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iDXA, Prodigy, and DPXL dual-energy X-ray absorptiometry whole-body scans: a cross-calibration study

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Abstract

Purpose—Total body fat, lean, and bone mineral content (BMC) in addition to regional fat and lean mass values for arms, legs, and trunk were compared across a pencil-beam (Lunar DPX-L) and two fan-beam (GE Lunar Prodigy and GE Lunar iDXA) dual energy x-ray absorptiometry (DXA) systems.

Methods—Subjects were a multi-ethnic sample of 99 healthy adult males (47%) and females (mean ± SD: age 46.3 ± 16.9 yrs; weight 73.4±16.6 kg; height 167.6±9.7 cm; BMI 26.0±5.2 kg/m^2) who had whole-body scans performed within a 3 hour period on the three systems. Repeated measures ANOVA was used to test the null hypothesis that the mean values for the three systems were equal. Translation equations between the methods were derived using regression techniques.

Results—BMC: For both genders, total BMC by iDXA was lower ($P \leq 0.004$) than the other systems. Lean: For males, iDXA was lower ($P \leq 0.03$) than the other systems for total, trunk and arms. For females, DPXL estimated higher ($P<0.001$) lean mass compared to the other systems for total, trunk and arms, but iDXA estimated greater legs lean mass. For both genders, all DPXL mean values were greater than Prodigy mean values ($P<0.001$).

Fat: In females, all 3 systems were different from each other for total, trunk, and legs ($P \leq 0.04$). For arms, DPXL and iDXA were higher than Prodigy ($P<0.0004$). For males, DPXL was less ($P<0.001$) for total body, trunk and legs compared to the other two systems and greater than Prodigy only for arms ($P<0.0007$). These data were used to derive translation equations between systems. For several measurements, the differences between systems were related to gender.

Conclusion—For estimation of BMC and body composition, there was high agreement between all DXA systems (R^2=0.85 to 0.99). Even so, cross-calibration equations should be used to examine data across systems to avoid erroneous conclusions.

Keywords

DXA; cross-calibration; densitometry; body composition; pencil beam; fan beam; iDXA

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Introduction

The accurate assessment of body composition for purposes of disease classification, disease risk or presence (osteopenia and osteoporosis), current health status by level of fatness and fat distribution, and changes in these components after an intervention is imperative. One technique commonly used to assess body composition is dual energy x-ray absorptiometry (DXA) which provides information on both bone mineral content (BMC) and soft-tissue content of the whole-body and regions (arms, legs and trunk). Over the past several years a number of different DXA systems have come onto the market and into research laboratories (1–3) where the principal technology differs.

One advancement made in DXA technology has been the transition from a pencil beam densitometer used in early systems (Lunar's DPX and DPXL) to a fan beam densitometer used in the currently available systems (GE/Lunar's Prodigy and iDXA systems). Fan-beam systems employ multiple detectors that allow for quicker scan acquisition and clearer image resolution but a higher though still minimal radiation dose (4). The results from cross-calibration studies comparing BMC, fat, and lean tissue estimates from the DPXL pencil beam system versus the Prodigy fan beam system in children (5) and in adults (4,6) have shown differences across systems.

The latest densitometer for body composition and bone mineral assessment is the iDXA (GE Lunar) which employs a fan beam technology with a greater number of detectors than earlier models. As yet it is unknown how the iDXA compares to previous DXA models. For ongoing longitudinal studies where follow-up body composition studies must be performed on a DXA system different from that on which the baseline studies were performed, it becomes essential that a cross-calibration study be performed to allow comparison of data collected on the different systems. Therefore, the use of cross-calibration equations is recommended to compare results between these systems.

The aim of this study was to compare total body fat, lean, and BMC in addition to regional fat and lean mass values for arms, legs, and trunk between a pencil-beam (Lunar DPX-L) and two fan-beam (GE Lunar Prodigy and GE Lunar iDXA) DXA systems.

