InBody VALIDATION STUDIES

Vs

GOLD STANDARD

(DEXA, D2 dilution, doubly labeled water, Bromide dilution, CT, Underwater weighing, BOD POD, indirect calorimetry) AND COMPETITORS



	Country	Research	Publication Year	Journal	Device	Subjects	Correlation Coefficient			
1	Brazil	Agreement Between Body Composition Assessed by Bioelectrical Impedance Analysis and Doubly Labeled Water in Obese Women Submitted to Bariatric Surgery : Body Composition, BIA, and DLW.	2019	Obesity Surgery	Doubly Labeled Water vs InBody230	20 class III obese women	FM (r = 0.84-0.92, CCC = 0.84- 0.95), FFM (r = 0.73-0.90, CCC = 0.68-0.80), and TBW (r = 0.76-0.91, CCC = 0.72-0.81) before and after bariatric surgery.			
Abstract	INTRODUCTION: Bariatric surgery has a significant influence on body composition (BC) which should be monitored. However, there is a need to recommend									
	low-cost pract	ical methods, with good es	timation of BC	for class III obese and/	or bariatric patients. OB	JECTIVE: The aim	of this study was to determine			
	accuracy and a	agreement between BC ass	essed by direct	segmental multifreque	ency bioelectrical imped	ance analysis (DS	M-BIA) and doubly labeled water			
	(DLW) as refer	ence method. MATERIAL A	ND METHODS:	Twenty class III obese	e women (age 29.3 ± 5.1	years; body mass	s index 44.8 ± 2.4 kg/m2) underwent			
	Roux-en-Y gas	tric bypass surgery. BC (fat	mass [FM], fat-	free mass [FFM], and t	total body water [TBW])	was assessed by	InBody 230 and DLW in the following			
	periods: befor	e and 6 and 12 months afte	er surgery. Accu	racy between the met	hods was evaluated by t	the bias and root	mean square error. Pearson's			
	correlation, co	ncordance correlation coef	fficient (CCC), a	nd Bland-Altman meth	nod were used to evalua	te agreement bet	tween the methods. RESULTS :			
	Correlations w	vere significant (p < 0.001) a	and CCC was go	od/excellent between	both methods for the e	valuation of FM (i	r = 0.84-0.92, CCC = 0.84-0.95), FFM			
	(r = 0.73-0.90,	CCC = 0.68-0.80), and TBW	(r = 0.76-0.91,	CCC = 0.72-0.81) befor	e and after bariatric sur	gery. In addition,	no significant bias was observed			
	between DSM	-BIA and DLW for FM (mea	n error [ME] = -	1.40 to 0.06 kg), FFM	(ME = 0.91-1.86 kg), and	TBW (ME = 0.71	-1.24 kg) measurements.			
	CONCLUSION: The DSM-BIA was able to estimate the BC of class III obese women submitted to bariatric surgery with values consistent with those of the DLW									
	method.									

	Country	Research	Publication Year	Journal	Device	Subjects	Correlation Coefficient
2	USA	Reliability and	2018	Journal of Clinical	DEXA	31 males and	Intraclass correlation coefficients
		Agreement of		Densitometry	vs InBody230-720-	36 females	for BF% (≥0.98), FM (≥0.98), and
		Various InBody Body			770		FFM (≥0.99).
		Composition					
		Analyzers as					
		Compared to Dual-					
		Absorptiometry in					
		Healthy Men and					
		Women.					
Abstract	BACKGROUND): Bioelectrical impedance a	analysis has evo	olved over the years to	include the use of mult	iple frequencies a	nd impedance measurements to
	improve the ac	ccuracy and reliability of bo	ody compositior	n estimates. The purpo	ose of this investigation v	was to evaluate th	ne reliability of the InBody230,
	InBody720, an	d InBody770 to measure bo	ody fat percent	(BF%), fat mass (FM),	and fat-free mass (FFM)	in the general po	pulation and to compare results to
	dual-energy X-	ray absorptiometry (DXA).	METHODS: A to	otal of 31 males and 36	6 females participated ir	n 2 d of testing sej	parated by 24-72 h. Each visit
	consisted of a	DXA scan, and analysis with	h the InBody230	D, InBody720, and InBo	ody770. RESULTS : All 3 b	pioelectrical impe	dance devices (InBody230, InBody720,
	and InBody770)) were reliable in men and	women as indi	cated by high intraclas	ss correlation coefficient	s for BF% (≥0.98),	, FM (≥0.98), and FFM (≥0.99) and low
	standard error	of measurement for BF% (0.77%-0.99%),	FM (0.54-0.87 kg), and	FFM (0.58-0.84 kg) and	minimum differe	ence for BF% (2.12%-2.73%), FM (1.49-
	2.39 kg), and F	FM (1.60-2.32 kg), respecti	ively. When exa	mining the agreement	t between the 3 InBody	analyzers with DX	A, systematic bias (underestimation of
	BF% and FM a	nd overestimation of FFM)	was present for	r all comparisons (p < (0.05) while proportional	bias was present	for FM in women and FFM in men.
	However, ther	e was small individual erro	r for all compar	isons as indicated by t	he standard error of est	imate and 95% lin	nits of agreement. CONCLUSION: The
	InBody analyze	ers produce small individua	l error, which s	uggest these methods	can be used as a surrog	ate when DXA is r	not available; however, practitioners
	should be awa	re of the systematic bias fo	or all compariso	ns and proportional bi	as for FM in women and	FFM in men. Fur	thermore, findings revealed that the
	research grade	e models, InBody720 and In	Body770, adde	d minimal benefit ove	r the portable InBody23	0 when assessing	BF%, FM, and FFM.

