Measuring subcutaneous adipose tissue using ultrasound in children

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Background: The method for assessing adipose tissue thickness using ultrasound has been used extensively in sport medicine. However, the reliability of this method in children was not evaluated. We aim to determine the inter-observer reliability in measuring uncompressed subcutaneous adipose tissue thickness (USAT) using ultrasound, in children.

Methods:
- 40 healthy children (20 male, 20 female),
- median age 11.85 years (5.3 to 18.1)
- Median BMI SDS = -0.13 (-3.9 to 4)
- 3 observers used a Hosand BX 2000 Ultrasonic Adipometer to measure uncompressed subcutaneous adipose tissue thickness (fig 1) at 3 sites: triceps, subcapular, supraspinale.
- 1 experienced observer used the 3 sites to measure the compressed adipose thickness using a skinfold caliper.

Results: 92.8% of individual observer deviations from the mean value of the 3 observers in adipometer measurement were <3 mm.

- Analysis separated by anatomical sites showed high reliability values for triceps: $R^2=0.84$, $p=0.000$; intraclass correlation coefficient ICC=0.92 and standard error of measurement SEM=0.63. For supraspinale site: $R^2=0.82$, $p=0.000$; ICC=0.89, SEM=1.17; for subcapular the values were lower: $R^2=0.79$, $p=0.000$; ICC=0.78, SEM=1.02.
- The body fat percentage (BF%) calculated using skinfold measurements was highly correlated with BF% calculated by adipometer ($R^2=0.83$, $p=0.000$).

Conclusion: This ultrasound measurement technique can be used to accurately and reliably measure uncompressed subcutaneous adipose tissue thickness in children, for research and clinical purposes.