THE UTILITY OF FAT-FREE MASS INDEX TO SCREEN FOR LOW BONE MINERAL DENSITY IN MEN AND WOMEN COLLEGIATE ATHLETES

Jennifer B. Fields[1,2], Andrew R. Jagim[2,3], Noelle Saine[2,4], and Margaret T. Jones[2,4]

[1]Department of Nutritional Sciences, University of Connecticut, Storrs, CT
[2]Frank Pettrone Center for Sports Performance, George Mason University, Fairfax,, VA
[3]Sports Medicine, Mayo Clinic Health System, Onalaska, WI
[4]Sport, Recreation, and Tourism Management, George Mason University, Fairfax, VA

BACKGROUND

- Fat-free mass index (FFMI) may be used to help to interpret measures of FFM and better evaluate athletic potential, tailor training and nutrition, support athlete recruitment, and gauge an individual's capacity for further FFM development.
- Low FFMI values may indicate athletes at risk of low energy availability, and thus may potentially serve as a non-invasive and easy screening tool for low bone mineral density (BMD).

PURPOSE

To determine the relationship between FFMI and whole-body BMD z-score in a diverse sample of NCAA Division I athletes (n=1667).

METHODS

Men (n=937) and women (n=730) DI athletes from the following sports participated:

Sport	n	Sport	n
Baseball	190	Softball	43
Basketball	300	Swimming	23
Football	218	Track & field	21
Lacrosse	277	Volleyball	125
Rowing	18	Wrestling	13
Soccer	439		

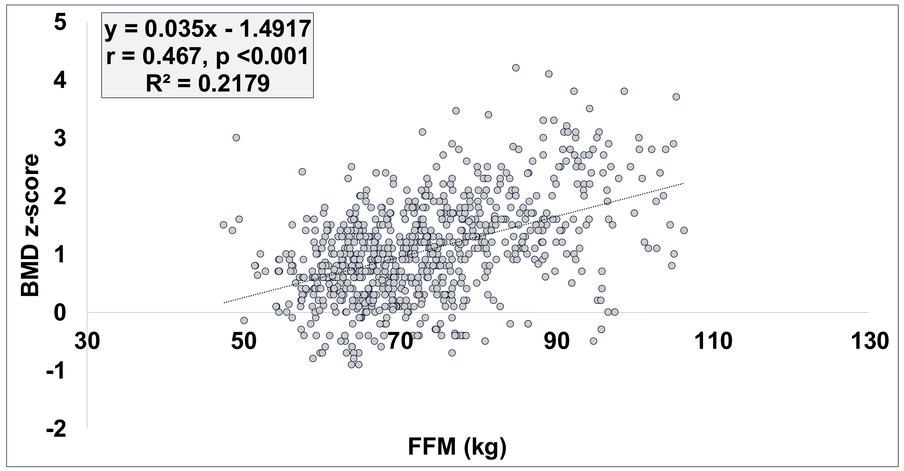
BMD z-score
FFM

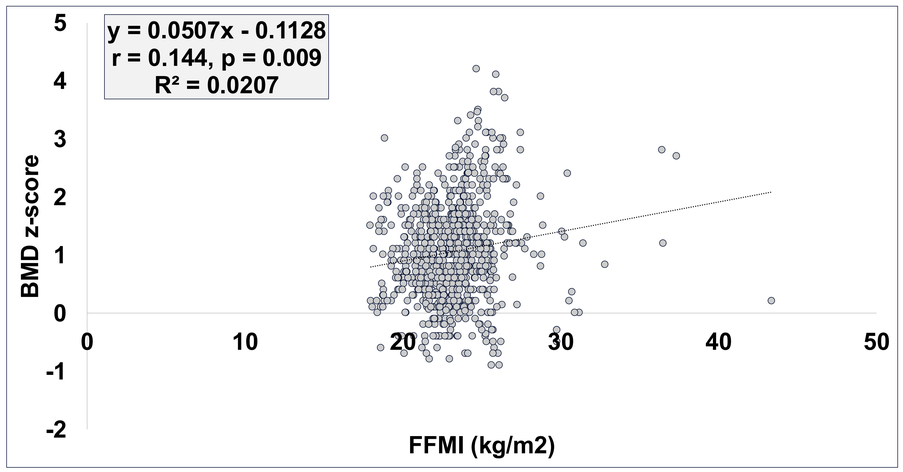
FFMI =
FFM (kg) / height (m)^2

Pearson correlations and linear regressions were used to determine associations between body composition (FFM, FFMI) and BMD z-score in men's and women's sports (p<0.05).