Materials & Methods

Subjects

The sample consisted of healthy multi-ethnic adults recruited to participate in a study to cross-calibrate three different DXA systems. Flyers placed locally in the community were used to recruit subjects. In total, 99 participants (47 males and 52 females) were tested on all three DXA systems. Participants ranged in age from 18 years to 81 years and ranged in BMI from normal to obese. The maximal weight for inclusion as a study participant was limited by the upper weight limit restriction of the DPXL and Prodigy systems (300 pounds).

Study Procedures

Subjects completed all testing at the Body Composition Unit (New York Obesity Research Center) at St. Luke's-Roosevelt Hospital. Scans were performed using a total body scan mode on each of the DXA systems within a three hour period. Body weight and height were measured wearing a hospital gown and foam slippers, and with the use of calibrated scale (Weight Tronix, NY, NY) and stadiometer (Holtain Stadiometer, Crosswell, Wales). Body mass index (BMI) was calculated (kg/m^2) from height and weight. Informed consents were obtained on all subjects prior to commencement of testing. The study was approved by the Radiation Safety Committee and Institutional Review Board of St. Luke's-Roosevelt Hospital.

Dual-Energy X-ray Absorptiometry

Total body fat, lean, and BMC were measured with three whole-body DXA scanners using a total body scan mode: DPXL, Prodigy, and iDXA (GE Lunar, Madison, WI) and analyses were performed using the following software versions: DPXL 4.7e, Prodigy 8.80 and iDXA 10.40. Using specific anatomic landmarks as previously described (7), regions including the arms, legs and trunk were demarcated. For soft tissue quality control purposes relating to the densitometers, monthly scans were performed using methanol and water bottles with a volume of 8 liters to simulate fat and fat-free soft tissues, respectively (8,9).

Pencil beam technology is used in the DPXL system whereas the Prodigy and iDXA are both fan beam systems. DXPL uses an x-ray source at 78 kVp and a K-edge filter to produce stable beams of x-rays at energies of 38 and 70 keV. The Prodigy employs a narrow fan beam at an angle of 4.5°, orientated parallel to the long axis of the body using a peak x-ray energy of 80 kVp, a current of 3 mA and a K-edge filter produce energies at 38 and 70 keV. The Prodigy system employs 16 detectors that are energy sensitive cadmium zinc telluride, 5 cm long, allowing for rapid photon counting(10). The iDXA system uses a staggered array of sixty-four detectors CZT-HD digital detectors to enhance the precision and eliminate dead space between detectors creating a high resolution image(11). The enhanced digital detectors increase the image resolution for bone especially, although this comes at the cost of a higher radiation dose. The radiation dose for a total body scan set on standard thickness using iDXA is 0.03 mSv (30% of the radiation dose received in a chest x-ray), which is greater than earlier systems (DPXL 0.002 mSv and Prodigy 0.004 mSv; 2% and 4% of the radiation dose received in a chest x-ray, but still less than the radiation dose received during a chest x-ray (0.1 mSv)(12).

Scan times for a total body scan using DPXL is approximately 20 minutes and for the Prodigy and iDXA are less than 10 minutes each. Other notable upgrades made to the iDXA system were done to accommodate scanning of heavier/obese subjects. These include a greater upper weight limit of 450 pounds (205 kg), a greater height of the arm to capture subjects with a greater trunk thickness, a wider bed platform (94 cm for iDXA versus 73 cm for prodigy) and a lower bed platform making mounting of the platform easier for patients or subjects. Even though there is a wider bed platform in the iDXA system, the field of view increased only minimally from the Prodigy system (196 cm long by 66 cm wide for iDXA versus 197 cm long by 60 cm wide for prodigy).

Statistical analysis

Descriptive statistics, including means, standard deviations, minimum and maximum values were calculated for all variables by gender. The hypothesis that the mean measurements of the three scanners were equal was tested using repeated measures analysis of variance. Multiple comparisons among the mean measurements from the three scanners were performed using Fisher's protected least significant difference procedure. Separate calculations were performed for total body bone mass, total body and regional lean mass, and total body and regional fat mass.

