InBody Validation Studies

2021.03.17 / InBody HQ Clinical Research Team

- Contents -

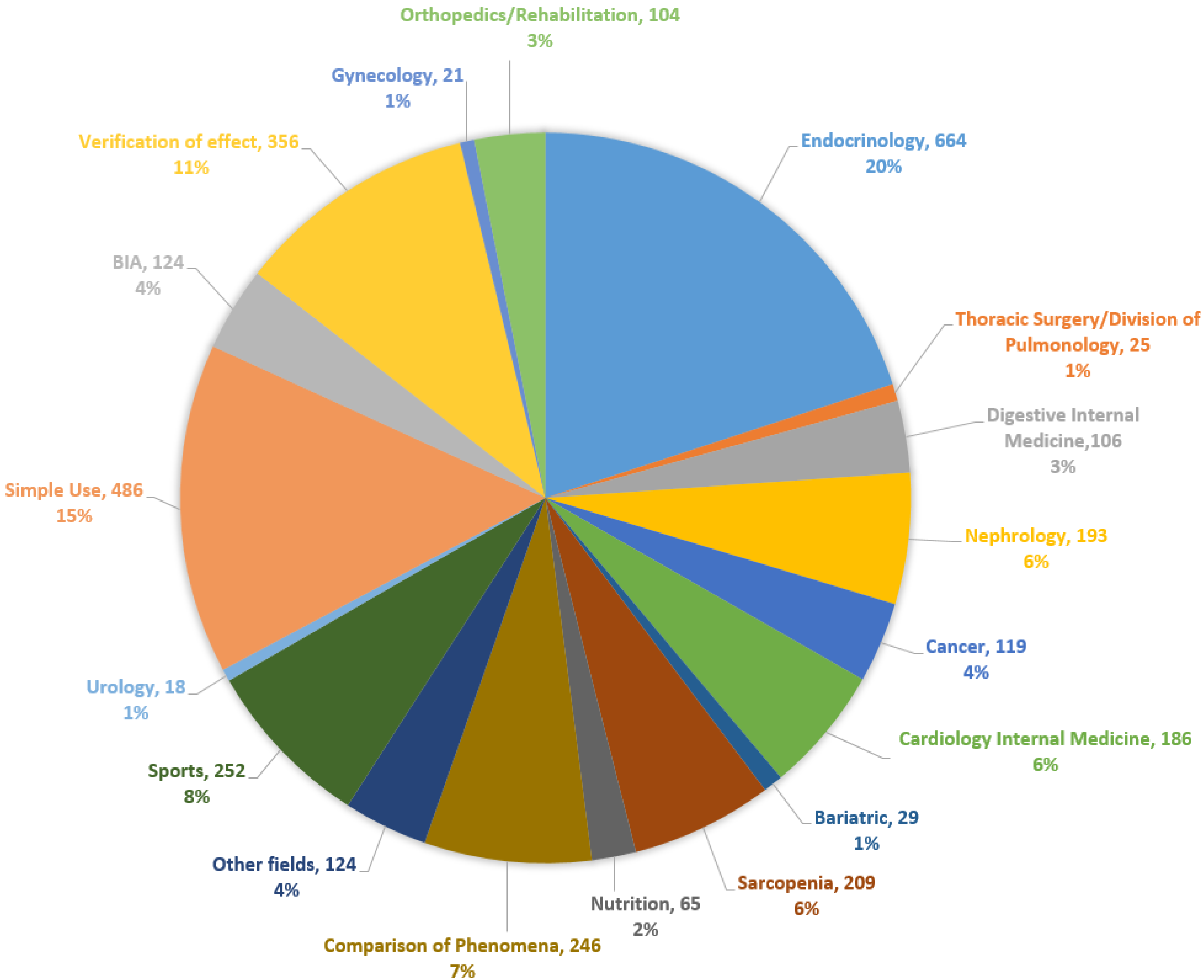
0. Overview of InBody research papers

Total InBody studies : 3,228 (Updated on 26 Feb 2021)

1st	2nd	3rd	#
Diease	Endocrinology	Endocrine disease	40
		Diabetes	212
		Metabolic Syndrome	79
		Obesity	269
		Child Obesity	64
	Thoracic Surgery /Division of Pulmonology	Respiratory Disease	25
	Digestive Internal Medicine	Liver Disease	76
		Digestive Disease	30
	Nephrology	Kidney Disease	193
	Urology	Urinary disease	18
	Cancer	Lymphedema	40
		Cancer	79
	Cardiology Internal Medicine	Cerebrovascular Disease	28
		Heart Disease	25
		Cardiopulmonary Disease	22
		Cardiovascular Disease	111
	Orthopedics /Rehabilitation	Rehabilitation	57
		Orthopedic	47
	Gynecology	Gynecology	21

1st	2nd	3rd	#
Independent Fields		AIDS	9
		ADHD	1
		Bariatric	29
		Sarcopenia	209
		Mental Health Illness	27
		Obstructive Sleep Apnea	10
		Nutrition	65
ETC	Comparison of Phenomena	Body Composition Comparison	104
		Body Composition in certain groups	142
	Verification of effect	Health Promotion	94
		Life Style Habits	59
		Food Effects	179
		Drug Effects	24
	Sports	Sports	252
	BIA	Validation	116
		BIA Performance	8
	Other fields		77
		Simple Use	486
Total			3,327

* Studies categorized as duplicates : 99


Orthopedics/Rehabilitation, 104
3%
Gynecology, 21
1%
Endocrinology, 664
20%
Verification of effect, 356
11%
BIA, 124
4%
Thoracic Surgery/Division of Pulmonology, 25
1%
Digestive Internal Medicine,106
3%
Simple Use, 486
15%
Nephrology, 193
6%
Cancer, 119
4%
Urology, 18
1%
Cardiology Internal Medicine, 186
6%
Sports, 252
8%
Bariatric, 29
1%
Other fields, 124
4%
Sarcopenia, 209
6%
Nutrition, 65
2%
Comparison of Phenomena, 246
7%

Comparison with DXA

I. DEXA vs InBody

Fat free mass, body fat mass and percent body fat

	Country	Research	Publication Year	Journal	Device	Subjects	Correlation Coefficient
1	USA	Comparison of Multi-Frequency Bioelectrical Impedance and Dual-Energy X-Ray Absorptiometry to Assess Body Composition in College-Aged Adults	2020	International Journal of Exercise Science	InBody 520	62 college-aged adults	Percent body fat r = 0.96
2	USA	A Comparative Study of Body Composition Assessment Techniques: DXA and InBody 270	2020	Journal of Exercise and Nutrition	InBody 270	88 adults	Percent body fat 2% less< DXA
3	USA	The Comparison of SMF-BIA and DEXA for Estimating Fat Free Mass and Percentage Body Fat in an Ambulatory Population	2020	J Parenter Enteral Nutr	InBody 770	176 healthy ambulatory participants	Fat free mass R = 0.98 Percent body fat R = 0.97
4	Hungary	How Length Sizes Affect Body Composition Estimation in Adolescent Athletes Using Bioelectrical Impedance	2020	Journal of Sports Science and Medicine	InBody 720	738 male adolescent athletes	Fat free mass 1kg more > DXA
5	USA	Relative Accuracy of Bioelectrical Impedance Analysis for Assessing Body Composition in Children with Severe Obesity	2020	Journal of Pediatric Gastroenterology and Nutrition	InBody 370	78 children	Percent body fat R = 0.90 Body fat mass R = 0.99

I. DEXA vs InBody

Fat free mass, body fat mass and percent body fat

	Country	Research	Publication Year	Journal	Device	Subjects	Correlation Coefficient
6	Taiwan	Accuracy augmentation of body composition measurement by bioelectrical impedance analyzer in elderly population	2020	Medicine	DEXA vs InBody 720	438 elderly people	Body fat mass R = 0.935
7	Thailand	Evaluation of Body Composition in Hemodialysis Thai Patients: Comparison between Two Models of Bioelectrical Impedance Analyzer and Dual-Energy X-Ray Absorptiometry	2018	Journal of Nutrition and Metabolism	InBody 720 vs InBody S10	69 Measurements	Body fat mass S10 r =0.91(m), 0.95(f) 720 r=0.91(m), 0.97(f)
8	Korea	Comparison between Dual-Energy X-ray Absorptiometry and Bioelectrical Impedance Analyses for Accuracy in Measuring Whole Body Muscle Mass and Appedicular Skeletal Muscle Mass	2018	Nutrients	DEXA(Hologic) vs InBody 770	504 Koreans aged 20–90 years	Fat free mass R = 0.972
9	Saudi Arabia	A cross-sectional study on sarcopenia using different methods: reference values for healthy Saudi young men	2017	BMC Musculoskeletal Disorders	DEXA(Not mentioned) vs InBody 770 vs Tanita 980	232 Saudi men aged between 20 and 35 years	Lean mass R^2 = 0.95
10	China	Estimation of prevalence of sarcopenia by using a new bioelectrical impedance analysis in Chinese community-dwelling elderly people	2016	BMC geriatrics	DEXA(Not mentioned) vs InBody 720	944명 elderly people over 60 years old	ASM M R^2=0.892 F R^2=0.815

I. DEXA vs InBody

Fat free mass, body fat mass and percent body fat

	Country	Research	Publication Year	Journal	Device	Subjects	Correlation Coefficient
11	USA	Comparison of total and segmental body composition using DXA and multi-frequency bioimpedance in collegiate female athletes	2015	Journal of Strength and Conditioning Research	DEXA(Lunar) vs InBody720	45 American Female Collegiate Athletes	Percent body fat r = 0.94
12	China	Validity of Four Commercial Bioelectrical Impedance Scales in Measuring Body Fat among Chinese Children and Adolescents	2015	BioMed Research International	DEXA(Lunar) vs Biodynamics-310 vs Tanita TBF543 & BC-545 vs InBody520	255 Healthy Chinese Children, 9-19 years old	Fat free mass Boy : r = 0.912 Girl : r = 0.957 Percent body fat Boy : r = 0.926 Girl : r = 0.979
13	Japan	Comparison of segmental multifrequency Bioelectrical impedance analysis with DEXA for the assessment of body composition in a community-dwelling older population	2015	Geriatrics and Gerontology International	DEXA(Hologic) vs InBody720	551 Japanese Elderly, 65-87 years old	Fat free mass M : r = 0.94 F : r = 0.92 Body fat mass M : r = 0.95 F : r = 0.97
14	Brazil	Comparison of two bioelectrical impedance devices and dual energy x ray absorptiometry to Evaluate body composition in heart failure	2014	Journal of Human Nutrition and Dietetics	DEXA (Hologic) vs BodyStat vs InBody230	55 Brazilian Heart Failure patients	Fat free mass r = 0.930 Body fat mass r = 0.905 Percent body fat r = 0.803
15	Canada	Validation of a portable bioelectrical impedance analyzer for the assessment of body composition	2013	Applied Physiology, Nutrition, and Metabolism	DEXA(Lunar) vs InBody230	145 Healthy Canadian, 18-85 years old	Percent body fat M : r = 0.94 F : r = 0.96

I. DEXA vs InBody

Fat free mass, body fat mass and percent body fat

	Country	Research	Publication Year	Journal	Device	Subjects	Correlation Coefficient
16	Japan	Accuracy of segmental multi-frequency bioelectrical impedance analysis for assessing whole-body and appendicular fat mass and lean soft tissue mass in frail women aged 75 years and older	2013	European Journal of Clinical Nutrition	DEXA(Hologic) vs InBody720	129 Japanese Frail Women over 75 years old	Fat free mass r=0.92 Body fat mass r=0.97
17	USA	Validity of two commercial grade bioelectrical impedance analyzers for measurement of body fat percentage	2013	Journal of Exercise Physiology	DEXA(Hologic) vs Tanita vs InBody R20	21 Americans, Average Age 37.6±16.8 years old	Percent body fat r =0.98
18	Korea	Comparison of bioimpedance analysis and dual energy X-ray absorptiometry body composition measurements in peritoneal dialysis patients According to edema	2012	Clinical Nephrology	DEXA(Hologic) vs InBody4.0	535 Korean Peritoneal Dialysis Patients	Body fat mass 1st : r^2 = 0.981 2nd : r^2 = 0.962 3rd : r^2 = 0.962 4th : r^2 = 0.971
19	USA	Utility of multifrequency bioelectrical impedance compared with dual-energy x-ray absorptiometry for assessment of total and regional body composition varies between men and women	2012	Nutrition Research	DEXA (Lunar) vs InBody720, 520	50 Americans, 18-49 years old	Fat free mass InBody720, 520 r^2 = 0.97, 0.95 Body fat mass InBody720, 520 r^2 = 0.90, 0.92
20	UK	Comparison of multifrequency bioelectrical impedance analysis and dual-energy x-ray absorptiometry assessments in outpatient hemodialysis patients	2011	American Journal of Kidney Diseases	DEXA(Hologic) vs InBody720	53 British Hemodialysis Patients	Fat free mass r^2 = 0.845 Body fat mass r = 0.93

I. DEXA vs InBody

Fat free mass, body fat mass and percent body fat

	Country	Research	Publication Year	Journal	Device	Subjects	Correlation Coefficient
21	Netherlands	Accuracy of direct segmental multi-frequency Bioimpedance analysis in the assessment of total body and segmental body composition in middle-aged adult population	2011	Clinical Nutrition	DEXA (Hologic) vs InBody720	484 middle-aged Cocassian	Body fat mass M : r = 0.93 F : r = 0.97
22	UK	Assessment of body composition in peritoneal dialysis(PD) Patients using bioelectrical impedance and dual-energy x-ray absorptiometry	2011	American journal of nephrology	DEXA(Hologic) vs InBody720	104 British Peritoneal Dialysis Patients	Fat free mass r = 0.95 Body fat mass r = 0.93
23	Korea	External cross-validation of bioelectrical impedance analysis for the assessment of body composition in Korean adults	2011	Nutrition Research and Practice	DEXA (Lunar) vs InBody4.0	174 Healthy Koreans	Fat free mass M : r = 0.982 F : r =0.956 Percent body fat M : r = 0.956 F : r =0.960
24	Korea	Comparisons of obesity assessments in over-weight elementary Students using anthropometry, BIA, CT and DEXA	2010	Nutrition Research and Practice	DEXA(Not mentioned) vs InBody230	103 Obese, Overweight Korean Children between 2-6th grade	Fat free mass M : r = 0.878 F : r =0.944 Body fat mass M : r = 0.853 F : r =0.887
25	Korea	Cross-calibration of multi-frequency bioelectrical impedance analysis with eight-point tactile electrodes and dual-energy X-ray absorptiometry for assessment of body composition in healthy children aged 6 – 18 years	2009	Pediatrics International	DEXA(Lunar) vs InBody720	166 Korean Children and Adolescents under 18 years old	Fat free mass r^2 = 0.990 Body fat mass r^2 = 0.934 Percent body fat r^2 = 0.940

I. DEXA vs InBody

Fat free mass, body fat mass and percent body fat

	Country	Research	Publication Year	Journal	Device	Subjects	Correlation Coefficient
26	Switzerland	Cross-validation of bioelectrical impedance analysis for the assessment of body composition in a representative sample of 6- to 13-year-old children	2009	European Journal of Clinical Nutrition	DEXA(Hologic) vs RJL vs InBody3.0	333 Swedish Children, 6-13 years old	Fat free mass $r^2 = 0.98$
27	Japan	Reference Data of Multi Frequencies Bioelectric Impedance Method in Japanese	2009	Anti-Aging Medicine	DEXA(Hologic) vs InBody720	15 Japanese	Fat free mass r = 0.983
28	Japan	Percentage of Total Body Fat as Estimated by Three Automatic Bioelectrical Impedance Analyzers	2004	Journal of Physiological Anthropology and Applied Human Science	DEXA(Lunar) vs Underwater weighing vs Tanita (BC118, TBF101) vs InBody3.0	45 Healthy Japanese Female Collegiate	Percent body fat DEXA r = 0.94 UW r = 0.81
29	Italy	Cross-calibration of eight-polar bioelectrical impedance analysis versus dual-energy X-ray absorptiometry for the assessment of total and appendicular body composition in healthy subjects aged 21–82 years	2003	Annals of Human Biology	DEXA(Lunar) vs InBody3.0	110 Healthy Italian Adults, 21-82 years old	Fat free mass $r^2 = 0.92$
30	Finland	Body Composition Assessment with Segmental Multifrequency Bioimpedance Method	2003	Journal of Sports Science and Medicine	DEXA vs Underwater weighing vs InBody3.0	58 Healthy Finnish Adults, 36-53 years old	DEXA Fat free mass r = 0.88 Body fat mass r = 0.94 Percent body fat r = 0.88

I. DEXA vs InBody

DEXA vs InBody 520

Original Research

Comparison of Multi-Frequency Bioelectrical Impedance and Dual-Energy X-Ray Absorptiometry to Assess Body Composition in College-Aged Adults

RACHEL N. TAUBER†‡1, CLAYTON L. CAMIC‡1, SHUQI ZHANG‡2, and PETER J. CHOMENTOWSKI III‡1

[1]Department of Kinesiology and Physical Education, Northern Illinois University, DeKalb, IL, USA; [2]Department of Kinesiology, Boise State University, Boise, ID, USA

†Denotes graduate student author, ‡Denotes professional author

Table 2. Comparison of %BF between DEXA and InBody 520 in all participants, males, and females.

	DEXA %BF	InBody 520 %BF	*r*	CE	SEE	TE
All (n = 62)	27.4 ± 9.5	23.6 ± 10.5*	0.96	3.79	2.50	4.72
Males (n = 32)	21.5 ± 5.6	17.6 ± 6.7*	0.94	3.87	1.93	4.50
Females (n = 30)	33.6 ± 8.8	29.9 ± 10.2*	0.95	3.70	2.78	4.95

DEXA= Dual-energy X-ray absorptiometry; %BF=Percent body fat (mean ± SD); *= statistically significant differences ($p < 0.05$) from DEXA; *r*= correlation coefficient from linear regression); CE= Constant error (CE=DEXA-InBody 520); SEE= Standard error of estimate; TE= Total error (TE = $\sqrt{\sum(\mathrm{DEXA} - \mathrm{InBody\ 520})^2/n}$).

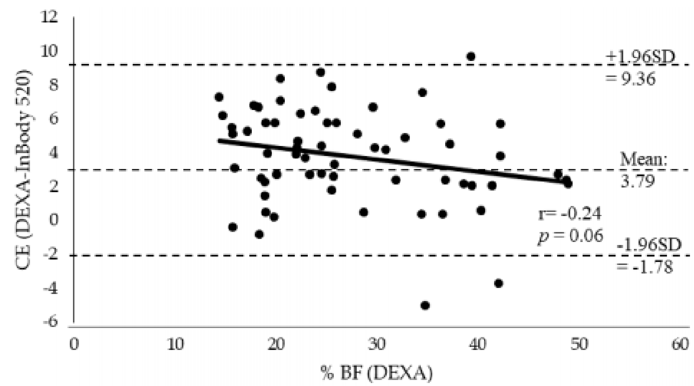


Figure 1. Difference plot showing the relationship of the constant error (CE) and %BF from the DEXA in all subjects ($n = 62$).

