

## InBody Validation

→ Validation study on the accuracy comparison between DEXA vs. Professional BCA InBody 970, and DEXA vs. Body Water Analyzer BWA 2.0

### 1. Introduction

InBody provides fat free mass and body fat mass calculated through the BIA principle. This data is derived from an external clinical trials and summarizes the results of correlation analysis between fat free mass and body fat mass measured by InBody and DEXA.

The accuracy of InBody is presented by the correlation analysis with values measured by DEXA (Dual Energy X-ray Absorptiometry) a standard method to calculate the amount of fat free mass and body fat mass for each segments of the body.

### 2. Materials and Methods

- ① Date : 2019.12.09 ~ 2020.01.31
- ② Location : University of Incheon Physical Education Laboratory
- ③ Subject : n=150 (M=74, F=76), Data collection count n=300

To include various subjects with different ages and physical conditions, age of 60 years or older was also included, and a total of 150 people were selected based on BMI. Each subject was asked to measure all measurements twice, and a total of 150 results were analyzed, excluding duplicate data from the same subject. This study will confirm the size of the effect to confirm the equivalence trial between DEXA and InBody, a minimum sample size of 116 or more is required based on statistical condition. (power of test 0.95, significance level 0.05, allowable difference 1.0, expected population standard deviation (SD) of 2.0 and a standard error of 5%)

(\*Sample Size Calculator: <http://riskcalc.org:3838/samplesize/>)

Xiaofeng Wang, PhD; and Xinge Ji, MS, Sample Size Estimation in Clinical Research From Randomized Controlled Trials to Observational Studies, 158 1S CHEST JULY 2020

Sample size	
Significance level	0.05
Power (1-beta)	0.95
Ratio of sample size, treat/control	1
Allowable difference	1
SD	2
Margin	0.05
Drop rate (%)	0
Result	
Sample Size - Treat	116
Sample Size - Control	116
Total sample size	232

#### ④ Methods

Professional body composition analyzer (InBody970), professional body water analyzer (BWA2.0), and DEXA were measured consecutively on the same day. The correct height was measured with a stadiometer and this value was entered when measuring body composition. After fasting for at least 4 hours, wearing with light short sleeve shirts and short pants, and resting in a standing position for at least 10 minutes before measurement, and then proceeded with the test. Before the measurement of the professional body water analyzer (BWA2.0), the test was started after resting in a lying position for at least 15 minutes. All

measurements were taken twice, and DEXA was scanned once, lying on the test table in a comfortable state after InBody measurement was completed, and the test time per person took about 10 minutes.

**Table1. Frequency of each device**

Device	Manufacturer	Frequency
DEXA LUNAR Prodigy DF+503202	GE Healthcare(USA)	-
InBody970	InBody Co., Ltd. (KOREA)	1, 5, 50, 250, 500, 1000, 2000, 3000 kHz
BWA2.0	InBody Co., Ltd. (KOREA)	1, 5, 50, 250, 500, 1000, 2000, 3000 kHz

### 3. Statistical Data Analysis

The correlation analysis of Fat Free Mass(FFM), Body Fat Mass(BFM), and Segmental Lean Mass measured by body composition analyzer (InBody) and DEXA was performed. For statistical processing of all data, SPSS 21.0 (PASW Statistics 21) was used, and when the P value was less than 0.05, it was determined that there was a statistically significant difference. Through the correlation analysis, it was decided that there was a high correlation between the two measured values when  $r=0.90$  or more

## 4. Results

### (1) General Characteristics

**Table2. General Characteristics (n=150, Data collection count n=300)**

	Total(n=150)	Male(n=74)	Female(n=76)
	Mean±SD(range)	Mean±SD(range)	Mean±SD(range)
<b>Age</b>	37.9 ± 13.4(19.0~73.0)	37.1 ± 13.0(19.0~73.0)	38.6 ± 13.7 (19.0~67.0)
<b>Weight(kg)</b>	70.9 ± 19.4(34.1~129.1)	81.2 ± 17.0(43.5~129.1)	60.9 ± 16.1(34.1~107.2)
<b>Height(cm)</b>	167.6 ± 9.8(145.6~189.3)	175.2 ± 6.7(162.0~189.3)	160.1 ± 5.8(145.6~173.1)
<b>BMI(kg/m<sup>2</sup>)</b>	25.0 ± 5.7(13.0~43.8)	26.3 ± 4.7(15.8~37.0)	23.8 ± 6.3(13.0~43.8)

