TACSM Abstract

Comparison of Bioimpedance Analysis and Dual Energy X-Ray Absorptiometry in Division III Football Athletes

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ABSTRACT

Body composition is an integral component of physiology and pathology, as well as an indication of how the musculoskeletal system changes over time in response to training and/or nutritional modifications. Two common methods of estimating body composition include bioelectrical impedance analysis (BIA) and dual-energy X-ray absorptiometry (DXA). There is a debate regarding the agreement between these two methods, and it is thought that the population being tested may influence the similarity of estimates obtained by these technologies. Limited data comparing these two methodologies in athletic populations are available. **PURPOSE:** The purpose of this study was to take examine the agreement between BIA and DXA for estimates of body mass (BM) and body fat percentage (BF%). **METHODS**: Forty-three division III football players (mean ± SD; age: 19.9 ± 1.7 y; height: 179.7 ± 7.4 cm; BM: 100.3 ± 21.9 kg; DXA BF%: 21.8 ± 7.1%) reported to the Human Performance Lab after abstaining from exercise for the previous 24 hours and fasting from food/beverages (except water) for 12 hours. After an initial height assessment, BM and BF% were assessed using both BIA (Inbody 770) and DXA (Hologic Horizon W). BIA was performed in the standing position using an 8-point electrode arrangement. The electrode panels were placed at the hands and feet. DXA was performed with the participants in a supine position and hips internally rotated. Differences in BM and BF% from DXA and BIA were compared using paired-samples t-tests, Bland-Altman analysis, and validity metrics. **RESULTS**: BM detected by DXA was significantly lower than BM obtained from the BIA scale (DXA: 98.2 ± 20.8 kg, BIA: 100.3 ± 21.9 kg; $p < 0.001$). Additionally, Bland-Altman analysis indicated significantly greater underestimation of BM by DXA in individuals with higher BM values (slope: 0.053; $p < 0.001$). BF% did not significantly differ between DXA and BIA (DXA: 21.8 ± 7.1%, BIA: 21.8 ± 8.4%; $p = 0.86$). However, Bland-Altman analysis indicated significant proportional bias, with underestimations of BF% by BIA in leaner individuals but overestimations of BF% in those with higher BF% (slope: 0.176; $p = 0.005$). The total error and 95% limits of agreement for BF% were 3.2% and ± 6.4%, respectively. **CONCLUSION**: This study demonstrates that although DXA and BIA exhibit good group-level agreement for BF%, several inconsistencies between these methodologies are present. Estimates of BM differed between technologies. Additionally, proportional bias for BF% was observed indicating different levels of agreement between DXA and BIA depending on the body fat of the individuals being tested. Based on these findings, caution should be employed when interpreting data from DXA and BIA assessments in athletic populations.