I. DEXA vs InBody

A Comparative Study of Body Composition Assessment Techniques: DXA and InBody 270

Research Brief

Jose R. Garcia[1], Rithin Manimaleth[1], Paulina Czartoryski[1], Paige Napolitano[1], Haley Watters[1], Catherine Weber[2], Alexsandra Alvarez-Beaton[2], Alexandra C. Nieto[2], Aysha Patel[2], Corey Peacock[1], Jonathan Banks[2], Jaime Tartar[2], Jose Antonio[1]

[1]Exercise and Sport Science, NSU Florida, Davie Florida USA
[2]Psychology and Neuroscience, NSU Florida, Davie Florida USA

Abstract
Introduction: The purpose of this study was to compare two common laboratory methods of body composition assessment: dual-energy X-ray absorptiometry (DXA) and the InBody® 270 Body Composition Analyzer.
Methods: Eighty-eight subjects (43 female, 45 male) volunteered for this study. Participants were tested in a controlled laboratory environment (i.e., 3-hour fast, no prior exercise, testing between 1100 and 1700 hours) first on the InBody® 270 followed by the DXA. A paired t-test was used to assess differences between the groups. Statistical significance was established at a p-value < 0.05.
Results: There were statistically significant differences between the DXA and InBody 270 for percent body fat, fat mass and fat-free mass. The DXA had significantly greater fat mass and percent body fat whereas fat-free mass was lower versus the InBody 270.
Conclusion: The Inbody 270 under-predicts fat mass and percent body fat; conversely, it over-predicts fat-free mass.

Table 1. Body Composition Comparison

	Percent Body Fat	Fat-free mass (kg)	Fat mass (kg)
DXA	27.7±7.5	51.1±12.5	19.7±7.3
InBody 270	24.6±9.0	53.7±13.0	17.8±8.2

Data are expressed as the Mean±SD. All values are significantly (p<0.0001) different between the DXA and InBody.

DEXA vs InBody 270

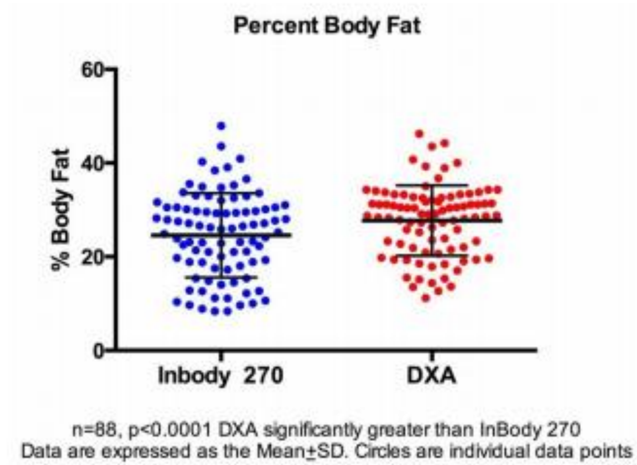


Figure 1. Percent Body Fat

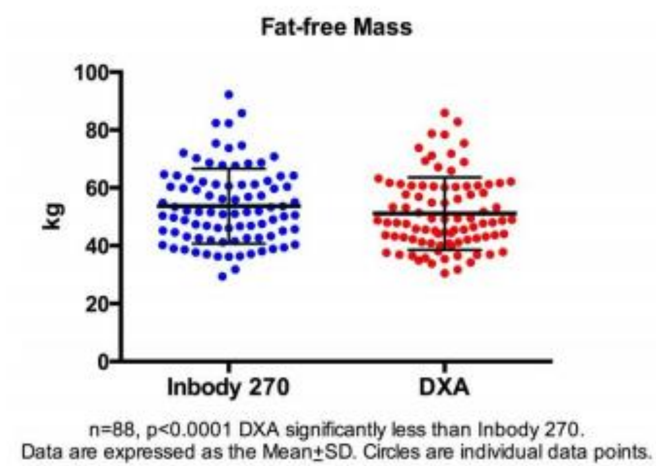


Figure 2. Fat-free Mass

I. DEXA vs InBody

DEXA vs InBody 770

The Comparison of Segmental Multifrequency Bioelectrical Impedance Analysis and Dual-Energy X-ray Absorptiometry for Estimating Fat Free Mass and Percentage Body Fat in an Ambulatory Population

Journal of Parenteral and Enteral Nutrition
Volume 00 Number 0
xxx 2020 1–8
DOI: 10.1002/jpen.1994
wileyonlinelibrary.com
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Ryan T. Hurt, MD, PhD[1,2,3]; Jon O. Ebbert, MD[4]; Ivana Croghan, PhD[1,4]; Sanjeev Nanda, MD[1]; Darrell R. Schroeder, MS[5]; Levi M. Teigen, PhD, RDN[6]; Saketh R. Velapati, MBBS[2]; and Manpreet S. Mundi, MD[2]

Table 2. Agreement Between DXA and S-MFBIA.[a].

Time (comparison)	N	Measurement: DXA (mean ± SD)	Measurement: S-MFBIA (mean ± SD)	Delta (S-MFBIA vs DXA): Mean ± SD	Delta (S-MFBIA vs DXA): 95% Limits of agreement	Concordance correlation Coefficient (95% CI)
Fat Free mass, kg						
Overall	176	52.8 ± 11.0	53.6 ± 11.4	0.8 ± 2.2[b]	−3.5 to +5.2	0.98 (0.97, 0.98)
According to BMI						
18.5–24.9	44	46.7 ± 9.0	47.9 ± 9.3	1.2 ± 1.9[b]	−2.6 to +5.0	0.97 (0.94, 0.98)
25.0–29.9	44	52.1 ± 11.6	53.3 ± 12.6	1.2 ± 2.2[b]	−3.2 to +5.6	0.98 (0.96, 0.99)
30.0–34.9	44	53.6 ± 11.2	53.9 ± 11.4	0.3 ± 2.0	−3.7 to +4.3	0.98 (0.97, 0.99)
≥35.0	44	58.7 ± 8.7	59.2 ± 9.5	0.6 ± 2.5	−4.4 to +5.5	0.96 (0.93, 0.98)
Percentage body fat, %						
Overall	176	37.5 ± 10.6	36.6 ± 11.3	−0.9 ± 2.6[b]	−6.0 to +4.2	0.97 (0.96, 0.98)
According to BMI						
18.5–24.9	44	27.4 ± 7.7	25.4 ± 7.7	−2.0 ± 2.8[b]	−7.5 to +3.5	0.90 (0.83, 0.94)
25.0–29.9	44	33.5 ± 8.4	32.3 ± 9.1	−1.3 ± 2.9[b]	−7.0 to +3.4	0.94 (0.89, 0.96)
30.0–34.9	44	40.5 ± 6.7	40.3 ± 6.9	−0.2 ± 2.3	−4.7 to +4.3	0.94 (0.90, 0.97)
≥35.0	44	48.6 ± 5.3	48.4 ± 5.2	−0.1 ± 2.0	−4.1 to +3.9	0.92 (0.87, 0.96)

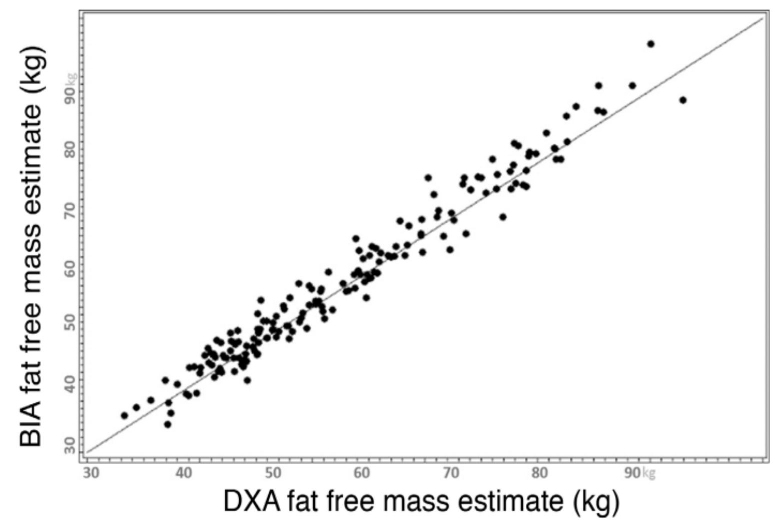


Figure 3. Fat-free mass estimate (kg): S-MFBIA vs DXA. BIA, S-MFBIA segmental multifrequency bioelectrical impedance analysis; DXA, dual-energy x-ray absorptiometry.

I. DEXA vs InBody

DEXA vs InBody 720

How Length Sizes Affect Body Composition Estimation in Adolescent Athletes Using Bioelectrical Impedance

Katinka Utczás ✉, Zsófia Tróznai, Gergely Pálinkás, Irina Kalabiska and Leonidas Petridis
Research Center for Sport Physiology, University of Physical Education, Budapest, Hungary

Table 2. Descriptive statistics of body composition by $BIA_{InBody\ 720}$ and DXA.

		$BIA_{InBody\ 720}$ (mean±SD)	DXA (mean±SD)	Effect size (Cohen's *d*)
Soccer	BF (kg)	6.1±2.4*	10.3±2.5	3.1
	PBF (%)	9.3±3.0*	15.7±2.9	2.9
	LBM (kg)	55.5±7.6*	52.4±7.4	2.3
Basketball	BF (kg)	6.1±3.5*	12.3±4.3	3.6
	PBF (%)	8.6±3.7*	17.4±4.3	3.8
	LBM (kg)	60.8±12.8*	55.5±12.0	2.9
Handball	BF (kg)	8.2±6.3*	14.6±6.4	3.2
	PBF (%)	10.4±5.9*	18.7±5.4	3.5
	LBM (kg)	62.8±8.0*	57.8±7.4	2.4

BF: body fat, PBF: percent body fat, LBM: lean body mass. BIA: bioelectrical impedance analysis, DXA: dual-energy X-ray absorptiometry. *significant difference between DXA and BIA, $p < 0.001$.

Table 3. Regression results and mean differences in body composition estimation between $BIA_{InBody\ 720}$ and DXA.

		r	R^2	b	Slope	SEE	TE	Limits of agreement CE±1.96 SD	Upper	Lower
Soccer	BF (kg)	0.84	0.71	4.92	0.88	1.45	2.05	4.2±2.7	6.9	1.5
	PBF (%)	0.72	0.52	9.20	0.70	2.98	2.54	6.4±4.3	10.7	2.1
	LBM (kg)	0.98	0.97	-0.95	0.96	0.47	1.76	-3.1±2.7	-0.4	-5.8
Basketball	BF (kg)	0.92	0.85	5.38	1.12	1.32	3.87	6.2±3.4†	9.6	2.8
	PBF (%)	0.84	0.72	8.84	1.00	2.38	4.75	8.8±4.5†	13.3	4.3
	LBM (kg)	0.99	0.98	-0.87	0.93	0.51	3.33	-5.3±3.6†	-1.7	-8.9
Handball	BF (kg)	0.95	0.90	6.56	0.97	1.23	2.51	6.3±3.9†	10.2	2.4
	PBF (%)	0.91	0.83	10.02	0.84	1.94	2.89	8.3±4.7†	13.0	3.6
	LBM (kg)	0.96	0.93	2.10	0.89	1.08	2.24	-5.0±4.1†	-0.9	-9.1

BF: body fat, PBF: percent body fat, LBM: lean body mass. b: intercept, SEE: Standard error of the estimate, TE: Total error, CE: Constant error. † Significant difference from soccer players, $p < 0.05$.

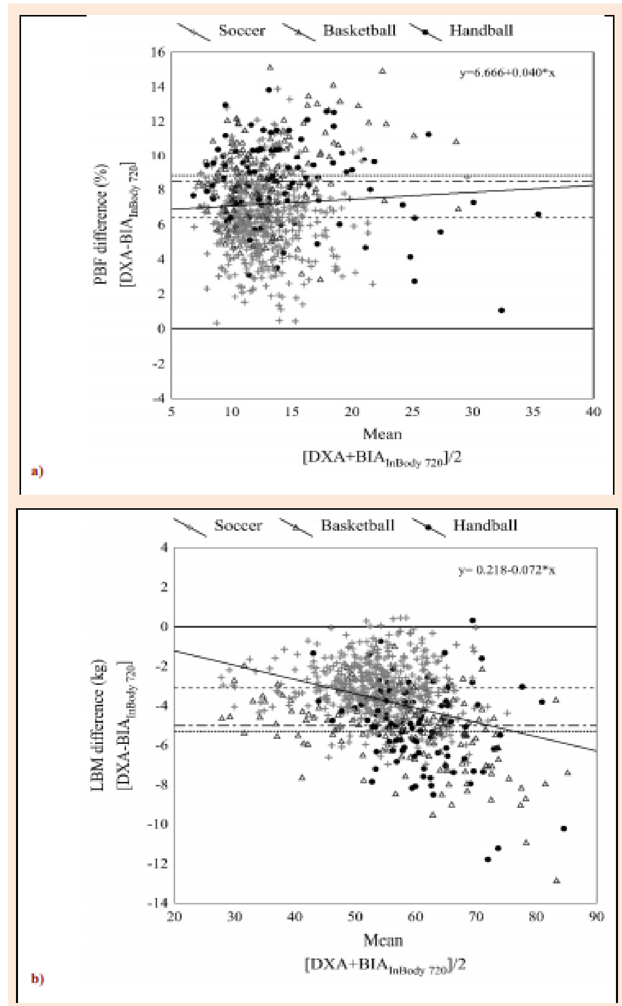


Figure 1. Differences between DXA and BIA with Bland-Altman analysis in a) Percent Body Fat, b) Lean Body Mass. dotted line: mean of soccer players; twodash line: mean of handball players; dashed line: mean of basketball players.

I. DEXA vs InBody

DEXA vs InBody 370

Relative Accuracy of Bioelectrical Impedance Analysis for Assessing Body Composition in Children With Severe Obesity

*Soofia Khan, *†Stavra A. Xanthakos, ‡Lindsey Hornung, *†Catalina Arce-Clachar, †§Robert Siegel, and *†Heidi J. Kalkwarf
*Division of Gastroenterology, Hepatology and Nutrition, Cincinnati Children's Hospital Medical Center,

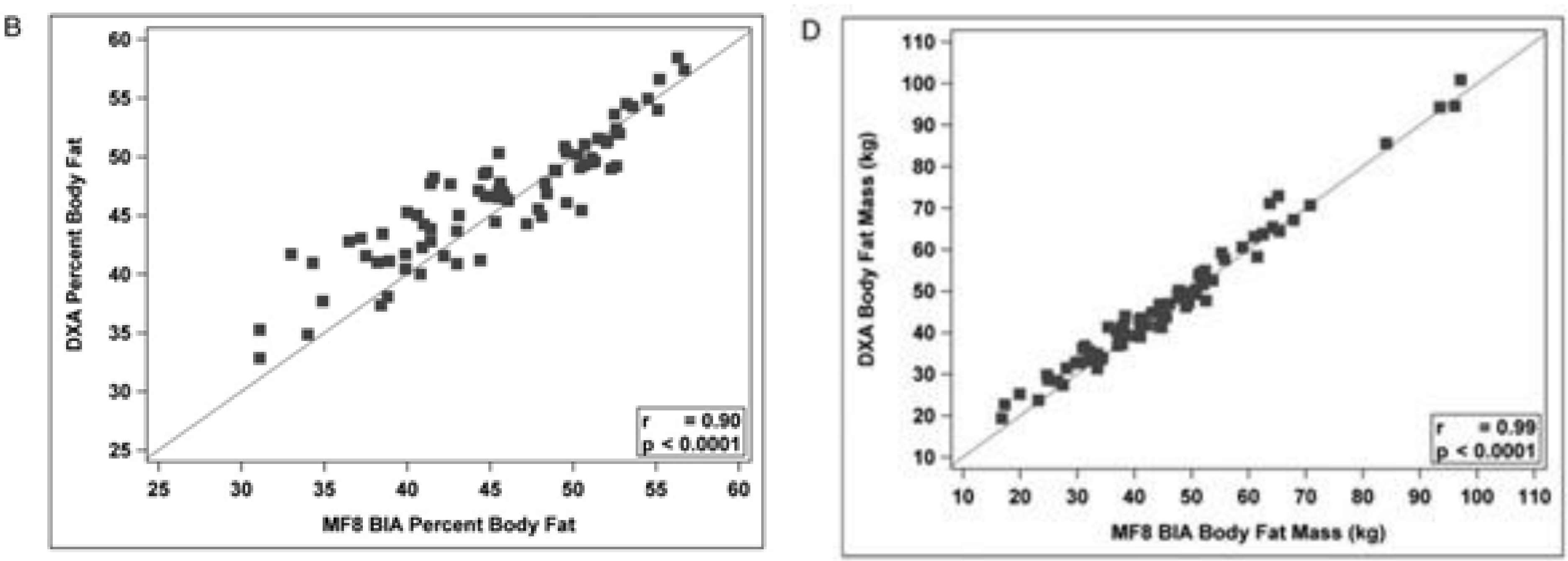


FIGURE 1. Body fat percentage by (A) SF4 BIA (*x*-axis) (B) MF8 BIA (*x*-axis) versus body fat percentage by DXA (*y*-axis). Fat mass by (C) SF4 BIA (*x*-axis) (D) MF8 BIA (*x*-axis) versus fat mass by DXA (*y*-axis). Solid line is the line of identity. Pearson correlations are listed in the graphs. Intraclass correlation coefficients are (A) 0.39, (B) 0.87, (C) 0.92, and (D) 0.99, respectively. BIA = bioelectrical impedance analysis; DXA = dual x-ray absorptiometry.

