

Cross-calibration of two dual-energy X-ray absorptiometry devices for the measurement of body composition in young children

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Running title: Calibration of DXA devices in young children

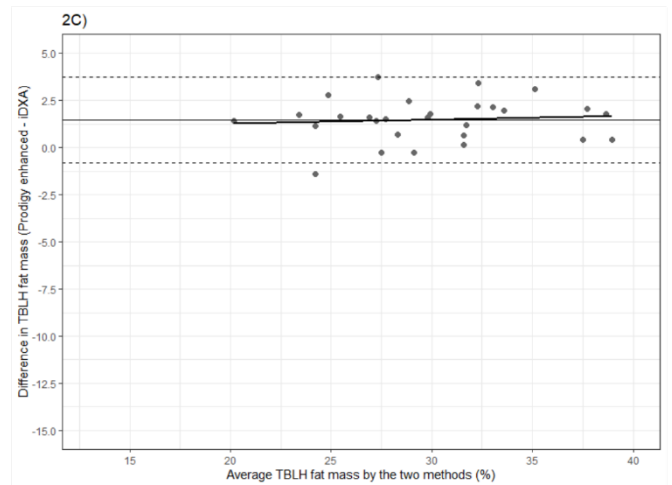
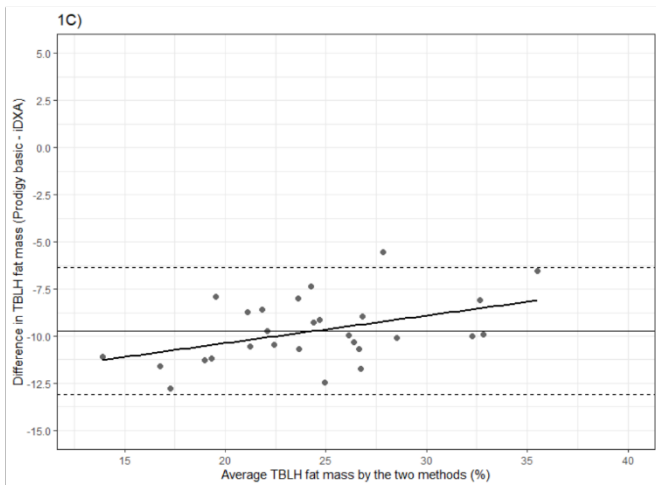
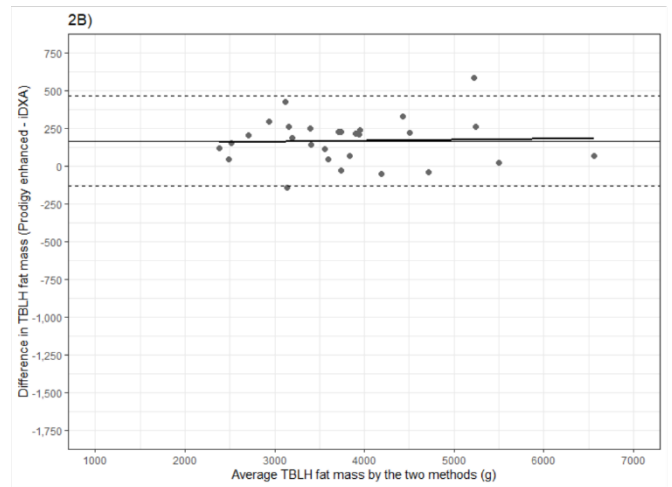
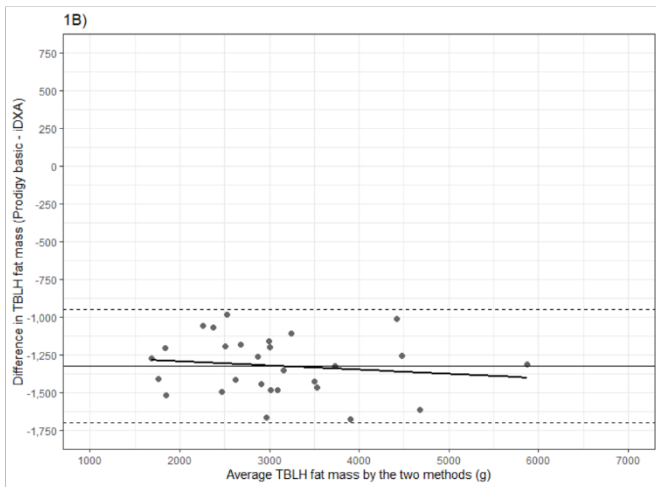
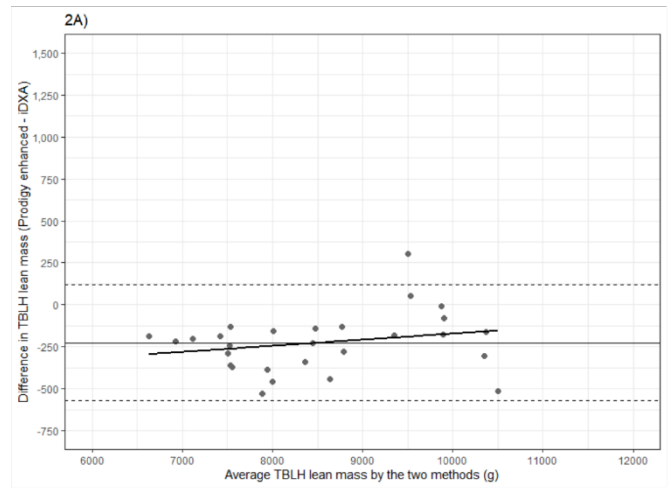
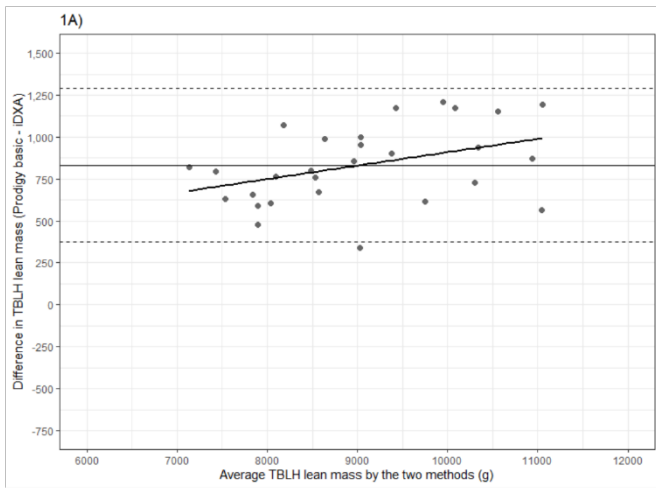
Competing interests: KMG, SYC, and WSC are part of an academic consortium that has received grants from Société Des Produits Nestlé S.A. outside the submitted work. SYC and KMG have received reimbursement for speaking at conferences sponsored by companies selling nutritional products. All other authors declare no competing interests.

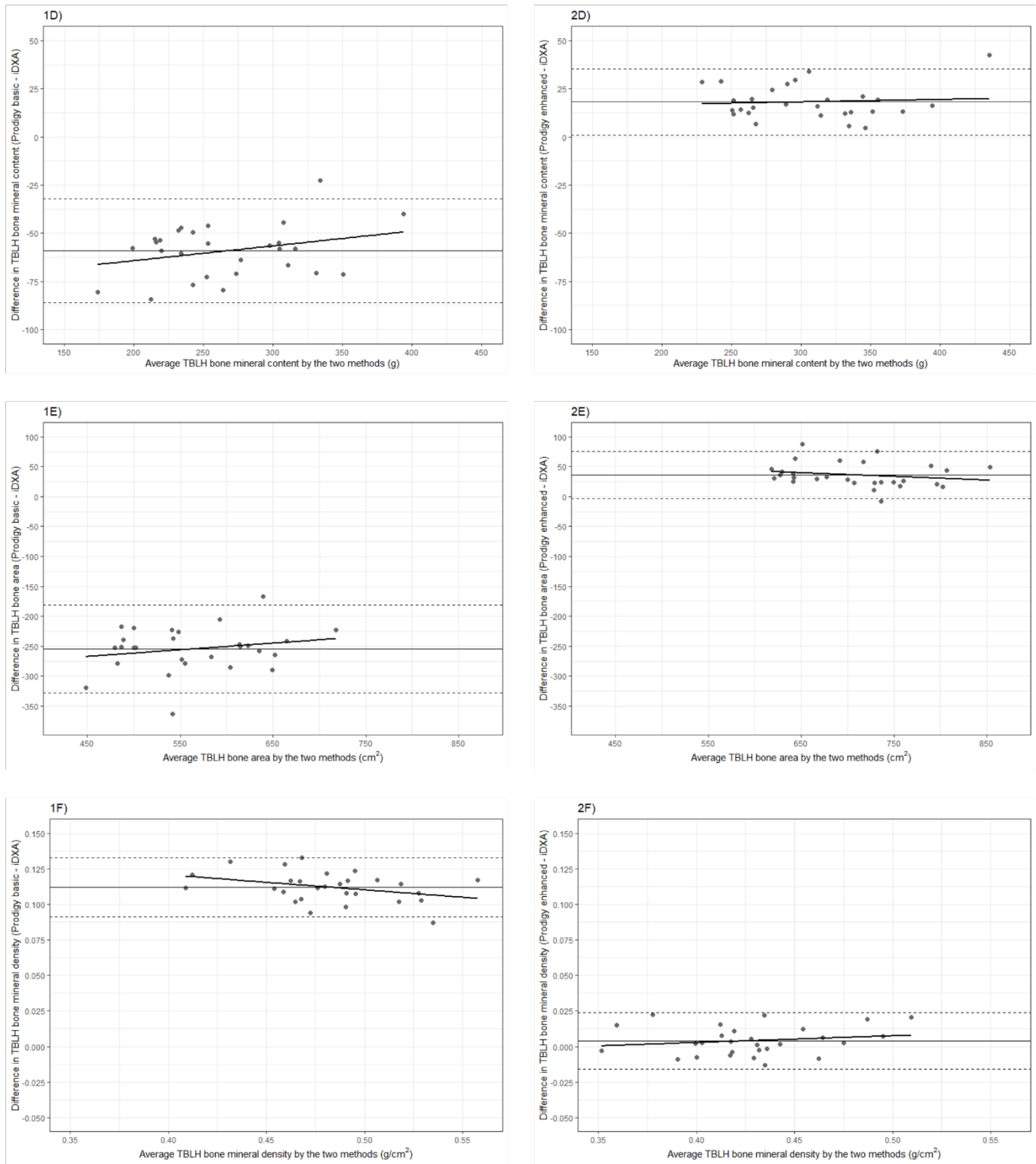
Supplementary Table 1 Regional body composition estimates and results from repeated measures analysis of variance and Bland–Altman analysis comparing body composition parameters of young children (n=28) measured using two dual-energy X-ray absorptiometry (DXA) devices analysed using different software versions: iDXA scan, Prodigy scan analysed with basic analysis; and Prodigy scan analysed with enhanced analysis.

	p^s	iDXA		Prodigy							
				Basic				Enhanced			
		Mean ± SD	Mean ± SD	p^a	% difference [@]	Bias (95% LOA) ⁺	Mean ± SD	p^{\wedge}	$p^{\#}$	% difference	Bias (95% LOA)
