

## Validity of BMI-based Equations for Estimating Body Fat Percentage in Collegiate Male Soccer Players: A Three-Compartment Model Comparison

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### ABSTRACT

The ease of calculating body mass index (BMI)-based body fat percentage (BF%) is appealing in collegiate male soccer player who have limited time availability and strict training regimens. However, research has yet to evaluate whether BMI-based BF% equations are valid when compared to a criterion multi-compartment model. **PURPOSE:** The purpose of this study was to compare BMI-based BF% equations with a three-compartment (3C) model in collegiate male soccer players. **METHODS:** Sixteen NCAA Division II male soccer players (age =  $21 \pm 2$  years; ht =  $179.0 \pm 8.2$  cm; wt =  $78.0 \pm 8.5$  kg) participated in this study. BMI was calculated as weight (kg) divided by height squared ( $m^2$ ). BF% was predicted with the BMI-based equations of Jackson et al. ( $BMI_{JA}$ ), Deurenberg et al. ( $BMI_{DE}$ ), Gallagher et al. ( $BMI_{GA}$ ), and Womersley and Durnin ( $BMI_{WO}$ ). The criterion 3C model BF% was determined using air displacement plethysmography (BOD POD<sup>®</sup>) for body volume and bioimpedance spectroscopy for total body water. **RESULTS:** The BMI-based BF% equations significantly overestimated mean group BF% for all equations when compared to the 3C model (2.78 to 5.18%; all  $p < 0.05$ ). The standard error of estimate ranged from 4.18 ( $BMI_{DE}$ ) to 4.29% ( $BMI_{WO}$ ). Furthermore, the 95% limits of agreement were similar for all comparisons and ranged from  $\pm 7.96$  ( $BMI_{GA}$ ) to 8.18% ( $BMI_{JA}$ ). **CONCLUSIONS:** The results of this study demonstrate that the selected BMI-based BF% equations produce fairly small SEEs and 95% limits of agreement. However, the equations also revealed systematic error and a tendency to overestimate mean group BF% when compared to the 3C model. BMI-based equations can be used as an alternative for the individual estimation of BF% in collegiate male soccer players when a more advanced 3C model is not available, but practitioners should consider adjusting for the systematic error (e.g., decrease  $BMI_{DE}$  by 2.78%).