	Country	Research	Publication	Journal	Device	Subjects	Correlation Coefficient		
2	The silve set		Year						
3	Inailand	Evaluation of Body	2018	Journal of	DEXA(Lunar)	69 subjects	DXA and InBody S10		
		Composition in		Nutrition and	vs inBody220		fat mass index $r=0.95$,		
		Patients: Comparison		MELADOIISIII	IIIBOUY720		lat-filee mass muex 1–0.78		
		between Two Models					DXA and InBody 720		
		of Bioelectrical					FMI: r=0.96.		
		Impedance Analyzer					FFMI: r=0.81		
		and Dual-Energy X-							
		Ray Absorptiometry.							
	absorptiomet practical and OBJECTIVE : T	ry (DXA) is a gold standa reliable tool. his cross-sectional study	rd test, but cli was aimed to	nically limited. Bioel	ectrical impedance an nent of BIA with DXA i	alysis (BIA) with in measurement	multifrequency technique is a to four the second seco		
	hemodialysis	patients and to evaluate	their associat	ed factors.					
	METHODS: Bo measuremen between met	ody composition was me ts were included. Pearso hods and to compare the	asured by 2 B n's correlatior e methods agr	A methods (InBody and Bland and Altm eement, respectivel	S10 and InBody 720) a nan analysis were usec y.	and DXA after a l I to determine t	hemodialysis session. A total of 69 he correlation of body composition		
	RESULTS : The correlation coefficients of body compositions were strong between DXA and InBody S10 (fat mass index (FMI): r=0.95, fat-free mass index (FFMI): r=0.78) and also between DXA and InBody 720 (FMI: r=0.96, FFMI: r=0.81). Comparing to DXA, the means of each body composition measured by InBody S10 method were not significantly different in each gender, but differences were found in FM, %FM, and FMI measured by InBody 720.								
	CONCLUSIONS : In maintenance hemodialysis patients, the measurement of body composition with DXA and both BIA methods had highly significant correlations; practically, BIA method could be used as an instrument to follow FM and FFM and to measure the edematous stage. Further studies with large populations are warranted.								

	Country	Research	Publication Year	Journal	Device	Subjects	Correlation Coefficient				
4	USA	Validity of the InBody 520™ to predict metabolic rate in apparently healthy adults.	2018	The Journal of Sports Medicine and Physical Fitness	Indirect calorimetry VS InBody 520	26 apparently healthy adults	Relationship between pRMR and mRMR (r=0.87, P<0.001)				
Abstract	t BACKGROUND: The present study seeks to assess the validity of the InBody 520™ device to predict RMR in apparently healthy adults relative to a metabolic cart (the standard, yet time-intensive, method for determining resting metabolic rate).										
	METHODS: Twenty-six apparently healthy adults participated in the study. Predicted RMR (pRMR) was calculated by the InBody 520 [™] and measured RMR (mRMR) was determined by 30-minute gas analysis and ventilated hood system. Of the 78 measurement trials conducted, 64 yielded acceptable measurement trials.										
	RESULTS: A Pearson pro difference exi	oduct-moment correlatio sted between the pRMR	n was used to (1650.89±295	determine the relati 5.96 kcal) and mRMR	ionship between pRM (1675.36±278.69 kcal	R and mRMR (r=) values (P=0.19	=0.87, P<0.001). No significant).				
	CONCLUSION Study findings efficient meth	S: s suggest that the InBody nod for collecting data in	⁄520™ provide a clinical setti	s valid measurement ng.	ts of RMR in apparent	ly healthy adult	s and can be an effective and				

