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 11.85years (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, subscapular, supraspinale.
- 1 experienced observer used the 3 sites to measure the **compressed adipose thickness** using a skinfold caliper.

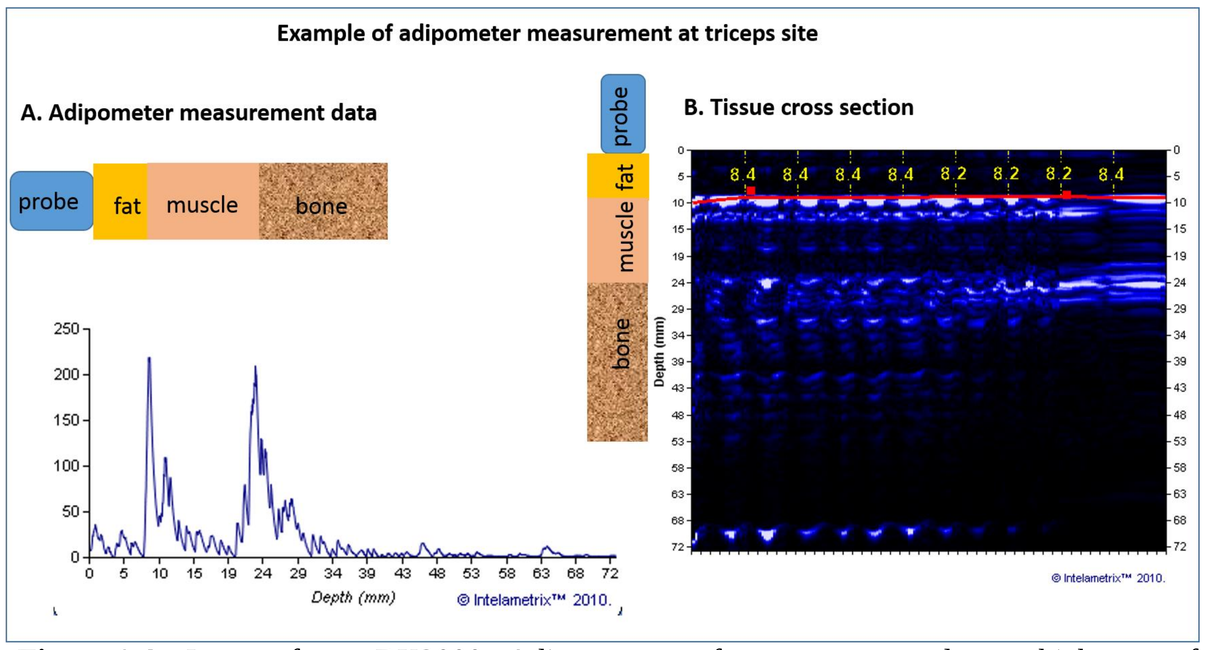

Figure.1.A Image from BX2000 Adipometer software - to evaluate thickness of uncompressed adipose tissue. **1.B** Actual ultrasound image interpreted by software - same assessment.

