Abstract

Introduction: In order to maintain the accuracy and reliability for both volume and mass measurements of the air displacement plethysmograph (BOD POD) on a day-to-day basis, quality assurance processes are undertaken. Given the importance of accurate estimation of body mass and body volume in determining body composition, the aim of this methodological investigation was to further examine the calibration approaches and to independently determine both the linearity and reliability of mass and volume measurements throughout the potential measurement range.
Methods: Routine calibration procedures for mass (sequentially add known masses ranging from 10-30 kg) range and volume (sequentially add known volume of balloons ranging from 49.900 L to 118.40 L) were conducted using BOD POD model 2000A (Life Measurement Inc. (LMI), Concord, CA, USA). Scatter plots between actual (known) against predicted (measurement) mass and volume values and bias and 95% limits of agreement plots were produced to illustrate the agreement, and paired *t*-tests to determine significant differences between the volumes.
Results: Results revealed that for all mass measurements between 10-30 kg the known mass and measured mass were in agreement. With respect to all volume measurements, the predicted (measured) volume differed from the actual (known) volume by as little as 0.2 L and as much as 0.9 L. There was a difference between actual (known) (mean±SD=65.1±35.9 l) and predicted (measured) (64.7±35.8 L), t9=6.35 $p<0.01$.
Conclusion: One might question the relevance of only being able to calibrate mass to a maximum of 30 kg, when body mass of adult participants certainly exceed 30 kg. Results from the adapted volume calibration trial using balloons revealed underreporting of predicted (measured) volumes by 0.4 L. However, on the basis of this methodological investigation, it is possible to be broadly confident with the linearity and reliability of both mass and volume measurement outcomes from the BOD POD involving a reasonable level of rigour.