

The Effect of Body Composition Methodology on Resulting Energy Availability Assessments

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ABSTRACT

Energy availability (EA) is defined as the total daily energy available to an individual after accounting for that expended during exercise and standardized to fat-free mass (FFM). Generally, EA values <30 kcal/kg FFM/day are considered “low” and have been associated with deleterious effects on reproductive and hormonal health in females. However, it is unclear whether the method used to estimate FFM influences the resulting EA values to a degree that may affect interpretation and clinical decision-making. **PURPOSE:** To determine the effect of FFM values derived from various methods of body composition assessment on the resulting range and interpretation of EA values. **METHODS:** Four EA estimates were generated in 38 healthy females (mean \pm SD age: 25.6 \pm 6.2 years; height: 163.6 \pm 7.4 cm; weight: 64.7 \pm 13.8 kg) using different combinations within a reasonable range of lower and higher (25 and 35 kcal/kg bodyweight, respectively) energy intake values and lower and higher (3.5 and 7 kcal/kg bodyweight, respectively) exercise energy expenditure values. Resulting estimates were then standardized to FFM values from air displacement plethysmography (ADP), bioelectrical impedance spectroscopy (BIS), and bioelectrical impedance analysis (BIA) from both a research-grade (multi-frequency) and consumer-grade (dual-frequency) device. Resulting EA values were then compared to those using FFM from dual-energy x-ray absorptiometry (DXA). Each estimate was assigned to one of three EA “zones”: “low” (<30 kcal/kg FFM), “reduced” (30-44.9 kcal/kg FFM), or “adequate” (\geq 45 kcal/kg FFM). Individual EA estimates that were in different zones when compared between two devices were considered discordant. **RESULTS:** When compared to DXA-derived estimates, EA values were discordant in up to 13-16% of individuals depending on body composition method used. Discordant values were generally more common in the plots assuming higher (35 kcal/kg bodyweight) energy intake values and were most likely to be considered “adequate” using DXA-derived FFM versus “reduced” using alternate methods. **CONCLUSION:** EA estimates are generally robust to the method of body composition assessment used. However, divergent interpretations may occur in a small minority of individuals in which alternate methods may provide lower EA values than DXA.