TACSM Abstract

Bias Varies for Bioimpedance Analysis and Skinfold Technique when Stratifying Collegiate Male Athletes Fat-free Mass Hydration Levels

MISAEL DUQUE[1], RONALD L. SNARR[2], GREG A. RYAN[2], KYUNG-SHIN PARK[1], BRETT S. NICKERSON[1]

[1] Exercise Physiology Laboratory; College of Nursing and Health Sciences; Texas A&M International University; Laredo, TX
[2]Department of Health Sciences & Kinesiology; Georgia Southern University; Statesboro, GA

Category: Undergraduate

Advisor / Mentor: Nickerson, Brett (brett.nickerson@tamiu.edu)

ABSTRACT

Bioelectrical impedance analysis (BIA) and skinfold (SF) techniques are commonly used to estimate body composition in athletic settings. Both methods are based upon a 2-compartment (2C) model approach, which assumes the hydration of fat-free mass (FFM) is constant (73.80%). Deviations from assumed constants such as FFM hydration have previously been observed in athletes. However, the magnitude of error associated with deviations in FFM hydration are scarce. **PURPOSE:** The purpose of this study was to evaluate the accuracy of BIA- and SF-based body fat percentage (BF%) estimates in collegiate athletes when stratifying FFM hydration levels. **METHODS:** FFM hydration levels for the entire sample ranged from 64.55–73.84%. Therefore, athletes were analyzed as a whole ($FFM\text{-}Hydration_{ALL}$: n=63) and at the FFM hydration levels of 64.00-68.99% ($FFM\text{-}Hydration_{L1}$: n=37) and 69.00-74.00% ($FFM\text{-}Hydration_{L2}$: n=26). A 3-compartment model utilizing air displacement plethysmography for body volume and bioimpedance spectroscopy for total body water was employed in order to determine the accuracy of BIA and SF for the 3 separate groups. **RESULTS:** The results of this study demonstrated that BIA had significant constant error (CE) when analyzed in $FFM\text{-}Hydration_{ALL}$, $FFM\text{-}Hydration_{L1,}$ and $FFM\text{-}Hydration_{L2}$ (all $p < 0.001$; CE = 5.64, 6.27, and 4.73%, respectively). However, the CE was not statistically significant for SF when evaluating $FFM\text{-}Hydration_{ALL}$, $FFM\text{-}Hydration_{L1,}$ and $FFM\text{-}Hydration_{L2}$ (all $p > 0.05$; CE = -0.04, -1.36, and 1.83%, respectively). The BIA device revealed proportional bias for $FFM\text{-}Hydration_{ALL}$ and $FFM\text{-}Hyrdration_{L1}$ (coefficients = -0.19 and -0.21; both $p < 0.05$). However, the proportional bias was not present for BIA when analyzed in $FFM\text{-}Hydration_{L2}$ (coefficient = -0.16; $p = 0.06$). Lastly, the SF method only had significant proportional bias when examined in $FFM\text{-}Hydration_{ALL}$ (coefficient = 0.17; $p = 0.02$). **CONCLUSIONS:** The current study results revealed that proportional bias for BIA is removed when FFM hydration levels approach the assumed 73.80% commonly employed in 2C models. In contrast, the large variance in FFM hydration levels did not impact the SF technique. Therefore, practitioners are encouraged to utilize the SF technique over BIA when assessing BF% in collegiate male athletes.