Lean mass (g)											
- Arms	<0.001	862 ± 127	1009 ± 177	<0.001	17.2 (12.3, 22.0)	147 (-69, 363)	835 ± 149	<0.001	0.245	-3.2 (-6.6, 0.2)	-27 (-181, 127)
- Left arm	<0.001	427 ± 67	505 ± 89	<0.001	18.6 (13.6, 23.6)	78 (-29, 186) [*]	416 ± 82	<0.001	0.786	-2.5 (-7.0, 1.9)	-11 (-108, 86)
- Right arm	<0.001	436 ± 65	504 ± 91	<0.001	16.0 (10.5, 21.6)	69 (-52, 190) [*]	419 ± 75	<0.001	0.143	-3.7 (-7.3, -0.1)	-16 (-97, 64)
- Legs	<0.001	2815 ± 425	3156 ± 456	<0.001	12.3 (10.4, 14.3)	341 (82, 600)	2534 ± 468	<0.001	<0.001	-10.4 (-12.3, -8.5)	-282 (-503, -60) [*]
- Left leg	<0.001	1398 ± 216	1 566 ± 225	<0.001	12.2 (10.3, 14.2)	167 (38, 296)	1266 ± 244	<0.001	<0.001	-9.9 (-12.0, -7.7)	-132 (-254, -10) [*]
- Right leg	<0.001	1417 ± 211	1591 ± 233	<0.001	12.4 (10.2, 14.6)	174 (26, 321)	1268 ± 229	<0.001	<0.001	-10.9 (-12.8, -9.0)	-150 (-270, -29)
- Trunk	<0.001	4948 ± 616	5292 ± 630	<0.001	7.1 (5.8, 8.3)	344 (38, 650)	5029 ± 599	<0.001	0.036	1.8 (0.5, 3.0)	81 (-232, 394)
Fat mass (g)											
- Arms	<0.001	636 ± 151	240 ± 137	<0.001	-64.4 (-59.0, -59.7)	-396 (-521, -271)	707 ± 177	<0.001	<0.001	11.4 (8.0, 14.8)	71 (-46, 188) [*]
- Left arm	<0.001	311 ± 78	119 ± 67	<0.001	-63.7 (-68.1, -59.3)	-192 (-256, -128)	352 ± 86	<0.001	<0.001	13.6 (9.9, 17.3)	40 (-17, 97)
- Right arm	<0.001	325 ± 75	121 ± 71	<0.001	-65.0 (-69.9, -60.0)	-204 (-272, -136)	355 ± 92	<0.001	<0.001	9.4 (5.6, 13.2)	31 (-40, 101) [*]