Regression techniques were used to derive translation equations between the scanners. For ongoing longitudinal studies where follow-up body composition studies must be performed on a DXA system different from that on which the baseline studies were performed, it becomes essential that a cross-calibration study be completed to allow comparison of data collected on the different systems. Since iDXA is the newest scanner, equations were derived to predict iDXA values from DPXL and Prodigy values. Gender was included as an independent variable in the models. Separate equations were derived for total body bone mass, total body and regional lean mass, and total body and regional fat mass.

All statistical calculations were performed using SAS statistical software (SAS Institute Inc, Cary, NC, version 9.1) and STATA statistical software (version 10.0) for personal computers. The level of significance for statistical tests was 0.05.

Results

Baseline characteristics

The descriptive characteristics for this study cohort are presented for males and females separately in Table 1. A total of 99 subjects (47 males and 52 females) completed the study. Descriptive statistics for measurements by scanner for males and females respectively, are presented in Tables 2a and 2b. No differences in BMD or bone area were found in either gender. These results are summarized in Table 3a and Table 3b.

Total body bone measurements

The results of the repeated measures analysis of variance are presented in Tables 3a and 3b for males and females, respectively. For total BMC measurements, the mean iDXA values were significantly less than the mean values for Prodigy and DPXL for both males and females. No other differences were indicated for total BMC measurements.

Total body and regional lean measurements

For males, all pair-wise comparisons between the scanners were significantly different. The mean values for iDXA were significantly less than mean values estimated by the other scanners for total body, trunk and arms. All DPXL mean values were greater than Prodigy and iDXA mean values. These results are summarized in Table 3a. For females, all but two of the comparisons were significantly different for lean mass measurements. Similar to males, DPXL estimated higher lean mass values compared to Prodigy and iDXA for total body, trunk and arms. For legs, DPXL values were greater than Prodigy. iDXA estimated greater lean mass values for total body and legs compared to Prodigy. These results are summarized in Table 3b.

Total body and regional fat measurements

For males, all but three of the pair-wise comparisons between scanners were significantly different. Considering all significant pair-wise comparisons, DPXL estimated lower fat mass for total, trunk and legs compared to the other scanners. Prodigy estimated lower fat mass values than DPXL and iDXA for arms. For total body, iDXA measured greater fat mass than the other two scanners. These results are summarized in Table 3a. For females, all but one of the comparisons was significantly different for fat mass measurements. Within significant pair-wise comparisons, iDXA estimated greater total, trunk and legs fat mass compared to DPXL, however iDXA estimated less total, trunk and leg fat mass compared to Prodigy. Prodigy estimated smaller values for fat mass compared to the other systems for arms. These results are summarized in Table 3b.

Translation equations to convert to iDXA

The translation equations are presented in Table 4. There was a significant gender effect for all but five of the equations. In general, the gender effect was expressed as a different slope for males and females. Total body BMC estimates by both Prodigy and DPXL were highly correlated to iDXA BMC estimates (R^2 = 0.96 and 0.97, respectively). Lean mass R^2 values for total and all regional measurements were greater than 0.94. Similarly, the R^2 for total and regional fat mass values were highly correlated (>0.95), excluding arms by DPXL which had a slightly lower R^2 (0.85).

Discussion

With the advent of fan beam technology, most DXA manufacturers are offering this technology in their newest models, though some manufacturers continue to sell pencil beam systems. Body composition investigators who conduct longitudinal studies and those who need to merge data collected using different generation systems are encouraged to use cross-calibration equations so that the validity of merged data is maintained. This study compared total body and regional fat, lean, and BMC of a pencil-beam (Lunar DPXL) and two fan-beam (GE Lunar Prodigy and GE Lunar iDXA) DXA systems and developed regression equations to translate Prodigy and DPXL measurements to iDXA values. For several measurements, the differences between systems were significantly different for males and females. The newest system, iDXA estimated lower values for total body BMC when compared to Prodigy and DPXL in both genders. For total and regional body composition, estimates varied according to the type of DXA system. DPXL tended to estimate greater amounts of total and regional body lean mass for both genders.

