Comparison of Relative Fat Mass Equation and Body Mass Index in Predicting Body Composition of Male Collegiate Athletes
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Introduction

Body Mass Index (BMI) has been widely used as a predictor of adiposity and overall health status in the general population. It has been recognized that using BMI may lead to misclassification among athletes, as BMI does not adequately account for the fat-free mass in this population.

In 2018, Woolcott and Bergman developed the Relative Fat Mass (RFM) equation as an alternative to BMI to predict body fat in the general population.

Relative Fat Mass Equation:

\[ 64 - (20 \times \text{height/waist circumference}) + (12 \times \text{sex}^*) \]

\[ \text{sex}^* = '0' \text{ for men and '1' for women} \]

Methods

Division I male collegiate athletes (n = 119) on the football (n = 46), hockey (n = 29), soccer (n = 34), and basketball (n = 10) teams underwent a variety of anthropometric and body composition assessments. Such measurements included height, weight, waist circumference, air displacement plethysmography with measured thoracic gas volume via the BOP POD.

Primary Aim: To determine whether the RFM equation was a better predictor of body fat percentage in male collegiate athletes compared to BMI or waist circumference (WC).

Secondary Aim: To determine to what extent the relationship between RFM, BMI, WC, and body fat percentage (BF%) are influenced by sport.

Results

From this sample of athletes, BMI, RFM, and WC all showed a strong significant correlation to BF%.

<table>
<thead>
<tr>
<th>Correlation to Fat</th>
<th>RFM</th>
<th>0.842*</th>
</tr>
</thead>
<tbody>
<tr>
<td>WC</td>
<td>0.877**</td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>0.855***</td>
<td></td>
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</tbody>
</table>

Examining correlation at a sport specific level, BMI showed a stronger correlation to body fat percentage in basketball and soccer than RFM did. In hockey, RFM displayed a moderate and statistically significant relationship to body fat percentage, while BMI correlation was not statistically significant. For football, both RFM and BMI had strong, statistically significant correlations to body fat percentage, even when dividing players up into their respective positions (line vs. non-line).

Conclusions

Based on these findings, the RFM equation may not offer greater accuracy compared to BMI in predicting a male collegiate athlete’s body fat percentage. There are small amounts of evidence to show that results could potentially vary based on the sport and level of competition. A limitation of this population was a large portion of the athletes were considered normal or healthy weight, therefore they were not misclassified by BMI. More research is needed to determine if this is consistent among female collegiate athletes and professional athletes. Using a variety of anthropometric and body composition methods remains necessary when assessing an athlete’s overall health status.