- Legs	<0.001	1705 ± 433	1158 ± 403	<0.001	-33.5 (-36.6, -30.5)	-547 (-717, -377)	1774 ± 386	<0.001	0.003	5.1 (2.6, 7.6)	69 (-122, 259) [*]
- Left leg	<0.001	849 ± 217	575 ± 202	<0.001	-33.6 (-36.8, -30.4)	-273 (-371, -176)	873 ± 192	<0.001	0.105	4.0 (1.1, 7.0)	24 (-90, 138) [*]
- Right leg	<0.001	856 ± 219	582 ± 201	<0.001	-33.4 (-36.5, -30.3)	-274 (-368, -181) [*]	901 ± 197	<0.001	<0.001	6.2 (3.5, 8.9)	44 (-62, 150) [*]
- Trunk	<0.001	1390 ± 433	1010 ± 444	<0.001	-29.6 (-34.5, -24.6)	-379 (-630, -128)	1417 ± 450	<0.001	0.801	1.9 (-1.6, 5.3)	27 (-222, 277)
Fat mass (%)											
- Arms	<0.001	40.9 ± 6.1	18.1 ± 7.2	<0.001	-57.1 (-61.9, -52.2)	-22.9 (-30.6, -15.2)	44.1 ± 6.2	<0.001	<0.001	8.2 (4.8, 11.6)	3.2 (-3.3, 9.7)
- Left arm	<0.001	40.6 ± 6.4	18.1 ± 7.2	<0.001	-56.8 (-61.5, -52.0)	-22.6 (-30.3, -14.9)	44.2 ± 6.8	<0.001	<0.001	9.2 (5.1, 13.2)	3.5 (-4.3, 11.3)
- Right arm	<0.001	41.2 ± 5.6	18.1 ± 7.2	<0.001	-57.3 (-62.3, -52.3)	-23.2 (-31.5, -14.8)	44.1 ± 6.1	<0.001	<0.001	7.4 (4.0, 10.9)	2.9 (-3.9, 9.7)
- Legs	<0.001	36.5 ± 4.9	25.8 ± 5.8	<0.001	-30.1 (-33.3, -26.8)	-10.7 (-15.0, -6.4) [*]	40.0 ± 5.1	<0.001	<0.001	9.9 (7.4, 12.5)	3.5 (-0.9, 8.0)
- Left leg	<0.001	36.5 ± 4.9	25.8 ± 5.8	<0.001	-30.1 (-33.4, -26.8)	-10.7 (-15.3, -6.1) [*]	39.7 ± 5.5	<0.001	<0.001	8.9 (6.0, 11.8)	3.2 (-2.1, 8.4)
- Right leg	<0.001	36.4 ± 5.0	25.7 ± 5.8	<0.001	-30.0 (-33.3, -26.7)	-10.7 (-15.0, -6.3)	40.3 ± 4.9	<0.001	<0.001	11.0 (8.4, 13.6)	3.9 (-0.6, 8.3)