### (2) Analysis Results\_Correlation Analysis

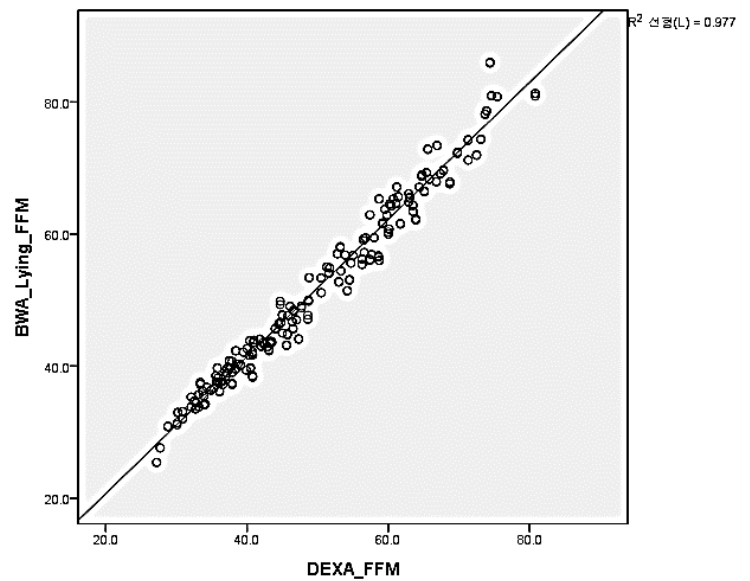
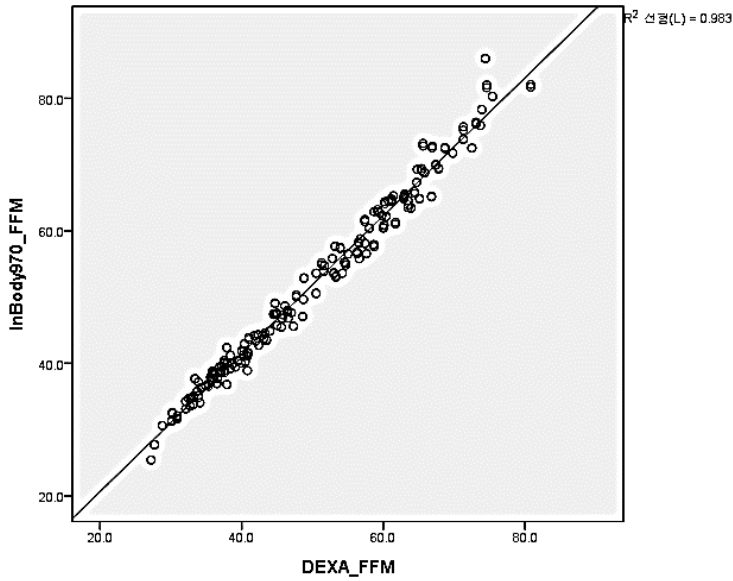
**Table3. Analysis Result\_DEXA vs InBody970, DEXA vs BWA2.0 Total FFM, BFM Correlation analysis**

DEXA \ InBody	Fat Free Mass(FFM)			Body Fat Mass(BFM)		
	r	R <sup>2</sup>	SEE(kg)	r	R <sup>2</sup>	SEE(kg)
<b>InBody970</b>	0.992	0.983	0.7865	0.986	0.972	0.5770
<b>BWA2.0</b>	0.988	0.977	0.7870	0.981	0.962	0.6043

Both fat free mass and fat mass of InBody970 and BWA2.0 had a very high correlation with DEXA of  $r=0.98$  or higher. In particular, it was confirmed that InBody970 and BWA2.0 showed a high correlation with DEXA.

