Tracking Resistance Training-Induced Changes in Body Composition via 3-Dimensional Optical Scanning

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ABSTRACT

Tracking changes in body composition is potentially useful for monitoring health status, disease risk, and results of lifestyle interventions. In active individuals, evaluating body composition changes over time may provide useful information regarding the effectiveness of nutrition and exercise programs. **PURPOSE**: The purpose of this study was to compare changes in body composition estimates obtained from a 4-compartment (4C) model and a 3-dimensional optical (3DO) scanner in resistance-trained males. **METHODS**: Twenty resistance-trained males underwent assessments via 4C and 3DO before and after 6 weeks of supervised resistance training plus overfeeding with a high-calorie protein/carbohydrate supplement. To generate the 4C model, tests were performed using dual-energy x-ray absorptiometry, air displacement plethysmography, and bioimpedance spectroscopy. Changes in fat mass (ΔFM) and fat-free mass (ΔFFM) detected by 3DO were compared with the reference 4C model using paired-samples t-tests, Bland-Altman analysis, equivalence testing, and evaluation of validity metrics. **RESULTS**: Both ΔFM (mean ± SD: 4C: 0.6 ± 1.1 kg; 3DO: 1.9 ± 1.9 kg) and ΔFFM (4C: 3.2 ± 1.7 kg; 3DO: 1.9 ± 1.4 kg) differed between methods ($p < 0.002$). The correlation (r) for ΔFM was 0.49 (95% confidence interval [CI]: 0.06 to 0.77) and was 0.42 (95% CI: -0.03 to 0.73) for ΔFFM. The total error for ΔFM and ΔFFM estimates was 2.1 kg. ΔFFM demonstrated equivalence between methods based on a ± 2 kg (~62% of 4C change) equivalence interval, whereas ΔFM failed to exhibit equivalence even with a 100% equivalence interval. Proportional bias was observed for ΔFM but not ΔFFM. **CONCLUSION**: Our data indicate that changes in FM and FFM detected by a 3D scanner did not exhibit strong agreement with changes detected by a 4C model. However, within the context of our study, agreement in FFM changes was superior to agreement in FM changes based on the results of equivalence testing and lack of proportional bias in FFM changes. Therefore, depending on the level of accuracy needed, the error in FFM changes observed for the 3D scanner may be potentially acceptable for some applications. Future research should investigate the utility of 3D scanners for monitoring changes in body composition and anthropometric variables in healthy and clinical populations, as well as investigate novel body phenotypes that may be associated with disease risk or health status.