Certifications and patents obtained by Biospace

U.S. patent U.S. 5720296

Canada patent C.N. 2225184

German patent

France patent

England patent

Italy patent

Japan patent

BIOSPACE

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Results Interpretation & Application

BIOSPACE

INTRODUCTION

This manual provides a detailed explanation of InBody720 Body Composition Analyzer and its functions. This manual makes use of actual examinees ’results to explain the following: the meaning of various analyses; what constitutes the standard range for a particular test; what kind of health management measures are required; and how to properly use this piece of equipment. Please read this manual carefully before using our InBody720 Body Composition Analyzer in your everyday life.

BODY COMPOSITION ANALYSIS

Things to keep in mind for the accurate measurement with InBody720

The accuracy of a test involving a body composition analyzer is dependent on the examinee and on the environment in which the test is conducted. As such, certain precautionary steps should be taken in order to assure accurate test results. Before conducting the test, please read the following rules carefully and make sure that the examinees have taken into account all the factors capable of affecting the test results and the accuracy of the testing.

Precautionary steps to be taken before conducting a test

1. Assure that the test is conducted before a meal

In cases where the examinee has already eaten, the test should be put off until two hours have elapsed since the last meal. This is because the mass of the food is counted as weight, and thus, may result in measurement errors.

2. Make sure to use the bathroom

Although not included in the body's compositional elements, the volume of urine and excrement is included in the weight measurement. This can result in biological errors.

3. Do not exercise right before conducting the test

Strenuous exercise or sharp movements can cause temporary changes in body composition.

4. Stand still for about 5 minutes

Conducting the test immediately after laying in bed or sitting for a long period of time might result in a slight change in the test results. This is because body water tends to move to the lower extremities of the body as soon as a person stands or gets up.

5. Do not conduct the test right after shower or the sauna

Sweating causes temporary changes in a person's body composition.

6. Do not take measurements during the menstrual cycle

Females experience increases in body water during their menstrual cycle.

7. Conduct the test at normal temperatures (20℃~25℃)

While the human body is stable at normal temperatures, body composition is susceptible to change in hot or cold weather.

8. If a retest is carried out, make sure to conduct the test under consistent conditions

Identical conditions (i.e. wearing the same clothes, testing before eating or exercising etc.) should be maintained in order to assure the accuracy of the test results.

Posture guide for body composition analysis

A Proper posture increases the accuracy of the test results.

Input of personal data and how to hold the handgrips

Please enter your exact height. If not, test results will be inaccurate. The gender and age of the examinee should also be entered. Once you have entered your personal data, please take the proper posture. Put your thumb on the top of the handgrip, while holding the bottom of the handgrip with your other four fingers. Straighten out your elbows and leave some space between your armpits and body.

** If the handgrips are not properly held during the test, an incorrect estimation of the examinee ś body composition may occur. Please assure that proper testing methods are maintained until the test is complete.*

Weight measurement and how to step on the footpads

Please remember to remove your socks or stockings before stepping on the footpad. If at all possible wear light clothing to assure the accuracy of the test. Be sure to remove everything from your pockets and all accessories. When ready, place your feet on the footpads as the shapes of electrodes guide. A reading of your weight will first be conducted. Do not hold on to the handgrips while the body weight is being registered. Moreover, do not make any sudden moves during the weighing process.

** It is important to properly place your feet on the footpads. Please do not move during weighing.*

EXAMPLE

Weight-Loss Follow-up

InBody 720 Body Composition Analysis

I.D.	AGE	HEIGHT	GENDER	DATE / TIME
Daniel . G	29	156cm	F	2004.04.29/09:23:50(65)

SGP Hospital Obesity Clinic
Doctor Lee

Body Composition Analysis

Compartments	Values	Total Body Water	Soft Lean Mass	Fat Free Mass	Weight	Normal Range
I C W (ℓ) Intracellular Water	17.7	28.7				16.1 ~ 19.7
E C W (ℓ) Extracellular Water	11.0		36.8			9.9 ~ 12.1
Protein (kg)	7.7			39.1	76.5	7.0 ~ 8.5
Mineral (kg)	2.76		osseous: 2.29			2.41 ~ 2.94
Body Fat Mass (kg)	37.4					10.2 ~ 16.4

▸ Mineral is estimated.

Muscle - Fat Analysis

	Under	Normal	Over	Normal Range
Weight (kg)			76.5	43.4 ~ 58.8
S M M (kg) Skeletal Muscle Mass			21.1	19.2 ~ 23.5
Body Fat Mass (kg)			37.4	10.2 ~ 16.4

Obesity Diagnosis

	Under	Normal	Over	Normal Range
B M I (kg/m²) Body Mass Index			31.4	18.5 ~ 25.0
P B F (%) Percent Body Fat			48.9	18.0 ~ 28.0
W H R Waist-Hip Ratio			0.90	0.75 ~ 0.85

Lean Balance

Lean ■ Lean /Ideal Lean x100 (%)

	Under	Normal	Over	Segmental Edema ECF / TBF	Segmental Edema ECW / TBW	Edema ECF / TBF	Edema ECW / TBW
Right Arm (kg)		76.2	1.86	0.331	0.378		
Left Arm (kg)		75.6	1.85	0.333	0.379		
Trunk (kg)		63.7	17.2	0.337	0.384		
Right Leg (kg)		64.5	5.96	0.334	0.381		
Left Leg (kg)		64.1	5.91	0.333	0.380		
						0.335	0.382

Visceral Fat Area

VFA(cm²): + 70.8

Nutritional Evaluation

Protein	☑ Normal	☐ Deficient	
Mineral	☑ Normal	☐ Deficient	
Fat	☐ Normal	☐ Deficient	☑ Excessive

