - Physitemp SST-1 (reference)
- Protocol: rest (15min) → exercise (30min) → recovery (15min)
- Participants: n = 14 (10 male, 4 female)
- Mean Skin Temperature: Ramanathan 4-site formula [3]



Key Results

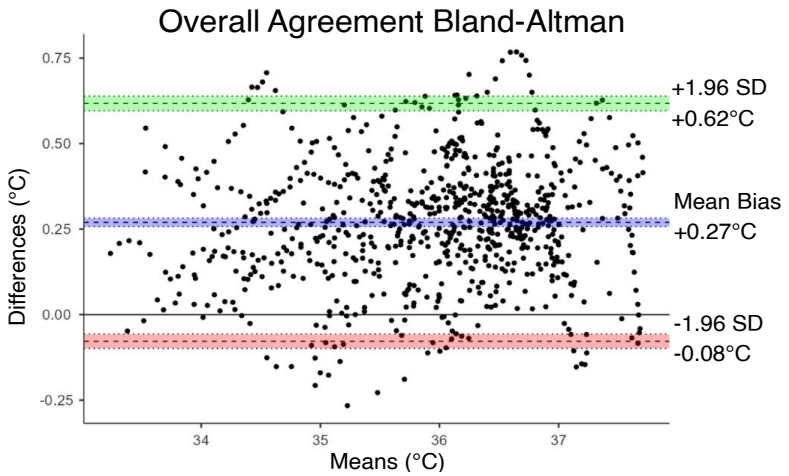


Figure 1- ***Agreement between the eTemp and Physitemp SST-1 sensors for mean skin temperature across the whole testing period (n=794) [4].***

- **Mean bias:** +0.27°C
- **Limits of Agreement:** -0.08°C to 0.62°C
- **Mean absolute error:** 0.27°C
- Good overall agreement across all stages
  - Low mean bias and limits of agreement, within commonly accepted ranges

Exercise-specific findings

- Slightly higher bias and wider limits of agreement during exercise
- No meaningful proportional bias
- Measurement error remained small and independent of absolute temperature

Discussion

- eTemp slightly overestimated skin temperature versus Physitemp
- Bias was small and acceptable for exercise monitoring [4,5]
  - Agreement consistent across rest, exercise and recovery
- Differences likely due to sensor housing and surface area
- Physitemp has lower thermal mass may enhance evaporative cooling
- Overestimation represents a conservative error for heat strain monitoring

Future Perspectives

- Validation in outdoor exercise and occupational heat exposure
- Use in conservative safety thresholds where overestimation reduces risk
- Potential application in sport, military and clinical monitoring

References

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