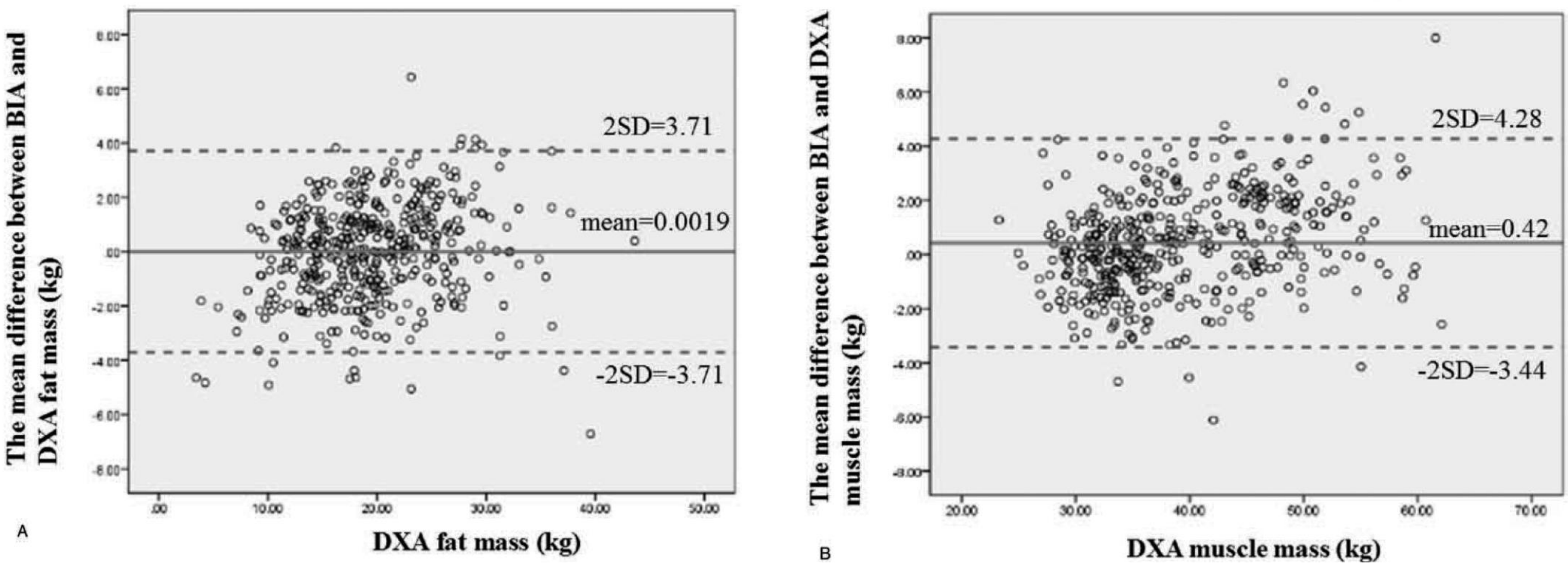
I. DEXA vs InBody

DEXA vs InBody 720

Accuracy augmentation of body composition measurement by bioelectrical impedance analyzer in elderly population

Wen-Hui Fang, MD[a], Jie-Ru Yang, MS[b], Chih-Ying Lin, MD[c], Po-Jen Hsiao, MD[d], Ming-Yu Tu, MD, PhD[e], Chien-Fu Chen, MD[f], Dung-Jang Tsai, MS[b,g], Wen Su, RN[h], Guo-Shu Huang, MD[i,*], Hung Chang, MD, PhD[j,k,*], Sui-Lung Su, PhD[b,*]

Department of Family and Community Medicine, Tri-Service General Hospital, Taipei, Taiwan



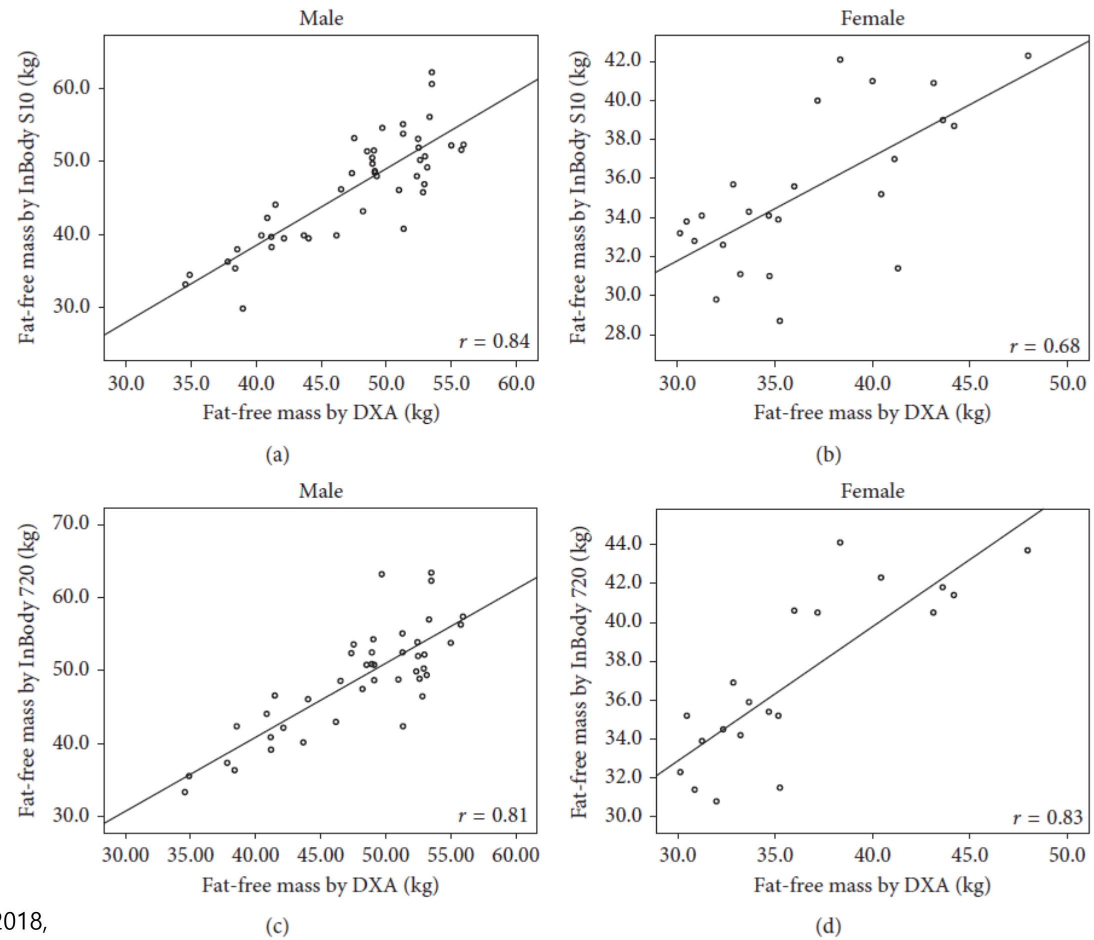
I. DEXA vs InBody

DEXA vs InBody S10, 720

Evaluation of Body Composition in Hemodialysis Thai Patients: Comparison between Two Models of Bioelectrical Impedance Analyzer and Dual-Energy X-Ray Absorptiometry

Kulapong Jayanama,[1] Supanee Putadechakun,[2] Praopilad Srisuwarn,[2] Sakda Arj-Ong Vallibhakara,[3] Prapimporn Chattranukulchai Shantavasinkul,[2] Chanika Sritara,[4] Surasak Kantachuvesiri,[5] and Surat Komindr[2]

[1]*Chakri Naruebodindra Medical Institute, Faculty of Medicine Ramathibodi Hospital, Mahidol University, 270 Rama 6 Road Thungphayathai, Ratchathewi, Bangkok 10400, Thailand*



I. DEXA vs InBody

DEXA(Hologic) vs InBody 770

Article

Comparison between Dual-Energy X-ray Absorptiometry and Bioelectrical Impedance Analyses for Accuracy in Measuring Whole Body Muscle Mass and Appendicular Skeletal Muscle Mass

Seo Young Lee [1,2], Soyeon Ahn [3], Young Ji Kim [1], Myoung Jin Ji [1], Kyoung Min Kim [1], Sung Hee Choi [1], Hak Chul Jang [1] and Soo Lim [1,*]

	N	Mass by DXA (kg)	Mass by BIA (kg)	Difference (kg)	* p	† p	ICC
			(b) Appendicular skeletal muscle mass (ASMM)				
Total	507	16.2 ± 4.1	18.2 ± 4.4	2.0 ± 1.1	<0.001		0.972
Gender						<0.001	
Men	213	19.9 ± 3.2	22.1 ± 3.3	2.3 ± 1.1	<0.001		0.939
Women	294	13.5 ± 2.2	15.3 ± 2.5	1.8 ± 0.9	<0.001		0.928
BMI (kg/m^2)						0.093	
<20	22	12.2 ± 2.4	14.4 ± 3.1	2.2 ± 1.3	<0.001		0.932
20–22.9	112	14.4 ± 3.3	16.5 ± 3.9	2.1 ± 1.1	<0.001		0.973
23–24.9	97	15.8 ± 3.3	17.9 ± 3.7	2.1 ± 1.0	<0.001		0.968
25–26.9	137	16.3 ± 3.6	18.2 ± 3.9	1.9 ± 1.1	<0.001		0.958
27–29.9	75	17.8 ± 4.7	19.6 ± 5.0	1.8 ± 0.9	<0.001		0.985
≥30	47	19.5 ± 5.3	21.2 ± 5.4	1.8 ± 1.0	<0.001		0.981
Age (years)						0.503	
19–39	21	19.2 ± 6.5	21.3 ± 6.7	2.2 ± 0.9	<0.001		0.991
40–49	33	20.4 ± 4.7	22.1 ± 4.7	1.7 ± 1.1	<0.001		0.971
50–59	69	17.8 ± 4.2	19.7 ± 4.5	1.9 ± 1.0	<0.001		0.979
60–69	228	15.4 ± 3.6	17.5 ± 4.0	2.0 ± 1.0	<0.001		0.968
≥70	142	15.0 ± 3.3	17.0 ± 3.9	2.0 ± 1.2	<0.001		0.959
Body fat (%) ‡						0.675	
Non-obese	74	15.4 ± 3.8	17.4 ± 4.5	2.0 ± 1.1	<0.001		0.975
Obese	420	16.3 ± 4.2	18.2 ± 4.5	2.0 ± 1.1	<0.001		0.972

Table 2. Mean differences in muscle mass observed by dual-energy X-ray absorptiometry (DXA) and bioelectrical impedance analysis (BIA) according to gender, BMI, and age groups and body fat categories.

I. DEXA vs InBody

A cross-sectional study on sarcopenia using different methods: reference values for healthy Saudi young men

DEXA vs InBody 770 vs Tanita 980

Shaea A. Alkahtani
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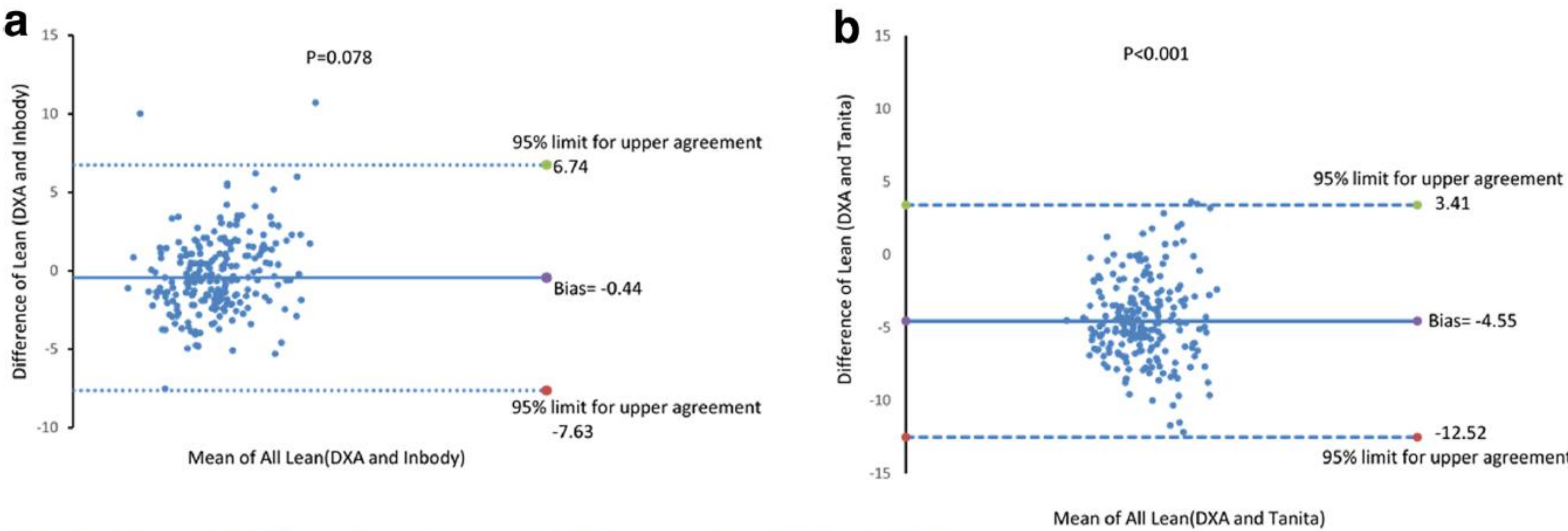

Fig. 1 Bland Altman plot for difference between lean values of Inbody and DXA (**a**) and Tanita and DXA (**b**)

I. DEXA vs InBody

DEXA vs InBody 720

Estimation of prevalence of sarcopenia by using a new bioelectrical impedance analysis in Chinese community-dwelling elderly people

Hui Wang[1], Shan Hai[1], Li Cao[1], Jianghua Zhou[2], Ping Liu[1] and Bi-Rong Dong[1,3*]

[1]Center of Gerontology and Geriatrics, West China Hospital, Sichuan University, No. 37 Guoxue Lane, Chengdu 610041, China. [2]School of Clinical Medicine, Chengdu Medical College, Chengdu, China. [3]Collaborative Innovation Center of Sichuan for Elderly Care and Health, Chengdu, China.

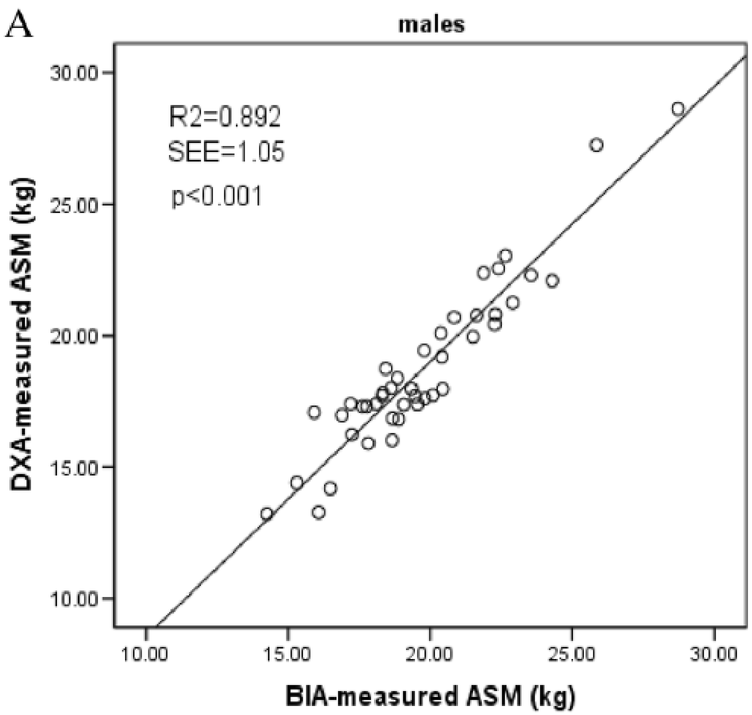

Fig. 1 a Regression between the bioelectrical impedance analysis (BIA)-measured and Dual-energy X-ray absorptiometry (DXA)-measured appendicular skeletal muscle mass (ASM) in males. Solid line, regression line.

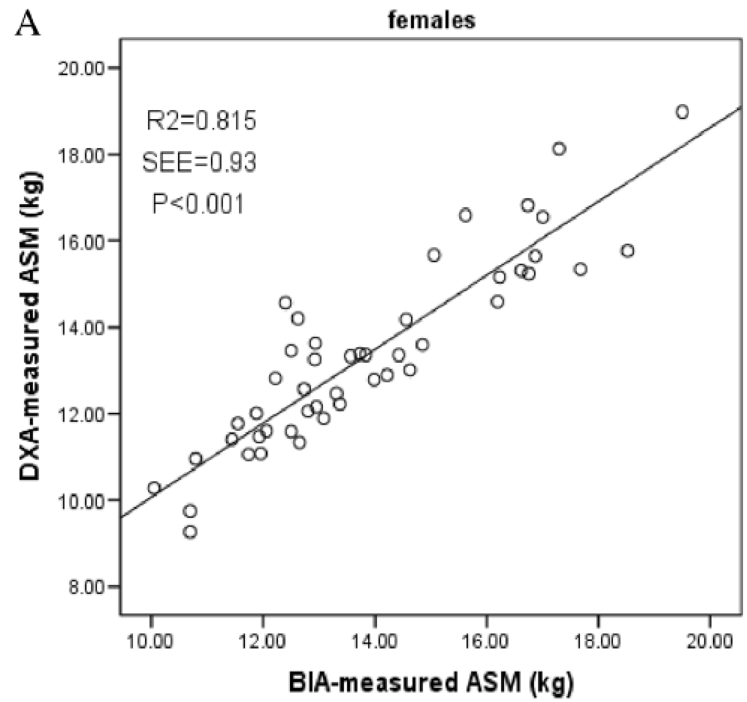

Fig. 2 a Regression between the bioelectrical impedance analysis (BIA)-measured and Dual-energy X-ray absorptiometry (DXA)-measured appendicular skeletal muscle mass (ASM) in females. Solid line, regression line.

I. DEXA vs InBody

DEXA(Lunar)vs InBody720

Comparison of Total and Segmental Body Composition Using DXA and Multifrequency Bioimpedance in Collegiate Female Athletes

Michael R. Esco,[1,2] Ronald L. Snarr,[2] Matthew D. Leatherwood,[1] Nik A. Chamberlain,[1] Melvenia L. Redding,[1] Andrew A. Flatt,[2] Jordan R. Moon,[3] and Henry N. Williford[1]

[1]Department of Kinesiology, Human Performance Laboratory, Auburn University at Montgomery, Montgomery, Alabama; [2]Department of Kinesiology, University of Alabama, Tuscaloosa, Alabama; and [3]MusclePharm Sports Science Institute, Muscle Pharm Corp., Denver, Colorado

Table 1. Comparison of body composition values between InBody 720 and DXA (n = 45).*

								Limits of agreement			
Value	Mean ± *SD*	*p*	Cohen's *d*	*r*	R^2	SEE	TE	CE ± 1.96 *SD*	Upper	Lower	Trend
DXA BF%	25.87 ± 5.56	<0.001	0.63	0.94	0.88	2.88	4.37	−3.33 ± 5.62	2.29	−8.95	0.10
InBody 720 BF%	22.54 ± 5.07										
DXA FFM	46.08 ± 5.91	<0.001	0.35	0.95	0.91	1.80	2.83	2.12 ± 3.73	5.85	−1.61	−0.07
InBody 720 FFM	48.20 ± 6.30										
DXA $ARMS_{LST}$	4.66 ± 0.82	0.371	0.06	0.89	0.79	0.38	0.40	0.05 ± 0.79	0.84	−0.74	−0.08
InBody 720 $ARMS_{LST}$	4.71 ± 0.88										
DXA $LEGS_{LST}$	14.88 ± 2.35	0.049	0.18	0.83	0.68	1.34	1.38	−0.41 ± 2.62	2.21	−3.03	0.11
InBody 720 $LEGS_{LST}$	14.47 ± 2.13										
DXA $TRUNK_{LST}$	20.53 ± 2.58	0.567	0.05	0.82	0.66	1.51	1.61	0.14 ± 3.18	3.32	−3.04	−0.06
InBody 720 $TRUNK_{LST}$	20.67 ± 2.73										
DXA $TOTAL_{LST}$	40.07 ± 5.28	0.520	0.04	0.92	0.85	2.06	2.14	−0.21 ± 4.23	4.02	−4.44	−0.06
InBody 720 $TOTAL_{LST}$	39.86 ± 5.57										

*BF% = body fat percentage; FFM = fat-free mass; $ARMS_{LST}$ = lean soft tissue of both arms; $LEGS_{LST}$ = lean soft tissue of both legs; $TRUNK_{LST}$ = lean soft tissue of the trunk; $TOTAL_{LST}$ = total segmental lean soft tissue (i.e., $TOTAL_{LST}$ = $ARMS_{LST}$ + $LEGS_{LST}$ + $TRUNK_{LST}$); SEE = standard error of estimate; TE = total error; CE = constant error, significant = $p < 0.0084$.

