

Body Composition Assessment of NFL Combine Athletes: DXA, BIS and Bod Pod

Research Brief

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Abstract

Introduction: There are multiple methods of assessing body composition. The purpose of this study was to evaluate different body composition methods (i.e., Bod Pod, DXA and BIS) in college football players who were preparing for the NFL Combine.

Methods: College football players (mean \pm SD: 22.5 \pm 1.0 yr.; 184.7 \pm 8.3 cm height; 101.7 \pm 15.3 kg body weight) came to the laboratory for body composition assessment via dual-energy X-ray absorptiometry (DXA), Bod Pod and bioimpedance spectroscopy (BIS). In addition, total body water (TBW) was measured via BIS (Impedimed).

Results: There no significant differences in measures of lean body mass (LBM) ($p=0.1314$), fat mass (FM) ($p=0.2772$) or percentage body fat (BF%) ($p=0.3816$) between the three methods.

Conclusions: There were no significant differences between the DXA, Bod Pod or BIS vis a vis LBM, FM or BF%. Thus at least for group measures, all are feasible methods for assessing body composition.

Key Words: body fat, measurement, methods.

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Introduction

Body composition can be assessed in a multitude of ways. Previous work has shown the DXA, BIS and Bod Pod to be valid instruments; however, notable differences may exist.¹⁻⁶ Thus, the purpose of this study was to evaluate different body composition measures (i.e., Bod Pod, DXA and BIA) in trained college football players who were preparing for the NFL Combine.

Methods

Participants

Twenty-six college football players participated in this study (age: 22.5 \pm 1.0 years; height: 184.7 \pm 8.3 cm; body weight: 101.7 \pm 15.3 kg). Body composition was assessed via DXA, BIS and Bod Pod. All participants were asked to fast for three hours prior to being tested, as well as refrain from any type of exercise the day of. Testing took place between 1100 and 1400 h.

Protocol

Body composition was assessed via DXA, Bod Pod and BIS. All testing instruments were calibrated as per manufacturer's protocol prior to the start of testing, as well as between each subject. All participants were measured in controlled conditions. They were instructed to not exercise the day of the testing and also fast for 3 hours prior being tested. The participants wore minimal, athletic clothing, secured their hair in a cap and removed all metal jewelry.

DXA

Participants were asked to lay supine on the DXA (Hologic Horizon W; Hologic Inc., Danbury CT USA) platform and were positioned appropriately by the researcher within the borders delineated by the scanning table. Each scan took approximately seven minutes.

BIS

Bioimpedance spectroscopy (BIS; Impedimed) measures the resistance to electrical current as it moves through the body's water pool. Electrodes were placed on the participant's wrists and ankles, and they were instructed to remain still while the analysis was being conducted. Subjects were supine during the assessment which took approximately one minute.

Bod Pod

Air displacement plethysmography method (Bod Pod) was (COSMED USA, Concord CA) used as an additional tool. Subjects were instructed to wear tight fitting clothes and tuck their hair into an acrylic swim cap. At least two sets of measurements were performed on each subject. If movement was noted by the device, a third measurement was done. The Bod Pod was calibrated prior to subject evaluation and each assessment took approximately two minutes.

Statistical Analysis

Data is provided as mean \pm SD. An ANOVA was used to assess the possible differences in body composition between the DXA, Bod Pod and BIS. A $p \leq 0.05$ was considered statistically significant a priori and all statistics were analyzed using IBM SPSS 25.0 (version 25.0, IBM Inc., Armonk, NY).

Results

The participants physical characteristics were: (mean \pm SD); age 22.5 ± 1.0 years; height 184.7 ± 8.3 cm; body weight 101.7 ± 15.3 kg. There were no significant differences in measures of LBM ($p=0.1314$), FM ($p=0.2772$) or BF% ($p=0.3816$) between the three methods (Table 1 and Figure 1).

Table 1. Body Composition

	DXA	Bod Pod	BIS
LBM (kg)	83.3 ± 9.5	84.9 ± 9.0	86.2 ± 9.6
FM (kg)	17.7 ± 6.5	16.5 ± 8.0	16.3 ± 7.5
BF%	17.1 ± 3.6	15.6 ± 5.0	15.4 ± 5.1

Data are Means \pm SD

Although there were no differences between the groups, one can observe that the BIS and Bod Pod methods have a greater degree of variability (Figure 1) in comparison to the DXA.

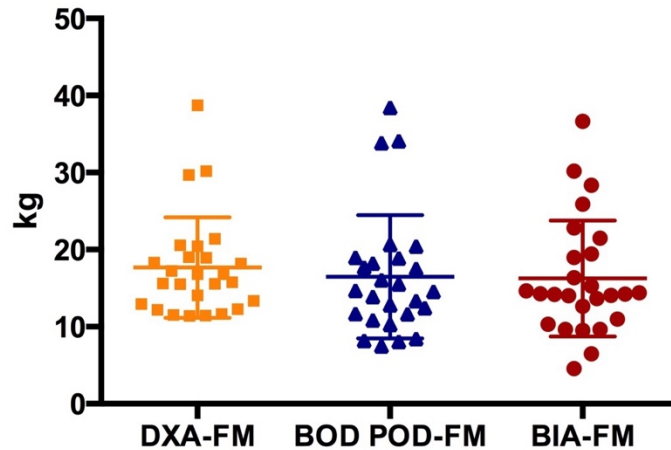


Figure 1. There was no significant difference between the three testing instruments in FM. The middle horizontal line represents the mean. The lines above and below represent the standard deviation. Each square, triangle or circle represents individual data points.

Discussion

Our data suggest that the DXA, BIS and Bod Pod provide similar body composition data in college football players. The testing instruments resulted in slight differences between individuals, however there were no significant differences between the methods when looking at the subjects as a group. The DXA is shown to have a slightly higher FM mean when compared to the BIS and Bod Pod; however, this was not statistically significant. Other work from our lab has consistently shown the DXA to have a higher body fat percentage in comparison to the Bod Pod or BIS. A recent study that compared the DXA, BIA and Bod Pod confirmed that the three methods were correlated ($p < .0001$) BIA vs DXA ($r = .84$) and BIA vs Bod Pod ($r = .74$).³ However, at times the BIS underestimated BF% and overestimated FFM, most likely due to fluctuations in TBW. The aforementioned study was performed on renal disease which could have had an additional impact on TBW.³ Furthermore, Frisard et al. found that the BIA and Bod Pod were relatively accurate for measuring body composition in comparison to the DXA in a cohort of overweight men and women.⁴ Thus at least for group measures, all are feasible methods for assessing body composition. This study was limited by the small sample size ($n = 26$), therefore generalizations should be made with caution.

Media-Friendly Summary

According to this study on college football players, there were no significant differences between the DXA, Bod Pod or BIS for assessing body composition.

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