Weight Management

Weight	☐ Normal	☐ Under	☑ Over
S M M	☑ Normal	☐ Strong	☐ Under
Fat	☐ Normal	☐ Under	☑ Over

Obesity Diagnosis

B M I	☐ Normal	☐ Under	☐ Over
		☑ Extremely Over	
P B F	☐ Normal	☐ Obese	☑ Extremely Obese
W H R	☐ Normal	☐ Obese	☑ Extremely Obese

Body Balance

Upper	☑ Balanced	☐ Slightly Unbalanced	☐ Extremely Unbalanced
Lower	☑ Balanced	☐ Slightly Unbalanced	☐ Extremely Unbalanced
Upper-Lower	☐ Balanced	☑ Slightly Unbalanced	☐ Extremely Unbalanced

Body Strength

Upper	☐ Normal	☐ Developed	☑ Weak	
Lower	☐ Normal	☐ Developed	☑ Weak	
Muscle	☑ Normal	☐ Muscular	☐ Weak	

Health Diagnosis

Body Water	☑ Normal	☐ Under	
Edema	☑ Normal	☐ Slight Edema	☐ Edema
Life Pattern	☑ Normal	☐ Alert	☐ Risky
		☐ Highly Risky	

Body Composition History

DATE / TIME	Weight	SMM	Fat	Score	ECF/TBF
04/04/29 09:23	76.5	21.1	37.4	54	0.335

Additional Data (Normal Range)

Obesity Degree = 149 %	90 ~ 110
B C M = 25.4 kg	23.1 ~ 28.3
B M C = 2.29 kg	1.98 ~ 2.42
B M R = 1215 kcal	1130 ~ 1299

Anthropometry

NECK = 36.3cm	CHEST = 97.9cm
ABD = 109.9cm	HIP = 122.6cm
ACR = 34.3cm	ACL = 34.0cm
THIGHR = 58.8cm	THIGHL = 58.9cm
AMC = 26.6cm	

Weight Control

Target Weight	51.1	kg
Weight Control	- 25.4	kg
Fat Control	- 25.6	kg
Muscle Control	+ 0.2	kg
Fitness Score	54	Points

Impedance

R	RA	LA	TR	RA	LL
1kHz	412.0	413.0	31.2	277.1	288.7
5kHz	406.1	407.3	30.0	268.6	278.0
50kHz	369.0	373.9	24.7	240.0	249.8
250kHz	334.3	339.4	23.0	215.8	222.1
500kHz	325.0	330.1	22.5	209.0	216.4
1000kHz	248.4	254.0	18.1	194.2	195.0
Xc 5kHz	98.9	34.0	3.0	51.8	49.5
50kHz	56.2	91.9	9.5	11.3	12.8
250kHz	18.7	49.8	5.9	83.1	80.8

Subject 29 year-old female

History Enjoyed meat, fast food.
Treadmill 30min/day.

Treatment Energy intake 1200 kcal/day.
No snack but tomato, fruits.
Treadmill 1hour/day with occasional walking and jogging.

InBody 720 Body Composition Analysis

I.D.	AGE	HEIGHT	GENDER	DATE / TIME
Daniel . G	29	156cm	F	2004.07.28/10:32:25(170)

SGP Hospital Obesity Clinic
Doctor Lee

Body Composition Analysis

Compartments	Values	Total Body Water	Soft Lean Mass	Fat Free Mass	Weight	Normal Range
I C W (ℓ) Intracellular Water	18.0	29.4	37.6	39.9	64.6	16.1 ~ 19.7
E C W (ℓ) Extracellular Water	11.4					9.9 ~ 12.1
Protein (kg)	7.8					7.0 ~ 8.5
Mineral (kg)	2.80	osseous: 2.33				2.41 ~ 2.94
Body Fat Mass (kg)	24.7					10.2 ~ 16.4

▸ Mineral is estimated.

Muscle - Fat Analysis

	Under	Normal	Over	Normal Range
Weight (kg)		64.6		43.4 ~ 58.8
S M M (kg) Skeletal Muscle Mass		21.4		19.2 ~ 23.5
Body Fat Mass (kg)		24.7		10.2 ~ 16.4

Obesity Diagnosis

	Under	Normal	Over	Normal Range
B M I (kg/m²) Body Mass Index		26.5		18.5 ~ 25.0
P B F (%) Percent Body Fat		38.2		18.0 ~ 28.0
W H R Waist-Hip Ratio		0.83		0.75 ~ 0.85

Lean Balance

Lean ■ Lean /Ideal Lean x100 (%)

	Under	Normal	Over	Segmental Edema ECF / TBF	Segmental Edema ECW / TBW	Edema ECF / TBF	Edema ECW / TBW
Right Arm (kg)		1.71 / 82.8		0.334	0.381		
Left Arm (kg)		1.69 / 82.0		0.336	0.383		
Trunk (kg)		17.9 / 78.1		0.342	0.389		
Right Leg (kg)		6.25 / 80.2		0.340	0.387		
Left Leg (kg)		6.19 / 79.3		0.343	0.390		
						0.341	0.388

Visceral Fat Area

VFA(cm²) 250 / 200 / 150 / 100 / 50 / 0 — + 44.3 — 20 / 40 / 60 / 80 / Age

Nutritional Evaluation

Protein	☑ Normal	☐ Deficient	
Mineral	☑ Normal	☐ Deficient	
Fat	☐ Normal	☐ Deficient	☑ Excessive

Weight Management

Weight	☐ Normal	☐ Under	☑ Over
S M M	☑ Normal	☐ Strong	☐ Under
Fat	☐ Normal	☐ Under	☑ Over