I. DEXA vs InBody

DEXA(Lunar) vs Biodynamics-310 vs Tanita TBF543 & BC-545 vs InBody520

Research Article

Validity of Four Commercial Bioelectrical Impedance Scales in Measuring Body Fat among Chinese Children and Adolescents

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[2]*Department of Sports Science and Physical Education, The Chinese University of Hong Kong, Hong Kong*

TABLE 2: Lin's concordance correlation coefficients between parameters assessed by different BIA and DXA measurement.

		BIA devices			
		Model A	Model B	Model C	Model D
Boys (n = 127)	%BF-DXA	0.765	0.750	0.855	0.926
	FFM-DXA	0.953	0.953	0.951	0.979
Girls (n = 128)	%BF-DXA	0.747	0.863	0.881	0.912
	FFM-DXA	0.909	0.897	0.910	0.957

Note: BMI: body mass index; %BF-DXA: body fat percentage measured by dual-energy X-ray absorptiometry; FFM-DXA: fat-free mass measured by dual-energy X-ray absorptiometry.
Model A: Biodynamics-310; Model B: Tanita TBF 543; Model C: Tanita BC-545; Model D: InBody 520.

I. DEXA vs InBody

DEXA(Hologic) vs InBody720

Comparison of segmental multifrequency bioelectrical impedance analysis with dual-energy X-ray absorptiometry for the assessment of body composition in a community-dwelling older population

Miji Kim,[1] Shoji Shinkai,[2] Hiroshi Murayama[2] and Seijiro Mori[3]

[1]Research Team for Promoting Independence of the Elderly, [2]Research Team for Social Participation and Community Health, Tokyo Metropolitan Institute of Gerontology, and [3]Department of Internal Medicine, Tokyo Metropolitan Geriatric Hospital, Tokyo, Japan

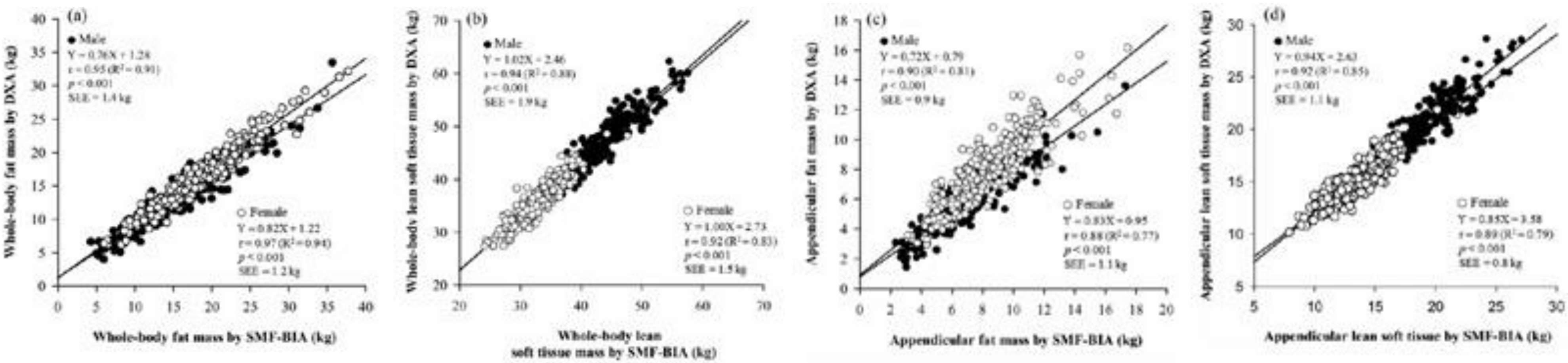

Figure 2 Linear regression between segmental multifrequency bioelectrical impedance analysis (SMF-BIA) and dual-energy X-ray absorptiometry (DXA). (a) Whole-body fat mass, (b) whole-body lean soft tissue mass, (c) appendicular fat mass and (d) appendicular lean soft tissue mass. Solid lines, regression line. SEE, standard error of estimate.

I. DEXA vs InBody

DEXA(Hologic) vs BodyStat1500 vs InBody230

Comparison of two bioelectrical impedance devices and dual-energy X-ray absorptiometry to evaluate body composition in heart failure

F. D. Alves,[1,2] G. C. Souza,[2,3] A. Biolo[1,2,3] & N. Clausell[1,2,3]

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[2]Department of Internal Medicine, Faculty of Medicine, Federal University of Rio Grande do Sul, Porto, Alegre, Brazil
[3]Department of Cardiology, Hospital de Clínicas de Porto Alegre, Porto Alegre, Brazil

Table 3 Correlation between the methods to assess body composition in heart failure patients

		SF-BIA and DEXA		MF-BIA and DEXA	
		Correlation*	*P*	Correlation*	*P*
All patients (*n* = 55)	Body fat%	0.910	<0.001	0.803	<0.001
	Fat mass (kg)	0.760	<0.001	0.905	<0.001
	FFM (kg)	0.978	<0.001	0.930	<0.001
Male (*n* = 42)	Body fat (%)	0.682	<0.001	0.548	0.002
	Fat mass (kg)	0.631	<0.001	0.849	<0.001
	FFM (kg)	0.964	<0.001	0.883	<0.001
Female (*n* = 13)	Body fat (%)	0.899	<0.001	0.953	0.001
	Fat mass (kg)	0.968	<0.001	0.996	<0.001
	FFM (kg)	0.934	<0.001	0.961	0.001

DEXA, dual-energy X-ray absorptiometry; FFM, fat-free mass; MF-BIA, multifrequency bioelectrical impedance analysis; SF-BIA, single-frequency bioelectrical impedance analysis.
*Pearson correlation (*r* value).

Table 2 Means of each method in heart failure patients

		DEXA	SF-BIA	MF-BIA
All patients (*n* = 55)	Body fat (%)	28 (6)	24 (8)*	27 (9)
	Fat mass (kg)	20 (6)	18 (8)*	20 (9)
	FFM (kg)	52 (10)	56 (12)*	53 (11)
Male (*n* = 42)	Body fat (%)	25 (3)	21 (4)*	24 (7)
	Fat mass (kg)	19 (5)	17 (7)*	19 (8)
	FFM (kg)	56 (8)	61 (9)*	57 (9)
Female (*n* = 13)	Body fat (%)	36 (5)	35 (7)	39 (7)
	Fat mass (kg)	23 (7)	23 (8)	26 (11)
	FFM (kg)	40 (6)	41 (6)	39 (6)

Data are the mean (SD).
DEXA, dual-energy X-ray absorptiometry; FFM, fat-free mass; MF-BIA, multifrequency bioelectrical impedance analysis; SF-BIA, single-frequency bioelectrical impedance analysis.
*Mean values were significantly different from DEXA ($P < 0.05$).

I. DEXA vs InBody

DEXA(Lunar) vs InBody230

NRC Research Press

ARTICLE

Validation of a portable bioelectrical impedance analyzer for the assessment of body composition

Antony D. Karelis, Gabriel Chamberland, Mylène Aubertin-Leheudre, Christian Duval, and the Ecological mobility in Aging and Parkinson (EMAP) group

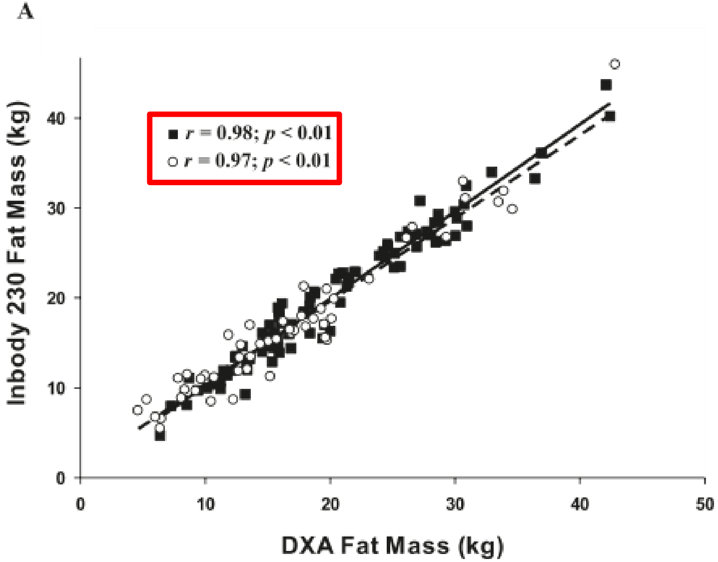

Fig. 1. (A) Correlation between both methods for fat mass for all participants ($r = 0.97$). Dotted line represents best fit for men (empty circles) ($r = 0.97$) and solid line represents best fit for women (filled squares) ($r = 0.98$). (B) Bland–Altman analysis between dual-energy X-ray absorptiometry (DXA) and the Inbody 230 for fat mass for all participants ($r = 0.10$), for men (empty circles) ($r = 0.17$), and for women (filled squares) ($r = -0.04$)). Solid line represents the mean difference (0.11 kg). Outer dotted lines represent limits of agreement (–3.5 to 3.7 kg) (95% confidence interval).

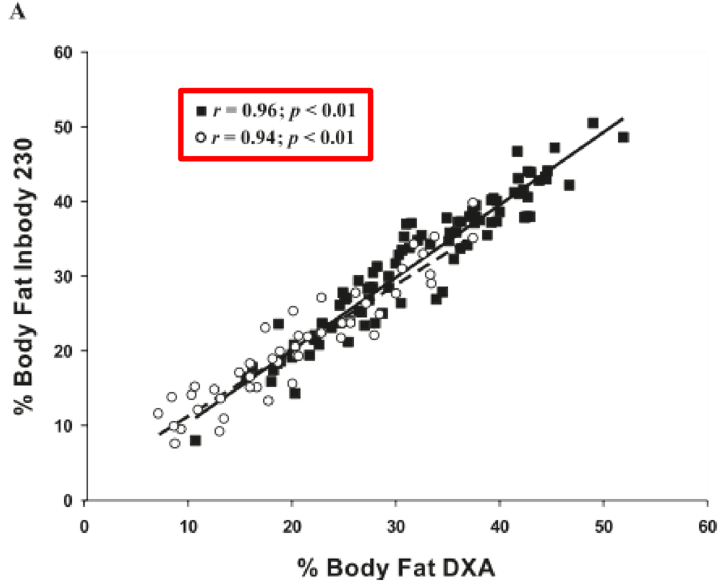

Fig. 2. (A) Correlation between both methods for % body fat for all participants ($r = 0.97$). Dotted line represents best fit for men (empty circles) ($r = 0.94$) and solid line represents best fit for women (filled squares) ($r = 0.96$). (B) Bland–Altman analysis between dual-energy X-ray absorptiometry (DXA) and the Inbody 230 for % body fat for all participants ($r = 0.04$), for men (empty circles) ($r = 0.19$), and for women (filled squares) ($r = 0.06$). Solid line represents the mean difference (0.18%). Outer dotted lines represent limits of agreement (–5.1% to 5.4%) (95% confidence interval).

I. DEXA vs InBody

DEXA(Hologic) vs InBody720

European Journal of Clinical Nutrition (2013) **67,** 395–400

www.nature.com/ejcn

ORIGINAL ARTICLE

Accuracy of segmental multi-frequency bioelectrical impedance analysis for assessing whole-body and appendicular fat mass and lean soft tissue mass in frail women aged 75 years and older

M Kim and H Kim

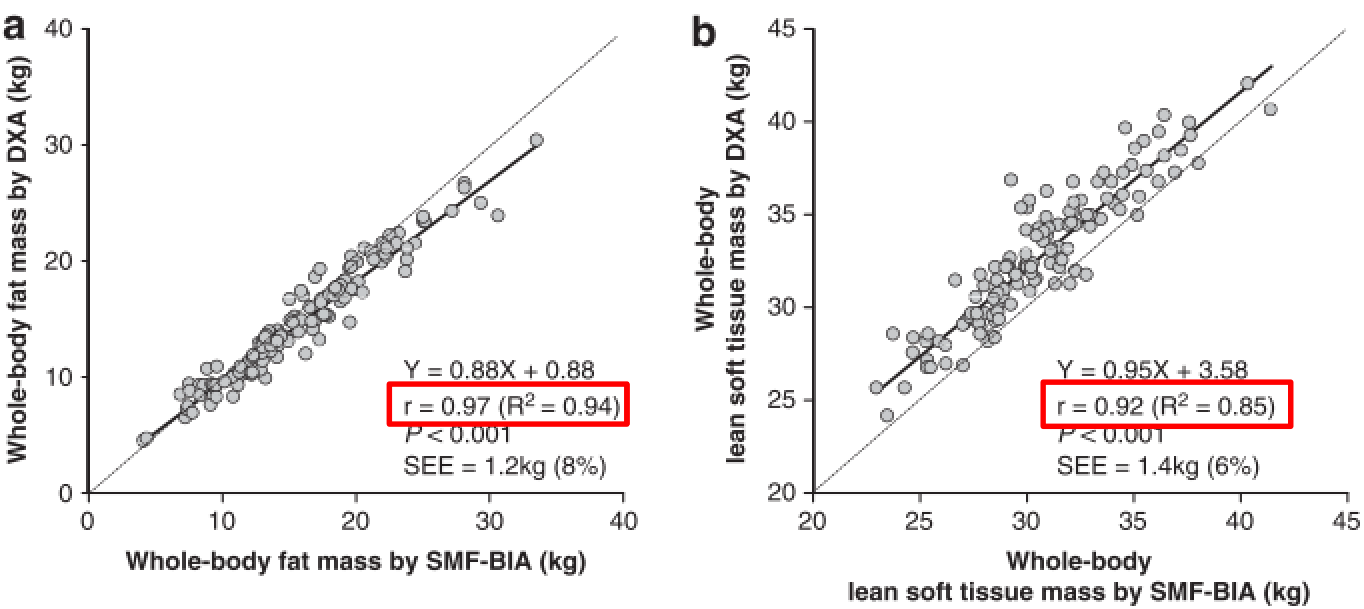

Figure 1. Linear regression between SMF-BIA and DXA. (**a**) Whole-body fat mass, (**b**) whole-body lean soft tissue mass, (**c**) appendicular fat mass and (**d**) appendicular lean soft tissue mass. SEE, s.e. of estimate; solid lines, regression line; dotted lines, identity line.

I. DEXA vs InBody

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Validity of Two Commercial Grade Bioelectrical Impedance Analyzers for Measurement of Body Fat Percentage

Brett A. Dolezal, Michael J. Lau, Marlon Abrazado, Thomas W. Storer, Christopher B. Cooper

Exercise Physiology Research Laboratory, Departments of Medicine and Physiology, David Geffen School of Medicine, University of California Los Angeles, CA, USA

DEXA(Hologic) vs Tanita BC-590BT vs InBody R20

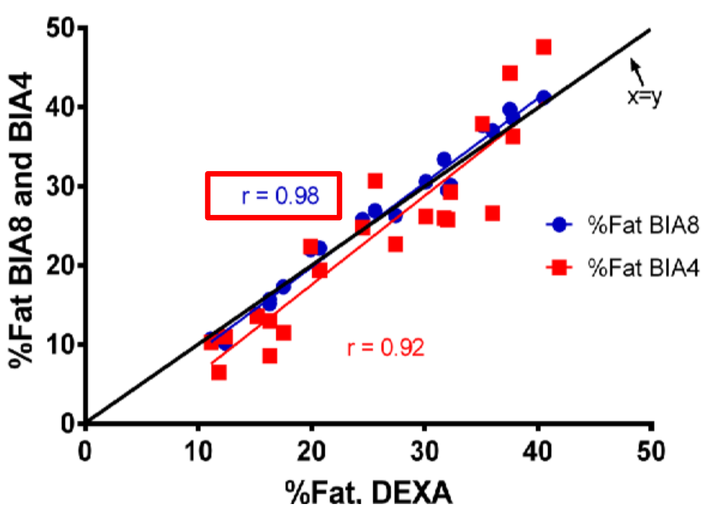

Figure 2. Correlations Between %Fat Determined by BIA8 and BIA4 vs. DEXA.

I. DEXA vs InBody

DEXA(Hologic) vs InBody4.0

Clinical Nephrology, Vol. 79 – No. 4/2013 (261-268)

Comparison of bioimpedance analysis and dual-energy X-ray absorptiometry body composition measurements in peritoneal dialysis patients according to edema

Seok Hui Kang, Kyu Hyang Cho, Jong Won Park, Kyung Woo Yoon, and Jun Young Do

Division of Nephrology, Department of Internal Medicine, Yeungnam University Hospital, Daegu, Korea

Table 4. Simple linear regression analysis using measurements of DXA for predictions of body compositions by BIA.

Variables	1st quartile		2nd quartile		3rd quartile		4th quartile	
	NS-β* (SE)	R^2	NS-β* (SE)	R^2	NS-β* (SE)	R^2	NS-β* (SE)	R^2
Total lean mass	1.008 (0.004)	0.996	1.000 (0.004)	0.995	0.986 (0.003)	0.998	0.949 (0.005)	0.993
Total fat mass	1.034 (0.009)	0.981	1.016 (0.012)	0.962	1.094 (0.013)	0.962	1.162 (0.012)	0.971
Limb lean mass	0.968 (0.009)	0.974	0.985 (0.008)	0.982	0.972 (0.011)	0.963	1.047 (0.009)	0.983
Trunk lean mass	0.930 (0.007)	0.984	0.904 (0.006)	0.987	0.868 (0.006)	0.986	0.818 (0.006)	0.985
Bone mineral content	1.360 (0.015)	0.966	1.410 (0.016)	0.966	1.488 (0.025)	0.926	1.432 (0.016)	0.968

DXA = dual-energy X-ray absorptiometry; BIA = bioimpedance analysis; NS-β = non-standardized-β; SE = standard error. *$p < 0.001$.

I. DEXA vs InBody

DEXA(Lunar) vs InBody720, 520

Utility of multifrequency bioelectrical impedance compared with dual-energy x-ray absorptiometry for assessment of total and regional body composition varies between men and women

*Lindsey J. Anderson, David N. Erceg, E. Todd Schroeder**

Division of Biokinesiology and Physical Therapy at the School of Dentistry, The Clinical Exercise Research Center, University of Southern California, ET Schroeder, 1540 E. Alcazar CHP-155, Los Angeles, CA 90033, USA

Table 2 – Correlation (ρ), regression, ICC, and CV% for BIA estimates

	ρ_C	Linear regression	R^2	SEE	CV%
LBM: DXA vs 720					
All	0.97*	Y = 1.02x − 3.0	0.97	2.4	0.3
Men	0.95*	Y = 0.94x + 3.8	0.91	2.3	0.5
Women	0.85*	Y = 0.82x + 6.0	0.88	1.8	0.4
LBM: DXA vs 520					
All	0.96*	Y = 1.03x − 3.0	0.95	2.8	0.6
Men	0.93*	Y = 0.88x + 7.7	0.87	2.8	0.5
Women	0.83*	Y = 0.83x + 5.4	0.87	1.9	0.7
FM: DXA vs 720					
All	0.95*	Y = 0.89x + 1.4	0.90	2.8	2.4
Men	0.90*	Y = 0.78x + 2.2	0.87	2.6	2.1
Women	0.98*	Y = 0.96x + 1.3	0.95	2.2	2.7
FM: DXA vs 520					
All	0.95*	Y = 0.86x + 2.3	0.92	2.5	1.9
Men	0.93*	Y = 0.74x + 3.1	0.93	1.9	1.9
Women	0.98*	Y = 0.93x + 2.0	0.95	2.2	1.7

Lin concordance correlation coefficient (ρ_C), linear regression equation, association variable (R^2), and SEE for BIA vs DXA. Test-retest reliability of body composition estimation for each BIA device is indicated by CV%.
* P < .001.