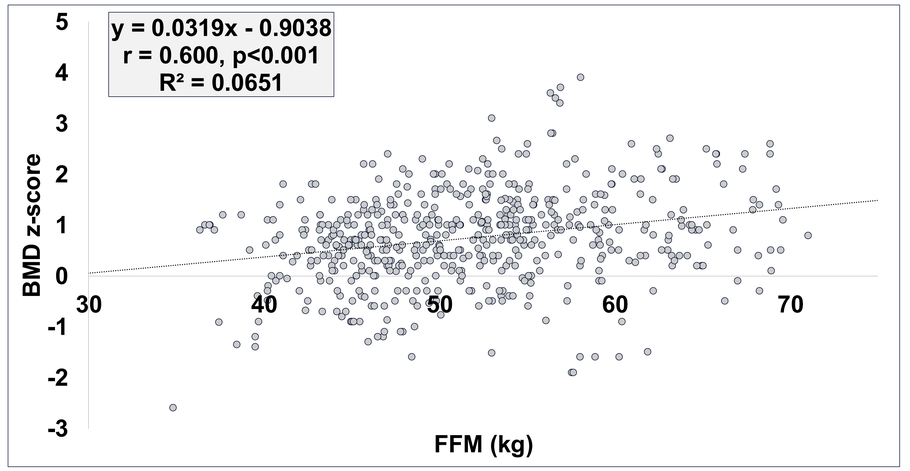
RESULTS

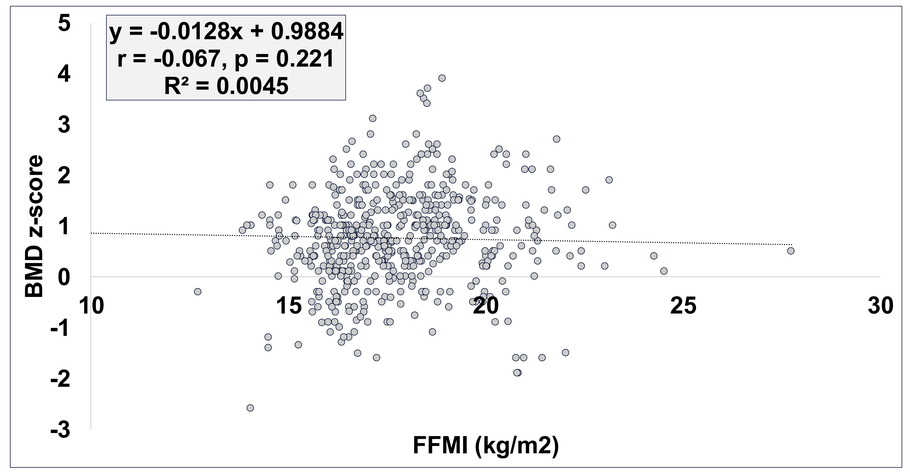
For men's sports, there was a positive, moderate relationship between FFM and BMD z-score, and a positive, very weak relationship between FFMI and BMD z-score.





For women's sports, there a positive, strong relationship between FFM and BMD z-score, and a non-significant negative, weak correlation between FFMI and BMD z-score.





After accounting for both sport (p < 0.001, t = 9.1) and sex (p < 0.001, t = 5.3), FFMI was not a significant predictor of BMD z-score (p = 0.852, R^2 = 0.080). When the model was adjusted for FFM, FFM emerged as the strongest predictor of BMD z-score (p < 0.001, t = 13.8, R^2 = 0.201).

CONCLUSIONS & PRACTICAL APPLICATION

- **BMD z-score is most influenced by FFM, followed by sport and sex. In contrast, FFMI removes the effect of height, potentially diminishing its predictive power for BMD.**
- **It is recommended that practitioners prioritize strategies that enhance FFM to support bone adaptation and sport performance.**
- **Sport-specific and sex-based differences suggest an individualized approach to training and nutritional interventions.**