ESTIMATION OF INTERNAL ABDOMINAL FAT FROM ANTHROPOMETRY MEASUREMENTS IN CHILDREN

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Introduction

Internal abdominal fat (IAF) measured by dual energy X-ray absorptiometry (DXA) has been proposed as subrogate of visceral adipose tissue, which is a cornerstone measurement for screening of metabolic syndrome[1,2]. However, measuring IAF is time-consuming, expensive and impractical for field studies with children. Since 1990, anthropometric models have been developed to estimate IAF in adults, but no models exist for children. Because of the high prevalence of childhood obesity, the assessment of IAF is a major factor in the evaluation metabolic risk.

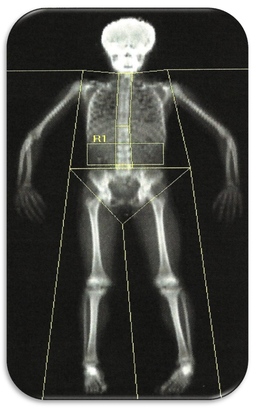
Purpose

The aim of this study was to develop an anthropometry-based model to estimate IAF in children.

Methods

Forty-one (n=24 boys, n=17 girls) healthy Caucasian children (age 11.4±0.6 years, BMI 20.1±3.9 Kg/m2) were volunteers. Anthropometric measurements (waist and hip circumferences, abdominal sagittal diameter and skinfolds) were taken in accordance with ISAK guidelines. Total body and IAF (dependent variable) body composition were measured by DXA. Stepwise regression analysis was carried out to obtain the fittest variables and beta coefficients in order to develop the equation that predicts IAF with a high squared R and a low standard error of estimation.

DXA. Total body and segmental tissue composition, and new parameters obtained from DXA. The abdominal region delineated by an upper horizontal border located at half of the distance between acromions and external end of iliac crests, a lower border determined by the external end of iliac crests and laterally to any trunk soft tissue (R1).



Results

The best-correlated variables with IAF were BMI, waist circumference, calf and subscapular skinfolds (r=0.900; r=0.946; r=0.901; r=0.900; respectively, all P<0.001). The best model for estimating the IAF included waist circumference and subscapular skinfold (R2=0.93 SEE=115.43; P<0.001). The estimated model was IAF (g) = -1332.89 + (18.515*WC) + (773.39*log(SubSKF)).

Table 1. Characteristics of participants by sex.

	All (n=41)	Boys (n=24)	Girls (n=17)
Age (years)	11.4±0.6	11.4±0.6	11.4±0.6
Weight (Kg)	44.8±13.2	44.6±12	44.2±15.2
Height (cm)	148±10.3	147.5±9.1	148.7±12
BMI (Kg/m2)	20,1±3.9	20.2±3.7	19.9±4.3
%FM	32.1±8.7	29.9±7.9	35.2±9.2
PA Total Score	3.3±0.6	3.4±0.6	3.3±0.7
WC (cm)	71.9±11.7	73±11.9	70.3±11.5
SubSKF (mm)	12.7±9.1	13.6±10.2	11.3±7.2

Values are presented as mean ± SD.
BMI, Body Mass Index; FM, Fat Mass; PA, Physical Activity; WC, Waist Circumference; SubSKF, Subscapular Skinfold.

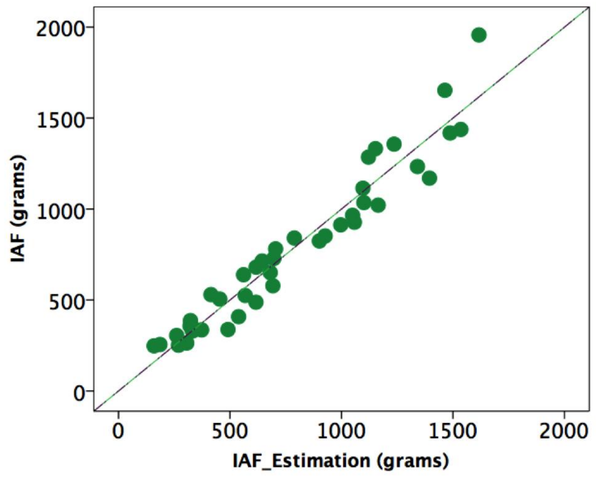


Figure 1. Scatter plot of measured and estimated IAF. Dashed line represents identity line.

Table 2. Lineal regression model to estimate internal abdominal fat (IAF).

Variables	B coefficients
Intercept	-1332.9
WC (cm)	18.5
logSUB_SKF (mm)	773.4
SEE (grams)	115.4
R^2	0.933

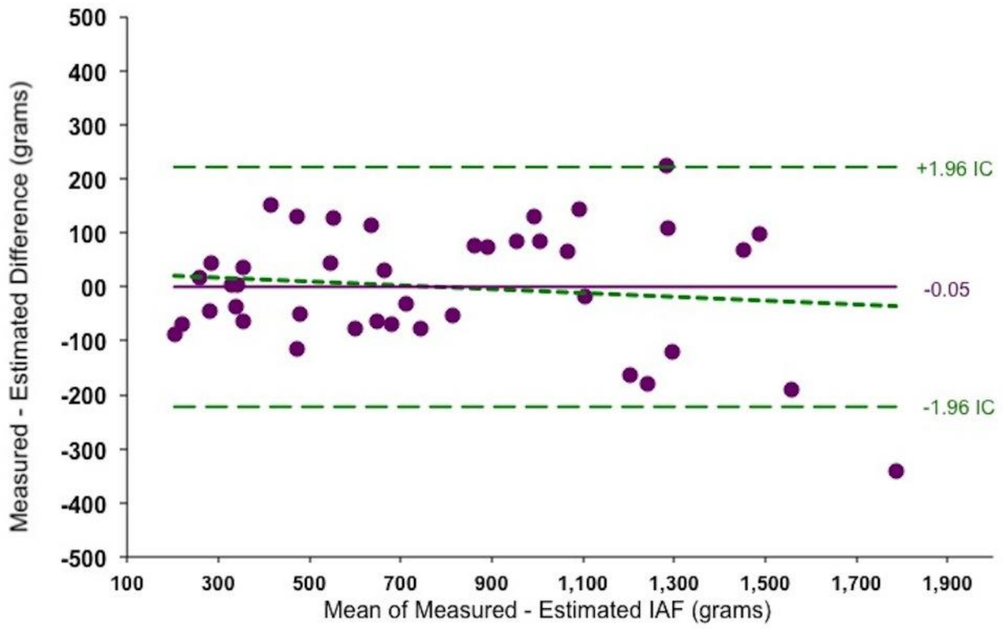


Figure 2. Bland & Altman plot for agreement analyses between measured and estimated IAF.

Conclusions

We developed a model, which accurately predict IAF in children, affording a practical tool to quantify this variable without expensive techniques such as DXA. However, external cross-validation must be performed in order to confirm the model validity. Additionally, construct validity should be carried out to determine the applicability of this measurement in children.

IAF (g) = -1332.89 + (18.515*WC) +(773.39*log(SubSKF))

Acknowledgments

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