■ Fat Free Mass (kg)

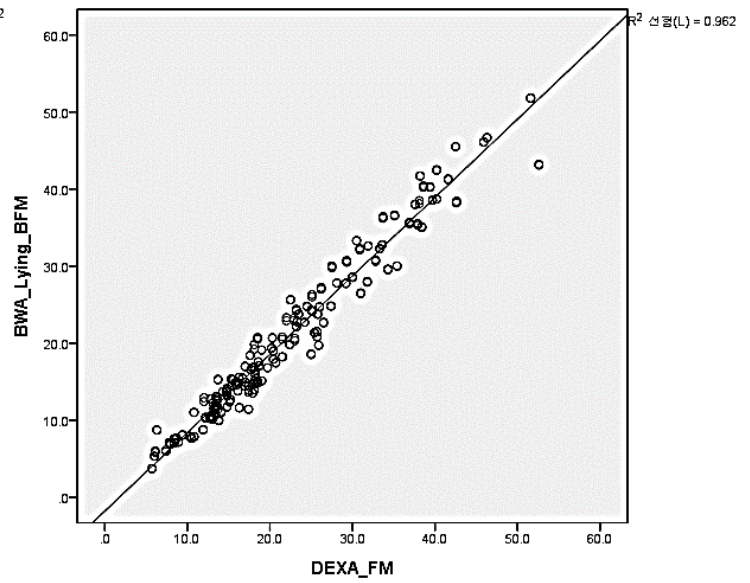
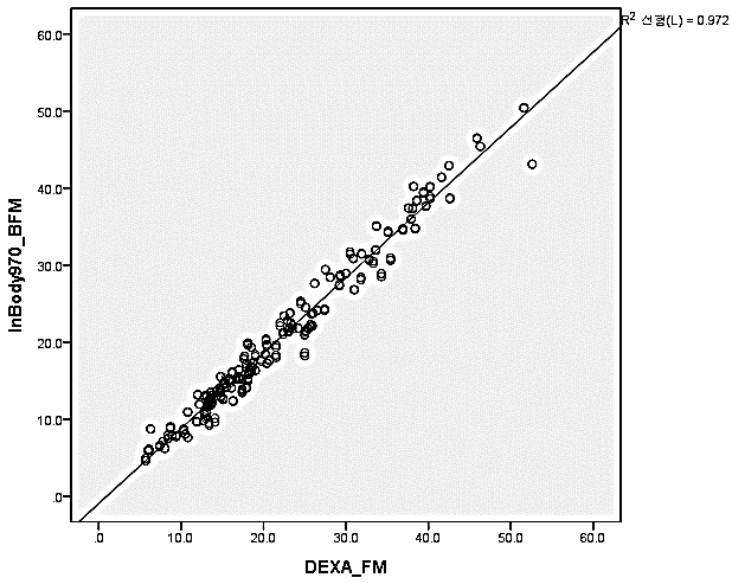
FFM(kg)	Total	Male	Female
	Mean±SD(range)	Mean±SD(range)	Mean±SD(range)
DEXA	49.1 ± 12.9(27.2~80.8)	59.5 ± 9.2(37.6~80.8)	39.0 ± 6.4(27.2~57.6)
InBody970	50.9 ± 13.6(25.4~86.0)	64.5 ± 10.0(38.6~86.0)	40.3 ± 6.3(25.4~57.7)
BWA2.0	50.9 ± 13.6(25.4~86.0)	61.8 ± 10.0(39.8~86.0)	40.2 ± 6.2(25.4~58.1)



< Correlation of fat free mass between DEXA and InBody970 / BWA2.0 >

■ Body Fat Mass (kg)

BFM(kg)	Total	Male	Female
	Mean±SD(range)	Mean±SD(range)	Mean±SD(range)
DEXA	21.5 ± 10.1(5.7~52.6)	21.3 ± 9.5(5.7~52.6)	21.6 ± 10.6(6.3~51.6)
InBody970	20.0 ± 10.0(4.6~50.4)	19.4 ± 9.0(4.6~43.1)	20.5 ± 10.8(6.4~50.4)
BWA2.0	20.0 ± 10.5(3.7~51.8)	19.4 ± 9.4(3.7~45.5)	20.6 ± 11.3(5.9~51.8)