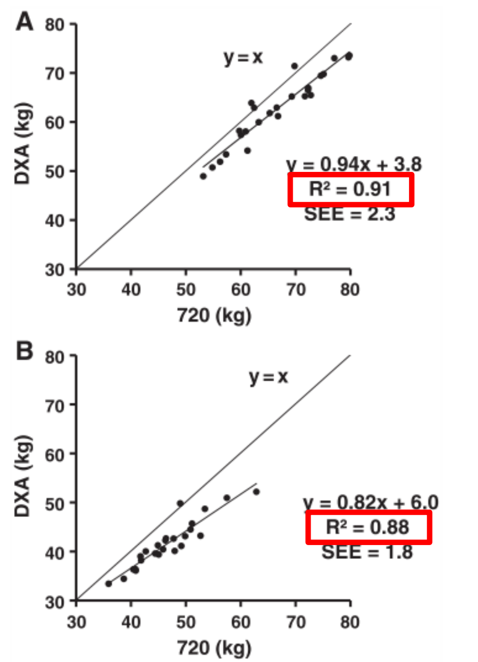

Fig. 2 – Dual-energy x-ray absorptiometry vs 720 BIA LBM estimation for men (A) and women (B). Linear regression line and equation, association variable (R^2), and line of best fit (y = x).

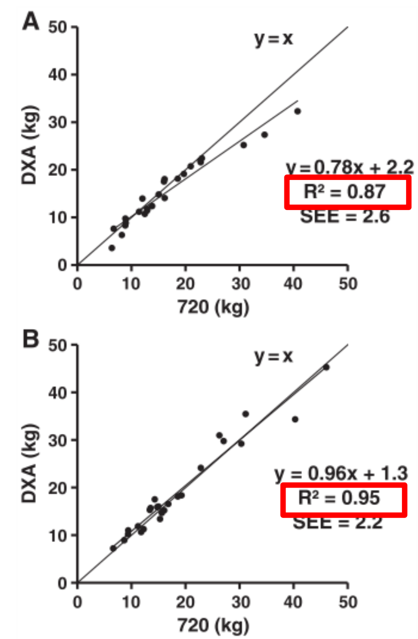

Fig. 3 – Dual-energy x-ray absorptiometry vs 720 BIA FM estimation for men (A) and women (B). Linear regression line and equation, association variable (R^2), and line of best fit (y = x).

I. DEXA vs InBody

DEXA(Hologic) vs InBody720

AJKD

Original Investigation

Comparison of Multifrequency Bioelectrical Impedance Analysis and Dual-Energy X-ray Absorptiometry Assessments in Outpatient Hemodialysis Patients

Antje Fürstenberg, MD,[1] and Andrew Davenport, FRCP[2]

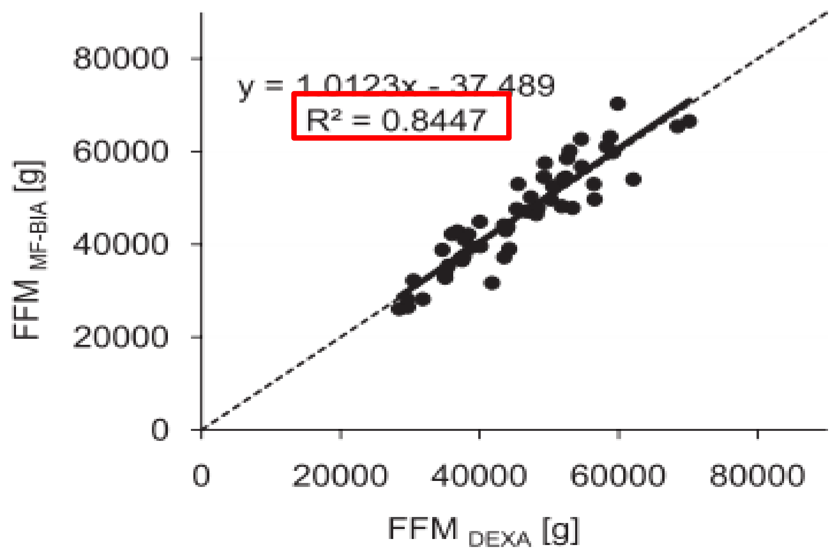

Figure 1. Plot of total-body fat-free mass (FFM) using dual-energy x-ray absorptiometry (FFM_{DEXA}) and multifrequency bioelectrical impedance analysis (FFM_{MF-BIA}). Broken line indicates identity line, solid line indicates trend line.

I. DEXA vs InBody

DEXA(Hologic) vs InBody720

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Clinical Nutrition

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Original article

Accuracy of direct segmental multi-frequency bioimpedance analysis in the assessment of total body and segmental body composition in middle-aged adult population

Carolina H.Y. Ling [a,*], Anton J.M. de Craen [a,d], Pieternella E. Slagboom [b], Dave A. Gunn [e], Marcel P.M. Stokkel [c], Rudi G.J. Westendorp [a,d], Andrea B. Maier [a,d]

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Table 2
Body composition parameters measured on DEXA and BIA according to gender.

Body composition parameter, mean (SD)	Female ($N = 242$)			Male ($N = 242$)		
	DEXA	BIA	ICC[a]	DEXA	BIA	ICC[a]
Whole body measurement						
Weight, kg	72.2 (12.5)	72.7(12.6)	1.00	84.5 (10.8)	85.5 (10.9)	1.00
Lean mass, kg	47.2 (5.8)	46.5 (5.2)	0.95	65.0 (6.8)	63.6 (7.0)	0.96
Body fat, kg	25.0 (7.8)	26.2 (9.5)	0.97	19.5 (5.9)	21.9 (7.3)	0.93
Percentage body fat, %	33.9 (5.5)	35.1 (7.3)	0.93	22.7 (4.6)	25.3 (6.2)	0.88
Segmental lean mass measurement						
Right arm, kg	2.5 (0.4)	2.5 (0.4)	0.93	4.0 (0.6)	3.8 (0.5)	0.87
Left arm, kg	2.3 (0.4)	2.4 (0.4)	0.91	3.8 (0.5)	3.7 (0.5)	0.92
Trunk, kg	24.1 (3.0)	21.3 (2.5)	0.73	32.5 (3.5)	28.8 (3.1)	0.69
Right leg, kg	7.6 (1.1)	7.0 (0.9)	0.83	10.4 (1.3)	9.8 (1.2)	0.85
Left leg, kg	7.4 (1.1)	7.0 (0.9)	0.86	10.2 (1.3)	9.7 (1.2)	0.85

[a] intraclass correlation coefficient, all $p < 0.001$.

I. DEXA vs InBody

DEXA(Hologic) vs InBody720

American Journal of Nephrology

Original Report: Patient-Oriented, Translational Research

Am J Nephrol 2011;33:150–156
DOI: 10.1159/000324111

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Accepted: January 5, 2011
Published online: February 3, 2011

Assessment of Body Composition in Peritoneal Dialysis Patients Using Bioelectrical Impedance and Dual-Energy X-Ray Absorptiometry

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UCL Centre for Nephrology, Royal Free Hospital, University College London Medical School, London, UK

Table 3. Correlation of body composition measurements DEXA vs. MF-BIA (r = correlation coefficient)

	r	95% CI	p
Fat-free mass	0.95	0.93–0.97	<0.0001
Fat mass	0.93	0.90–0.96	<0.0001
Total lean body mass	0.95	0.93–0.97	<0.0001
Lean trunk	0.90	0.86–0.93	<0.0001
Lean left arm	0.86	0.80–0.90	<0.0001
Lean right arm	0.84	0.77–0.89	<0.0001
Lean left leg	0.89	0.83–0.92	<0.0001
Lean right leg	0.90	0.85–0.93	<0.0001
Bone mineral content	0.77	0.68–0.84	<0.0001

I. DEXA vs InBody

Nutrition Research and Practice (*Nutr Res Pract*) 2011;5(3):246-252
DOI: 10.4162/nrp.2011.5.3.246

DEXA(Lunar) vs InBody4.0

External cross-validation of bioelectrical impedance analysis for the assessment of body composition in Korean adults

Hyeoijin Kim[1]*, Chul-Hyun Kim[2]*, Dong-Won Kim[3], Mira Park[4], Hye Soon Park[5], Sun-Seek Min[2], Seung-Ho Han[2], Jae-Yong Yee[2], Sochung Chung[6] and Chan Kim[2§]

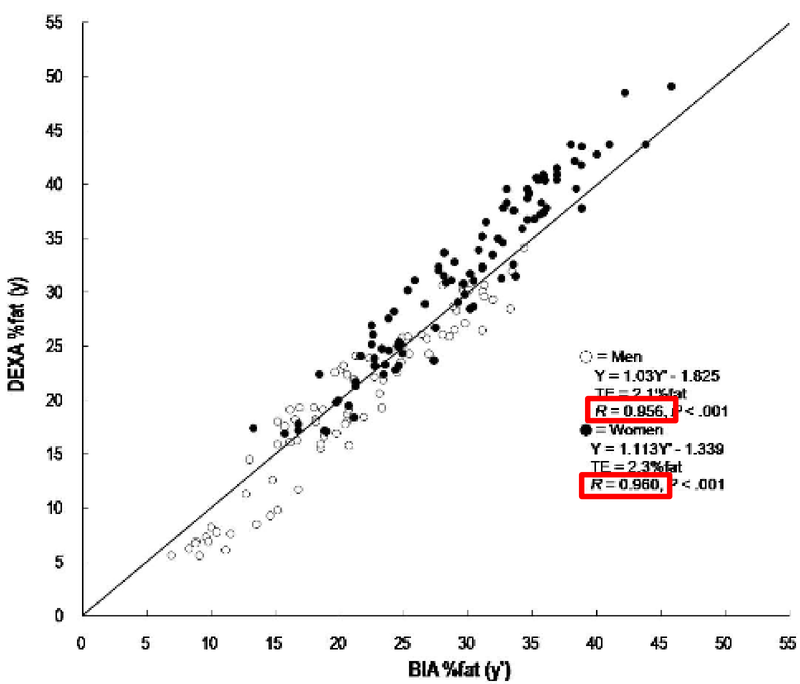

Fig. 1. Relationship between %fat by BIA and %fat by DEXA

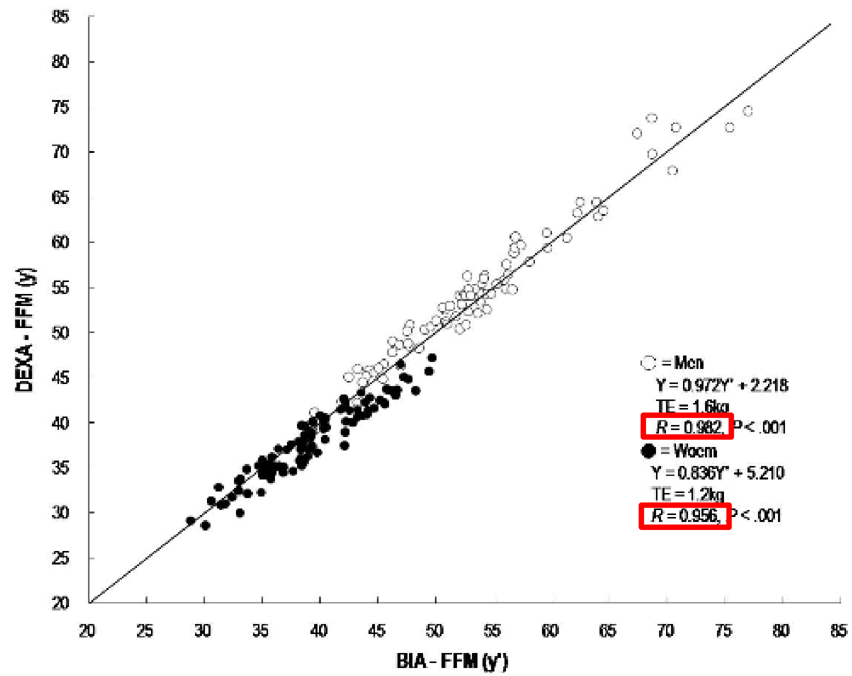

Fig. 4. Relationship between FFM by BIA and FFM by DEXA

I. DEXA vs InBody

DEXA(Not mentioned) vs CT vs InBody230

Nutrition Research and Practice (*Nutr Res Pract*) 2010;4(2):128-135

Comparisons of obesity assessments in over-weight elementary students using anthropometry, BIA, CT and DEXA

Ok-Kyeong Yu[1,2], Yang-Keun Rhee[1,3], Tae-Sun Park[1,3] and Youn-Soo Cha[1,2§]

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[3]*Department of Internal Medicine, Chonbuk National University, Deokjin-dong, Deokjin-gu, Jeonju 561-756, Korea*

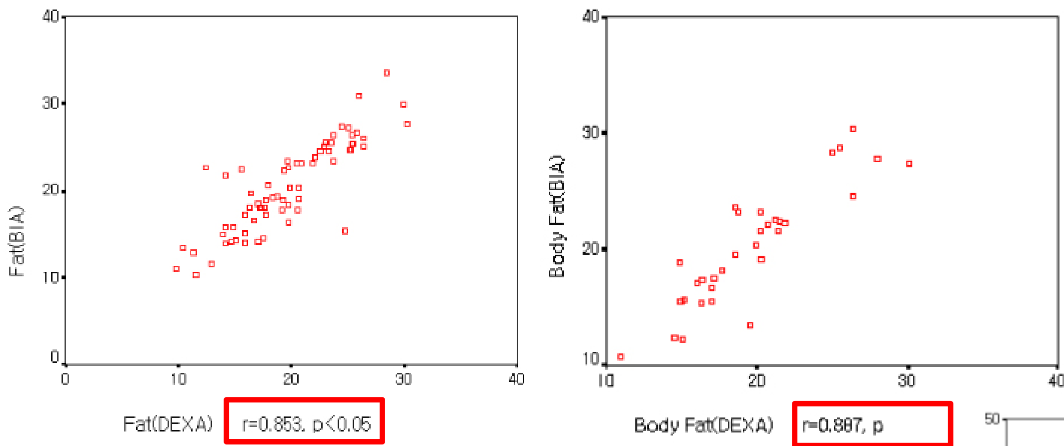

Fig. 1. Correlations between DEXA & BIA of fat mass (boys & girls)

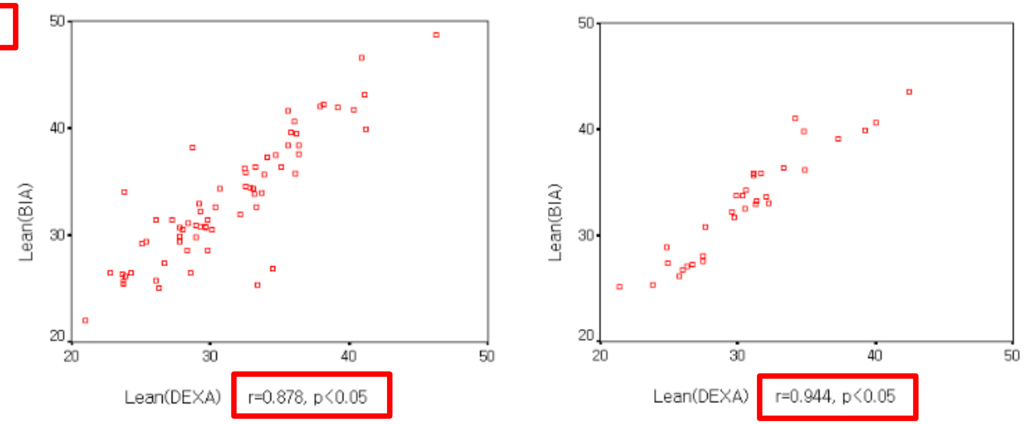

Fig. 2. Correlations between DEXA & BIA of lean body mass (boys & girls)

I. DEXA vs InBody

DEXA(Lunar) vs InBody720

Pediatrics International (2009) **51**, 263–268

doi: 10.1111/j.1442-200X.2008.02698.x

Original Article

Cross-calibration of multi-frequency bioelectrical impedance analysis with eight-point tactile electrodes and dual-energy X-ray absorptiometry for assessment of body composition in healthy children aged 6–18 years

Jung S. Lim,[1] Jin S. Hwang,[2] Jun A. Lee,[1] Dong H. Kim,[1] Kyung D. Park,[1] Jin S. Jeong[3] and Gi J. Cheon[3]

Departments of [1]Pediatrics and [3]Nuclear Medicine, Korea Cancer Central Hospital, Nowon-gu, Seoul and [2]Department of Pediatrics, Ajou University School of Medicine, Suwon, Korea

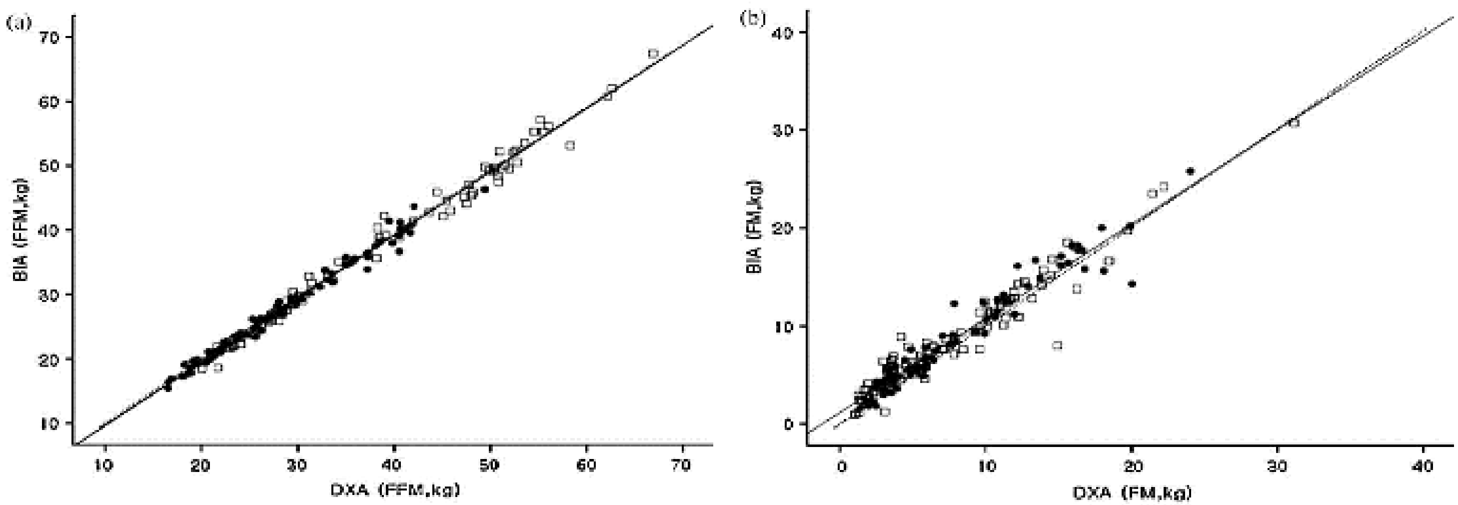

Fig. 1 Linear regression analysis cc paring body compositions by BIA w by DXA in 166 children and adol cents. (a) DXA FFM = 1.006(BIA FFM 0.554; $\boxed{R^2 = 0.990;}$ standard error of estimate (SEE) = 1.16 kg. (b) D: FM = 0.971(BIA FM) – 0.596; R^2 $\boxed{0.934;}$ SEE = 1.34 kg; (c) D: %BF = 0.940(BIA %BF) – 1.026; R^2 0.858; SEE = 3.03%. BIA, bioelectri impedance analysis; %BF, percent bo fat; DXA, dual-energy X-ray absorptic etry; FM, fat mass; FFM, fat-free mas

