

Laser-based 3D body scanning reveals a higher prevalence of abdominal obesity than tape measurements: Results from a population-based sample

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Table S1: Extended baseline characteristics with group comparisons

Gender	Male: N=160 (45.2%)		Female: N=194 (54.8%)		Comparisons [†]			
Metabolic syndrome N (%)	Yes 71 (44.4%)	No 89 (55.6%)	Yes 39 (20.1%)	No 155 (79.9%)	* p<0.01			
					A	B	C	D
Variable	Median / IQR				Mann-Whitney U Test			
Age (Years)	49.0 / 19.0	41.0 / 20.0	54.0 / 17.0	44.0 / 18.0			*	*
Body mass index (kg/m ²)	30.3 / 4.93	26.0 / 3.93	31.0 / 6.32	24.2 / 5.19		*	*	*
Waist-to-height ratio	0.58 / 0.06	0.50 / 0.07	0.58 / 0.07	0.46 / 0.08		*	*	*
Body fat percentage	25.8 / 6.00	21.6 / 5.65	38.3 / 6.50	30.5 / 10.0	*	*	*	*
HbA1c (%)	5.30 / 0.60	5.10 / 0.50	5.30 / 0.90	4.90 / 0.70			*	*
Total cholesterol (mmol/l)	5.50 / 1.70	5.20 / 1.30	5.70 / 1.00	5.30 / 1.40				
HDL cholesterol (mmol/l)	1.14 / 0.40	1.34 / 0.37	1.33 / 0.35	1.66 / 0.43	*	*	*	*
LDL cholesterol (mmol/l)	3.50 / 1.12	3.20 / 1.28	3.57 / 0.87	3.16 / 1.11				
Triglycerides (mmol/l)	1.92 / 1.36	1.17 / 0.81	1.90 / 0.87	0.94 / 0.52		*	*	*
Variable	% / Frequency				Fisher Exact Test			
Smoking status								
Never smoker	25.4 / 18	37.1 / 33	41.0 / 16	35.5 / 55				
Former smoker	45.1 / 32	28.1 / 25	33.3 / 13	33.6 / 52				
Current smoker	29.6 / 21	34.8 / 31	25.6 / 10	31.0 / 48				
Obesity						*	*	*
BMI < 25 kg/m ²	4.2 / 3	36.0 / 32	10.3 / 4	59.4 / 92				
BMI 25 - 29 kg/m ²	45.1 / 32	55.1 / 49	33.3 / 13	29.0 / 45				
BMI 30 - 34 kg/m ²	38.0 / 27	9.0 / 8	35.9 / 14	11.0 / 17				
BMI > 35 kg/m ²	12.7 / 9	0.0 / 0	20.5 / 8	0.7 / 1				
Metabolic syndrome [‡]								
Abdominal obesity	90.1 / 64	29.2 / 26	97.4 / 38	38.1 / 59			*	*
Elevated glucose	74.7 / 53	13.5 / 12	48.7 / 19	5.8 / 9			*	*
Low HDL cholesterol	40.9 / 29	6.7 / 6	61.5 / 24	14.2 / 22			*	*
Elevated triglycerides	62.0 / 44	21.4 / 19	64.1 / 25	7.1 / 11		*	*	*
Hypertension	97.2 / 69	50.6 / 45	84.6 / 33	19.4 / 30		*	*	*
[†] Bonferroni correction for five comparisons. Overall comparison by gender omitted. [‡] According to the harmonized IDF diagnostic criteria (Alberti et al., Circulation 2009)					A: MetS (Y) by gender B: MetS (N) by gender C: Males by MetS D: Females by MetS			