- Trunk	<0.001	21.3 ± 4.8	15.5 ± 5.4	<0.001	-28.9 (-33.8, -24.0)	-5.8 (-9.6, 2.0)	21.3 ± 5.0	<0.001	1.000	0.1 (-3.2, 3.3)	0.0 (-3.5, 3.5)
BMC (g)											
- Arms	<0.001	46 ± 8	32 ± 9	<0.001	-32.8 (-36.3, -29.3)	-15 (-21, -9)	53 ± 10	<0.001	<0.001	14.1 (10.9, 17.3)	6 (-1, 14)

	p^s	iDXA Mean \pm SD	Prodigy								
			Basic				Enhanced				
			Mean \pm SD	p^*	% difference [@]	Bias (95% LOA) [†]	Mean \pm SD	p^*	$p^\#$	% difference	Bias (95% LOA)
- Left arm	<0.001	23 \pm 5	16 \pm 4	<0.001	-31.1 (-34.4, -27.7)	-7 (-10, -4)	27 \pm 5	<0.001	<0.001	15.5 (12.0, 18.9)	3 (0, 7)
- Right arm	<0.001	23 \pm 4	16 \pm 5	<0.001	-34.4 (-38.6, -30.3)	-8 (-12, -4) [*]	26 \pm 5	<0.001	<0.001	12.9 (9.1, 16.7)	3 (-2, 8) [*]
- Legs	<0.001	115 \pm 23	97 \pm 24	<0.001	-16.0 (-18.6, -13.5)	-18 (-30, -5)	123 \pm 20	<0.001	<0.001	8.4 (5.4, 11.5)	8 (-3, 20) [*]
- Left leg	<0.001	57 \pm 12	48 \pm 12	<0.001	-16.0 (-18.8, -13.2)	-9 (-16, -2)	61 \pm 10	<0.001	<0.001	7.4 (3.9, 10.8)	3 (-3, 10) [*]
- Right leg	<0.001	58 \pm 11	49 \pm 12	<0.001	-16.0 (-18.6, -13.5)	-9 (-15, -3)	63 \pm 11	<0.001	<0.001	9.5 (6.5, 12.5)	5 (-1, 11)
- Trunk	<0.001	135 \pm 21	108 \pm 23	<0.001	-20.4 (-23.2, -17.7)	-27 (-44, -10)	138 \pm 24	<0.001	0.105	2.4 (0.1, 4.7)	3 (-12, 19)
Bone area (cm ²)											
- Arms	<0.001	135 \pm 18	67 \pm 16	<0.001	-50.3 (-53.4, -47.3)	-67 (-91, -44)	147 \pm 16	<0.001	<0.001	9.8 (6.5, 13.1)	12 (-9, 33)