Obesity Diagnosis

B M I	☐ Normal	☐ Under	☑ Over / ☐ Extremely Over
P B F	☐ Normal	☐ Obese	☑ Extremely Obese
W H R	☐ Normal	☑ Obese	☐ Extremely Obese

Body Balance

Upper	☑ Balanced	☐ Slightly Unbalanced	☐ Extremely Unbalanced
Lower	☑ Balanced	☐ Slightly Unbalanced	☐ Extremely Unbalanced
Upper-Lower	☑ Balanced	☐ Slightly Unbalanced	☐ Extremely Unbalanced

Body Strength

Upper	☑ Normal	☐ Developed	☐ Weak	
Lower	☐ Normal	☐ Developed	☑ Weak	
Muscle	☑ Normal	☐ Muscular	☐ Weak	

Health Diagnosis

Body Water	☑ Normal	☐ Under	
Edema	☑ Normal	☐ Slight Edema	☐ Edema
Life Pattern	☑ Normal	☐ Alert	☐ Risky / ☐ Highly Risky

Body Composition History

DATE / TIME	Weight	SMM	Fat	Score	ECF/TBF
04/04/29 09:23	76.5	21.1	37.4	54	0.335
04/07/28 10:32	64.6	21.4	24.7	66	0.341

Additional Data

	(Normal Range)
Obesity Degree = 126 %	90 ~ 110
B C M = 25.7 kg	23.1 ~ 28.3
B M C = 2.33 kg	1.98 ~ 2.42
B M R = 1232 kcal	1146 ~ 1319

Anthropometry

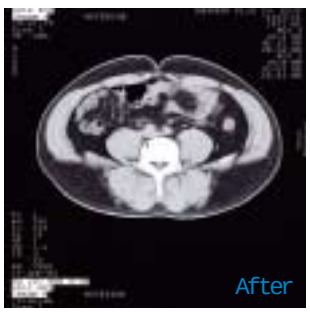
NECK = 33.1cm	CHEST = 89.5cm
ABD = 96.1cm	HIP = 116.0cm
ACR = 30.1cm	ACL = 29.7cm
THIGHR = 55.4cm	THIGHL = 54.9cm
AMC = 24.7cm	

Weight Control

Target Weight	54.8	kg
Weight Control	- 9.8	kg
Fat Control	- 9.8	kg
Muscle Control	0.0	kg
Fitness Score	66	Points

Impedance

R	RA	LA	TR	RA	LL
1kHz	401.0	402.0	29.2	246.1	263.7
5kHz	394.2	394.3	26.8	235.3	246.0
50kHz	362.0	366.9	23.3	213.0	223.8
250kHz	329.3	335.4	21.7	192.8	202.1
500kHz	320.0	326.1	20.1	187.0	197.4
1000kHz	296.4	298.0	18.1	176.2	182.0
Xc 5kHz	98.9	34.0	3.0	51.8	49.5
50kHz	56.2	91.9	9.5	11.3	12.8
250kHz	18.7	49.8	5.9	83.1	80.8



Results Among 11.9kg of total weight loss, 12.7kg was achieved by fat loss.
SMM increases 1.7kg.
%BF and WHR were improved.

RESULT SHEET

I.D., AGE, HEIGHT, GENDER, DATE/TIME

Once the body composition analysis of the examinee is complete, the results are automatically printed.

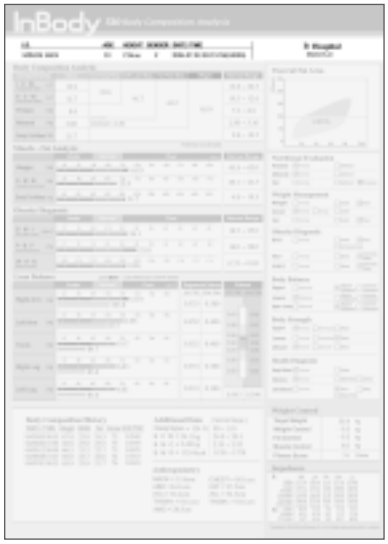
I.D.	AGE	HEIGHT	GENDER	DATE / TIME
SM00085	39	159cm	F	2004.07.01/09:23:50(65000)

B Hospital
Doctor Lee

At the top of the results sheet, appear the I.D., age, height and gender of the examinee and the date and time when the test was conducted. The logo, registration number, and name of the hospital (or user) can also be recorded on the result sheet. **This allows the user to indirectly advertise their company or institution.**

1) Personal data such as gender, age, and height of the examinee should be entered as well.

2) The user's logo can be entered only using a software program provided by an external service provider. Therefore, the equipment provider's assistance will be required should the user desire to install his/her logo.



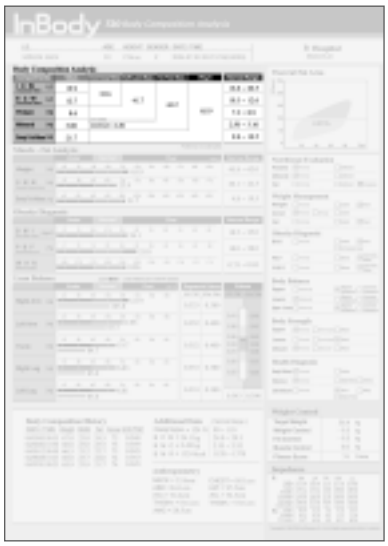
** The entering of the user's logo is usually offered when InBody720 is first purchased. To change the logo after purchased, simply contact our marketing manager or your local Biospace Customer Services.*

Body Composition Analysis

Body Composition Analysis

Compartments	Values	Total Body Water	Soft Lean Mass	Fat Free Mass	Weight	Normal Range
I C W (ℓ) Intracellular Water	19.9	32.6	41.7	44.2	65.9	16.8 ~ 20.5
E C W (ℓ) Extracellular Water	12.7					10.3 ~ 12.6
Protein (kg)	8.6	non-osseous				7.2 ~ 8.9
Mineral (kg)	3.00	osseous: 2.49				2.50 ~ 3.10
Body Fat Mass (kg)	21.7					9.8 ~ 19.5

▸ Mineral is estimated.