< Correlation of body fat mass between DEXA and InBody970 / BWA2.0 >

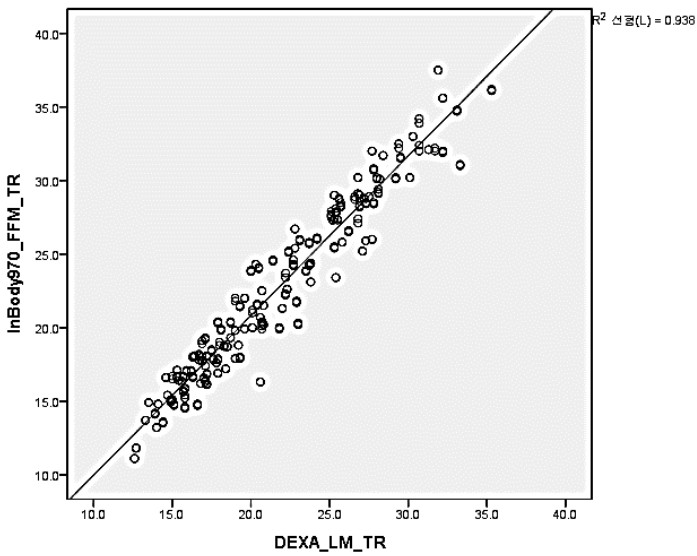
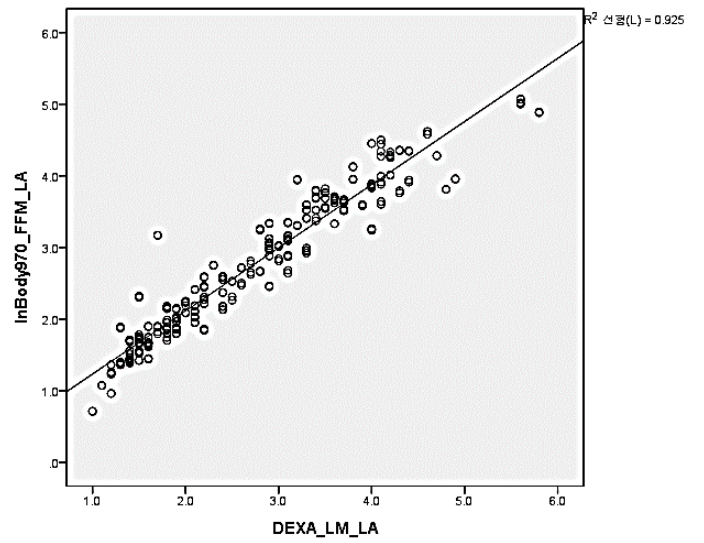
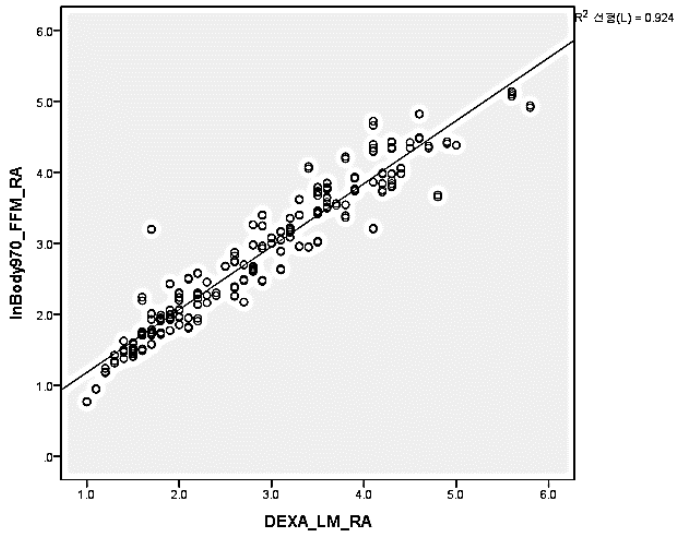
**Table4. Analysis Result\_DEXA vs InBody970, DEXA vs BWA2.0 Segmental LM Correlation analysis**

