Influence of Acute Water Ingestion on Bioelectrical Impedance Analysis Estimates of Body Composition

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ABSTRACT

Body composition estimation is a significant component of health and fitness assessments. Multi-frequency bioelectrical impedance analysis (MFBIA) uses multiple electrical frequencies that travel through body tissues in order to estimate fluid content and body composition. Prior to body composition assessments, it is common to implement a wet fast (i.e., a fasting period that allows water intake); however, the influence of a wet fast as compared to a dry fast (i.e., disallowing water intake) is relatively unknown. **PURPOSE**: To determine the effects of acute water consumption on MFBIA body composition estimates. **METHODS**: A randomized crossover study was conducted in 16 adults (8 F, 8 M; age: 22.0 ± 2.9 y; height: 173.6 ± 9.9 cm; weight: 74.3 ± 21.6 kg; body mass index: 24.6 ± 4.7; body fat % [BF%]: 16.7 ± 8.1%). On two occasions, participants reported to the laboratory after an overnight food and fluid fast. After a baseline MFBIA assessment, participants either consumed 11 mL/kg of bottled water (W condition) or consumed no fluid as the control (CON condition). The 11 ml/kg dose of water corresponded to absolute intakes of 531 to 1360 mL. After the water consumption time point, MFBIA tests were performed every 10 minutes for one hour. Participants stood upright for the entire research visit. MFBIA estimates of body mass (BM), fat mass (FM), fat-free mass (FFM), and BF% were analyzed using 2 x 7 (condition x time) analysis of variance with repeated measures, follow-up pairwise comparisons, and evaluation of the partial eta-squared (η_p^2) effect sizes. **RESULTS**: No variables differed between conditions at baseline. Condition x time interactions were present for all variables (BM: $p<0.0001$, $\eta_p^2=0.89$; FM: $p=0.0008$, $\eta_p^2=0.30$; BF%: $p=0.005$, $\eta_p^2=0.23$) except FFM ($p=0.69$, $\eta_p^2=0.03$). Follow-up testing indicated that BM was ~0.6 kg higher in W as compared to CON at all post-baseline time points ($p<0.01$). FM was ~0.7 to 1.0 kg higher in the W condition as compared to CON at all post-baseline time points ($p<0.0001$). Correspondingly, BF% was 0.9 to 1.1% higher in W as compared to CON at all post-baseline time points ($p<0.01$). A time main effect indicated that FFM estimates were ~0.4 to 0.6 kg lower than baseline beginning at 30 minutes after the water ingestion time point ($p=0.002$, $\eta_p^2=0.32$), regardless of condition. **CONCLUSION**: Up to one hour after ingestion, acute water intake was exclusively detected as increased FM by MFBIA. This contrasts with the common belief that ingesting water prior to bioimpedance tests would result in inflated FFM and decreased BF%. Since body composition estimates never returned to baseline within the hour after water ingestion, it is not clear how long this effect would persist. These results suggest acute water ingestion can produce an inflation of MFBIA body fat estimates for at least one hour. These results indicate that water intake during fasting periods should be considered as part of pre-assessment standardization.