- Left arm	<0.001	66 \pm 11	34 \pm 8	<0.001	-48.5 (-51.4, -45.6)	-32 (-45, -19) [*]	73 \pm 9	<0.001	<0.001	11.7 (7.7, 15.8)	7 (-5, 19)
- Right arm	<0.001	69 \pm 8	33 \pm 8	<0.001	-52.0 (-55.6, -48.4)	-35 (-49, -22)	74 \pm 9	<0.001	<0.001	8.2 (4.5, 11.9)	5 (-7, 18)
- Legs	<0.001	255 \pm 31	169 \pm 32	<0.001	-34.1 (-36.8, -31.4)	-86 (-118, -54)	267 \pm 24	<0.001	<0.001	5.1 (2.4, 7.8)	12 (-17, 40) [*]
- Left leg	<0.001	128 \pm 16	84 \pm 16	<0.001	-34.2 (-37.1, -31.2)	-43 (-62, -25)	131 \pm 12	<0.001	0.130	3.5 (0.5, 6.6)	4 (-14, 21) [*]
- Right leg	<0.001	127 \pm 15	85 \pm 16	<0.001	-33.9 (-36.7, -31.2)	-43 (-59, -27)	135 \pm 13	<0.001	<0.001	6.8 (3.7, 9.9)	8 (-8, 24)
- Trunk	<0.001	301 \pm 26	200 \pm 32	<0.001	-33.8 (-36.5, -31.0)	-101 (-143, -60)	313 \pm 30	<0.001	<0.001	4.0 (2.7, 5.3)	12 (-9, 33)
BMD (g/cm ²)											
- Arms	<0.001	0.34 \pm 0.04	0.47 \pm 0.03	<0.001	36.1 (32.2, 40.1)	0.12 (0.07, 0.18)	0.36 \pm 0.04	<0.001	0.015	4.2 (1.5, 6.8)	0.01 (-0.03, 0.06)
- Left arm	<0.001	0.35 \pm 0.04	0.47 \pm 0.03	<0.001	34.5 (30.4, 38.6)	0.12 (0.06, 0.18)	0.36 \pm 0.04	<0.001	0.136	3.8 (0.4, 7.2)	0.01 (-0.05, 0.07)
- Right arm	<0.001	0.34 \pm 0.04	0.46 \pm 0.04	<0.001	37.6 (33.4, 41.9)	0.13 (0.06, 0.19)	0.35 \pm 0.04	<0.001	0.003	4.5 (2.2, 6.8)	0.02 (-0.03, 0.05)
- Legs	<0.001	0.45 \pm 0.05	0.57 \pm 0.04	<0.001	27.8 (25.9, 29.8)	0.12 (0.09, 0.15)	0.46 \pm 0.05	<0.001	<0.001	3.2 (2.0, 4.3)	0.01 (-0.01, 0.04)