Total body bone measurements

Oldroyd and colleagues(6) performed *in vivo* comparisons in a group of adult patients diagnosed with cystic fibrosis, anorexia or classified as normal. This study compared total BMC using the Lunar DPXL and GE Lunar Prodigy. They reported significantly higher BMC by Prodigy when compared to DPXL (2413 g vs. 2380 g, respectively; $P<0.001$). In both males and females, no differences were found between Prodigy and DPXL to estimate total body BMC. Though a correction factor was developed for femoral neck bone mineral density, the use of a correction factor for total BMC was not evaluated.

Total body and regional fat and lean measurements

Oldroyd and colleagues (6) compared body composition estimate by DPXL and Prodigy and reported significantly higher Prodigy derived total body weight and total body fat and lean mass. These findings are contrary to the findings of the current study where Prodigy estimated lower values for total and regional lean mass compared to DPXL for both genders. A previous study from our laboratory comparing the DPX (4.7), Prodigy (software versions 5.6 and 6.6) and DPXL (software version 4.7e) systems in healthy males and females (4), while reporting only on percentage total body fat differences across systems, found that percentage body fat by Prodigy was greater compared to DPXL in both genders which is consistent with the direction of differences in the current study.

This study is the first to compare DXA systems for regional fat and lean mass. Most other studies have concentrated on examination of bone mineral density (6,13) measurements and did not include a comparison of soft-tissue estimates. In the two studies that did include comparisons of body composition, only one study included total percentage fat(4) while the other study included total body lean and fat mass estimates(6), but reports for estimates of regional analysis were not included. With the current rates of metabolic disease, the need to characterize overall adiposity is evident, but more important is the need to characterize the distribution of adiposity, central versus peripheral. DXA systems provide a way to characterize disease risk by examining location of fat mass. Most importantly, DXA offers a way to track where changes in fat mass occurs; in the periphery (arms and legs) or centrally (trunk).

Translation equations to convert to iDXA

A direct comparison of soft-tissue and BMC values across systems is not meaningful as each system can provide different values for each measured tissue (4,6). One approach to overcoming this problem is to develop regression equations to make values from one system comparable to values from another system. DPXL and Prodigy measurements were translated to iDXA values using regression equations as presented in Table 4. We found high correlations between iDXA and both DPXL and Prodigy for males and females with the R^2 values ranging from 0.85 to 0.99. As previously reported (4), gender was found to impact BMC and body composition results.

The variability of results between systems indicates that interpretation of serial measurements acquired on different systems can produce erroneous results. DPXL tended to estimate higher amounts of lean mass, however, there was a lack of consistency between iDXA and Prodigy with regard to which system estimated greater amounts of lean mass. It is highly recommended that when upgrading DXA systems, a laboratory first performs a cross-calibration study so that equations can be developed that are specific to that laboratory's DXA systems. A cross calibration study consists of scanning the same persons on the system being phased out and the new system. Using regression analysis, equations are developed that translate data from the old system to the new system. In longitudinal studies where the systems are changed during data collection, this allows for the continuation of data collection to detect any change that may have occurred over time. By using translation equations, differences in the data attributed to changing systems are minimized. This allows for the true change due to time to be detected.

To illustrate the possible error associated with using uncorrected data, consider a 50 year old female whose baseline total body scan is performed on the DPXL and returns 5 years later for a follow-up scan on the iDXA. When no correction is applied, the changes observed include losses of bone (−0.25 kg) and lean (−1.0 kg) with a gain (+3.75 kg) in fat. When the baseline DPXL data are translated to iDXA values, the changes observed include a similar loss of bone (−0.22 kg), a negligible change in lean (+0.068 kg) and a much smaller gain in fat (+1.655 kg). Ideally, each center should develop their own translation equations specific to their equipment. However, when this is not possible such as when a system unexpectedly malfunctions and cannot be repaired, the equations contained in this report provide a way to translate data from DPXL and Prodigy systems for comparison iDXA estimates.