Table S2: Comparison of tape and 3D body scan measurements

	Manual measurements		Body scan measurements		Delta [†]		Correlation [‡]		
Variable	Median / IQR		Median / IQR		Median / IQR		Pearson's <i>r</i>		
	M	F	M		M	F	M	F	
Height	179.0 / 8.0	165.0 / 9.0	179.3 / 9.0		165.2 / 8.3	0.3 / 1.8	0.6 / 1.1	0.990	0.990
Weight	87.3 / 18.7	68.4 / 16.8	87.0 / 18.2		68.1 / 16.6	-0.2 / 0.5	-0.2 / 0.5	0.999	0.999
Right upper arm circ.	31.0 / 4.0	28.0 / 4.6	31.7 / 3.2		28.7 / 3.8	0.9 / 2.2	1.0 / 2.0	0.801	0.896
Waist circumference	95.5 / 14.7	80.1 / 16.9	a	98.4 / 15.6	82.6 / 17.6	2.8 / 3.4	3.1 / 3.4	0.968	0.975
			b	98.9 / 16.6	85.9 / 19.5	3.5 / 4.0	6.1 / 5.1	0.969	0.962
			c	101.0 / 14.5	92.9 / 14.6	6.0 / 4.5	12.0 / 5.0	0.953	0.938
			d	101.3 / 14.8	93.9 / 14.0	6.5 / 4.2	13.3 / 4.8	0.956	0.943
Hip circumference	99.1 / 9.3	98.5 / 13.9	e	100.0 / 13.3	98.2 / 15.5	2.1 / 6.3	1.0 / 4.2	0.888	0.946
			f	100.5 / 14.9	95.3 / 13.5	2.3 / 8.4	-3.4 / 5.5	0.862	0.914
			g	105.2 / 8.2	105.3 / 13.2	6.3 / 4.7	7.3 / 5.0	0.886	0.925
			h	104.1 / 7.9	104.3 / 12.8	4.9 / 3.5	6.0 / 3.6	0.905	0.937

M: Male subjects (N=160); F: Female subjects (N=194)

All variables measured in centimeter

[†] Difference body scan measurement - manual measurement; sign test (two-sided) significant for all variables at p<0.05

[‡] Pearson's correlation coefficient, pairwise by gender, two-sided, with Bonferroni correction; p<0.05 for all results

a: High waist circumference; b: Waist circumference; c: Belly circumference; d: Maximum belly circumference

e: Middle hip circumference; f: High hip circumference; g: Hip circumference; h: Buttock circumference

