

BodyMetrix System vs. Skinfold Caliper

Conducted at: Pepperdine University (Malibu, CA)

Conducted by: Rose Drew, Jamie Lyon, & Holden MacRae, Department of Sports Medicine

Introduction: Skinfold thickness measures obtained with calipers for determination of body composition (BC) are quite accurate when performed by a trained technician. However, skinfold determination of BC is an estimate or prediction of body composition, not an absolute measurement. Ultrasound imaging is now routinely used in a variety of clinical settings, and when used to assess BC, is highly correlated with X-ray computed tomography (CT Scan), an expensive procedure and one in which the high radiation dose limits its use for regular body composition measurements. The primary objective of this study was to assess BC via calipers, and to compare those measures with BC obtained by ultrasound imaging using the BodyMetrix System (IntelaMetrix, CA).

Methods: 24 women athletes (± 1.3 yr, ± 8.7 kg, ± 9.0 cm) and 15 male athletes (± 1.3 yr, ± 8.7 kg, ± 9.0 cm) participated in the study. Following random assignment to either skinfold thickness (SF) or ultrasound measures (BX), SF was made in duplicate at seven sites by trained technicians (TEM 0.226 ± 0.1 mm; % TEM 1.57 ± 0.5). BX at these same sites was measured using the BodyMetrix System (one-dimensional imaging). Comparisons between the two methods were made using interclass correlation.

Results: Sum of SF and BX respectively for women was 94.8 ± 22.7 mm and 94.5 ± 20.4 mm (change in mean = -0.87 , 95% CI = $-4.08 - 2.34$), and for men was 77 ± 6.9 mm and 76.3 ± 6.5 mm (change in mean = -0.70 , 95% CI = $-2.33 - 2.94$). % body fat for SF and BX respectively for women was $13.6 \pm 3.4\%$ and $13.6 \pm 3.2\%$ (change in mean = -0.10 , 95% CI $-0.58 - 0.37$), and for men was $10.7 \pm 4.2\%$ and $10.6 \pm 4.1\%$ (change in mean = -0.10 , 95% CI $-0.35 - 0.14$). Interclass r for sum of skinfolds for women was 0.947 (95% CI = $0.868-0.979$), and for men was 0.991 (95% CI = $0.977-0.966$). Intraclass r for % body fat for women was 0.950 (95% CI = $0.876-0.980$), and for men was 0.991 (95% CI = $0.978-0.997$).

Conclusion: Ultrasound imaging using the BodyMetrix System reliably measures body composition in young athletic men and women whose body fat percentage is low.

BodyMetrix System vs. Skinfold Caliper vs. Underwater Weighing

Conducted at: Appalachian State University (Boone, NC)

Conducted by: Marion Hager & Alan Utter, Department of Health, Leisure, and Exercise Science

Introduction: A study was performed at Appalachian State University by Professor Alan Utter to compare the BodyMetrix System ultrasound technology (ULTRA) to hydrostatic weighing (HW) and skinfold calipers (SF). The results summarized in the paragraph below illustrate that ultrasound is an accurate technique for measuring body composition.

Methods: Body composition was determined by ULTRA, HW, and 3-site SF in 70 HS wrestlers (Mean \pm SD, age: 15.5 ± 1.5 , height 1.60 ± 0.08 m, body mass 65.8 ± 12.7 kg). For all methods, body density (Db) was converted to percent body fat (%BF) using the Brozek equation. Hydration state was quantified by evaluating urine specific gravity.

Results: There were no significant differences for estimated FFM between ULTRA (57.2 ± 9.7 kg) and HW (57.0 ± 9.9 kg); however SF (54.9 ± 8.8 kg) was significantly different than HW. The standard errors of estimate for FFM with HW as the reference method were 2.40 kg for ULTRA and 2.74 kg for SF. Significant correlations were found for FFM between HW and ULTRA ($r = 0.97$, $P < 0.001$), and between HW and SF ($r = 0.96$, $P < 0.001$). A systematic bias was found for SF, as the difference between SF and HW significantly correlated with the FFM average of the two methods ($r = -0.38$, $P < 0.001$). This systematic bias was not found for ULTRA ($r = -0.07$).

Conclusion: This study demonstrates that ULTRA provides similar estimates of FFM when compared to HW in a heterogeneous HS wrestling population during a hydrated state. ULTRA should be considered as an alternative field-based method of estimating the FFM of HS wrestlers.

Ongoing Studies

- BodyMetrix System & Muscle Mass
University of Oklahoma—Norman, OK
- BodyMetrix System vs. DXA
University of Rome—Rome, Italy
- Using BodyMetrix System in a Multi-year Study on Childhood Obesity
University of Bremen—Bremen, Germany