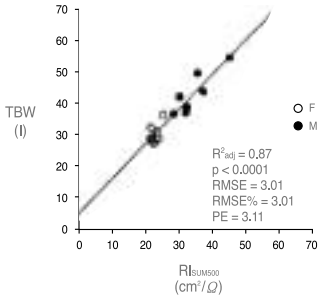


With regards to the analysis of body composition, InBody720 assigns a quantitative value to the various body compositional elements. These values demonstrate the weight of each body compositional element that makes up the examinee's total body weight. The estimated values are then compared with the standard values.

1) 4-compartment model

InBody720 analysis of body composition is based on the 4-Compartment Model. This 4-Compartment Model assumes that body is composed of four different elements: total body water, protein, minerals, and body fat. Total body water is separated into intracellular and extracellular water by cellular membranes.

** **Ref 1.** Vivian H.Heyward, Applied Body Composition Assessment, Human Kinetics, p.9,1996.*



**** Figure 1. Accuracy of Total Body Water analysis***
The above graph displays the results of Total Body Water analysis, comparing results from InBody720 with results from deuterium oxide dilution method. The accuracy of Total Body Water analysis was found to be $R^2adj=0.87$. This confirms that InBody720 is capable of higher accuracy when it comes to the analysis of Total Body Water.

**** Ref 2.*** *G Bedogni, Accuracy of an eight-point tactile electrode impedance method in the assessment of total body water, Eur. J. Clin. Nutr. 56, 1143~1148, 2002.*

2) Intracellular water(ICW), Extracellular water(ECW), Total Body Water(TBW)

InBody720 measures TBW by using a multi-frequency technique that separates TBW into ICW and ECW. Intracellular water (ICW) indicates the quantity of water within cellular membrane. Extracellular water (ECW) indicates the total quantity of water in the interstitial fluid and blood. In the case of a healthy body, the proportion of ICW and ECW should be maintained at about 3:2.

Total Body Water (TBW) = Intracellular Water (ICW) + Extracellular Water (ECW)

FAQ 1

Q1. How do you measure the amount of water in the intestine?
As microamperage current is limited in its ability to penetrate the walls of the intestine it is impossible to measure the amount of water in the intestine using a bioelectrical impedance analysis (BIA). This is why examinees are recommended to conduct the test before eating. For example, if a examinee uses InBody720 after having taken in 1L of water, this water can cause an increase in body weight. Water that has not been accounted for is calculated as fat cells, thus increasing the Fat Mass. This can lead to measurement errors as it over-calculates the quantity of the Fat Mass. Therefore, examinees are recommended to remove their clothes and accessories, to avoid eating prior to the test, and to dispose of urine and excrement; all of which, while not being part of the body 's composition, affect body weight.

Ref 3*. Vivian Heyward, Applied Body Composition Assessment, Human Kinetics, p44-55, 1996*

3) Protein

Protein is a solid organic compound that consists of nitrogen and can be found in body cells. Protein is also the main component, along with body water, of Soft Lean Mass. Protein is directly related to intracellular water. Therefore, a lack of protein indicates a lack of intracellular water, which in turn implies poor cell nutrition.

4) Mineral

Minerals help the body preserve tand play a core role in the human body. InBody720 analyzes two large groups of minerals: osseous minerals and non-osseous minerals. Osseous minerals are the minerals found in the bones while non-osseous minerals are those which are found in all other parts of the body. Osseous minerals account for about 80% of the body's total minerals. The quantity of minerals found in the body is closely related to the muscle mass. As muscle mass increases, the weight of bones also increases.

5) Body Fat Mass

Body Fat Mass refers to the total quantity of Lipids that can be extracted from fat and other cells. Body Fat Mass cannot be directly estimated using the BIA method, but rather is calculated by excluding Fat Free Mass from body weight.

Body Fat Mass = Body Weight - Fat Free Mass(FFM)

Body Fat Mass is stored under the skin, as well as between the abdomen and muscles. When an examinee's body fat mass is outside of the standard range, he/she is diagnosed as being obese.

6) Soft Lean Mass

Soft Lean Mass can be calculated by excluding the mineral found in the bones from Fat Free Mass.

7) Fat Free Mass

Fat Free Mass consists of the weight of the remaining components once Body Fat Mass has been excluded from body weight.

8) Weight

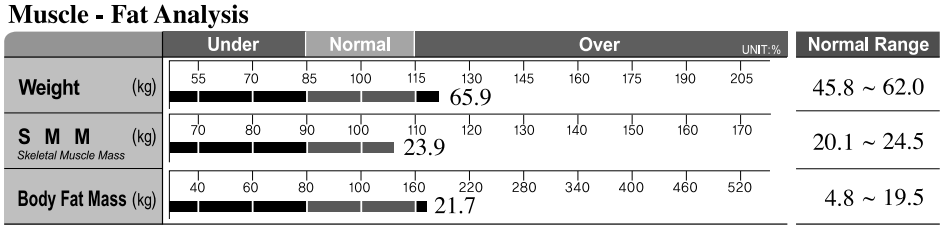
Weight consists of Body Water, Protein, Mineral and Body Fat Mass. Thus, body weight is the sum total of these four body components.

Weight = Total Body Water + Protein Mass + Mineral Mass + Body Fat Mass

Muscle-Fat Analysis

The horizontal bar graphs help you understand your body composition state compared to standard values. The values next to bars show you the values and the end of bars indicate your position in the range. If the length of the bars would be similar, your body composition is well balanced, while if the lengths of the bars fluctuate, it means your body composition is not balanced.