There are well established differences in the measurement of soft-tissue estimates when examined across different DXA manufacturers (e.g. GE Lunar vs. Hologic)(4,14–17), within manufacturer models using different technologies (pencil-beam versus fan-beam)(3,4,6,13, 18), within the same manufacturer using the same technologies(19))(4,20) and within the same manufacturer and same instrument but different software versions(15,19). This study reports on differences between the newest version from GE Lunar, the iDXA (fan-beam) compared to older versions namely the DPXL (pencil-beam) and Prodigy (fan-beam). Due to differences across different DXA manufacturers, caution should be used when applying these prediction equations to data acquired on systems other than those used in this study.

The iDXA system incorporates several upgrades from prior systems in an effort to accommodate larger subjects. Though the new system has a wider and longer platform with a greater upper weight limit, the field of view for soft tissue is a modest 6 cm wider (66 cm by 196 cm iDXA vs. 61 cm by 197 cm Prodigy). Unfortunately, many obese subjects cannot be accommodated within the iDXA field of view. The arm height was also increased to accommodate subjects with a greater trunk volume (45 cm tall by 66 cm wide iDXA vs. 41 cm tall by 61 cm wide Prodigy).

A limitation is the upper weight of the participants that could be included in the study. Though the iDXA bed platform can accommodate body weights up to 450 pounds (205 kg), as per the manufacturer's guidelines, the DPXL and Prodigy can only accommodate body weight up to 300 pounds. Since we did not measure subjects over 300 pounds, we cannot comment on the performance of iDXA in comparison to DPXL and Prodigy to assess BMC and body composition in this population. Further, since the equations were not developed in a population beyond 300 pounds, the prediction equations would not be valid for use in a population beyond this upper weight limit.

Our results indicate that differences in total BMC and total and regional fat and lean mass estimates vary by DXA system and are influenced by gender. For estimation of BMC and body composition, there was high agreement between all DXA systems (R^2=0.85 to 0.99). With the increasing use of DXA for body composition research in both pediatric and adult populations, further research is needed to highlight ways in which differences between DXA systems can be minimized, in particular the newest fan-beam version iDXA, for regional measurements of fat and lean mass.

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Table 1

Descriptive characteristics for demographic variables

Sex	Variable	Mean (SD)	Range
Males (n=47)	Age (yr)	43.4 (17.1)	19 – 76
	Height (cm)	174.6 (8.1)	149.0 – 197.4
	Weight (kg)	80.6 (13.3)	59.0 – 106.5
	BMI (kg/m^2)	26.4 (3.9)	19.2 – 35.0
Females (n=52)	Age (yr)	48.9 (16.4)	18 – 81
	Height (cm)	161.3 (6.0)	149.9 – 176.0
	Weight (kg)	67.0 (16.8)	43.7 – 112.5
	BMI (kg/m^2)	25.7 (6.2)	18.1 – 46.4

Table 2

Table 2a. Descriptive statistics for scanner measurements on male subjects (n=47)

