TACSM Abstract

Comparing the Validity of Five Different Resting Metabolic Rate Prediction Equations in Active Women

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Category: Doctoral

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ABSTRACT

Resting metabolic rate (RMR) prediction equations are often used in settings where the measurement of RMR through indirect calorimetry (IC) may not be feasible. However, commonly used equations developed in less active populations may not accurately predict RMR in active individuals who have a higher proportion of lean tissue. **PURPOSE**: The purpose of this study was to determine the validity of RMR prediction equations by Harris & Benedict (1918), Cunningham (1980 and 1991), DeLorenzo (1999), and ten Haaf & Weijs (2014) against a criterion model (IC) in a population of active women. **METHODS**: Forty-one generally healthy women were included in this analysis. All participants self-attested to engaging in two or more hours of moderate- to vigorous-intensity exercise per week, of any modality, for the past three months or more. Participants abstained from all food, fluid, caffeine, and alcohol for at least 8 hours and from exercise for at least 24 hours prior to their visit. Body fat percentage (BFP) was obtained via dual-energy x-ray absorptiometry (DXA; Lunar iDXA, General Electric). RMR was measured using a metabolic cart (Parvo Medics TrueOne 2400) with ventilated hood. After 30 minutes of supine rest, gas was collected for a minimum of ten minutes with the first five minutes discarded. Data were collected until a coefficient of variation <10% for VO_2 and VCO_2 and <5% for RMR was achieved, with the average of the final five minutes used. Total error (TE) was calculated as the root mean square error between the estimate of each prediction equation and that obtained via IC. Constant error (CE) was calculated as the average difference between the estimate of each equation and that obtained via IC. Equivalence was assessed using two one-sided t-tests (TOST) assuming a ±100-kcal region of equivalence. Finally, Bland-Altman plots were generated for each equation and the slope and statistical significance of the linear regression line reported. **RESULTS**: Participants (mean ±SD age: 21.7±3.7 years, height: 164.4±6.1 cm; weight of 64.8±9.3 kg; BFP: 33.2±5.9%) had an average measured RMR of 1624±191 kcal/day. In the entire sample, TE ranged from 143 (ten Haaf & Weijs) to 353 (Cunningham 1991) kcal/day. CE ranged from -324±142 (Cunningham 1991) to +25±145 (DeLorenzo) kcal/day. Only the DeLorenzo and ten Haaf & Weijs equations were statistically equivalent via TOST. For all five equations, the slope of the Bland-Altman plot was negative and significantly different from zero (i.e., showed negative proportional bias), with most equations overestimating RMR in those with lower measured values and underestimating RMR in those with higher measured values. **CONCLUSION:** Equations developed more recently and in active populations (i.e., DeLorenzo 1999 and ten Haaf & Weijs 2014) exhibited greater validity overall. Both the DeLorenzo (1999) and ten Haaf & Weijs (2014) equations may be more suitable to use when predicting RMR in a population of generally healthy, active young women.