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Validity and reliability of prediction equations based on anthropometric indices to estimate body composition in athletes with an amputation

Rivera-Amézquita, L.V., Saavedra-Bernal, X., Escorcia-Gómez, D.C., Ramos-Caballero, D.M.

Universidad Del Rosario

INTRODUCTION:
Body composition needs to be monitored in athletes with amputation because these parameters are related with their performance and health. The most common method of evaluation is the prediction equations based on anthropometric indices. However, they assume body symmetry; this is not the case of athletes with amputation. Consequently, the use of anthropometry and the prediction equations might not be adequate. Therefore, the aim of this study is to explore the validity and reliability of predictive equations based on anthropometric indices to estimate body composition in athletes with unilateral lower limbs amputation, compared with the gold standard Dual-energy X-ray absorptiometry (DEXA).
METHODS:
Body composition was measured in 28 paralympic athletes with unilateral amputation using DEXA and anthropometry at the same day. Wilcoxon test was used to estimate the differences between DEXA and prediction equations. Pearson's correlation coefficient was estimated to determine the association between techniques. Absolute agreement was assessed using the Intraclass Correlation Coefficient (ICC).
RESULTS:
Statistically significant differences ($p<0,001$) were found in all of the variables between DEXA and the predictive equations. Anthropometry significantly overestimated fat mass by 3.38 Kg, fat mass index by 1.23 Kg/m2, lean mass index by 5.70 Kg/m2 and bone mass by 12.15%. Also, anthropometry significantly underestimated fat percent (by 10.6% with Slaughter, by 8.87% with Faulkner and by 13.44% with Carter equation), lean mass by 11.78 Kg and lean mass percentage by 26,72%. Only fat mass index had an excellent agreement between the equations and DEXA (ICC= 0.81). Lean mass (ICC= 0.63) and fat percent estimated with Slaughter (ICC= 0.47) and Faulkner (ICC= 0.49) had good agreement. For the other variables, this agreement was poor. Very strong correlations were found for fat mass index (r= 0.82) and lean mass (r= 0.86), and strong associations for fat mass (r= 0.79), fat percent (r= 0.7 for Slaughter, 0.64 for Faulkner and 0.79 for Carter) and lean mass index (r= 0.69 compared to Appendicular muscular mass index given by DEXA) between instruments. Other variables reported weak to moderate associations.
CONCLUSION:
Prediction equations based on anthropometric indices are valid to measure fat mass, fat mass percentage (Slaughter, Faulkner and Carter equations), fat mass index, lean mass and lean mass index compare to DEXA on athletes with lower limb unilateral amputation. But this method is not valid for the estimation of lean mass percentage, fat free mas index and bone mass percentage. The precision of the equations is excellent only for fat mass index compared to DEXA, which means that they will give biased results for the rest of the parameters. Therefore, we do not recommend to use of the traditional equations based on anthropometric indices for the estimation of body composition in athletes with unilateral lower limb amputation. Specific equations for them should be developed.

Topic: **Training and Testing**

Presentation **Poster**

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