Variable	Region	Scanner	Mean (SD)	Range
Total Body	Bone (kg)	DPXL	3.11 (0.49)	2.27 – 4.35
		Prodigy	3.11 (0.47)	2.27 – 4.28
		iDXA	3.06 (0.46)	2.21 – 4.12
	Area cm^2	**DPXL**	**2508 (250)**	**1906 – 2996**
		Prodigy	**2488 (211)**	**2014 – 2865**
		iDXA	**2484 (204)**	**1880 – 2856**
	BMD g/cm^2	**DPXL**	**1.2342 (0.1046)**	**1.0620 – 1.4970**
		Prodigy	**1.2466 (0.1172)**	**1.0492 – 1.5763**
		iDXA	**1.2269 (0.1264)**	**1.0068 – 1.5838**
Lean Mass (kg)	Total Body	DPXL	57.12 (8.53)	40.10 – 85.85
		Prodigy	54.69 (8.73)	35.86 – 87.34
		iDXA	53.90 (8.63)	36.57 – 84.93
	Trunk	DPXL	26.33 (3.86)	18.13 – 37.01
		Prodigy	25.07 (4.14)	16.02 – 40.10
		iDXA	24.25 (3.92)	16.33 – 37.83
	Arms	DPXL	7.25 (1.64)	4.70 – 13.45
		Prodigy	6.87 (1.55)	4.42 – 13.20
		iDXA	6.77 (1.57)	4.33 – 13.02
	Legs	DPXL	19.97 (3.46)	13.17 – 31.23
		Prodigy	18.97 (3.41)	12.15 – 29.90
		iDXA	19.46 (3.51)	12.81 – 30.29
Fat Mass (kg)	Total Body	DPXL	19.78 (10.17)	5.77 – 49.24
		Prodigy	22.81 (10.20)	6.76 – 52.17
		iDXA	23.36 (9.50)	8.09 – 49.41
	Trunk	DPXL	10.13 (5.27)	2.47 – 24.01
		Prodigy	12.74 (6.01)	3.06 – 27.51
		iDXA	12.71 (6.02)	3.00 – 26.61
	Arms	DPXL	2.28 (1.42)	0.52 – 5.88
		Prodigy	2.01 (1.06)	0.52 – 4.96
		iDXA	2.28 (0.98)	0.92 – 5.30
	Legs	DPXL	6.44 (3.70)	1.84 – 18.62
		Prodigy	7.38 (3.43)	2.51 – 18.50
		iDXA	7.38 (2.96)	3.25 – 16.99

Table 2b. Descriptive statistics for scanner measurements in females (n=52)

Variable	Region	Scanner	Mean (SD)	Range
Total Body	Bone (kg)	DPXL	2.36 (0.32)	1.74 – 3.15
		Prodigy	2.37 (0.34)	1.66 – 3.31
		iDXA	2.31 (0.31)	1.62 – 3.04

Table 2b. Descriptive statistics for scanner measurements in females (n=52)

Variable	Region	Scanner	Mean (SD)	Range
	Area cm^2	**DPXL**	**2047 (153)**	**1721 –2370**
		Prodigy	**2046 (195)**	**1657 – 2434**
		iDXA	**2069 (136)**	**1679 – 2290**
	BMD g/cm^2	**DPXL**	**1.1484 (0.0875)**	**0.9620 – 1.3380**
		Prodigy	**1.1568 (0.1038)**	**0.9885 – 1.5069**
		iDXA	**1.1166 (0.1147)**	**0.8899 – 1.4359**
Lean Mass (kg)	Total Body	DPXL	39.93 (5.37)	28.69 – 53.52
		Prodigy	37.92 (5.60)	27.24 – 53.43
		iDXA	38.52 (5.77)	27.32 – 53.60
	Trunk	DPXL	19.23 (2.74)	13.39 – 26.56
		Prodigy	18.08 (2.92)	12.85 – 26.49
		iDXA	17.88 (2.50)	12.19 – 24.24
	Arms	DPXL	4.31 (0.83)	2.86 – 5.94
		Prodigy	3.97 (0.77)	2.66 – 5.59
		iDXA	3.94 (0.91)	2.55 – 5.93
	Legs	DPXL	13.52 (2.19)	9.72 – 19.69
		Prodigy	12.86 (2.24)	9.30 – 19.20
		iDXA	13.79 (2.57)	9.85 – 20.99
Fat Mass (kg)	Total Body	DPXL	23.61 (11.93)	4.92 – 54.93
		Prodigy	25.99 (12.52)	6.55 – 59.63
		iDXA	25.71 (11.99)	8.55 – 57.00
	Trunk	DPXL	10.66 (5.81)	1.72 – 24.89
		Prodigy	12.45 (6.87)	2.59 – 32.78
		iDXA	12.07 (6.76)	2.93 – 30.32
	Arms	DPXL	2.85 (1.62)	0.44 – 7.13
		Prodigy	2.58 (1.44)	0.70 – 6.85
		iDXA	2.92 (1.48)	1.20 – 7.26
	Legs	DPXL	9.15 (4.69)	2.30 – 22.14
		Prodigy	10.19 (4.54)	2.88 – 24.62
		iDXA	9.86 (4.06)	3.74 – 22.97