	Country	Research	Publication Year	Journal	Device	Subjects	Correlation Coefficient
5	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
Abstract	The purpose of energy x-ray a (LST) in colleg in this study. trunk (TRUNK p < 0.001) and and ±3.7 kg for (0.14 kg), LEG for TRUNK(LS and DXA appen noninvasive m	of this investigation was absorptiometry (DXA) for giate female athletes. For Variables measured thro C(LST)), and the total bod d significantly higher valu or FFM. No significant dif (S(LST) (-0.4 kg), and TOT T), and ±4.23 kg for TOT/ eared to provide exceller nethod to assess LST in fo	to determine r measuring bo rty-five female ugh BIA and D y (TOTAL(LST) ues for FFM (2 ferences (p < 0 AL(LST) (-0.21 AL(LST). This st at agreement f emale athletes	the agreement betw ody fat percentage (f athletes (age = 21.2 XA were as follows:). Compared with the .1 kg, p < 0.001) with 0.008) existed betwee kg). The limits of age tudy found discrepar for measuring total b s when DXA is not av	een multifrequency bi 3F%), fat-free mass (FF ± 2.0 years, height = 2 BF%, FFM, and LST of e DXA, the InBody 720 n limits of agreement (een the 2 devices (InBo reement were ±0.79 k ncies in BF% and FFM k body and segmental LS railable.	oelectrical imper M), and total be 166.1 ± 7.1 cm, w the arms (ARMS provided signifi 1.96 SD of the n ody 720-DXA) fo g for ARMS(LST) between the 2 d T. Therefore, th	edance analysis (BIA) and dual- ody and segmental lean soft tissue weight = 62.6 ± 9.9 kg) participated 6(LST)), the legs (LEGS(LST)), the icantly lower values for BF% (-3.3%, nean difference) of ±5.6% for BF% r ARMS(LST) (0.05 kg), TRUNK(LST) 0, ±2.62 kg for LEGS(LST), ±3.18 kg levices. However, the InBody 720 e InBody 720 may be a rapid

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6	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 individuals (28 men and 85 women) in the age group of 23- 81 years.	Bone mineral content r=0.9136
Abstract	The purpose of against Dual of by DXA and b parameters w correlation ar	of this study was to valid energy X-ray Absorption ioelectrical impedance at vere derived from impeda nd low prediction error. It	ate a Bioelecti etry (DXA) in I t various frequ ance data and t was found va	rical Impedance Anal ndian adults. Healthy iencies was measure a new BIA equation alid in subjects with I	ysis (BIA) equation for y 113 subjects were in d by a commercial seg was developed for the arge variations in Body	r prediction of B vestigated by tv gmental multi-fr e estimation of B y Mass (BM) an	one Mineral Content (BMC) vo methods: BMC was measured equency BIA instrument. Body BMC, which exhibited high d age.

	Country	Research	Publication	Journal	Device	Subjects	Correlation Coefficient
			Year				
7	Korea	Body composition	2012	Health med	Bod-Pod	143 African	Fat free mass
		measurements		Journal	vs InBody720	American	M:r=0.911
		determined by air				Collegiate	F:r=0.918
		alsplacement					Body fat mass
		eight-nolar					F·r=0.931
		bioelectrical					1.1-0.331
		impedance analysis					
		are equivalent in					
		African American					
		College students					
Abstract	The purpose polar bioelect Human Perfo and Decembe using BOD PC body compos body compos concluded the for field tests	of this study was to comp trical impedance analysis rmance & Leisure Studies er 31, 2011. Measuremer DD (Life Measurement Ind sition measurements take sition measurements take at measurements taken u requiring body composit	bare body con (BIA) in Africa s laboratory a nts of body con c., California, U en using BOD I en using the B using BOD POI tion measurer	nposition measurem an American college t North Carolina A&T mposition, including JSA) and an eightpol POD and eight-polar OD POD and the eigh D and eight-polar BIA nents and can be use	ents taken with air dis students. The 143 sub State University, Gree fat mass (FM), fat free ar BIA (Inbody-720, Bi BIA were assessed usi htpolar BIA correlated were similar in Africa ed interchangeably in t	placement pleth jects, aged 17–3 ensboro, NC, Ur e mass (FFM), ar ospace, Seoul, k ng Pearson's r c significantly wit in American stud the field.	hysmography (BOD POD) to eight- 39 years, visited the participating nited States, between June 1, 2011 nd % body fat were determined Corea). The relationships between orrelation. Results showed that h respect to FFM. [] The authors dents. These methods are useful