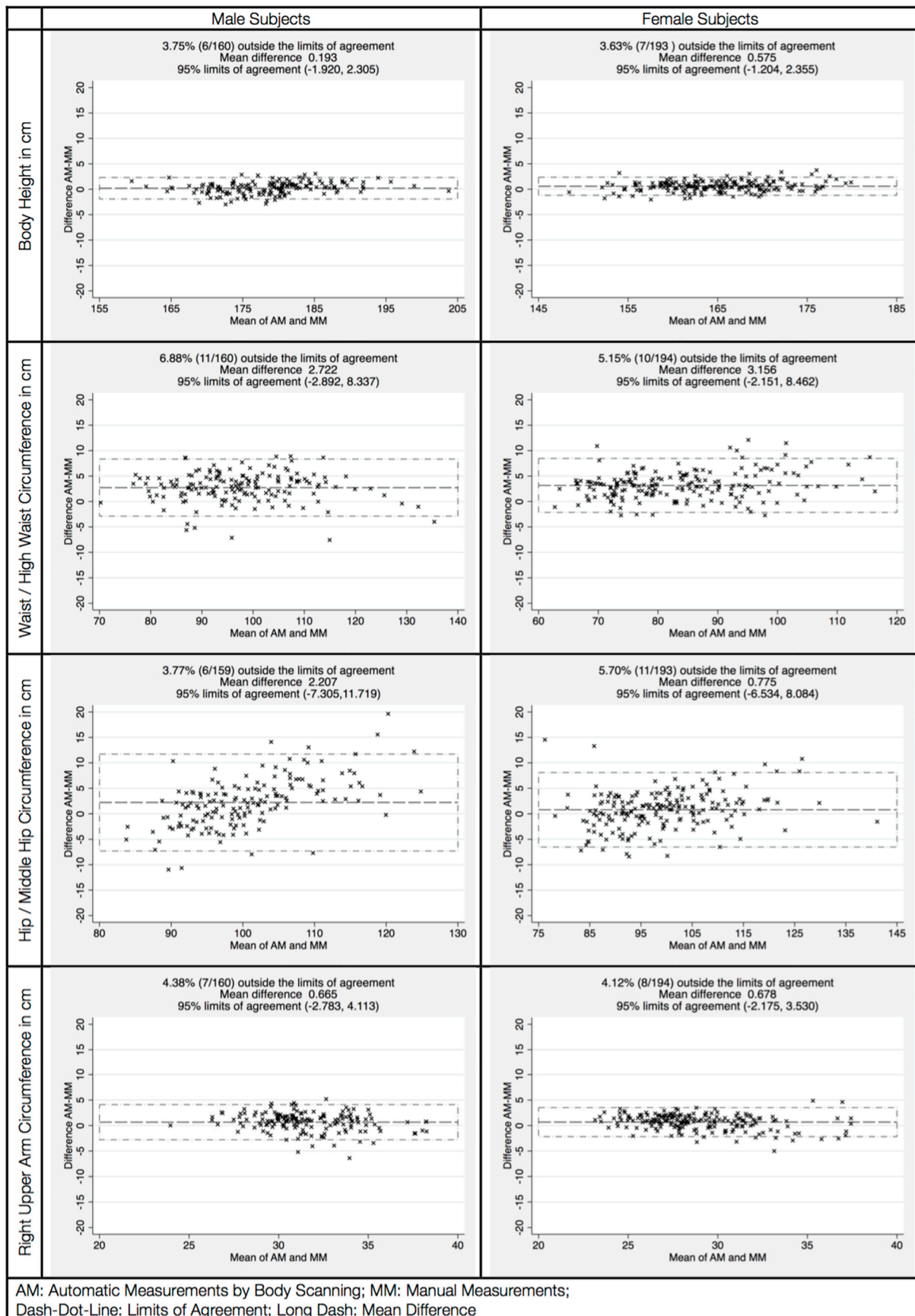
Table S3: Bland-Altman plots

Table S4: 3D body scan measurements by gender and metabolic syndrome classification

Gender	Male: N=160 (45.2%)		Female: N=194 (54.8%)		Comparisons [†]			
Metabolic Syndrome N (%)	Yes 71 (44.4%)	No 89 (55.6%)	Yes 39 (20.1%)	No 155 (79.9%)	* p<0.01			
					A	B	C	D
Body scan variable (cm)	Median / IQR				Mann-Whitney U Test			
Body height	178.5 / 8.7	179.3 / 9.7	162.7 / 7.2	165.9 / 8.0	*	*		*
Body weight	95.8 / 19.4	82.6 / 12.6	77.8 / 24.2	65.2 / 15.2	*	*	*	*
Middle neck circumference	43.6 / 4.5	40.0 / 3.6	38.2 / 4.1	33.5 / 3.2	*	*	*	*
Neck diameter (transversal)	14.6 / 1.5	13.4 / 1.4	13.0 / 1.6	11.8 / 1.3	*	*	*	*
Neck circumference at base	47.9 / 4.9	44.6 / 3.7	41.6 / 3.8	38.7 / 3.3	*	*	*	*
Sagittal neck diameter at base	13.3 / 1.8	11.5 / 1.7	11.5 / 1.5	9.8 / 1.5	*	*	*	*
Bust circumference	116.1 / 12.9	105.3 / 10.4	113.1 / 13.1	97.5 / 13.2		*	*	*
Underbust circumference	109.9 / 10.6	98.4 / 8.9	97.4 / 13.4	82.6 / 11.1	*	*	*	*
Sagittal chest diameter	30.5 / 3.7	26.8 / 3.2	31.7 / 3.8	26.5 / 4.3	*		*	*
Total torso circumference	184.3 / 8.9	176.9 / 9.8	166.9 / 13.3	161.1 / 8.9	*	*	*	*
Waist circumference	108.1 / 13.8	93.7 / 11.7	101.2 / 15.2	82.3 / 16.8	*	*	*	*
High waist circumference	107.3 / 13.2	92.4 / 11.4	97.3 / 15.1	79.6 / 14.2	*	*	*	*
Maximum belly circumference	109.1 / 16.3	96.7 / 9.8	105.8 / 14.3	91.4 / 12.9		*	*	*
SAD	31.4 / 5.2	26.0 / 4.3	30.0 / 5.2	24.1 / 4.6		*	*	*
High hip circumference	108.0 / 15.5	96.2 / 9.0	105.6 / 14.4	92.1 / 13.3		*	*	*
Middle hip circumference	106.7 / 15.1	96.4 / 8.8	109.8 / 15.2	95.4 / 14.1			*	*
Hip circumference	107.8 / 8.4	103.3 / 6.8	113.3 / 17.1	104.1 / 11.4			*	*
Buttock circumference	106.6 / 8.7	102.0 / 7.3	113.0 / 16.1	102.2 / 11.8			*	*
Right upper arm circumference	32.6 / 3.4	31.2 / 2.9	31.2 / 4.7	28.4 / 3.3		*	*	*
Right upper arm diameter	13.8 / 1.9	12.7 / 1.7	12.4 / 1.9	10.6 / 1.7	*	*	*	*
Right thigh circumference	58.7 / 5.7	56.4 / 4.5	58.9 / 9.9	56.7 / 5.9				*
SAD: Sagittal abdominal diameter at maximum belly circumference					A: MetS (Y) by gender			
[†] Bonferroni correction for five comparisons. Overall comparison by gender omitted.					B: MetS (N) by gender			
					C: Males by MetS			
					D: Females by MetS			