DEXA InBody	Segmental Lean Mass								
	RA			LA			TR		
	r	R <sup>2</sup>	SEE(kg)	r	R <sup>2</sup>	SEE(kg)	r	R <sup>2</sup>	SEE(kg)
<b>InBody970</b>	0.961	0.924	0.0586	0.962	0.925	0.0574	0.968	0.938	0.3481
<b>BWA2.0</b>	0.967	0.934	0.0590	0.965	0.932	0.0579	0.967	0.934	0.3498

DEXA InBody	Segmental Lean Mass					
	RL			LL		
	r	R <sup>2</sup>	SEE(kg)	r	R <sup>2</sup>	SEE(kg)
<b>InBody970</b>	0.953	0.909	0.1234	0.952	0.907	0.1218
<b>BWA2.0</b>	0.956	0.914	0.1219	0.955	0.912	0.1201

InBody970's segmental lean mass showed a very high correlation with DEXA, r=0.95 or higher. Likewise, in the case of BWA2.0, the correlation between all muscle mass and DEXA showed a very high correlation with r=0.95 or higher. In addition, in the accuracy comparison with DEXA for the muscle mass of each arm and leg, confirmed that BWA2.0 had a higher accuracy for the muscle mass of the limbs than InBody970. In the trunk area, both equipment showed similar accuracy but BWA2.0 was slightly higher.

■ Segmental Lean Mass (kg)

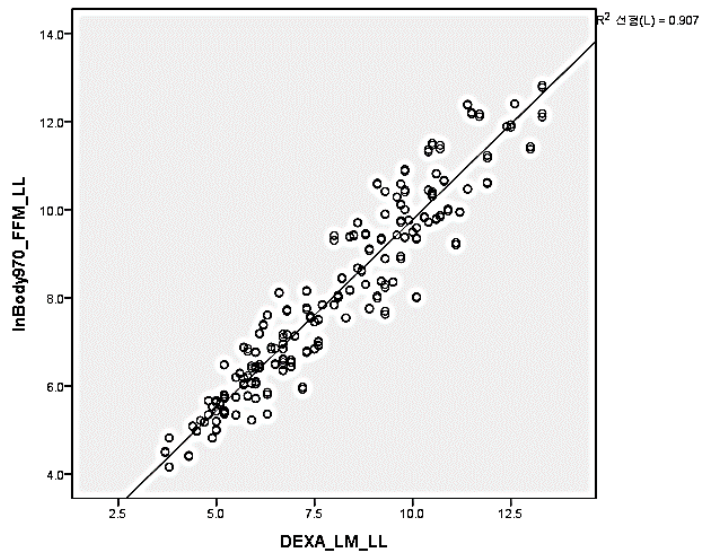
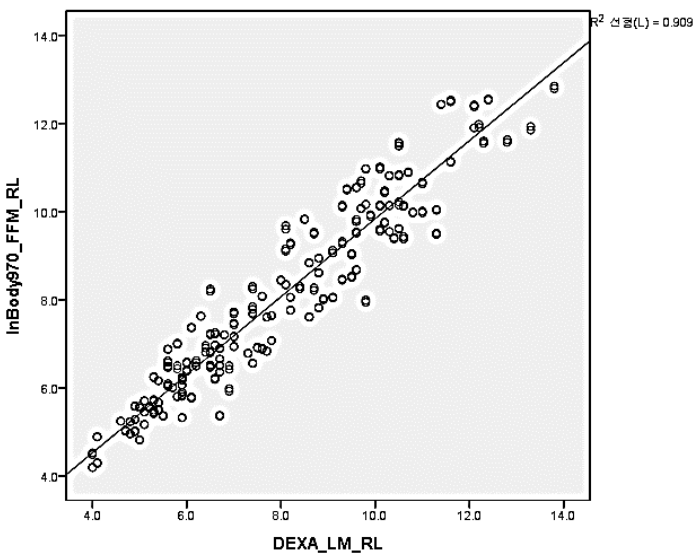