- Left leg	<0.001	0.44 \pm 0.05	0.57 \pm 0.04	<0.001	28.1 (25.9, 30.4)	0.12 (0.09, 0.16)	0.46 \pm 0.05	<0.001	<0.001	3.8 (2.3, 5.2)	0.02 (-0.02, 0.05)
- Right leg	<0.001	0.45 \pm 0.05	0.57 \pm 0.05	<0.001	27.6 (25.3, 29.8)	0.12 (0.09, 0.16)	0.46 \pm 0.05	<0.001	0.008	2.7 (1.1, 4.2)	0.01 (-0.02, 0.05)
- Trunk	<0.001	0.45 \pm 0.04	0.54 \pm 0.03	<0.001	20.4 (18.6, 22.2)	0.09 (0.06, 0.12)	0.44 \pm 0.04	<0.001	0.047	-1.6 (-2.9, -0.3)	-0.01 (-0.04, 0.02)

Abbreviations: BMC, bone mineral content; BMD, bone mineral density; FFM, fat-free mass; LOA, limits of agreement. [@]Percentage difference (95% CI) in body composition values in reference to the values obtained from the GE Lunar iDXA. ^sp value for repeated measures analysis of variance comparing the three measurement conditions: GE Lunar iDXA, GE Lunar Prodigy (basic), and GE Lunar Prodigy (enhanced). ^{*}Bonferroni adjusted p value for the comparison of the GE Lunar iDXA and the GE Lunar Prodigy (basic). [#]Bonferroni adjusted p value for the comparison of the GE Lunar Prodigy (basic) and the GE Lunar Prodigy (enhanced). [†]Bonferroni adjusted p value for the comparison of the GE Lunar iDXA and the GE Lunar Prodigy (enhanced). ^{*}Bias and 95% LOA from Bland–Altman analysis of body composition values in reference to the values obtained from the GE Lunar iDXA. ^{*}Statistically significant regression line from Bland–Altman analysis of body composition values in reference to the values obtained from the GE Lunar iDXA.