Table S5: Correlation of 3D body scan measurements with metabolic syndrome components

	Metabolic syndrome		MetS comp. without WC [†]		Abdominal obesity [‡]		Elevated Glucose		Low HDL cholesterol		Elevated triglycerides		Hypertension		Body fat percentage	
	Spearman's rho [§]															
Variable	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Body height																
Body weight	0.48	0.39	0.43	0.35	0.67	0.73		0.32					0.37	0.30	0.67	0.84
Transversal neck diameter	0.42	0.39	0.41	0.34	0.52	0.59							0.37	0.31	0.48	0.50
Middle neck circumference	0.57	0.50	0.51	0.50	0.66	0.75	0.35	0.35					0.45	0.44	0.60	0.74
Neck circumference at base	0.49	0.38	0.46	0.35	0.58	0.63							0.48	0.32	0.53	0.64
Sagittal neck diameter at base	0.56	0.47	0.50	0.43	0.62	0.68	0.37	0.34				0.28	0.45	0.38	0.51	0.69
Bust bircumference	0.53	0.53	0.46	0.50	0.71	0.84		0.38					0.38	0.42	0.65	0.86
Underbust circumference	0.57	0.52	0.48	0.50	0.75	0.84		0.37	0.31				0.42	0.46	0.66	0.84
Sagittal chest diameter	0.53	0.56	0.46	0.53	0.72	0.82		0.38				0.30	0.41	0.45	0.66	0.85
Total torso circumference	0.41	0.34	0.40	0.29	0.55	0.57							0.35		0.57	0.68
Waist circumference	0.61	0.51	0.51	0.49	0.82	0.84	0.34	0.36				0.29	0.41	0.45	0.74	0.90
High waist circumference	0.63	0.53	0.52	0.52	0.83	0.85	0.33	0.37				0.29	0.43	0.48	0.73	0.89
Maximum belly circumference	0.57	0.49	0.48	0.49	0.79	0.83	0.33	0.36				0.28	0.40	0.44	0.76	0.91
SAD	0.62	0.53	0.53	0.53	0.80	0.83	0.35	0.39				0.31	0.42	0.47	0.73	0.90
High hip circumference	0.55	0.49	0.47	0.49	0.78	0.82	0.33	0.36				0.29	0.38	0.43	0.76	0.91
Middle hip circumference	0.53	0.47	0.45	0.48	0.77	0.79	0.32	0.35				0.28	0.37	0.44	0.75	0.91
Hip circumference	0.35	0.33			0.55	0.61		0.29							0.67	0.82
Buttock circumference	0.38	0.37	0.32	0.33	0.60	0.66		0.31						0.31	0.68	0.85
Right upper arm circumference					0.34	0.54		0.29							0.40	0.66
Right upper arm diameter	0.32	0.35		0.30	0.39	0.61									0.45	0.64
Right thigh circumference					0.36	0.48									0.53	0.68
Body mass index	0.56	0.49	0.48	0.47	0.73	0.78		0.38					0.39	0.39	0.69	0.90
Waist-to-height ratio	0.62	0.55	0.50	0.56	0.74	0.83	0.34	0.39				0.32	0.41	0.50	0.66	0.86
Waist-to-hip ratio	0.40	0.38	0.38	0.35	0.44	0.56								0.30		0.40
SAD-to-height ratio	0.63	0.56	0.52	0.56	0.74	0.80	0.36	0.41				0.34	0.41	0.49	0.69	0.87

M: Male subjects (N=160); F: Female subjects (N=194).

SAD: Sagittal abdominal diameter at maximum belly circumference

[†] Sum of metabolic syndrome components without waist circumference (0-4);

[‡] Manually measured waist circumference greater than 94 cm for males and 80 cm for females

[§] Spearman's rho, calculated by gender with Bonferroni correction, pairwise analysis

p<0.05 for all shown results. statistically insignificant results omitted