Muscle - Fat Analysis



The Muscle-Fat Analysis consists of an estimation of the value of three elements, weight, skeletal muscle mass, and body fat mass. This analysis is also capable of carrying out relative comparisons of the above-mentioned body components using numbers and bar graphs.

The numbers shown in the bar graphs indicate the measured values for each element while the length of the graph demonstrates the percentage of the standard value for each item. Thus, a score of 100% would indicate a standard value, with the standard weight calculated using the examinee's height. Therefore, the examinee's body composition balance can be ascertained simply by looking at the graphs and seeing if they are longer or shorter than the standard value of 100%.

** BMI Standard Weight Calculation Method*

Standard Weight(kg)
= ideal BMI × Height² (m^2)

1) Weight (kg)

The 100% standard weight refers to the ideal value for an examinee given his/her height. This is also calculated using the BMI standard weight calculation method. For both Asian and Western male adults a value of 22 is applied, while for Asian female adults this value is 21 and Western females 21.5. In the case of children under the age of 18, the standard weight is calculated based on standard BMI for their particular age group.

2) Skeletal Muscle Mass(Kg)

100% standard Skeletal Muscle Mass refers to the ideal quantity of Skeletal Muscle Mass for an examinee's standard weight.

There are three types of muscle- cardiac muscle, visceral muscle and skeletal muscle. However, it is the quantity of skeletal muscle that is the most changed through exercise. As such, InBody720 displays Skeletal Muscle Mass separately from Soft Lean Mass. By comparing the percentage of Body Fat Mass and Skeletal Muscle Mass found in each body component, the level of obesity can be estimated in a more pro-active and exact manner.

3) Body Fat Mass(Kg)

100% standard Body Fat Mass refers to the Body Fat Mass that an examinee should maintain for his/her standard weight. In general, the ideal Body Fat Mass is 15% for males and 23% for females. The bar graph, which exhibits the current Body Fat Mass divided by standard Body Fat Mass in percent form, displays reasonable levels of body fat mass.

Table 1. Standard body composition ranges

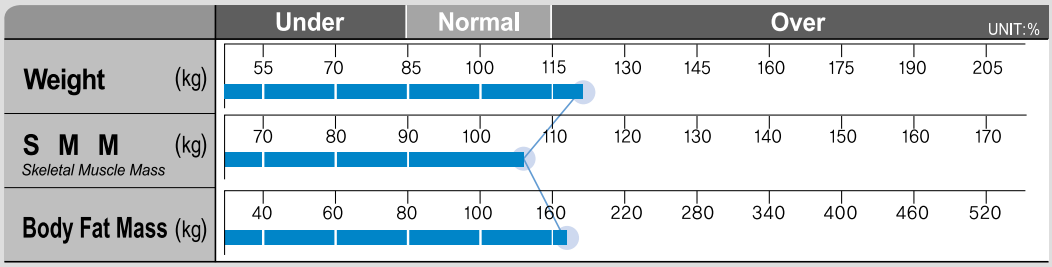
Standard Rage	Males	Females
Weight	85 ~ 115% of standard weight	85 ~ 115% of standard weight
Skeletal Muscle Mass	90 ~ 110% of standard SMM	90 ~ 110% of standard SMM
Body Fat Mass	80 ~ 160% of standard BFM	80 ~ 160% of standard BFM

** Compared with Skeletal Muscle Mass, Body Fat Mass is various among people. Therefore, each bar has different scale.*

HOW TO APPLY THIS RESULT TO YOUR CLIENTS

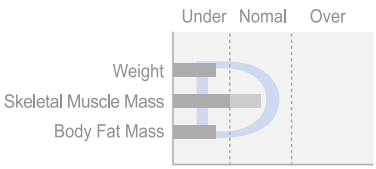
The test results have been designed in a manner that the examinee can easily understand and that facilitates his/her ability to follow the conductor of the test's instructions. The test conductor can use alphabetical shapes that are based on the length of the graphs to provide explanations to the examinees regarding their overall health.

Relations among Weight, Skeletal Muscle Mass and Body Fat Mass



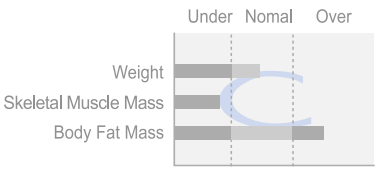
A person is identified as having an ideal body composition when the body composition graphs form a 'D' shape. In such cases, the SMM graph is longer than the weight and Body Fat Mass graphs. On the other hand, if the SMM graph is shorter than the Body Fat Mass graph, the body composition graphs form a 'C' shape. Persons with such results should immediately begin taking weight control measures.

Let us now use the following examples to identify ways of using the test results.



8 different body types, based on a balanced body composition

In the case of this body type, the body composition graphs form a slightly curved 'D'. This is the ideal body composition state. Of course, it goes without saying that this healthy state should be continuously maintained. As such, the person conducting the test should mention to the examinee that the rate of increase of abdomen fat often increases as a person gets older, and emphasize the necessity for continuous monitoring to assure that this healthy state is maintained.

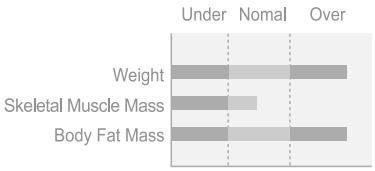


At the opposite end of the health spectrum, we find the following graph shape, a 'C' shape. In this case, the examinee's weight is within the normal range. Although the examinee's body weight may not be classified as obese, he/she is dissatisfied with the shape of his/her body. As they are experiencing difficulties managing the shape of their bodies through simple weight control measures, people who are in this category usually visit an obesity clinic. If a person who is diagnosed as this type, changes his/her body composition through exercise, he/she can maintain a satisfactory body shape without actually losing any weight. The conductor of the test can recommend that the examinee attempt to achieve a 'D' shape on his/her body composition graphs, by losing Body Fat Mass while gaining SMM. Many adults who are found to have a high level of Body Fat Mass are included in this type. Abdominal obesity can become a factor in the development of cardiovascular diseases for those within the standard weight range just as well as it can for those in the overweight range.

