

The difference between body composition analysis measured by air-displacement plethysmography and dual x-ray absorptiometry depends on relative fat mass.

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Rationale

Air-displacement plethysmography (ADP) and dual x-ray absorptiometry (DXA) are regarded valid measures for body composition analysis (BCA). Reported differences between these methods are not consistent across studies with different populations. Therefore, we aim to investigate the relation between BCA by ADP and DXA in a BMI-heterogeneous population.

Methods

Body composition of strength athletes, rowers and obese older adults was assessed using ADP (Bodpod) and DXA (Hologic Discovery A). Agreement between both methods for relative fat mass (FM) and absolute fat free mass (FFM) was analyzed using bias, 95% limits of agreement (LoA) and root mean square error (RMSE). Differences were calculated as ADP – DXA. Proportional bias was assessed by regression of the difference between the methods on the mean of the methods.

Results

In total, 129 subjects (38 strength athletes, 25 rowers, 66 older adults) were included in the study. Mean [range] BMI was $28.2\text{kg}\cdot\text{m}^{-2}$ [17.9; 54.1], FM 27% [13; 50] and FFM 63kg [38; 87]. For FM the bias was 1.1% ($p=0.05$), LoA [-11.5; 13.8] and RMSE 6.5%. Regression analysis revealed $\beta=0.47$ ($p<0.001$, $R^2=0.73$) indicating proportional bias. The regression line crossed the DXA=ADP line at FM=25.6%. For FFM the bias was -3.0kg ($p<0.001$), LoA [-14.5; 8.6] and RMSE 6.6kg. The regression analysis resulted in $\beta=0.02$ ($p=0.72$, $R^2=0.00$) meaning that proportional bias was absent.

Conclusions

This study shows that BCA by ADP and DXA results in different FM and FFM in a BMI-heterogeneous population, depending on the relative fat mass. This means that ADP underestimates FM compared to DXA for FM smaller than 25.6%, while it overestimates FM for higher FM.

Keywords: body composition, fat mass