

Estimates of percentage body fat in overweight and obese children: a comparison of dual-energy x-ray absorptiometry and air displacement plethysmography.

Duncan Radley, Paul J Gately, Carlton B Cooke, Sean Carroll, Brian Oldroyd and John G Truscott.

Objective: To compare percentage body fat (%fat) estimates from dual-energy x-ray absorptiometry (DXA) and air displacement plethysmography (ADP) in overweight and obese children.

Research Methods and Procedures: 69 children (49 male & 20 female), age (mean \pm SD) 14.0 ± 1.65 y, body mass index 31.3 ± 5.6 kg.m⁻² and %fat (DXA) $42.5 \pm 8.4\%$ participated in the study. ADP body fat content was estimated from body density (D_b) using equations devised by Siri (1961) (ADP_{Siri}) and Lohman (1986) (ADP_{Loh}).

Results: ADP estimates of %fat were highly correlated with those of DXA in both male and female subjects ($r = 0.90 - 0.93$, all $p < 0.001$; SEE = 2.50 – 3.39%). Compared to DXA estimates ADP_{Siri} and ADP_{Loh} produced significantly ($p < 0.01$) lower estimates of mean body fat content in males (-2.85%; -4.64%) and females (-2.95%; -5.15%), respectively. Agreement between ADP and DXA methods was further examined using the total error (TE) and methods of Bland and Altman (1986). TE ranged from 4.46% to 6.38% in both male and female subjects. The 95% limits of agreement were relatively similar for all %fat estimates, ranging from $\pm 6.73\%$ to $\pm 7.94\%$.

Discussion: In the present study conversion of D_b using the Siri (1961) equation led to mean %fat estimates that agreed better with that determined by DXA, compared with the Lohman (1986) equations. However, relatively high limits of agreement using either equation resulted in %fat estimates that were not interchangeable with %fat determined by DXA. Further investigation is required to establish the magnitude of error attributable to DXA, ADP body volume measurement and the conversion of D_b to %fat in overweight and obese children.