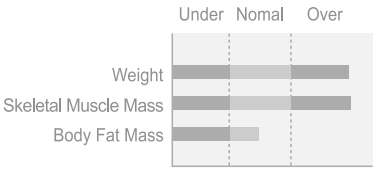
This type is a typical healthy body type in which SMM is well developed. However, people of this type need to be careful not to lose any further Body Fat Mass.

This type is exemplified by a person whose weight is within the standard range, but yet cannot be regarded as being in ideal health. For this type, the length of the SMM graph is shorter than the standard range, while the Body Fat Mass is within the standard range. An examinee of this type will also exhibit a 'C'shape on his/her body composition graphs. However, this type should be identified as a weak body type, and not as an obesity type. People who belong to this type have usually lost intestine and muscular protein; a situation caused by such potential factors as a lack of exercise, lack of proper protein nutrition, or an increased metabolism as a result of injuries or disease. Symptoms of this include edema, the decomposition of muscle cells, changes in nerve tissues, secondary infections, and stunted growth in children.

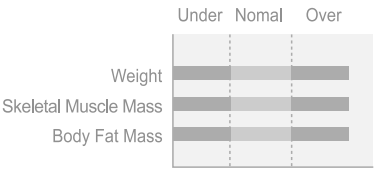
Obesity causes many diseases. People diagnosed as being obese run a higher risk of myocardial Infarction, congestion, cardiac failure, and hypertension. In addition, there exists a correlation between obesity and diabetes(NIDDM). Moreover, obese people also run a higher risk of contracting large intestine cancer, rectal cancer, and in the case of males, prostatic carcinoma. Furthermore, other potential problems have been identified, such as a decrease in tolerance to exercise, osteoarthritis, as well as a decrease in lung function.



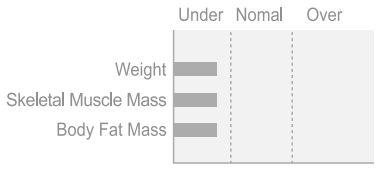
Athletes are usually included in the overweight muscle type. As such, such people can easily be included in the obese category when the BMI method is used. This type is deemed to be overweight because of the weight of their skeletal muscle. This type of person does not need to undertake weight control measures.



Most people who fall under the obesity type caused by an excess of weight are those that have been diagnosed as chronically obese. In such cases, the reason why SMM is measured to be over the standard range is not SMM has been developed through exercise but because a person has excessive body composition mass compared with the standard weight. Those diagnosed as being chronically obese need medical treatment. This type of people should follow a weight reduction program that is designed to decrease their Body Fat Mass, and on treating or preventing diseases that may accompany this condition, rather than focusing on improving the shape of their body.



Those people who are diagnosed as belonging to the underweight weak body type, have a lower possibility of developing adult diseases. However, should this poor nutrition continue for a long period of time, many health problems can arise, such as a decrease in the body's ability to absorb nutrition, poor nutrition caused by a loss of appetite, imbalanced nutrition due to a loss of intestinal protein, metabolic disorders, as well as other side effects.



Obesity Diagnosis

InBody720's obesity diagnosis function makes use of BMI (Body Mass Index) and Percent Body Fat to determine obesity levels. By analyzing the examinee's weight using BMI and Percent Body Fat, InBody720 makes it possible to screen for sarcopenic obesity. People included in this sarcopenic obesity type fall within the standard range when it comes to weight, but are regarded as obese when their percentage of body fat is calculated.

Obesity Diagnosis

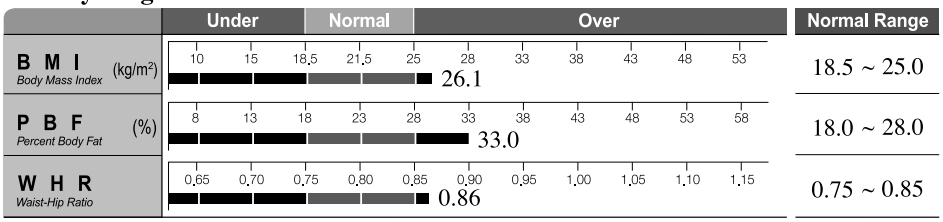


Table 2. Standard ranges of body compositon

Standard Range	Males	Females
BMI	22(standard ragne : 18.5 ~ 24.9)	21.5(standard ragne : 18.5 ~ 24.9)
Percent Body Fat	10 ~ 20% of standard weight	18 ~ 28% of standard weight
Waist-Hip Ratio	0.80 ~ 0.90	0.75 ~ 0.85

1) BMI(Body Mass Index)

As we can see from the formula, BMI= Weight (kg)/height (m^2), BMI is used approximate obesity levels. The BMI method has been widely applied in the general medicine, dietary, and sports medicine fields as the main means of diagnosing obesity. However, this method is flawed in that it cannot be applied to adults with high levels of SMM, children, those over the age of 65, or pregnant females. Nevertheless, as the BMI has been the most commonly used index, many researches on using the BMI method to prevent adult diseases has been conducted. This is why InBody720 also includes BMI based information. Differences have emerged among researchers as to which standards should be used to determine the BMI of examinees of different ages and gender. InBody720 uses the WHO standards as the standard ranges for BMI (1998, Table3)

Table 3. European weight classification based on the BMI method (WHO, 1998)

Classification	BMI(kg/㎡)	Danger of onset of accompanying diseases
Underweight	< 18.5	Low
Normal	18.5 ~ 24.9	Moderate
Overweight	≥ 25	
Dangerous weight level	25 ~ 29.9	Increased
1st level obesity	30 ~ 34.9	Dangerous
2nd level obesity	35 ~ 39.9	Advanced
3rd level obesity	≥ 40	Very advanced

** With regard to the BMI and Percent Body Fat of children, InBody720 applies children standards, not adult standards.*

InBody720 identifies the standard BMI as 22 for males, 21.5 for western females and 21 for asian females, and the standard BMI ranges as 18.5-24.9 for both males and females.