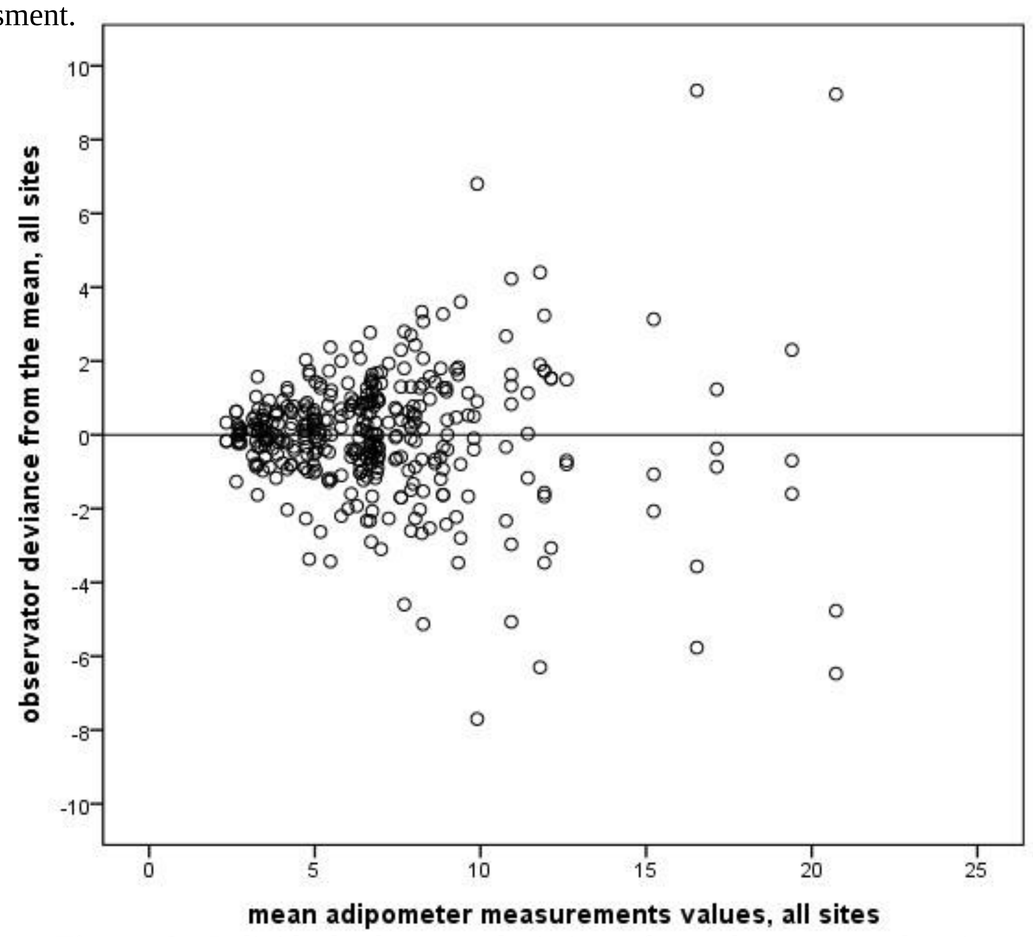

Figure 2. Individual observer deviations from the mean value in adipometer assessments (in mm) in 40 children, all 3 sites, 3 observers, 360 adipometer measurements.

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 **subscapular** 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).

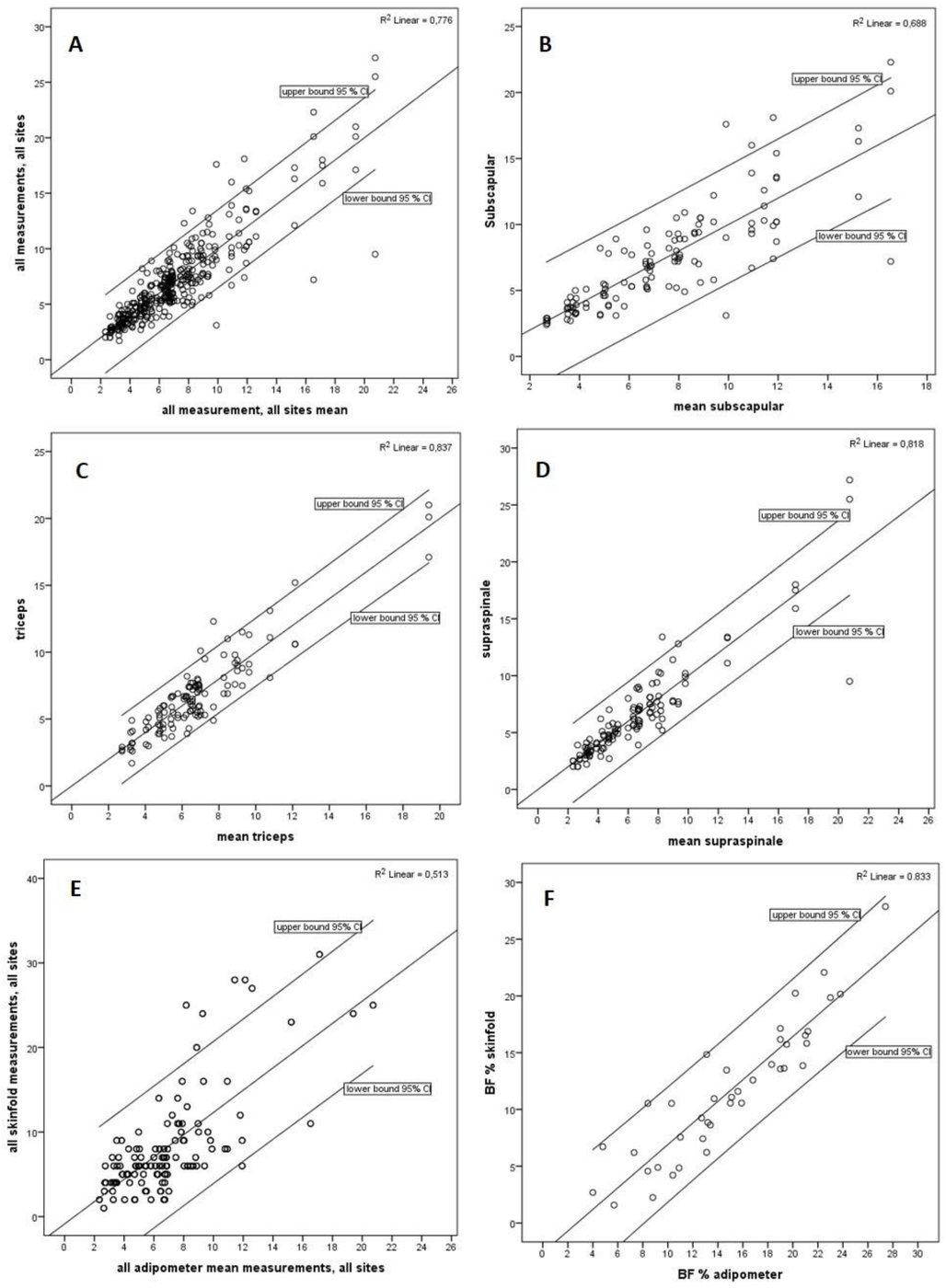

Figure 4. A,B,C,D,E,F: Regression lines, $R^2$and CI for adipometer measurements
Fig.4A: 360 measurements plotted against mean values each observer/each child.
Figures 4B, 4C, 4D, adipometer measurements at subscapular site (fig. 4B), triceps (fig.4C) and supraspinale (fig. 4D) are plotted against mean values each observer/ each child (120 measurements).
Fig. 2E: skinfold measurements are plotted against mean measurements at all sites, all observers (120 measurements).
Fig. 4F: BF% from skinfold measurements plotted against the BF% calculated by the adipometer (40 measurements).

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.

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