DEXA	RA	LA	TR	RL	LL
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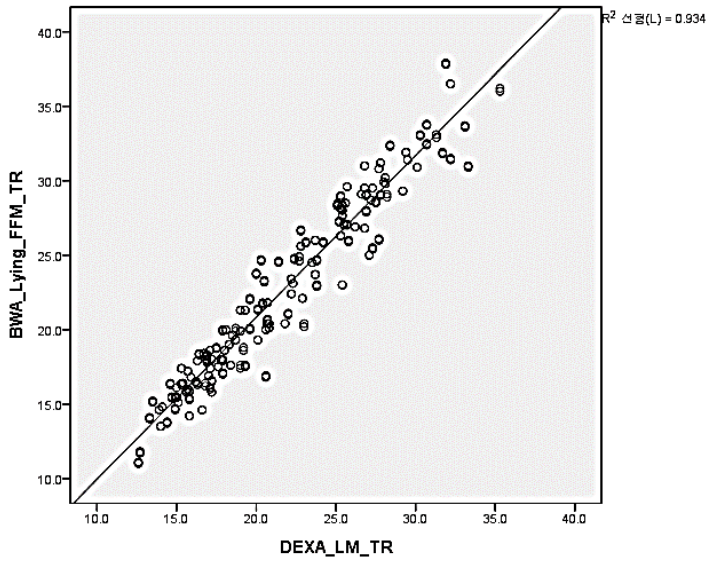
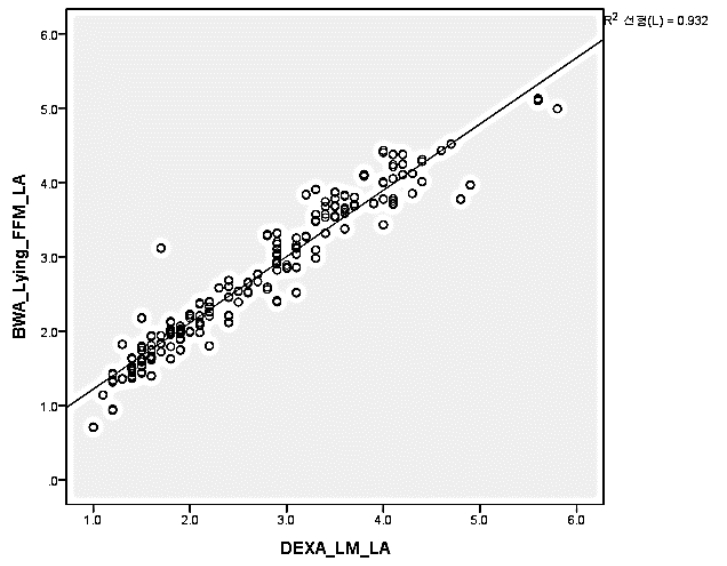
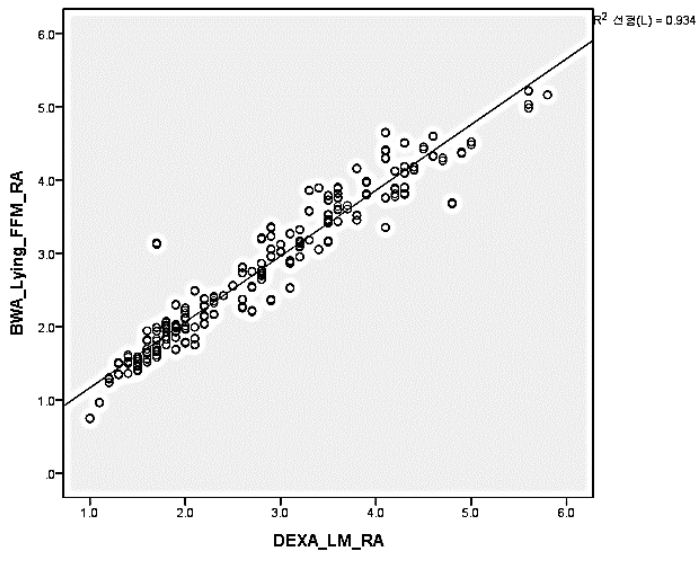
<b>Total</b>	2.75±1.10	2.66±1.08	21.70±5.37	7.86±2.30	7.83±2.31
<b>Male</b>	1.87±0.45	1.80±0.46	17.61±2.96	6.15±1.22	6.11±1.27
<b>Female</b>	3.67±0.78	3.55±0.79	25.90±3.82	9.62±1.75	9.59±1.74