2) Percent Body Fat(%)

Percent Body Fat indicates the percentage of body fat to body weight.

Percent Body Fat (%)= Body Fat Mass(㎏) / Body Weight(㎏) ×100

The standard Percent Body Fat is 15% for males and 23% for females[4,5] while the standard range of Body Fat Mass for males is 10-20% of the standard weight, and 18-28% of the standard weight for females.

In case of children under the age of 18, InBody720 identifies the standard Percent Body Fat of 8-year-old boys as 20%, with this amount going down by 0.5% every year, to reach a standard Percent Body Fat of 15% by the time they become 18.

Percent Body Fat (%)	Age	8	9	10	11	12	13	14	15	16	17	18
	Boy	20.0	19.5	19.0	18.5	18.0	17.5	17.0	16.5	16.0	15.5	15.0
	Girl	23.0										

When a person's Percent Body Fat is calculated as being beyond the standard range, he/she is regarded as being obese. When a person's Percent Body Fat falls below the standard range, he/she is regarded as having a low level of body fat. This low level of body fat can be separated into two types:The first is a person whose muscle type is deemed to account for a desirable proportion of the body composition. Such people's weight is regarded as being within the standard range or falling within the overweight range. The second type, the poor nutrition type, is one in which a person's body is deemed to be in an unhealthy state because of a lack of Body Fat Mass and SMM. This type has a higher possibility of contracting clinical diseases.

* ***Ref 4.*** *Robert D.Lee, David C. Niteman, Nutritional Assessment 2nd, McGraw-Hill, 1998*

* ***Ref 5.*** *George A. Bray, MD. Contemporary Diagnosis and Management of Obesity, Handbooks in Health Care co., 1998*

3) Waist-Hip Ratio

WHR, which is calculated based on the waist/hip circumference ratio, is used as an effective indicator of the Body Fat Mass[6,7]. However, due to the difficulties involved with using a measuring tape to conduct the actual obesity test, such as the complicated nature of measuring a human body, and the existence of different readings depending on who is conducting the test, accurate estimations of the waist/hip ratio have been hard to come by.

InBody720 uses its impedance index to provide a scientific estimation of the examinee's WHR. Given its high degree of reproduction and accuracy, InBody720's estimation of the ratio of abdominal fat can be used as an effective tool with which to treat obesity. Males and Females found to have 0.90 and 0.85 respectively in WHR are considered to suffer from abdominal obesity. An adult found to suffer from abdominal obesity is one who exhibits the excessive visceral fat mass that, by increasing free fatty acid levels in the blood than in subcutaneous fat, causes hypertension, heart disease, diabetes and various other clinical diseases.

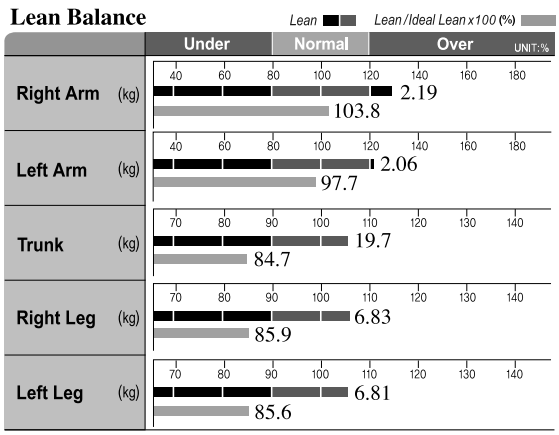
* ***Ref 6.*** *VivianH. Heyword, Ph D, Lisa M. Stolarczyk, Ph D, Applied Body Composition Assessment, p. 21-43, Human Kinetics, 1996*

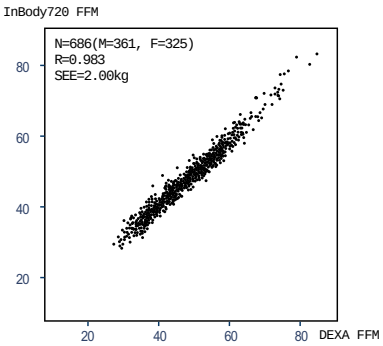
* ***Ref 7.*** *Rosalind S. Gibson, Principles of Nutritional Assessment, Oxford University Press, 1990*

* ***In the case of children,*** *abdominal obesity refers to an subcutaneous fat type with little increase in visceral fat. However, WHR can increase as a result of the onset of morbid obesity, which in turn can lead to the development of clinical diseases among children, and thus should be closely monitored.*

Lean Balance

Through its segmental analyses, InBody720 makes it possible to estimate the Soft Lean Mass in each part of the body.





Thanks to its ability to conduct segmental analyses, InBody720 is capable of providing detailed information about the body parts. Therefore, the analysis of Lean Balance will allow the examinee to see whether his/her muscle development is balanced as well as the strength of his/her muscles. Continuous estimations and monitoring of Lean Balance make it possible for the examinee to see the changes in muscle tone in each part of the body which occurs as a result of exercise. The Lean Balance graph's standard range is 80 ~ 120% for the right and left hands, and 90 ~ 110% for the trunk and the right and left legs.