	Country	Research	Publication	Journal	Device	Subjects	Correlation Coefficient
			Year				
8	UK	Comparison of	2011	American Journal	DEXA(Hologic)	53 British	Fat free mass
		multifrequency		of Kidney	vs InBody720	Hemodialysis	r2=0.845
		bioelectrical		Diseases		Patients	Body fat mass
		impedance analysis					r=0.93
		and dual-energy x-					
		ray absorptiometry					
		assessments in					
		outpatient					
		hemodialysis patients					
Abstract	BACKGROUN reliable, and of for routine cli for thrice-wee absorptiomet tests of body using the 2 te -1,173 to 1,17 showed strom < 0.001; Bland and 0.75, resp overestimate ambulant out monitoring to between the	D : Malnutrition is comm easily available methods inical practice. STUDY DE ekly outpatient hemodial rry (DEXA) and multifreque composition. REFERENC echniques correlated high 75]), as did fat mass (r = 0 ag correlations between I d-Altman bias, -859, +364 bectively; P < 0.001; Blan d that measured using D spatient cohort. CONCLU otal-body fat and lean bo 2 methods.	on in hemodia of determinin SIGN: Diagnos lysis in a unive uency bioelect E TEST: None. hly, with good 0.93; P < 0.001 ean body mas 4, and +552 g, d-Altman bias EXA (r = 0.77; SIONS: Compa dy mass in her	alysis patients and clo g nutritional status a stic test study. SETTI rrsity tertiary hospita rical impedance ana RESULTS: Assessment method agreement s ; bias, -157 g [95% C s of the trunk and rig respectively), but we , -240 and +12 g, res P < 0.001; bias, +530 ared with DEXA, mult modialysis patients; l	osely related to increa and recognition of sho NG & PARTICIPANTS: I dialysis center. INDE lysis (BIA) using a tetra nt of whole-body com shown using a Bland-A I, -1,251 to 937]). Simi ght and left legs with s eaker correlations for pectively). Bone mine g [95% CI, 422-638]). tifrequency BIA appea however, there is less	sed morbidity a rt-term changes 53 stable adult X TEST: Compar apolar 8-point ta position showed Altman plot (r = 0.3 ilarly, segmenta mall bias (r = 0.3 lean body mass ral content deriv LIMITATIONS: F rs to be a robus agreement in bo	nd mortality. As such, simple, in body composition are desirable hemodialysis patients attending ison of dual-energy x-ray actile electrode system as 2 index d that lean body mass measured 0.92; P < 0.001; bias, +1 g [95% Cl, I analysis of lean body mass 85, 0.89, and 0.86, respectively; P for the right and left arm (r = 0.69 ved using multifrequency BIA Retrospective study in a healthy t tool for measuring and one mineral content assessment

	Country	Research	Publication Year	Journal	Device	Subjects	Correlation Coefficient
9	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
Abstract	BACKGROUN clinical settin accuracy of d X-ray absorpt METHODS: A for total and RESULTS: Exc (ICC female = revealed narr mass and per demonstrate shown for the CONCLUSION population, p	D & AIMS: Body composings. Although bioimpedant irect segmental multi-free cometry (DEXA) as a refer total of 484 middle-aged segmental body composi- cellent agreements were 0.97, ICC male = 0.93) and row limits of agreements centage body fat quantified for the upper limbs (ICC e trunk measurements (ICC)	sition measure ice analysis (Bl equency BIA te rence standar d participants d pa	ement is a valuable t IA) can easily assess echnique (DSM-BIA) i d. from the Leiden Long ation were assessed ween both technique body fat (ICC female ases noted for the wh gmental lean muscle , ICC men≥0.87) and 73, ICC male = 0.70) asments of total body	ool for assessing nutri body composition, its n assessing different b gevity Study were recr using intraclass correl es in whole body lean e = 0.93, ICC male = 0. nole body lean mass q mass quantification, lower limbs (ICC fema y and segmental body	tional status and accuracy remain body compositio ruited. Agreeme ation coefficien mass (ICC female 88) measureme uantification bu excellent agreer ale≥0.83, ICC ma composition in	d physical fitness in a variety of ns unclear. We examined the in parameters, using dual energy nts between DSM-BIA and DEXA ts and Bland-Altman plots. e = 0.95, ICC men = 0.96), fat mass nts. Similarly, Bland-Altman plots t relatively wider limits for fat nents between methods were le≥0.85), with good agreements the general middle-aged

	Country	Research	Publication Year	Journal	Device	Subjects	Correlation Coefficient
10	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
Abstract	INTRODUCTION reliable and ex- important for METHODS: W energy X-ray RESULTS: Ass DEXA as the r were found for between LBM by MF-BIA ov CONCLUSION recognize sho	ON: Protein energy wast easily available methods of clinical practice. Ve compared whole-body absorptiometry (DEXA) in essment of whole-body of reference test (r = 0.95, p or fat mass (r = 0.93, p < 1 for trunk, left and right rerestimated that measur I: MF-BIA may potentially ort-term changes in body	ing is closely re of determining y and segment n 104 stable Pl composition s o < 0.0001; bias 0.0001; bias 0 arms and legs red by DEXA (k y be a useful to composition.	elated to increased r g nutritional status a cal composition using D patients. howed that lean bod s -0.88 kg, 95% Cl -1. .69 kg, 95% Cl 0.03-1 c (r = 0.90, 0.84, 0.86, bias 0.740 kg, 95% Cl pool for determining r	norbidity and mortalit nd recognition of shor g multifrequency bioel y mass (LBM) was hig 53 to 0.23 kg). Similar 36 kg). Segmental an . 0.89 and 0.90, respec 0.66-0.82 kg). nutritional status in PD	y in peritoneal o t-term changes ectrical impedan hly correlated w ly, high correlat alysis of LBM re ctively, p < 0.000	dialysis (PD) patients. Simple in body composition are therefore ince analysis (MF-BIA) and dual- with good method agreement using ion and good method agreement vealed strong correlations D1). Bone mineral content derived erial estimations may help