<b>InBody970</b>	<b>RA</b>	<b>LA</b>	<b>TR</b>	<b>RL</b>	<b>LL</b>
<b>Total</b>	2.74±1.01	2.70±0.99	22.66±6.02	7.94±2.13	7.89±2.11
<b>Male</b>	3.55±0.71	3.50±0.69	27.52±4.15	9.70±1.49	9.62±1.48
<b>Female</b>	1.94±0.51	1.92±0.51	17.92±3.05	6.22±0.93	6.20±0.91

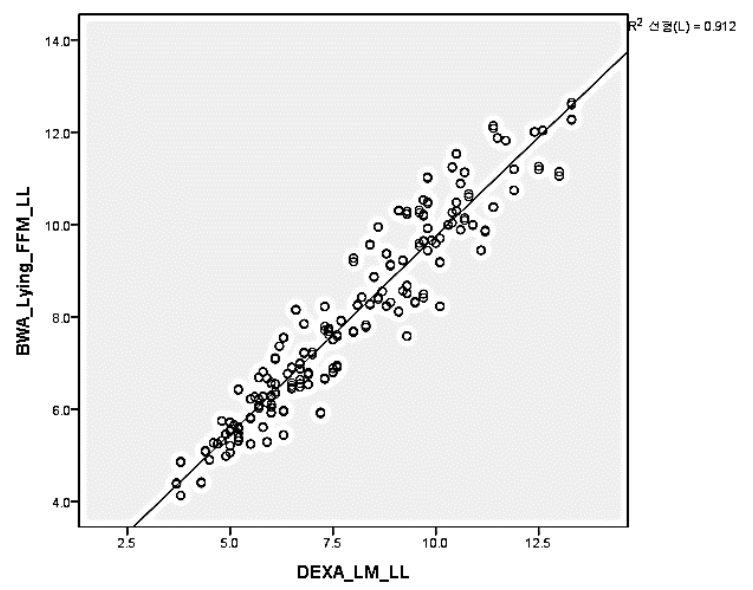
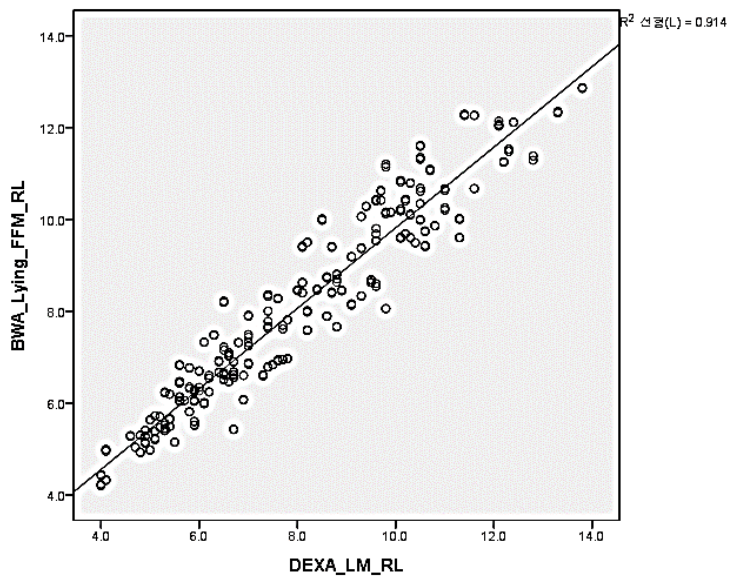
<b>BWA2.0</b>	<b>RA</b>	<b>LA</b>	<b>TR</b>	<b>RL</b>	<b>LL</b>
<b>Total</b>	2.74±1.01	2.70±0.99	22.66±6.02	7.94±2.13	7.89±2.11
<b>Male</b>	3.58±0.70	3.52±0.69	27.61±4.12	9.67±1.45	9.59±1.43
<b>Female</b>	1.93±0.49	1.91±0.49	17.87±2.97	6.24±0.95	6.22±0.95



<Correlation of Segmental Lean Mass between DEXA and InBody970>







< Correlation of segmental lean mass between DEXA and BWA2.0