

Evaluation and Validity of a Predictive Equation for Measuring Core Temperature during Exercise in Heat Stress

ROBERT J. CASTRO, ALEX J. GONSALVES, EDGAR B. DOOLAN, & JOCHEN KRESSLER

Kasch Laboratory; Exercise and Nutritional Sciences; San Diego State University; San Diego, CA

Category: Masters

Advisor / Mentor: Kressler, Jochen (jkressler@sdsu.edu)

ABSTRACT

Exercising in the heat is very common yet can pose significant health risks such as heat exhaustion and heat stroke when core temperature exceeds 38°C and 40°C, respectively. However, current methods of core temperature measurement are invasive and impractical. Recent research indicates that core temperature can be predicted with two non-invasive inputs, heart rate (HR) and skin temperature. **PURPOSE:** The objective of this study was to assess the validity and reliability of this predictive equation against the direct measurement of core temperature. **METHODS:** Participants ($n = 11$) cycled in an environmental chamber (40°C, 40% humidity) at 75% of maximal HR for 45 minutes. Measurements included HR, scapular skin and core temperature, blood pressure, and rating of perceived exertion. Exercise stopped if core temperature exceeded 38.5°C for two consecutive measurements or volitional fatigue. Agreement between predicted and actual core temperature was assessed with Bland–Altman analysis. **RESULTS:** There was a low correlation ($r^2 = 0.2$) between the direct measure and predicted core temperatures. The Bland–Altman analysis for core minus predicted temperatures showed a bias of 0.14°C and limits of agreement ranging from 0.72°C to -0.45°C. In addition, a large proportion of measurements (40.5%) of the total scores had a difference in temperature greater than $\pm 0.3^\circ\text{C}$. The predictive equation overpredicted as mean temperature increased from the average core temperature (37°C). **CONCLUSION:** Based on the narrow temperature range the human body must stay within to prevent heat-related issues, we've concluded that the predictive equation lacks sufficient validity and reliability.