Evaluation of Leg-to-Leg BIA in Assessing Body Composition in High-School Aged Males and Females

Jessica L. Unick, Alan C. Utter, Sean Schumme, Tim C. McInnis

Abstract

Purpose: The present investigation was conducted to evaluate the accuracy of the Tanita 300WA leg-to-leg bioelectrical impedance analyzer (BIA) for measuring body composition when compared to the criterion, hydrostatic weighing (HW), in an American high-school (HS) aged population. Methods: Body composition was determined in 77 HS aged students: 40 males (mean ± SD, age: 14.9 ± 1.7 years) and 37 females (mean ± SD, age: 15.5 ± 1.9 years) comparing skinfolds (SK) and BIA measurements to HW. For all methods, body density (Db) was used to calculate percent body fat (%BF) using age and gender specific equations. Results: Among the males, there were no significant differences found in %BF between BIA (14.1 ± 2.8%) and HW (14.9 ± 9.1%). A significant correlation in fat-free mass (FFM) was found between these two methods (r = 0.96, p < 0.001) and the standard error of estimate (SEE) for FFM was 2.93 kg. At the group level, the Tanita 300WA leg-to-leg BIA system (r = 0.78, p < 0.001) and the SEE for FFM was 3.28 kg. In females, a significant difference (p < 0.001) was found between these two methods (r = 0.96, p < 0.001) and the SEE for FFM was 3.38 kg. Conclusions: The correlation in FFM between these two methods was lower for FFM was 3.28 kg. In females, a significant difference (p < 0.001) was found comparing skinfolds (SK) and BIA measurements to HW. For all tests, statistical significance was accepted at p < 0.05.

Methods

• Forty male and 37 female subjects (ages 13-18) participated in this study.
• To ensure normal initial hydration status, the following suggested guidelines by the American College of Sports Medicine were used: 1) no eating or drinking within four hours of the test 2) no vigorous exercise within 12 hours 3) no caffeine or alcohol consumption within 12 hours, 4) no diuretic ingestion within seven days, and 5) routine urination within thirty minutes of the test.

Introduction

The assessment of body composition is one way to determine if a child is at an increased risk of disease and/or intervention treatments are needed.

The leg-to-leg (LL) BIA system is a quick, simple and portable method for assessing body composition and it has also been suggested that this device may be useful in an educational institution by providing a simplified approach for assessing body composition in children and adolescents (Otte, et al. 2005).

Previous investigations that have examined body composition in adolescent populations using LL-BIA systems have found differing results.

- Luzar et al (2001) found that two separate LL-BIA systems underestimated FM (-1.7 kg, p < 0.001) and found large inter-individual variability in FM in 53 overweight/obese Chinese adolescents.

- La et al (2003) found similar results in that there were large limits of agreement for FM (4.47 kg to 7.43 kg) and %BF (11.10% to 105.0%) when comparing the Tanita TBF-401 to DEXA in 64 overweight and obese Chinese children (aged 10-17 years).

- Tyrrell et al (2001) found that LL-BIA correlated to DEXA in the estimation of FFM (+0.96) and %BF (r=0.94) in European children 3-16 years old when using their own regression equation.

- To our knowledge, no previous research has been completed evaluating the validity of the leg-to-leg BIA system in healthy high-school aged American children.

The purpose of the present investigation was to evaluate the validity of the Tanita 300WA leg-to-leg BIA in measuring body composition when compared to HW in an American high-school aged male and female population.