Cross-sectional and Longitudinal Relationships Between Skinfold Thicknesses Obtained by Ultrasonography and Body Fat Estimates Produced by Dual-energy X-ray Absorptiometry

JACOB J. GREEN, ROBERT W. SMITH, PATRICK S. HARTY, MATTHEW T. STRATTON, CHRISTIAN RODRIGUEZ, SARAH J. WHITE, ABEGALE D. WILLIAMS, BAYLOR A. JOHNSON, JACOB R. DELLINGER, MARQUI L. BENAVIDES, MADELIN R. SIEDLER & GRANT M. TINSLEY

Energy Balance & Body Composition Laboratory; Department of Kinesiology & Sport Management; Texas Tech University; Lubbock, TX

Category: Masters

Advisor / Mentor: Tinsley, Grant (grant.tinsley@ttu.edu)

ABSTRACT

Ultrasonography (US) and dual-energy X-ray absorptiometry (DXA) are frequently used to assess body composition. Although sometimes compared cross-sectionally, their agreement longitudinally requires further exploration. **Purpose:** The purpose of the present study was to examine the cross-sectional and longitudinal relationships between total and segmental raw skinfold thicknesses obtained by US and total and segmental body composition estimates produced by DXA over the course of an overfeeding study. **Methods:** Twenty healthy, resistance-trained males (mean ± SD; age: 22.0 ± 2.6 years; height: 179.1 ± 7.0 cm; body mass: 74.8 ± 11.5 kg, body fat: 17.5 ± 4.5%) completed a 6-week intervention that included 3 weekly sessions of supervised resistance training (RT) and the consumption of a hypercaloric diet. Before and after the 6-week intervention, body composition was assessed using DXA and B-mode US on seven measurement locations specified by Jackson and Pollock. Relationships between DXA and US variables were examined using Pearson's product-moment correlation (r) and Lin's concordance correlation coefficient (CCC). Additional validity metrics were also calculated. **Results:** Cross-sectionally, correlations were observed between whole body DXA fat mass (FM) and total subcutaneous tissue thickness ($r = 0.88$ [95% CI: 0.72, 0.95]). Longitudinally, a significant correlation was observed between total DXA FM changes and total subcutaneous thickness changes ($r = 0.49$, CCC = 0.38). Correlations of similar magnitudes were observed for the upper body and trunk. In contrast, DXA FM changes were unrelated to changes in subcutaneous tissue thicknesses for the lower body and arms. Cross-sectionally, 2-compartment (2C) FM estimates from US and DXA FM were correlated ($r = 0.91$, CCC = 0.83). However, the mean difference between these FM estimates was 2.2 ± 2.1 kg (mean ± SD), and the total error (TE) between DXA and US FM estimates was 2.97 kg. Longitudinally, a weaker correlation was observed than that cross-sectionally ($r = 0.47$, CCC = 0.33), and the TE between DXA and US FM changes was 1.80 kg. **Conclusion:** Results from this study showed generally good agreement between DXA and US cross-sectionally, but a much weaker relationship longitudinally. In addition, DXA FM changes were unrelated to changes in subcutaneous tissue thicknesses for the lower body and arms, indicating better agreement when examining the upper body as compared to the lower body. Future research with US or calipers should report raw skinfold thicknesses, and the differences between common body composition estimation techniques should be considered when examining longitudinal body fat changes.