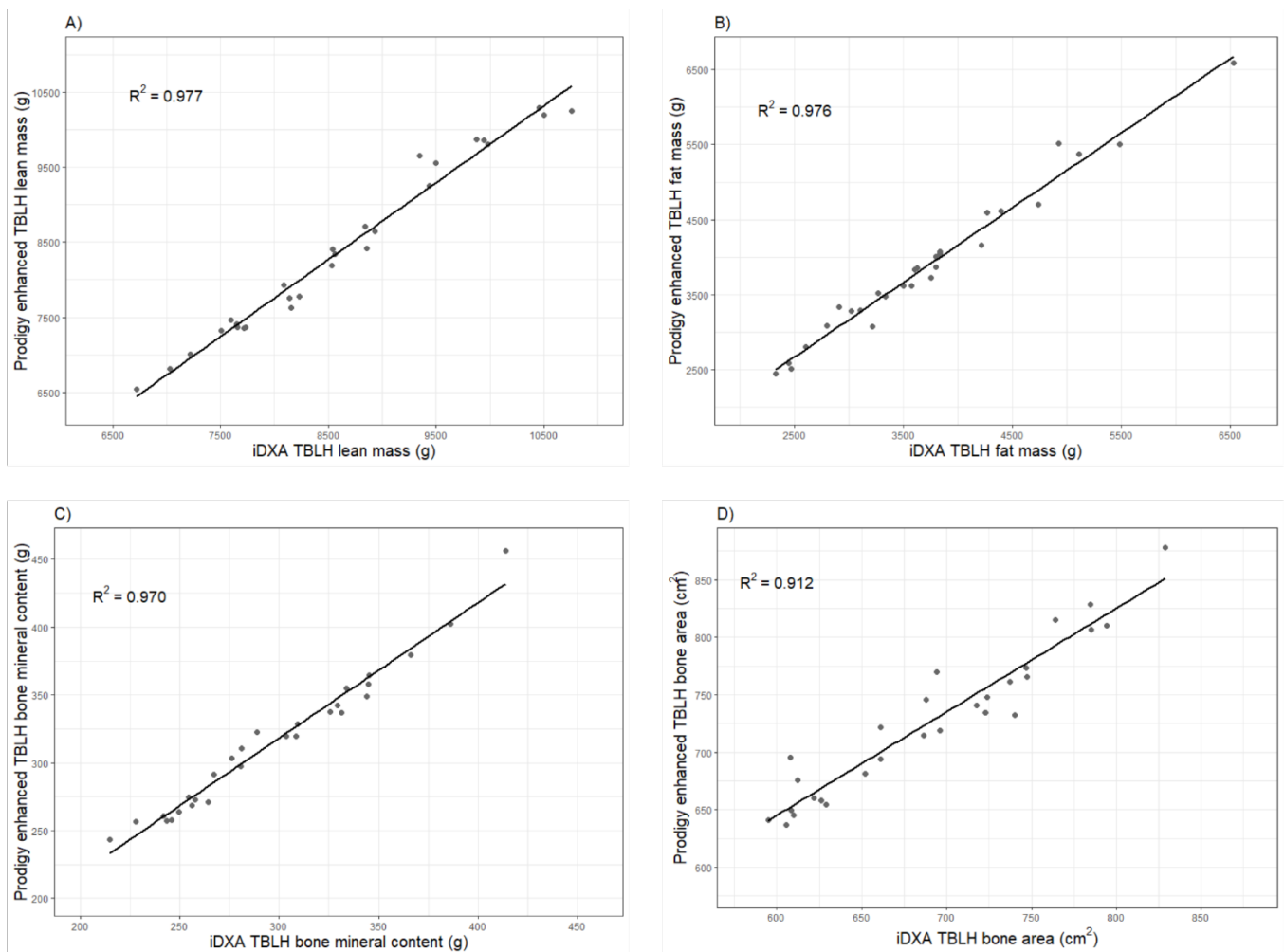




Supplementary Figure 1 Bland–Altman plots comparing total body less head (TBLH) body composition parameters of young children (n=28) measured on the GE Lunar iDXA (reference) and 1) the GE Lunar Prodigy (basic) and 2) the GE Lunar Prodigy (enhanced). Body composition parameters are A) lean mass, B) fat mass, C) fat mass percentage, D) bone mineral content, E) bone area, and F) bone mineral density.

Supplementary Table 2 Cross-calibration equations between GE Lunar Prodigy enhanced and GE Lunar iDXA (reference) measurements among 28 young children.

	Slope (95% CI)	Intercept (95% CI)	R ²
TBLH lean mass (g)	0.95 (0.89, 1.01)	619.60 (145.52, 1093.69)	0.977
TBLH fat mass (g)	0.98 (0.92, 1.04)	-96.18 (-333.77, 141.41)	0.976
TBLH bone mineral content (g)	0.97 (0.91, 1.03)	-9.52 (-30.41, 11.37)	0.970
TBLH bone area (cm ²)	1.01 (0.89, 1.13)	-46.22 (-134.44, 42.00)	0.912



Supplementary Figure 2 Scatterplots of total body less head (TBLH) estimates of A) lean mass (g), B) fat mass (g), C) bone mineral content (g), and D) bone area (cm²) from the GE Lunar Prodigy enhanced and the GE Lunar iDXA.