

The Accuracy & Reliability of Using a Handheld Indirect Calorimeter for Assessing Body Fat in Overweight Adults

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BACKGROUND

- Weight management programs often assess patient percent body fat (% BF) to evaluate changes in fat and fat-free mass (FFM).
- FFM is commonly assessed by dual-energy x-ray absorptiometry (DEXA), bioelectrical impedance (BIA), skin-fold, & hydrostatic methods.
- FFM explains approximately 70% to 80% of the variance of resting energy expenditure (REE) (1-3).
- The “gold standard” for assessing REE is through indirect calorimetry (IC) since many REE estimation equations are inaccurate in ill and overweight patients (4-6).
- In theory, measured REE from IC should be able to estimate FFM and % BF.
- The purpose of this study was to compare the accuracy & reliability of using IC, with a proprietary algorithm, for the assessment of FFM and % BF in overweight adults.

METHODS

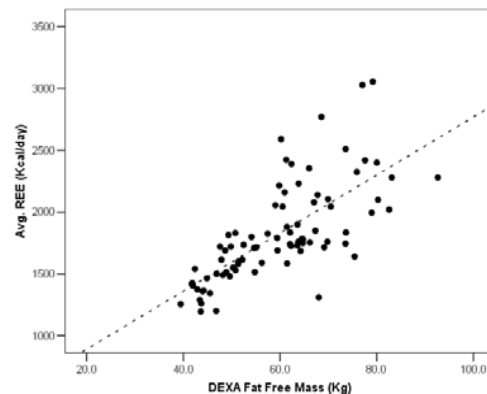
- 83 overweight (BMI > 25.0 kg/m²) men (n= 50) and women (n= 33) participated in the study.
- FFM and % BF were measured by DEXA using a Discovery™ QDR Series bone densitometer (Hologic, Inc., Bedford, MA) and BIA using a Tanita® Body Fat Analyzer- TBF 310 (Tanita Corporation of American, Inc., Arlington Heights, IL) systems.
- REE was measured in duplicate by IC using a MedGem® handheld device (Medical Home Solutions, Inc., Golden, CO) following a 12-hour fast and 15-minute resting protocol.
- IC with a proprietary algorithm estimated FFM and % BF following REE measurement.
- Paired sample t-test and Spearman's Rho correlation was conducted using SPSS 13.0.

	Mean ± SD	Range
Age (yrs)	47.8 ± 15.5	18 - 75
Weight (kg)	84.5 ± 12.8	64.1 – 127.3
BMI (kg/m ²)	28.9 ± 3.1	25.1 – 40.6
REE (kcal/day)	1823 ± 398	1195 - 3055
DEXA BF (%)	28.4 ± 9.1	10.2 – 47.4

	DEXA	BIA	IC
DEXA	1.00	0.89 *	0.89 *
BIA	0.89 *	1.00	0.88 *
IC	---	---	1.00

* p ≤ 0.001

Figure 1. Level of Relationship between FFM (DEXA) and REE (IC). $r = 0.72$; $P = 0.001$



RESULTS

	FFM	% BF
DEXA	59.7 ± 12.1	28.4 ± 9.1
BIA	60.2 ± 11.5	29.0 ± 8.7
IC	59.7 ± 11.2	29.8 ± 7.4 *

* Significantly different from DEXA p ≤ 0.05

Figure 2. Bland Altman Analysis between DEXA and IC % Body Fat.

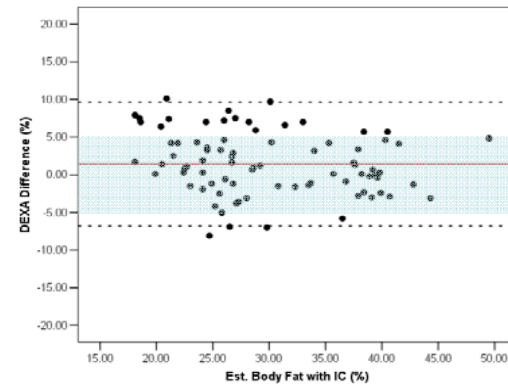
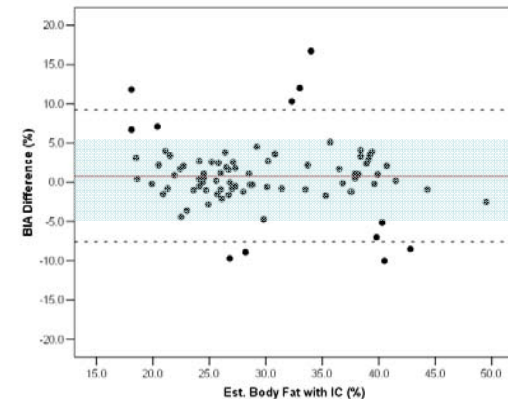


Figure 3. Bland Altman Analysis between BIA and IC % Body Fat.



CONCLUSION

- This is the first study comparing the accuracy and reliability of using a handheld IC device with a proprietary algorithm for assessing FFM and % BF.
- Similar to previous studies (1-3), these data indicate FFM is highly correlated with REE $r = 0.72$; $p \leq 0.001$
- There appears to be a small difference between DEXA and IC % BF ($-1.4 \pm 4.1\%$; $p \leq 0.05$). However, there was no difference between IC and BIA % BF.
- The level of agreement with IC % BF is reliable to DEXA ($r = 0.89$; $p \leq 0.05$) and BIA ($r = 0.88$ $p \leq 0.05$). Approximately 80% of IC % BF values were within $\pm 5\%$ of DEXA values.
- Based on these data, the use of a handheld IC device with a proprietary algorithm appears to accurately and reliably assess FFM and % BF in overweight adults.

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