Table 3

Table 3a. Descriptive statistics for differences between scanner measurements in males (n=47)

Variable	Region	Scanner 1	Scanner 2	Mean	Standard Error	P value
Total Body	Bone (kg)	iDXA	DPXL	−0.05	0.02	**0.0029**
		iDXA	Prodigy	−0.06	0.02	**0.0009**
		Prodigy	DPXL	0.01	0.02	0.7270
	Area cm^2	**iDXA**	**DPXL**	**−23.61**	**16.82**	**0.1639**
		iDXA	**Prodigy**	**−4.08**	**16.82**	**0.8090**
		Prodigy	**DPXL**	**−19.53**	**16.82**	**0.2487**
	BMD g/cm^2	**iDXA**	**DPXL**	**−0.0073**	**0.0041**	**0.0774**
		iDXA	**Prodigy**	**−0.0197**	**0.0041**	**0.0001**
		Prodigy	**DPXL**	**0.0124**	**0.0041**	**0.0033**
Lean Mass (kg)	Total Body	iDXA	DPXL	−3.22	0.20	**0.0001**
		iDXA	Prodigy	−0.79	0.20	**0.0002**
		Prodigy	DPXL	−2.43	0.20	**0.0001**
	Trunk	iDXA	DPXL	−2.08	0.18	**0.0001**
		iDXA	Prodigy	−0.82	0.18	**0.0001**
		Prodigy	DPXL	−1.26	0.20	**0.0001**
	Arms	iDXA	DPXL	−0.47	0.05	**0.0001**
		iDXA	Prodigy	−0.10	0.05	**0.0345**
		Prodigy	DPXL	−0.37	0.05	**0.0001**
	Legs	iDXA	DPXL	−0.51	0.16	**0.0017**
		iDXA	Prodigy	0.49	0.16	**0.0027**
		Prodigy	DPXL	−1.00	0.16	**0.0001**
	Total Body	iDXA	DPXL	3.58	0.20	**0.0001**
		iDXA	Prodigy	0.55	0.20	**0.0065**
		Prodigy	DPXL	3.03	0.20	**0.0001**
Fat Mass (kg)	Trunk	iDXA	DPXL	2.58	0.17	**0.0001**
		iDXA	Prodigy	−0.03	0.17	0.8742
		Prodigy	DPXL	2.61	0.17	**0.0001**
	Arms	iDXA	DPXL	−0.00	0.08	0.9678
		iDXA	Prodigy	0.27	0.08	**0.0008**

Table 3a. Descriptive statistics for differences between scanner measurements in males (n=47)

Variable	Region	Scanner 1	Scanner 2	Mean	Standard Error	P value
		Prodigy	DPXL	−0.27	0.08	**0.0007**
	Legs	iDXA	DPXL	0.94	0.11	**0.0001**
		iDXA	Prodigy	0.00	0.11	0.9718
		Prodigy	DPXL	0.94	0.11	**0.0001**

Table 3b. Descriptive statistics for differences between scanner measurements in females (n=52)