	Country	Research	Publication	Journal	Device	Subjects	Correlation Coefficient
11	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 subjects ((34 men and 30 women) in the age group of 22- 59 years.	Bone mineral content r = 0.9531
Abstract	The purpose of with a body n mineral conte measured by equation was h ² /Z(body6.2 2.552±0.457 error=0.0998 the single pre under the the InBody720 an two methods	of this study was to validation nass index (BMI) between ent (BMC) was measured a newly developed bioel developed using all subj 5)))-(0.0032 x (age))-(0.1 kg. BMC predicted by eq 87 kg). The results of this ediction BIA equation can erapy for osteoporosis. For ad dual-energy X-ray abso	ate a single bin n 16.8 and 47. by a commerce ectrical imped ects as follows .03 x (sex); m uation was 2.5 study show the be used in sci or validation of orptiometry. H	oelectrical impedanc 3 kg m ⁻² . Healthy sul cial body compositio lance measurement s s: BMC = -3.5268 + (0. en = 1, women = 0). B 554 ± 0.447 kg (R = 0.9 nat the newly develop reening the subjects f commercial instrum ligh correlation (R = 0	e analysis (BIA) equati bjects (34 men and 30 n analyser and bioelec system. As correlation 0279 x h) + (0.0145 x MC measured from co 976, adjusted R ² = 0.94 ped multi-frequency b suspected with osteop nent InBody720, BMC 9.9531) and low error (on in healthy In women) were r strical impedance s were high and w) + (184 x (h ² / ommercial instru 8, standard error ioelectrical impo porosis and for f of 22 healthy su total error = 0.0	dian subjects aged 22-59 years measured by two methods: bone e at various frequencies was prediction error was low, a single Z(body50)))-(1.08 x (w x ument InBody720 was or of estimate = 0.104 kg, total edance measurement system with follow-up study of the patient ubjects was measured by 913 kg) was found between these

	Country	Research	Publication Year	Journal	Device	Subjects	Correlation Coefficient				
12	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	Visceral fat area values r= 0.759				
Abstract	BACKGROUND/AIMS: This study was conducted to assess the efficacy of bioelectrical impedance analysis by InBody 720 as a new tool for measuring visceral fat area. METHODOLOGY: A total of 53 consecutive patients elected to undergo surgical resection of primary gastric cancer received preoperative										
	measuremen	t of visceral fat area at th	e umbilical lev	vel with both compu	ted tomography and b	pioelectrical imp	edance analysis by InBody 720.				
	RESULTS: Viso	eral fat area values mea	sured by InBo	dy 720 significantly c	orrelated with those k	by computed to	mography (R = 0.759).				
	CONCLUSION	: Bioelectrical impedance	e analysis by Ir	Body 720 was show	n to be useful as a mo	re convenient s	ubstitute for computed				
	tomography	when measuring visceral	fat area.								

	Country	Research	Publication	Journal	Device	Subjects	Correlation Coefficient	
13	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 (720)	333 Swedish Children,6- 13 years old	Fat free mass r2=0.98	
Abstract	 BACKGROUND/OBJECTIVES: (1) To cross-validate tetra- (4-BIA) and octopolar (8-BIA) bioelectrical impedance analysis vs dual-energy X-ray absorptiometry (DXA) for the assessment of total and appendicular body composition and (2) to evaluate the accuracy of external 4-BIA algorithms for the prediction of total body composition, in a representative sample of Swiss children. SUBJECTS/METHODS: A representative sample of 333 Swiss children aged 6-13 years from the Kinder-Sportstudie (KISS) (ISRCTN15360785). Whole-body fat-free mass (FFM) and appendicular lean tissue mass were measured with DXA. Body resistance (R) was measured at 50 kHz with 4-BIA and segmental body resistance at 5, 50, 250 and 500 kHz with 8-BIA. The resistance index (RI) was calculated as height(2)/R. Selection of predictors (gender, age, weight, RI4 and RI8) for BIA algorithms was performed using bootstrapped stepwise linear regression on 1000 samples. We calculated 95% confidence intervals (CI) of regression coefficients and measures of model fit using bootstrap analysis. Limits of agreement were used as measures of interchangeability of BIA with DXA. RESULTS: 8-BIA was more accurate than 4-BIA for the assessment of FFM (root mean square error (RMSE)=0.90 (95% CI 0.82-0.98) vs 1.12 kg (1.01-1.24); limits of agreement 1.80 to -1.80 kg vs 2.24 to -2.24 kg). 8-BIA also gave accurate estimates of appendicular body composition, with RMSE < or = 0.10 kg for arms and < or = 0.24 kg for legs. All external 4-BIA algorithms performed poorly with substantial negative proportional bias (r> or = 0.48, P<0.001). CONCLUSIONS: In a representative sample of young Swiss children (1) 8-BIA was superior to 4-BIA for the prediction of FFM, (2) external 4-BIA algorithms gave biased predictions of FFM and (3) 8-BIA was an accurate predictor of segmental body composition. 							