I. DEXA vs InBody

DEXA(Hologic) vs InBody3.0

European Journal of Clinical Nutrition (2008), 1–8

0954-3007/08 $30.00
www.nature.com/ejcn

Cross-validation of bioelectrical impedance analysis for the assessment of body composition in a representative sample of 6- to 13-year-old children

S Kriemler[1], J Puder[2], L Zahner[1], R Roth[1], C Braun-Fahrländer[3] and G Bedogni[4]

[1]*Institute of Exercise and Health Sciences, University of Basel, Basel, Switzerland;* [2]*Division of Endocrinology, Diabetes and Metabolism, University Hospital of Lausanne, Lausanne, Switzerland;* [3]*Institute of Social and Preventive Medicine, University of Basel, Basel, Switzerland and* [4]*Clinical Epidemiology Unit, Liver Research Center, Trieste, Italy*

Table 3 KISS algorithms for the assessment of total and appendicular body composition

	FFM *Whole-body* 8-BIA	*FFM* *Whole-body* 4-BIA	*LTM* *Left arm* 8-BIA	*LTM* *Right arm* 8-BIA	*LTM* *Left leg* 8-BIA	*LTM* *Right leg* 8-BIA
Male	0.36* (0.14 to 0.58) [0.03]	0.77** (0.49 to 1.05) [0.06]	0.04** (0.02 to 0.07) [0.06]	0.05** (0.03 to 0.07) [0.07]	0.08* (0.03 to 0.14) [0.03]	0.09** (0.04 to 0.14) [0.04]
Age	0.50** (0.42 to 0.58) [0.16]	0.46** (0.36 to 0.56) [0.14]	0.03** (0.02 to 0.04) [0.18]	0.03** (0.02 to 0.04) [0.16]	0.09** (0.07 to 0.11) [0.15]	0.10** (0.08 to 0.13) [0.17]
Weight (kg)	0.27** (0.25 to 0.30) [0.39]	0.32** (0.29 to 0.36) [0.46]	0.01** (0.01 to 0.01) [0.25]	0.01** (0.01 to 0.01) [0.28]	0.05** (0.04 to 0.06) [0.37]	0.05** (0.04 to 0.06) [0.38]
$RI8_{500}$ ($cm^2 \Omega^{-1}$)[a]	0.88** (0.80 to 0.95) [0.49]	—	0.02** (0.01 to 0.02) [0.59]	0.02** (0.01 to 0.02) [0.57]	0.03** (0.03 to 0.04) [0.52]	0.03** (0.03 to 0.03) [0.48]
$RI4_{50}$ ($cm^2 \Omega^{-1}$)	—	0.41** (0.35 to 0.46) [0.42]	—	—	—	—
Intercept	−1.78** (−2.25 to −1.32)	−0.77* (−1.30 to −0.24)	−0.23** (−0.28 to −0.18)	−0.22** (−0.27 to −0.16)	−1.10** (−1.22 to −0.99)	−1.03** (−1.14 to −0.92)
R^2_{adj}, model fit	0.98** (0.98 to 0.98)	0.97** (0.96 to 0.98)	0.94** (0.92 to 0.95	0.93** (0.91 to 0.94)	0.96** (0.96 to 0.97)	0.96** (0.96 to 0.97)
RMSE (kg), model fit	0.90 (0.82 to 0.98)	1.12 (1.01 to 1.24)	0.09 (0.08 to 0.09)	0.10 (0.09 to 0.11)	0.24 (0.22 to 0.26)	0.23 (0.21 to 0.25

Abbreviations: —, not tested; FFM, fat-free mass; LTM, lean tissue mass; R^2_{adj}, adjusted coefficient of determination; $RI4_{50}$, tetrapolar resistance index at 50 kHz; $RI8_{500}$, octopolar resistance index at 500 kHz; RMSE, root mean square error of the estimate.
Values for predictors are regression coefficients with bootstrapped 95% CI (in round brackets) and standardized regression coefficients (in square brackets). The 95% CI for model-fitting metrics were calculated by bootstrap analysis (see text for details).
[a]Whole body or segmental value employed depending on the outcome.
$*P<0.01$; $**P<0.001$.

I. DEXA vs InBody

DEXA(Hologic) vs InBody720

ANTI-AGING MEDICINE

Received: Feb 20, 2009
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Reference Data of Multi Frequencies Bioelectric Impedance Method in Japanese

Nobuyuki Miyatake [1)], Akiko Tanaka [1)], Miki Eguchi [1)], Motohiko Miyachi [2)], Izumi Tabata [2)], Takeyuki Numata [1)]

1) Okayama Southern Institute of Health, Okayama Health Foundation, Okayama 700-0952, Japan
2) National Institute of Health and Nutrition, Shinjuku, Tokyo 162-8636, Tokyo

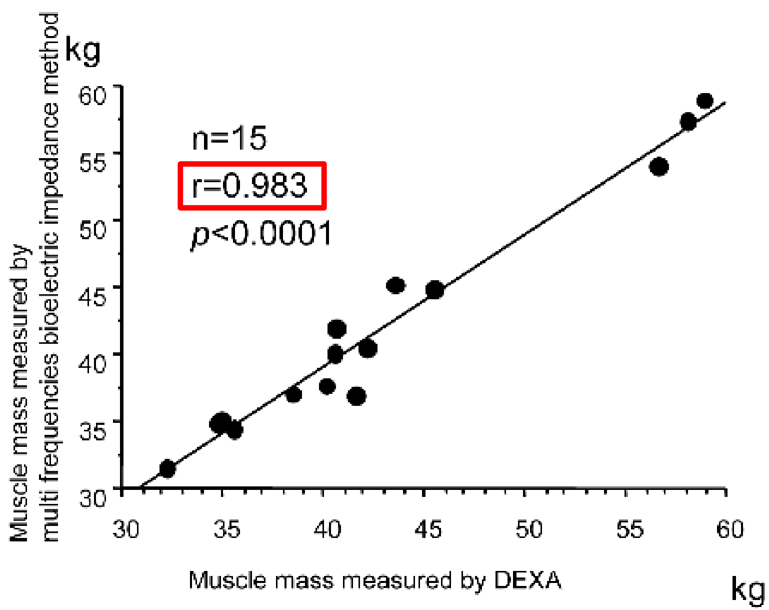


Fig. 1. Simple correlation analysis between muscle mass measured by multi frequencies bioelectric impedance method and that measured by DEXA in muscle mass

I. DEXA vs InBody

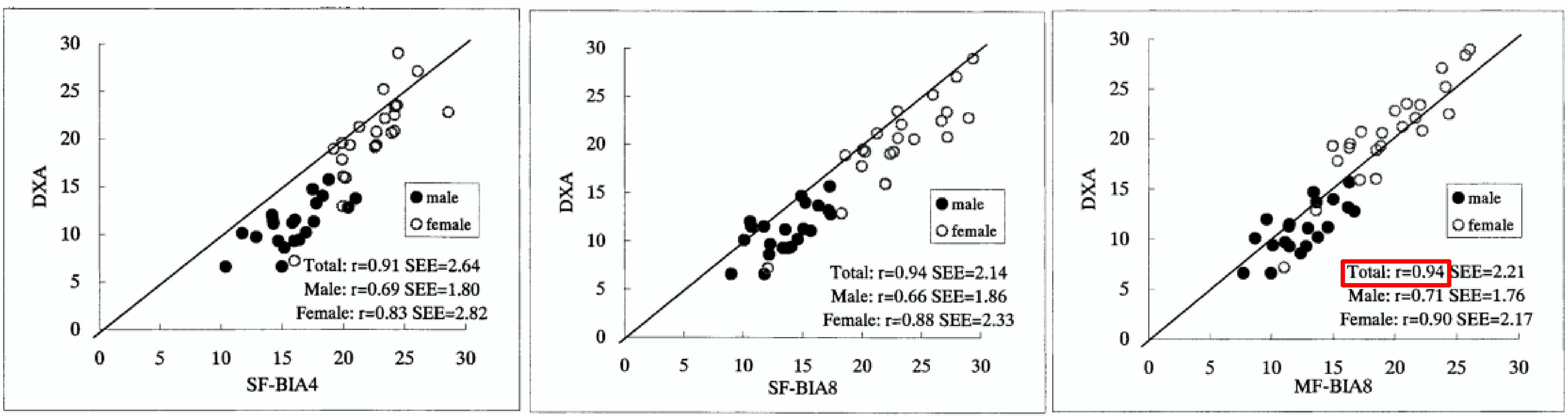
DEXA(Lunar) vs Underwater weighing vs Tanita(BC118, TBF101) vs InBody3.0

Journal of
PHYSIOLOGICAL
ANTHROPOLOGY
and Applied Human Science

Percentage of Total Body Fat as Estimated by Three Automatic Bioelectrical Impedance Analyzers

Shinichi Demura[1], Susumu Sato[2] and Tamotsu Kitabayashi[3]

1) Kanazawa University, Faculty of Education
2) Kanazawa Institute of Technology, Life-long Sports Core



I. DEXA vs InBody

DEXA(Lunar) vs InBody3.0

ANNALS OF HUMAN BIOLOGY
JULY–AUGUST 2003, VOL. 30, NO. 4, 380–391

Taylor & Francis healthsciences

Cross-calibration of eight-polar bioelectrical impedance analysis versus dual-energy X-ray absorptiometry for the assessment of total and appendicular body composition in healthy subjects aged 21–82 years

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‡ Geriatrics Chair, University of Modena and Reggio Emilia, Italy
§ Food Science and Nutrition Unit, USL, Modena, Italy

Received 9 October 2002; in revised form 2 January 2003; accepted 30 January 2003

Table 3. Accuracy of eight-polar BIA in estimating fat-free mass and appendicular lean tissue mass.

	FFM		LTM_{arm}		LTM_{leg}	
	R^2_{adj}*	RMSE%	R^2_{adj}*	RMSE%	R^2_{adj}*	RMSE%
Wt	0.57	14	0.48	22	0.50	16
Ht	0.69	12	0.62	19	0.73	12
R_5	0.52	15	0.56	20	0.36	18
R_{50}	0.56	14	0.57	20	0.45	17
R_{250}	0.58	14	0.59	19	0.48	16
R_{500}	0.59	14	0.60	19	0.49	16
RI_5	0.90	7	0.91	9	0.79	10
RI_{50}	0.92	6	0.92	9	0.84	9
RI_{250}	0.92	6	0.91	9	0.86	9
RI_{500}	0.92	6	0.93	8	0.86	8

*$p < 0.0001$ for all values of R^2_{adj}.
Abbreviations: FFM, fat-free mass; LTM, lean tissue mass; R^2_{adj}, adjusted coefficient of determination; RMSE%, percent root mean square error; Wt, weight; Ht, height; R_x, resistance at x kHz; RI_x, resistance index at x kHz.

I. DEXA vs InBody

DEXA vs Underwater weighing vs InBody3.0

BODY COMPOSITION ASSESSMENT WITH SEGMENTAL MULTIFREQUENCY BIOIMPEDANCE METHOD *

Jukka A. Salmi
Department of Physiology, University of Kuopio, Kuopio, Finland

Table 8. Pearson correlation coefficient matrix of measured variables (FM, FFM and F%) from UWW, DXA and SMFBIA.

n = 40	**UWW FM**	**DXA FM**	**SMFBIA FM**
UWW FM	1.0	-	-
DXA FM	.91	1.0	-
SMFBIA FM	.91	.94	1.0
n = 40	**UWW FFM**	**DXA FFM**	**SMFBIA FFM**
UWW FFM	1.0	-	-
DXA FFM	.82	1.0	-
SMFBIA FFM	.83	.88	1.0
n = 40	**UWW F%**	**DXA F%**	**SMFBIA F%**
UWW F%	1.0	-	-
DXA F%	.80	1.0	-
SMFBIA F%	.81	.88	1.0

I. DEXA vs InBody

Bone mineral content

	Country	Research	Publication Year	Journal	Device	Subjects	Correlation Coefficient
1	India	Estimation of bone mineral content from bioelectrical impedance analysis in Indian adults aged 23-81 years: a comparison with Dual energy X-ray absorptiometry	2012	International Journal of Biomedical Engineering and Technology	DEXA (Lunar) vs InBody720	113 Indians, 23-81 Years old	Bone mineral content r = 0.9136
2	India	Single prediction equation for bioelectrical impedance analysis in adults aged 22-59 years	2011	Journal of Medical Engineering & Technology	DEXA (Lunar) vs InBody720	64 Indians, 22-59 Years old	Bone mineral content r = 0.9531

I. DEXA vs InBody

DEXA(Lunar) vs InBody720

Int. J. Biomedical Engineering and Technology, Vol. 8, No. 1, 2012 99

Estimation of Bone Mineral Content from Bioelectrical Impedance Analysis in Indian adults aged 23–81 years: a comparison with Dual energy X-ray Absorptiometry

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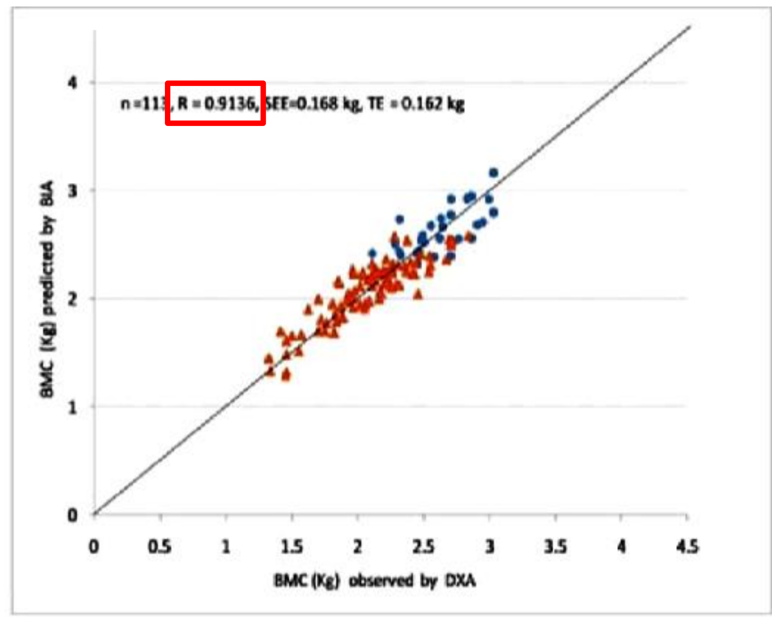


Figure 2 Correlations **(a)** of Bone Mineral Content (BMC) in all subjects measured by DXA and predicted by BIA equation. **(b)** differences of BMC in all subjects determined by using BIA and DXA. Solid line represents the linear relation between mean differences in BMC (=BMC by BIA – BMC by DXA) and average BMC ([BMC by DXA + BMC by BIA]/2); dark abbreviated line represents the mean difference and light abbreviated lines represent the 95% confidence interval. BIA, Bioelectrical Impedance Analysis; DXA, dual energy X-ray absorptiometry; n, number of subject; R, validity coefficient; SEE, standard error of estimation; TE, total error. Circles indicate men; triangles indicate women (see online version for colours)

I. DEXA vs InBody

DEXA(Lunar) vs InBody720

Single prediction equation for bioelectrical impedance analysis in adults aged 22–59 years

B. R. PATIL*†, D. P. PATKAR‡, S. A. MANDLIK§, M. M. KUSWARKAR§ and G. D. JINDAL§

†Department of Instrumentation Engineering, Bharati Vidyapeeth College of Engineering, Navi Mumbai, 400 614, India
‡MRI Centre, Dr Balabhai Nanavati Hospital, Vile Parle (West), Mumbai, 400 056, India
§Bio-Medical Section, Electronics Division, Modular Laboratories, B.A.R.C., Mumbai, 400 085, India

Journal of Medical Engineering & Technology, Vol. 35, No. 2, February 2011, 109–114

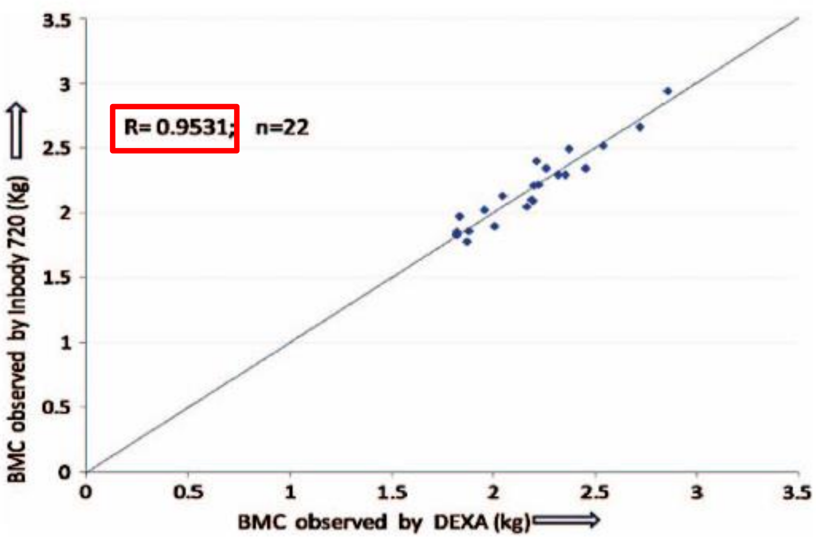


Figure 1. Relationship between bone mineral content (BMC) measured with DEXA and the commercial instrument InBody 720.