Variable	Region	Scanner 1	Scanner 2	Mean	Standard Error	P value
Total Body	Bone (kg)	iDXA	DPXL	−0.04	0.02	**0.0040**
		iDXA	Prodigy	−0.06	0.02	**0.0002**
		Prodigy	DPXL	0.01	0.02	0.3651
	Area cm^2	**iDXA**	**DPXL**	**21.92**	**15.30**	**0.1551**
		iDXA	**Prodigy**	**22.51**	**15.30**	**0.1444**
		Prodigy	**DPXL**	**−0.59**	**15.30**	**0.9692**
	BMD g/cm^2	**iDXA**	**DPXL**	**−0.0319**	**0.0041**	**0.0001**
		iDXA	**Prodigy**	**−0.0403**	**0.0041**	**0.0001**
		Prodigy	**DPXL**	**0.0084**	**0.0041**	**0.0425**
Lean Mass (kg)	Total Body	iDXA	DPXL	−1.41	0.16	**0.0001**
		iDXA	Prodigy	0.59	0.16	**0.0002**
		Prodigy	DPXL	−2.01	0.16	**0.0001**
	Trunk	iDXA	DPXL	−1.35	0.14	**0.0001**
		iDXA	Prodigy	−0.20	0.14	0.1525
		Prodigy	DPXL	−1.15	0.14	0.**0001**
	Arms	iDXA	DPXL	−0.36	0.05	**0.0001**
		iDXA	Prodigy	−0.03	0.05	0.5903
		Prodigy	DPXL	−0.34	0.05	**0.0001**
	Legs	iDXA	DPXL	0.27	0.11	**0.0187**
		iDXA	Prodigy	0.94	0.11	**0.0001**
		Prodigy	DPXL	−0.66	0.11	**0.0001**
Fat Mass (kg)	Total Body	iDXA	DPXL	2.11	0.14	**0.0001**
		iDXA	Prodigy	−0.28	0.14	**0.0444**

Table 3b. Descriptive statistics for differences between scanner measurements in females (n=52)

Variable	Region	Scanner 1	Scanner 2	Mean	Standard Error	P value
		Prodigy	DPXL	2.39	0.14	**0.0001**
	Trunk	iDXA	DPXL	1.40	0.18	**0.0001**
		iDXA	Prodigy	−0.39	0.18	**0.0353**
		Prodigy	DPXL	1.79	0.18	**0.0001**
	Arms	iDXA	DPXL	0.07	0.07	0.3625
		iDXA	Prodigy	0.34	0.07	**0.0001**
		Prodigy	DPXL	−0.27	0.07	**0.0004**
	Legs	iDXA	DPXL	0.71	0.11	**0.0001**
		iDXA	Prodigy	−0.33	0.11	**0.0020**
		Prodigy	DPXL	1.04	0.11	**0.0001**

Table 4

Regression equations to translate Prodigy and DPXL measurements to iDXA values.

Variable	Region	Independent Variable	Females		Males		SEE	R^2
			Slope	Intercept	Slope	Intercept		
Bone (kg)	**Total Body**	Prodigy	**0.883**	0.219	**0.912**	0.219	0.113	0.96
		DPXL	0.956	0.072	0.956	0.072	0.092	0.97
Lean Mass (kg)	**Total Body**	Prodigy	**1.005**	0.405	**0.978**	0.405	1.290	0.99
		DPXL	**1.052**	−3.486	**1.005**	−3.486	1.181	0.99
	Trunk	Prodigy	**0.798**	**3.448**	**0.923**	**1.114**	0.905	0.96
		DPXL	0.912	0.284	0.912	0.284	1.020	0.95
	Arms	Prodigy	**1.073**	−0.306	**1.029**	−0.306	0.266	0.98
		DPXL	0.955	−0.156	0.955	−0.156	0.387	0.96
	Legs	Prodigy	**1.047**	0.345	**1.007**	0.345	0.953	0.95
		DPXL	**1.052**	−0.407	**0.994**	−0.407	1.026	0.94
Fat Mass (kg)	**Total Body**	Prodigy	0.944	**1.171**	0.944	**1.829**	0.968	0.99
		DPXL	**1.003**	**2.032**	**0.925**	**5.073**	1.090	0.99
	Trunk	Prodigy	0.983	−0.004	0.983	−0.004	0.882	0.98
		DPXL	1.138	**−0.068**	1.138	**1.186**	1.127	0.97
	Arms	Prodigy	**0.985**	0.391	**0.934**	0.391	0.285	0.95
		DPXL	**0.799**	0.680	**0.682**	0.680	0.517	0.85
	Legs	Prodigy	0.880	0.892	0.880	0.892	0.403	0.99
		DPXL	**0.843**	2.176	**0.803**	2.176	0.602	0.98

The bolded slope and intercept values represent significant differences between males and females respectively.