	Country	Research	Publication	Journal	Device	Subjects	Correlation Coefficient
14	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 r2= 0.990 Body fat mass r2= 0.934 Percent body fat r2= 0.940
Abstract	 BACKGROUND: In diagnosis and treatment of obesity, body composition analysis including percent body fat (%BF) is useful in the clinical setting. Because bioelectrical impedance analysis (BIA) could be used quickly, easily and was non-invasive in clinical setting, the purpose of the present study was to evaluate the usefulness of multi-frequency BIA with eight-point tactile electrodes (MF-BIA8; InBody 720, Biospace) compared with dual-energy X-ray absorptiometry (DXA) in healthy children and adolescents. METHODS: A total of 166 children and adolescents under 18 (male, n = 86; female, n = 80) were recruited. Height, weight, body mass index (BMI) and Tanner stage were measured for each subject. The body composition such as fat-free mass (FFM), fat mass (FM), and %BF was measured on BIA and DXA and compared. RESULTS: On linear regression analysis, DXA FFM = 1.006(BIA FFM) + 0.554, R(2) = 0.99 and the standard error of the estimate (SEE) was 1.16 kg; DXA FM = 0.971(BIA FM) - 0.596, R(2) = 0.93; SEE, 1.34 kg; and DXA %BF = 0.940(BIA %BF) - 1.026, R(2) = 0.858; SEE, 3.03%. Limit of agreement in FFM, FM, and %BF was 0.7 +/- 2.3 kg, -0.9 +/- 2.9 kg and -2.2 +/- 6.1%, respectively. CONCLUSIONS: Although the %BF was not interchangeable with DXA, MF-BIA8 (InBody 720; Biospace) could be used to measure body composition of children and adolescents in the clinical field because of its high precision. 						

	Country	Research	Publication	Journal	Device	Subjects	Correlation Coefficient	
15	Italy	Body water distribution in severe obesity and its assessment from eight-polar bioelectrical impedance analysis	2005	European Journal of Clinical Nutrition	D2 dilution, Bromide dilution vs InBody 3.0 (720)	75 Italian Female, 18- 66 years old (non obese =25, Obese I-II = 25, Obese III = 25)	Total body water r2=0.82 Extracellular water r2=0.87	
Abstract	 OBJECTIVE: To measure body water distribution and to evaluate the accuracy of eight-polar bioelectrical impedance analysis (BIA) for the assessment of total body water (TBW) and extracellular water (ECW) in severe obesity. DESIGN: Cross-sectional study. SETTING: Obesity clinic. SUBJECTS: In all, 75 women aged 18-66 y, 25 with body mass index (BMI) between 19.1 and 29.9 kg/m(2) (ie not obese), 25 with BMI between 30.0 and 39.9 kg/m(2) (ie class I and II obese), and 25 with BMI between 40.0 and 48.2 kg/m(2) (ie class III obese). METHODS: TBW and ECW were measured by (2)H(2)O and Br dilution. Body resistance (R) was obtained by summing the resistances of arms, trunk and legs as measured by eight-polar BIA (InBody 3.0, Biospace, Seoul, Korea). The resistance index at a frequency of x kHz (RI(x)) was calculated as height (2)/R(x). RESULTS: ECW : TBW was similar in women with class III (46+/-3%, mean+/-s.d.) and class I-II obesity (45+/-3%) but higher than in nonobese women (39+/-3%, P<0.05). In a random subsample of 37 subjects, RI(500) explained 82% of TBW variance (P<0.0001) and cross-validation of the obtained algorithm in the remaining 38 subjects gave a percent root mean square error (RMSE%) of 5% and a pure error (PE) of 2.1 I. In the same subjects, RI(5) explained 87% of ECW variance (P<0.0001) and cross-validation of the obtained algorithm gave a RMSE% of 8% and a PE of 1.4 I. The contribution of weight and BMI to the prediction of TBW and ECW was nil or negligible on practical grounds. CONCLUSIONS: ECW : TBW is similar in women with class I-II and class III obesity up to BMI values of 48.2 kg/m(2). Eight-polar BIA offers accurate estimates of TBW and ECW in women with a wide range of BMI (19.1-48.2 kg/m(2)) without the need of population-specific formulae. 							