Comparison with Dilution methods

Ⅱ. D_2O vs InBody

Total body water, extracellular water

	Country	Research	Publication Year	Journal	Device	Subjects	Correlation Coefficient
1	USA	Validation of rapid 4-component body composition assessment with the use of dual-energy X-ray absorptiometry and bioelectrical impedance analysis	2018	The American journal of clinical nutrition	InBody S10	31 Healthy Adults	4-C model R^2 = 0.90 Body water R^2 = 0.93
2	USA	Utility of multi-frequency bioelectrical impedance compared to deuterium dilution for assessment of total body water	2015	Nutrition & Dietetics	D_2 dilution vs InBody520, 720, S10	50 Adults, 18-49 years old	InBody S10 M : r^2=0.89, F : 0.83 InBody720 M : r^2=0.90, F : 0.86 InBody520 M : r^2=0.86, F : 0.82
3	Italy	Body water distribution in severe obesity and its assessment from eight-polar bioelectrical impedance analysis	2005	European Journal of Clinical Nutrition	D_2 dilution, Bromide dilution vs InBody3.0	75 Italian Female, 18-66 years old (non obese =25, Obese I-II = 25, Obese III = 25)	Total body water r^2=0.82 Extracellular water r^2=0.87
4	Italy	Accuracy of an eight-point tactile-electrode impedance method in the assessment of total body water	2002	European Journal of Clinical Nutrition	D_2 dilution vs InBody3.0	50 Healthy Adults, Average age: 40 years old	Total body water r^2=0.81

Ⅱ. D_2O vs InBody

DEXA vs InBody S10

Validation of rapid 4-component body composition assessment with the use of dual-energy X-ray absorptiometry and bioelectrical impedance analysis

Bennett K Ng,[1] Yong E Liu,[2] Wei Wang,[3] Thomas L Kelly,[3] Kevin E Wilson,[3] Dale A Schoeller,[4] Steven B Heymsfield,[5] and John A Shepherd[2]

[1]University of California, Berkeley and University of California, San Francisco Graduate Program in Bioengineering, CA; [2]Department of Epidemiology, University of Hawaii Cancer Center, Honolulu, HI; [3]Hologic Inc., Marlborough, MA; [4]Department of Nutritional Sciences, University of Wisconsin-Madison, Madison, WI; and [5]Department of Metabolism and Body Composition, Pennington Biomedical Research Center, Baton Rouge, LA

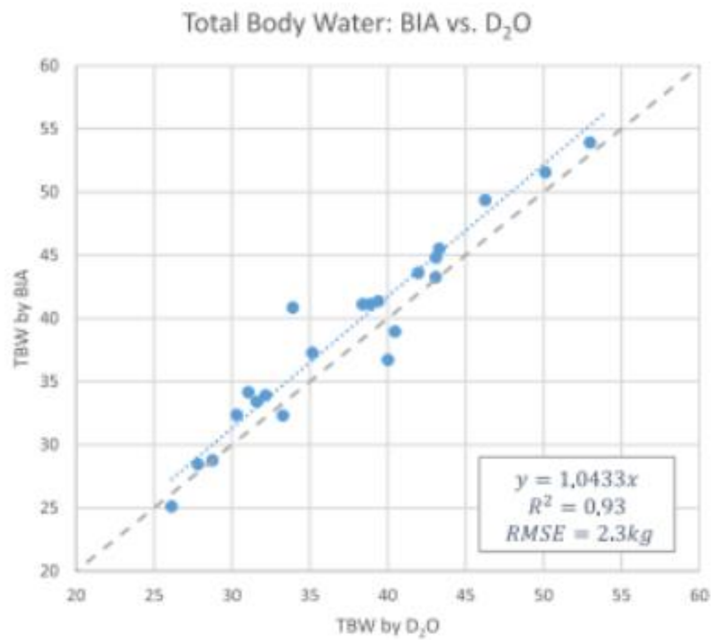


FIGURE 2 Linear regression between TBW measurements from BIA and D_2O (n = 23). High correlation was observed, although a slope significantly different from 1 was detected. These data were used to determine a linear correction equation for TBW from BIA: $TBW_{D2O} = 0.956\ TBW_{BIA}$ (95% CI: 0.932, 0.979). The dashed line is the line of identity. BIA, bioelectrical impedance analysis; D_2O, deuterium; RMSE, root mean squared error; TBW, total body water.

II. D_2O vs InBody

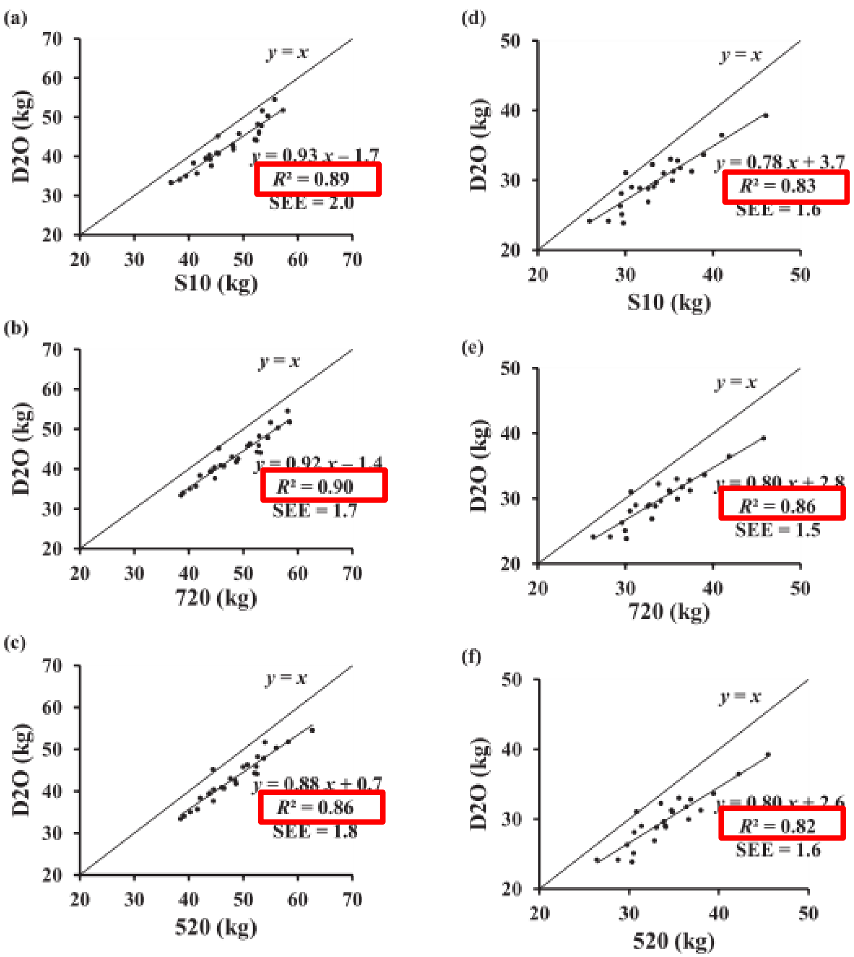
Utility of multi-frequency bioelectrical impedance compared to deuterium dilution for assessment of total body water

Lindsey J. ANDERSON, David N. ERCEG and E. Todd SCHROEDER

Division of Biokinesiology and Physical Therapy, School of Dentistry, Clinical Exercise Research Center, Universi of Southern California, Los Angeles, California, USA

D_2 dilution vs InBody520, 720, S10

Nutrition & Dietetics 2015; **72**: 183–189



II. D_2O vs InBody

D_2 dilution, Bromide dilution vs InBody3.0

Body water distribution in severe obesity and its assessment from eight-polar bioelectrical impedance analysis

A Sartorio[1], M Malavolti[2], F Agosti[1], PG Marinone[1], O Caiti[2], N Battistini[2] and G Bedogni[2,3]*

[1]*Malattie Metaboliche III e Laboratorio di Endocrinologia Sperimentale, Istituto Auxologico Italiano IRCCS, Piancavallo, Italy;* [2]*Cattedra di Nutrizione Umana, Università di Modena e Reggio Emilia, Italy; and* [3]*Centro Studi Fegato, AREA Science Park, Basovizza, Trieste, Italy*

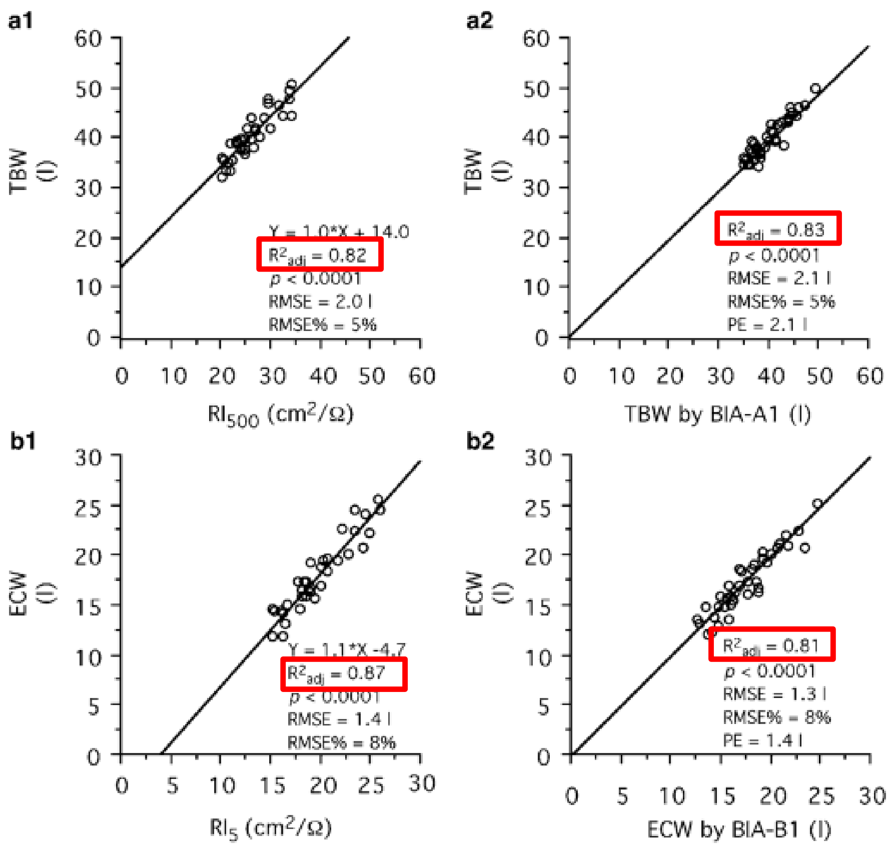


Figure 2 Generation (a1 and b1, $n = 37$) and cross-validation (a2 and b2, $n = 38$) of predictive equations for total body water and extracellular water in two random subsamples of women. Abbreviations: TBW = total body water; ECW = extracellular water; RI_x = resistance index at a frequency of x kHz; BIA = bioelectrical impedance analysis; R^2_{adj} = adjusted determination coefficient; RMSE = root mean squared error; RMSE% = percent root mean squared error; PE = pure error.

II. D_2O vs InBody

Accuracy of an eight-point tactile-electrode impedance method in the assessment of total body water

D_2 dilution vs InBody3.0

G Bedogni[1]*, M Malavolti[1], S Severi[1], M Poli[1], C Mussi[1,2], AL Fantuzzi[1,3] and N Battistini[1]

[1]*Human Nutrition Chair, Faculty of Medicine and Surgery, University of Modena and Reggio Emilia, Modena, Italy;* [2]*Geriatrics Chair, Faculty of Medicine and Surgery, University of Modena and Reggio Emilia, Modena, Italy; and* [3]*Food Science and Nutrition Unit, USL, Modena, Italy*

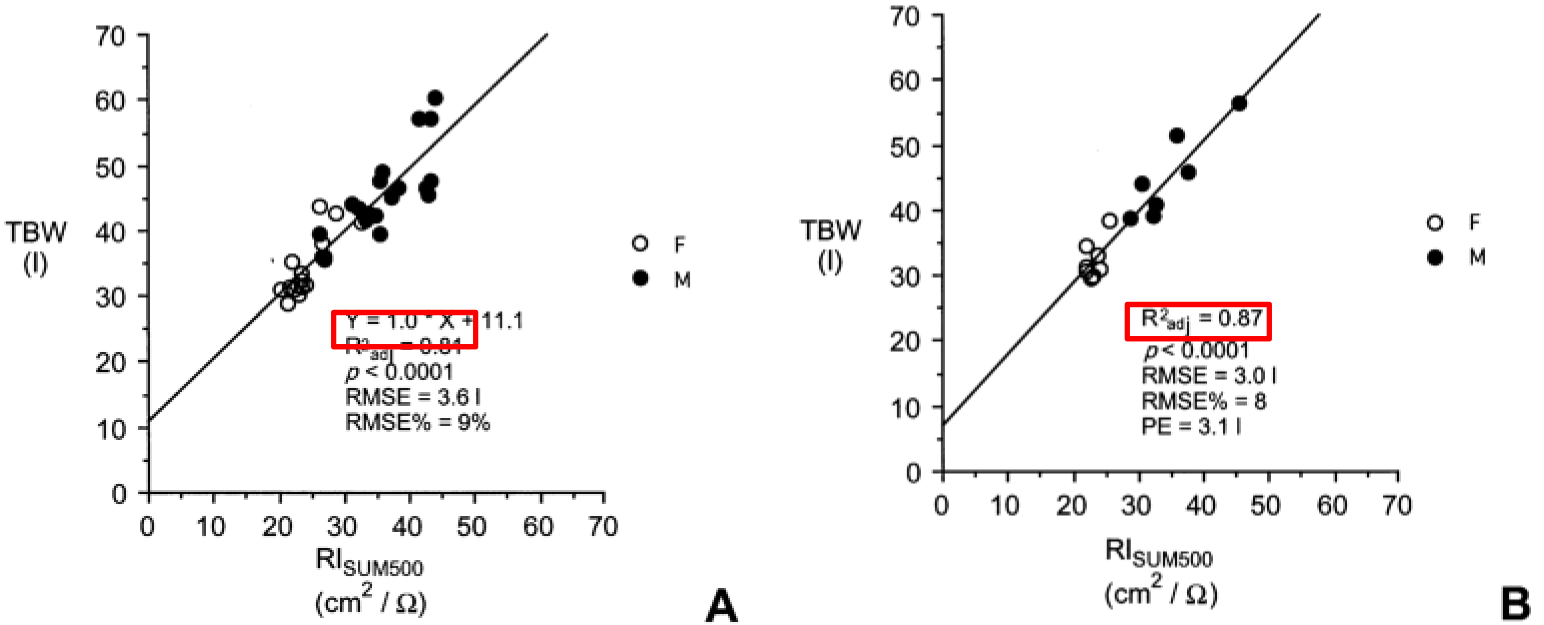


Figure 2 Random generation (A, $n = 35$) and cross-validation (B, $n = 15$) of a predictive algorithm for total body water from the whole-body resistance index at 500 kHz. TBW, total body water; F, female; M, male; RI_{SUM500}, resistance index at 500 kHz; RMSE, root mean square error; PE, pure error.

Comparison with CT

Ⅲ. CT vs InBody

Visceral fat area

	Country	Research	Publication Year	Journal	Device	Subjects	Correlation Coefficient
1	China	Comparison of visceral fat area measured by CT and bioelectrical impedance analysis in Chinese patients with gastric cancer: a cross-sectional study	2020	BMJ Open	InBody 720	157 gastric cancer patients	Visceral fat R=0.650
2	Japan	InBody720 as a new method of evaluation visceral obesity	2011	Hepato-Gastroentertology	CT vs InBody720	50 Stomach Cancer surgery Patients, 37-85 years old	r= 0.759 CT: 128.9cm^2 InBody : 103.0cm^2

Skeletal muscle mass

	Country	Research	Publication Year	Journal	Device	Subjects	Correlation Coefficient
1	Japan	Feasibility of computed tomography-based assessment of skeletal muscle mass in hemodialysis patients	2020	Journal of Nephrology	unknown	138 HD patients	SMM vs Psoas R = 0.770
2	Korea	Multifrequency Bioelectrical Impedance Analysis Compared With Computed Tomography for Assessment of Skeletal Muscle Mass in Primary Colorectal Malignancy: A Predictor of Short-Term Outcome After Surgery	2019	Nutrition in Clinical Practice	InBody 770	50 Colorectal Cancer Patients	SMM vs Psoas R = 0.705
3	Japan	Dual Energy X-ray Absorptiometry and Bioimpedance Analysis are Clinically Useful for Measuring Muscle Mass in Kidney Transplant Recipients With Sarcopenia	2018	Transplantation Proceedings	InBody 720	58 Kidney Transplant Recipients	SMM vs Psoas R = 0.761

III. CT vs InBody

CT vs InBody720

InBody 720 as a New Method of Evaluating Visceral Obesity

Hisataka Ogawa[1], Kazumasa Fujitani[1], Toshimasa Tsujinaka[1], Kenji Imanishi[2], Hatsumi Shirakata[2], Aiko Kantani[2], Motohiro Hirao[1], Yukinori Kurokawa[1], Shigetoshi Utsumi[2]
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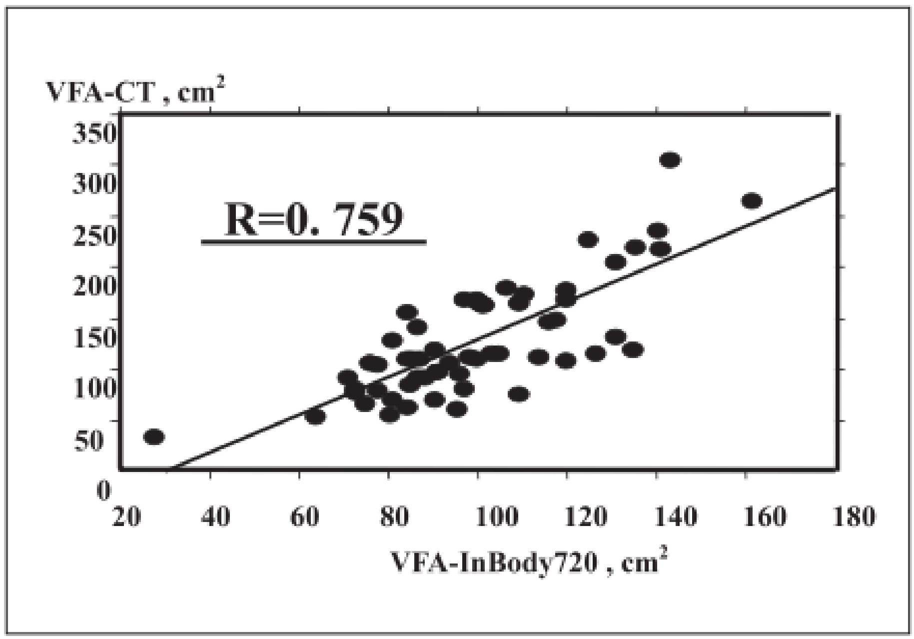

FIGURE 3 A scatter plot of VFA.

