The Effects Of Acute Resistance Exercise On Bioelectrical Impedance Analysis Measures Of Body Composition

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ABSTRACT

Bioelectrical Impedance Analysis (BIA) is a popular method of body composition assessment; however, validity of BIA is thought to be highly dependent on adhering to pre-test criteria, including the abstinence from exercise prior to testing. PURPOSE: The purpose of this study was to determine if acute, localized resistance exercise (RE) compromises the validity of BIA total body composition estimates. METHODS: In a crossover design, 16 healthy, resistance trained adults, including 7 females (age: 22.7 ± 1.9 y; height: 165.4 ± 8.4 cm; body mass: 62.1 ± 10.9 kg; body fat: 25.9 ± 7.3%) and 9 males (age: 24.3 ± 3.6 y; height: 179.1 ± 5.1 cm; body mass: 88.0 ± 7.6 kg; body fat: 18.4 ± 6.6%) completed three conditions in a randomized order: lower-body resistance exercise (RELOWER), upper-body resistance exercise (REUPPER), and rest (REST). The RE protocol consisted of a warm-up consisting of 2 sets of 12-15 repetitions of 3 upper-body exercises (upper) or 3 lower-body exercises (lower), followed by 5 sets of 10 repetitions per exercise, with 1-minute rest intervals. The REST condition involved no exercise. BIA (InBody 770) was completed immediately pre and post-exercise and at 15-, 30-, and 60-minutes post-exercise. BIA estimates of fat mass (FM) and fat-free mass (FFM) were analyzed using 3 x 5 (condition x time) analysis of variance with repeated measures, follow-up pairwise comparisons, and evaluation of the partial eta-squared (ηp²) effect sizes. RESULTS: Pre-exercise FM and FFM did not differ between conditions (0.1 to 0.4 kg; p > 0.4 for all). Condition x time interactions were present for both FM (p<0.0001, ηp² =0.48) and FFM (p<0.0001, ηp² =0.45). Pairwise comparisons indicated that FM was lower in the REUPPER condition as compared to both REST (1.5 kg; p<0.0001) and RELOWER (1.3 kg; p<0.001) conditions immediately post-exercise. These differences remained at 15-, 30-, and 60-minutes post-exercise (0.6 to 1.6 kg; p≤0.01 for all). Pairwise comparisons also indicated that FFM was higher in the REUPPER condition as compared to both REST (1.3 kg; p<0.001) and RELOWER (0.9 kg; p<0.01) conditions immediately post-exercise. These differences remained at 15- and 30-minutes post-exercise (0.8 to 1.3 kg; p≤0.02 for all). At 60-minutes post-exercise, FFM remained higher in REUPPER as compared to REST (1.0 kg; p=0.005) but no longer differed between REUPPER and RELOWER (0.4 kg; p=0.44). CONCLUSION: These data indicate that acute upper-body RE compromises the validity of BIA total body composition estimates compared to REST and lower-body RE and reinforces exercise abstinence as a pre-test consideration. Further exploration of the effects on segmental body composition data is warranted.