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16	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) vsInBody3.0 (720)	45 Healthy Japanese Female Collegiate	Percent body fat DEXA r=0.94 UW r=0.81		
Abstract	t The present study aimed to compare the accuracy of estimating the percentage of total body fat (%TBF) among three bioelectrical impedance analysis (BIA) devices: a single-frequency BIA with four tactile electrodes (SF-BIA4), a single-frequency BIA with eight tactile electrodes (SF-BIA8) and a multi-frequency BIA with eight tactile electrodes (MF-BIA8). Dual-energy x-ray absorptiometry (DXA) and hydrostatic weighing (HW) were used as references for the measured values. Forty-five healthy college student volunteers (21 males: 172.9 +/- 5.5 cm and 65.8 +/- 9.1 kg and 24 females: 160.7 +/- 6.6 cm, 52.6 +/- 6.2 kg) were the subjects. Correlation coefficients between the BIA measurements and the references were calculated. The standard error of estimation (SEE) was calculated by regression analysis when estimating the reference measures (DXA and HW) from the predictor (SF-BIA4, SF-BIA8 and MF-BIA8). The differences in %TBF between the reference and the predictor, calculated by the reference minus the predictor, were plotted against the %TBF measured by the references. The MF-BIA 8 here showed the highest correspondence to the reference and the least estimation error compared with the other BIA methods. It is considered that there is a limit to directly estimate FFM from a regression equation using impedance, weight, height and age as independent variables, and that %TBF can be more accurately estimated by measuring segmental impedances using eight electrodes and multi-frequency electric currents and then estimating total body water from these impedances.								

	Country	Research	Publication	Journal	Device	Subjects	Correlation Coefficient	
			Year				-	
17	Finland	Body Composition	2003	Journal of Sports	DEXA	58 Healthy	Fat free mass	
		Assessment with		Science and	vs Underwater	Finnish	r=0.83	
		Segmental		Medicine	weighing vs	Adults, 36-53	Body fat mass	
		Multifrequency			InBody3.0 (720)	Years old	r=0.91	
		Bioimpedance					Percent body fat	
		Method					r=0.81	
						<u> </u>		
Abstract	Body compos	ition assessment is an im	portant facto	r in weight manager	ient, exercise science ;	and clinical heal	th care. Bioelectrical impedance	
	analysis (BIA)	is widely used method for	or estimating I	body composition. Th	ne purpose of this stuc	ly was to evalua	te segmental multi-frequency	
	bioimpedanc	e method (SMFBIA) in bo	dy compositic	on assessment with u	nderwater weighing (I	UWW) and who	le body dual energy x-ray	
	absorptiomet	ry (DXA) in healthy obese	e middle-aged	male subjects. The r	neasurements were ca	arried out at the	e UKK Institute for Health	
	Promotion Re	search in Tampere, Finla	nd according	to standard procedu	res of BIA, UWW and [DXA. Fifty-eight	(n=58) male subjects, aged 36-53	
	years, body n	1ass index (BMI) 24.9-40.	7, were studie	ed. Of them forty (n=	40) underwent also D	XA measuremer	nt. Fat mass (FM), fat-percentage	
	(F%) and fat f	ree mass (FFM) were the	primary outc	ome variables. The n	nean whole body FM (±SD) from UWV	V was 31.5 kg (±7.3). By DXA it was	
	29.9 kg (±8.1)	and by SMFBIA it was 25	5.5 kg (±7.6), r	espectively. The Pea	rson correlation coeffi	cients (r) were (0.91 between UWW and SMFBIA,	
	0.94 betweer	DXA and SMFBIA and 0.	91 between U	WW and DXA, respe	ctively. The mean segr	mental FFM (±SI	D) from DXA was 7.7 kg (±1.0) for	
	arms, 41.7 kg	(±4.6) for trunk and 21.9) kg (±2.2) for	legs. By SMFBIA, it w	as 8.5 kg (±0.9), 31.7 k	g (±2.5) and 20،	.3 kg (±1.6), respectively. Pearson	
	correlation co	oefficients were 0.75 for a	arms, 0.72 for	legs and 0.77 for tru	nk. This study demons	strates that SMF	BIA is usefull method to evaluate	
	fat mass (FM), fat free mass (FFM) and fat percentage (F%) from whole body. Moreover, SMFBIA is suitable method for assessing segmental							
	distribution o	f fat free mass (FFM) cor	npared to who	ole body DXA. The re	sults of this study indi	cate that the SN	IFBIA method may be particularly	
	advantageou	s in large epidemiologica	l studies as be	ing a simple, rapid a	nd inexpensive metho	d for field use o	f whole body and segmental body	
	composition	assessment.						