Ⅲ. CT vs InBody

CT vs InBody 770

Multifrequency Bioelectrical Impedance Analysis Compared With Computed Tomography for Assessment of Skeletal Muscle Mass in Primary Colorectal Malignancy: A Predictor of Short-Term Outcome After Surgery

Eun Young Kim, MD, PhD[1]; Seong Ryong Kim, MD[2]; Daeyoun David Won, MD[2]; Moon Hyung Choi, MD[3]; and In Kyu Lee, MD, PhD,[2]

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[2] Division of Colorectal Surgery, Department of Surgery, Seoul St. Mary's Hospital, Seoul, South Korea
[3] Department of Radiology, Seoul St. Mary's Hospital, Seoul, South Korea

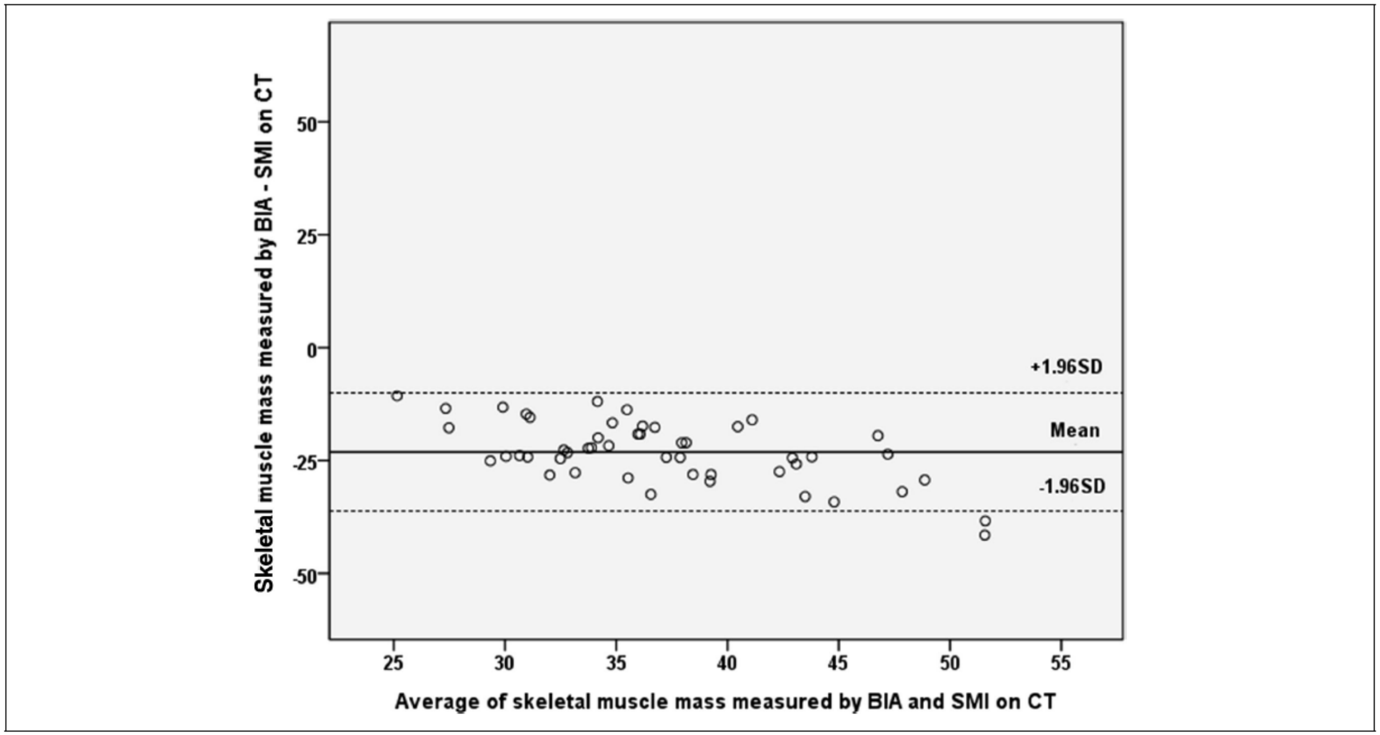

Figure 2. Bland-Altman plot for assessing agreement between SMI on CT scan and total body skeletal muscle mass determined by BIA. BIA, bioelectrical impedance analysis; CT, computed tomography; SMI, skeletal muscle index.

Ⅲ. CT vs InBody

CT vs DEXA vs InBody 720

Dual Energy X-ray Absorptiometry and Bioimpedance Analysis are Clinically Useful for Measuring Muscle Mass in Kidney Transplant Recipients With Sarcopenia

M. Yanishi[a,*], H. Kinoshita[a], H. Tsukaguchi[b], Y. Kimura[c], Y. Koito[a], E. Jino[a], M. Watanabe[a], M. Sugi[a], and T. Matsuda[a]

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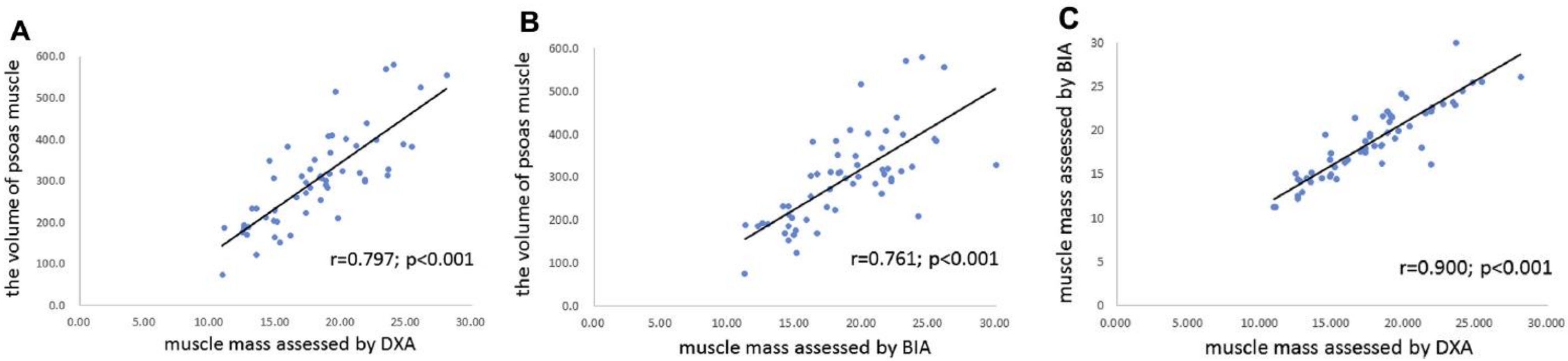


Comparison with Hydrodensitometry

Ⅳ. Underwater weighing, Bod-Pod vs InBody

Underwater weighing_Fat free mass, body fat mass and percent body fat

	Country	Research	Publication Year	Journal	Device	Subjects	Correlation Coefficient
1	USA	Evaluation of Multifrequency Bioelectrical Impedance Analysis in assessing body composition of wrestlers	2010	Medicine & Science in Sports & Exercise	Underwater weighing vs skinfold vs InBody520	72 American High School Wrestlers	Fat free mass r = 0.96
2	Japan	Percentage of Total Body Fat as Estimated by Three Automatic Bioelectrical Impedance Analyzers	2004	Journal of Physiological Anthropology and Applied Human Science	DEXA(Lunar) vs Underwater weighing vs Tanita vs vs InBody3.0	45 Healthy Japanese Female Collegiate	Percent body fat r = 0.81
3	Finland	Body Composition Assessment with Segmental Multifrequency Bioimpedance Method	2003	Journal of Sports Science and Medicine	DEXA(Not mentioned) vs Underwater weighing vs InBody3.0	58 Healthy Finnish Adults, 36-53 Years old	Fat free mass r = 0.83 Body fat mass r = 0.91 Percent body fat r = 0.81

Ⅳ. Underwater weighing, Bod-Pod vs InBody

BOD POD_Fat free mass, body fat mass and percent body fat

	Country	Research	Publication Year	Journal	Device	Subjects	Correlation Coefficient
1	USA	Evaluation of multi-frequency bioelectrical impedance analysis for the assessment of body composition in individuals with obesity	2018	Obesity science & practice	InBody 720	Sixty-two participants (BMI mean 38.9 kg/m2)	ADP Percent body fat R = 0.96
2	USA	Validating a new BIS system with Densitometry using BOD POD	2015	Journal of Kinesiology and Nutrition Student Research	Bod-Pod vs InBody (Not mentioned)	12 Students and Athletes	Fat free mass r^2 = 0.9826 Percent body fat r^2 = 0.8121
3	USA	Body composition measurements determined by air displacement plethysmography and eight-polar bioelectrical impedance analysis are equivalent in African American College students	2012	Health med Journal	Bod-Pod vs InBody720	143 African American Collegiate	Fat free mass M : r = 0.911 F : r = 0.918 Body fat mass M : r = 0.938 F : r = 0.931

IV. Underwater weighing, Bod-Pod vs InBody

BOP POD vs InBody 520

Evaluation of multi-frequency bioelectrical impedance analysis for the assessment of body composition in individuals with obesity

P. A. Sullivan[1,2], C. D. Still[1], S. T. Jamieson[1], C. B. Dixon[3], B. A. Irving[4] and J. L. Andreacci[2]
[1]Obesity Institute, Geisinger, Danville, PA, USA; [2]Department of Exercise Science, Bloomsburg University, Bloomsburg, PA, USA;
[3]Department of Health Science, Lock Haven University, Lock Haven, PA, USA; [4]Department of Kinesiology, Louisiana State University, Baton Rouge, LA, USA.

Objective

The purpose of this study was to compare body composition measurements estimated by multi-frequency bioelectrical impedance analysis (MF-BIA) with air displacement plethysmography (ADP) in individuals with obesity.

Methods

Bariatric patients were recruited from Geisinger's Center for Nutrition and Weight Management Clinic in Danville, Pennsylvania. Sixty-two participants (age = 52.4 ± 9.3 years; body mass index = 38.9 ± 8.0 kg m^{-2}) reported for a same-day testing visit. Body composition was measured using a common MF-BIA analyzer (InBody 720, Biospace Co., Beverly Hills, CA) and ADP.

Results

Strong relationships were observed between MF-BIA and ADP methods (r = 0.88–0.96, $P < 0.001$). There were no differences between MF-BIA and ADP measures of per cent body fat, fat mass or fat-free mass for the total sample or when examined by gender.

Conclusions

The InBody 720 MF-BIA analyzer produced body composition measurements that were similar to ADP supporting the use of this technology in the obese population.

Table 3 Comparison of FM between MF-BIA and ADP

Participant and method	FM (kg)	*r*	MD (kg)	SEE (kg)
Total (*n* = 62)				
ADP	49.2 ± 18.1			
MF-BIA	49.5 ± 18.9	0.99*	−0.3 ± 3.2	3.0
Women (*n* = 37)				
ADP	53.9 ± 16.8			
MF-BIA	54.7 ± 16.6	0.99*	−0.8 ± 2.8	2.8
Men (*n* = 25)				
ADP	42.3 ± 18.1			
MF-BIA	41.9 ± 19.7	0.99*	0.4 ± 3.7	3.2

*Significant at $P < 0.001$

Table 2 Comparison of per cent body fat between MF-BIA and ADP *Significant at $P < 0.001$

Participant and method	Body fat (%)	*r*	MD (%)	SEE (%)	Subjective SEE rating
Total (*n* = 62)					
ADP	43.3 ± 9.1				
MF-BIA	43.4 ± 9.7	0.96*	−0.1 ± 2.8	2.6	Very good
Women (*n* = 37)					
ADP	48.6 ± 5.4				
MF-BIA	49.2 ± 5.0	0.88*	−0.6 ± 2.6	2.6	Very good
Men (*n* = 25)					
ADP	35.9 ± 7.6				
MF-BIA	34.8 ± 8.4	0.93*	0.7 ± 3.0	2.8	Very good

Table 4 Comparison of FFM between MF-BIA and ADP *Significant at $P < 0.001$

Participant and method	FFM (kg)	*r*	MD (%)	SEE (%)	Subjective SEE rating
Total (*n* = 62)					
ADP	62.3 ± 12.4				
MF-BIA	62.3 ± 12.2	0.97*	0.02 ± 3.2	3.2	N/A
Women (*n* = 37)					
ADP	55.1 ± 7.6				
MF-BIA	54.6 ± 7.2	0.93*	0.5 ± 2.8	2.9	Good
Men (*n* = 25)					
ADP	72.9 ± 10.2				
MF-BIA	73.7 ± 8.6	0.94*	−0.7 ± 3.6	3.5	Good

Comparison with 4-C model

Ⅴ. 4-component model equation

Percent body fat

	Country	Research	Publication Year	Journal	Device	Subjects	Correlation Coefficient
1	USA	Validation of rapid 4-component body composition assessment with the use of dual-energy X-ray absorptiometry and bioelectrical impedance analysis	2018	The American journal of clinical nutrition	InBody S10	31 Healthy Adults	4-C model R^2 = 0.90 Body water R^2 = 0.93
2	USA	Ability of new octapolar bioimpedance spectroscopy analyzers to predict 4-component–model percentage body fat in Hispanic, black, and white adults	2008	The American Journal of Clinical Nutrition	4C model vs InBody720, 320	Healthy Adults 75 Hispanic, 75 Black, 75 White	Percent body fat InBody720 r = 0.8426 InBody320 r = 0.8418

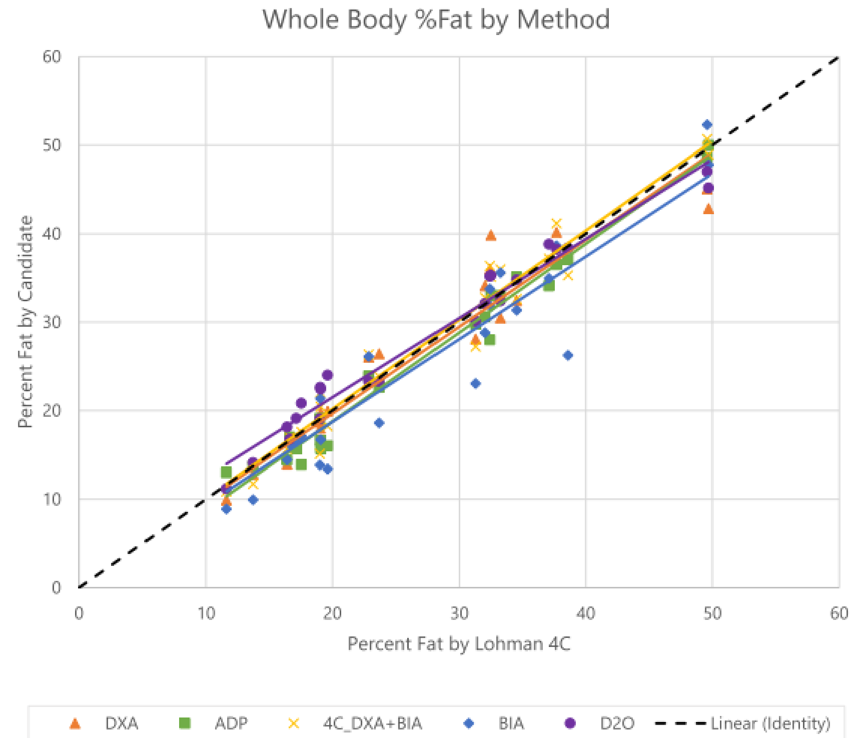
V. 4-component model equation

4-c model vs InBody S10

Validation of rapid 4-component body composition assessment with the use of dual-energy X-ray absorptiometry and bioelectrical impedance analysis

Bennett K Ng,[1] Yong E Liu,[2] Wei Wang,[3] Thomas L Kelly,[3] Kevin E Wilson,[3] Dale A Schoeller,[4] Steven B Heymsfield,[5] and John A Shepherd[2]

[1]University of California, Berkeley and University of California, San Francisco Graduate Program in Bioengineering, CA; [2]Department of Epidemiology, University of Hawaii Cancer Center, Honolulu, HI; [3]Hologic Inc., Marlborough, MA; [4]Department of Nutritional Sciences, University of Wisconsin-Madison, Madison, WI; and [5]Department of Metabolism and Body Composition, Pennington Biomedical Research Center, Baton Rouge, LA



Method	Slope [95% CI]	Intercept [95% CI]	R^2	RMSE
DXA	0.98 [0.94, 1.03]	n.s.	0.93	2.97
ADP	0.96 [0.94, 0.99]	n.s.	0.98	1.71
BIA	0.94 [0.88, 0.99]	n.s.	0.90	3.83
D_2O	0.90 [0.82, 0.97]	3.56 [1.45, 5.68]	0.97	1.80
4C DXA + BIA	1.01 [0.97, 1.04]	n.s.	0.96	2.33

V. 4-component model equation

4-c model vs InBody720

Ability of new octapolar bioimpedance spectroscopy analyzers to predict 4-component–model percentage body fat in Hispanic, black, and white adults[1–3]

Ann L Gibson, Jason C Holmes, Richard L Desautels, Lyndsay B Edmonds, and Laura Nuudi

$$\%BF_{4C} = [(2.747/\mathrm{Db}) - (0.714W) + (1.146M) - 2.0503] \times 100 \quad (3)$$

where Db came from HW, W was calculated as the ratio of TBW to BM, and M was calculated as the ratio of TBMC to BM. Lohman's cross-validation criteria (11) were also applied for each correlation.

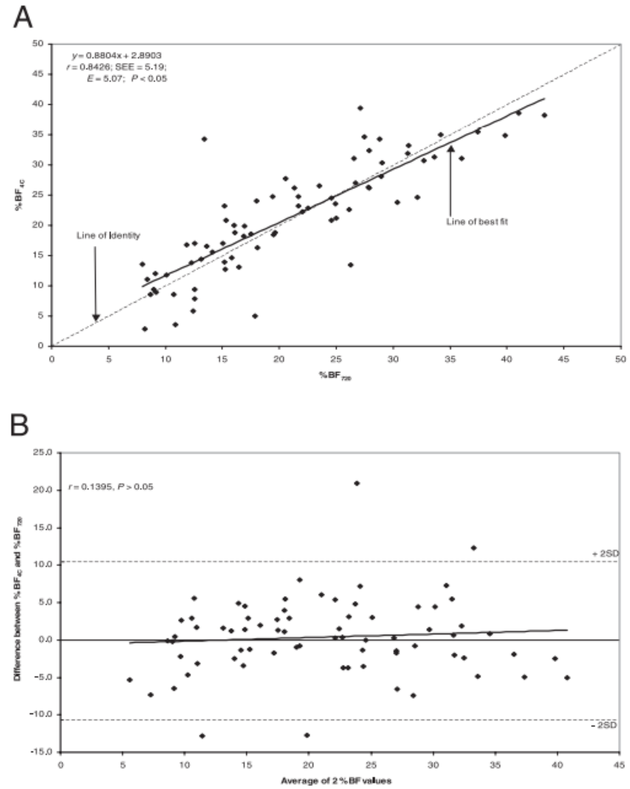


FIGURE 1. A: Correlation between percentage body fat in Selinger's 4-component model ($\%BF_{4C}$) and in the InBody 720 device ($\%BF_{720}$) in men ($n = 73$). B: Bland-Altman plot of $\%BF_{4C}$ and $\%BF_{720}$ in men. – – –, ± 2SD from a mean difference of 0.0.

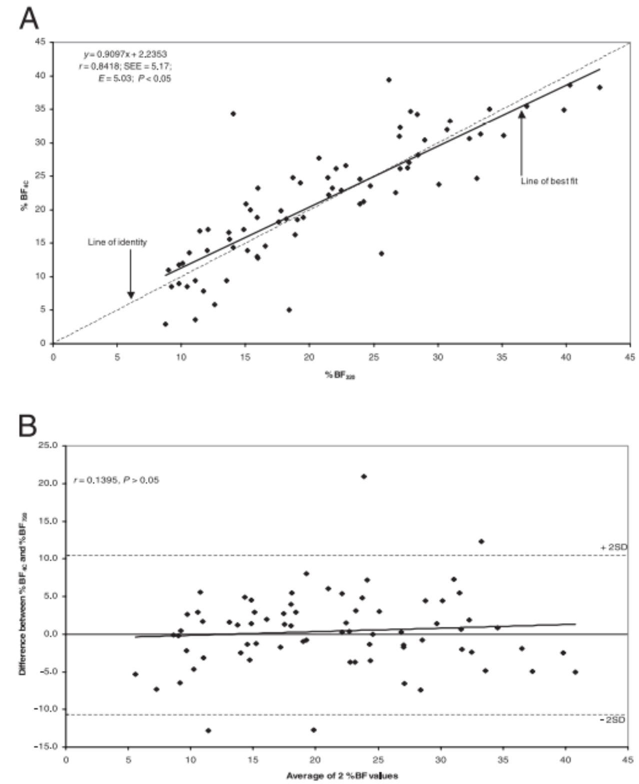


FIGURE 2. A; Correlation between percentage body fat in Selinger's 4-component model ($\%BF_{4C}$) and in the InBody 320 device ($\%BF_{320}$) in men ($n = 73$). B: Bland-Altman plot of $\%BF_{4C}$ and $\%BF_{320}$ in men. – – –, ± 2SD from a mean difference of 0.0.

Thank You