	Country	Research	Publication	Journal	Device	Subjects	Correlation Coefficient		
			Year						
18	Italy	Cross-calibration of	2003	Annals of Human	DEXA(Lunar)	110 Healthy	Fat free mass		
		eight-polar		Biology	vs InBody3.0 (720)	Italian	r2=0.92		
		bioelectrical				Adults, 21-82			
		impedance analysis				yearsold			
		versus dual-energy X-							
		ray absorptiometry							
		for the assessment of							
		total and							
		appendicular body							
		composition in							
		21_82 years							
		21-02 years							
Abstract	AIM: To calib	rate eight-polar bioelectr	ical impedance	e analysis (BIA) agaiı	nst dual-energy X-ray	absorptiometry	(DXA) for the assessment of total		
	and appendic	ular body composition in	healthy adult	ts.					
	RESEARCH DI	ESIGN: A cross-sectional s	study was carr	ried out.					
	SUBJECTS: Si>	kty-eight females and 42	males aged 21	L-82 years participate	ed in the study.				
	METHODS: W	/hole-body fat-free mass	(FFM) and ap	pendicular lean tissu	e mass (LTM) were me	easured by DXA	resistance (R) of arms, trunk and		
	legs was mea	sured by eight-polar BIA	at frequencies	s of 5, 50, 250 and 50	0 kHz; whole-body re	sistance was cal	culated as the sum R of arms,		
	trunk and legs.								
	RESULTS: The resistance index (RI), i.e. the height(2)/resistance ratio, was the best predictor of FFM and appendicular LTM. As compared with								
	weight (Wt), RI at 500 kHz explained 35% more variance of FFM (vs 0.57), 45% more variance of LTM(arm) (vs 0.48) and 36% more variance of								
	LTM(leg) (vs 0.50) ($p < 0.0001$ for all). The contribution of age to the unexplained variance of FFM and appendicular LTM was nil or negligible and								
	the RI x sex ir	iteractions were either n	ot significant o	or not important on I	oractical grounds. The	percent root m	ean square error of the estimate		
	was 6% for FF	M and 8% for LTM(arm)	and LTM(leg).		-				
	CONCLUSION	I: Eight-polar BIA offers a	ccurate estim	ates of total and app	endicular body compo	osition. The attra	active hypothesis that eight-polar		
	BIA is influenced minimally by age and sex should be tested on larger samples including younger individuals.								

	Country	Research	Publication Year	Journal	Device	Subjects	Correlation Coefficient			
19	Italy	Accuracy of an eight- point tactile- electrode impedance method in the assessment of total body water	2002	European Journal of Clinical Nutrition	D2dilution vs InBody3.0 (720)	50Healthy Adults, Average age: 40 years old	Total body water r2=0.81			
Abstract	OBJECTIVE : To establish the accuracy of an eight-polar tactile-electrode impedance method in the assessment of total body water (TBW).									
	DESIGN: Tran	sversal study.								
	SETTING: University department.									
	SUBJECTS: Fifty healthy subjects (25 men and 25 women) with a mean (s.d.) age of 40 (12) y.									
	METHODS: TBW measured by deuterium oxide dilution; resistance (R) of arms, trunk and legs measured at frequencies of 5, 50, 250 and 500 kHz									
	with an eight-	polar tactile-electrode ir	npedance-me	ter (InBody 3.0, Bios	pace, Seoul, Korea).					
	RESULTS : An	algorithm for the predict	ion of TBW fro	om the whole-body r	esistance index at 500	kHz (height (2)	/R(500) where R is the sum of the			
	segmental res	sistances of arms, trunk a	and legs) was o	developed in a rando	mly chosen subsample	e of 35 subjects	This algorithm had an adjusted			
	coefficient of	determination (r2(adj)) o	of 0.81 (P<0.00	001) and a root mear	n square error (RMSE)	of 3.6 l (9%). Cr	oss-validation of the predictive			
	algorithm in t	he remaining 15 subjects	s gave an r2(a	dj) of 0.87 (P<0.0001) and an RMSE of 3.0 I	(8%). The preci	sion of eight-polar BIA, determined			
	by measuring	R three times a day for f	ive consecutiv	ve days in a fasting su	ıbject, was < or =2.8%	for all segment	s and frequencies.			
	CONCLUSION	: Eight-polar BIA is a pred	cise method th	nat offers accurate es	stimates of TBW in he	althy subjects. T	his promising method should			
	undergo furth	ner studies of precision a	nd its accurac	y in assessing extrace	ellular water and appe	ndicular body c	omposition should be determined.			
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