The Lean Balance graph has two bar graphs for each part of the body. Moreover, these two bar graphs have different meanings respectively.

Of the two bar graphs, the number next to the above bar(■■) represents the absolute value for lean body mass of an examinee in kilograms. In the range, 100% actually determines the length of the graph. It represents ideal soft lean mass in the ideal weight of the examinee to his or her height. This does not take the actual weight of the examinee into account.
The number next to the below bar(■) represents the ratio of actual lean mass of the examinee to ideal lean mass in his or her weight and its unit is percentage. In the range, 100% again determines the length of the graph. However, it represents ideal lean mass in the actual weight of the examinee.

FAQ 2

Why are the standard ranges for arms and legs different?

The standard range for Soft Lean Mass in arm is 80 ~ 120%, while that in the trunk and leg is 90 ~ 110%. The difference in these standard ranges is based on the fact that while the upper body tends to vary greatly from individual to individual, very little variations are found in terms of people's legs. As people use their legs, to walk with, this part of the body tends to be the first to benefit from exercise; as such, the degree of Lean Mass in legs usually ranges somewhere between 90 ~ 110% of the standard. However, one should also take the time to exercise his/her upper body. In this regards, it is difficult to develop Lean Mass of arm when one does not partake in exercises designed to specifically develop muscle in that particular part of the body. This is the main reason why Lean Mass of arm tends to vary greatly from the standard. Therefore, the standard range for Lean Mass of arms is 80 ~ 120%, which is a wider range than that applied to Lean Mass of legs.

Application of Lean Balance

The Lean Balance graph contains two bars for each part of the body. These different length graphs help the examinee to see whether he/she has a balance in that particular body part. Moreover the differences in the length of the top and bottom bars display the strength of the Soft Lean Mass. The Lean Balance graph makes it possible to estimate the balanced development of the body and muscle strength.

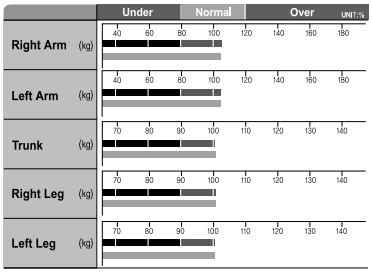
Here are some examples:

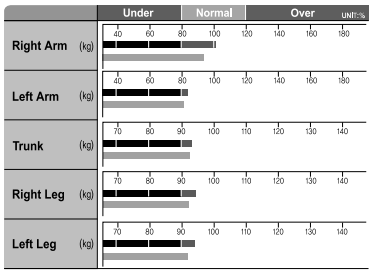
A. By comparing the lengths of the Lean Mass graph for each body part, one can see whether the muscles are properly distributed.

The lengths of the graphs for the arms, trunk and legs allow examinees to assure that their muscles have developed in a balanced manner (this can be ascertained by whether a particular graph is of similar length, or longer or shorter than the others).

Balanced Development of the Upper & Lower Body and of the Left & Right Side of the Body

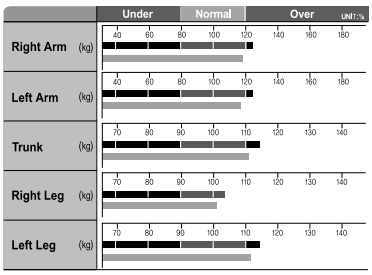
The length of the arm, trunk and leg graphs are similar, thus indicating that the upper and lower parts of the body are well balanced. In addition, the left and right sides of body are also in balance, as exhibited by the fact that the graphs for both arms and legs are of the same length. All the graph bars for the upper and lower body fall within the standard range, indicating a proper muscle balance.





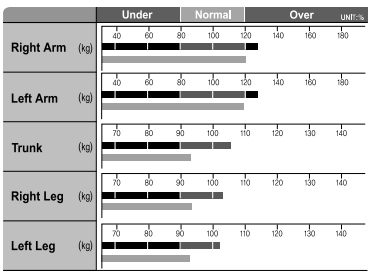
Upper Body Imbalance

The length of the bar graph for the examinee's right arm is different from that of the left one. This indicates that the examinee's arms are not properly developed. This imbalance indicates that the examinee may have a lifestyle in which he/she must use his/her right arm more often than the left one, or that the left arm has not been used for some period of time.



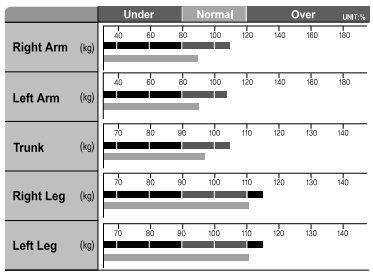
Lower Body Imbalance

The length of the bar graph for the right leg is shorter than that of the left one, which means that the lower body of the examinee is not properly developed. This imbalance indicates that the examinee may have a lifestyle in which he/she must use his/her left leg more often than the right one, or that the right leg has not been used for some period of time.



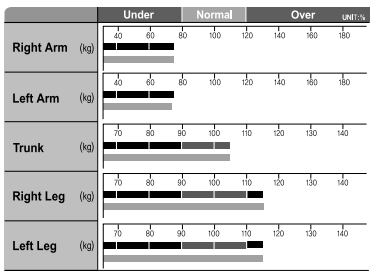
Upper & Lower Body Imbalance ; Strong Upper Body Type

The length of the bar graph for the arms is longer than that of the legs, which falls over the standard range. As the length of the bar graph for the legs falls within the standard range, this indicates that the examinee has an adequate degree of muscle development in the lower body. This case can be referred to as a Strong Upper Body Type, which indicates that the examinee's upper body is more developed than his/her lower body.



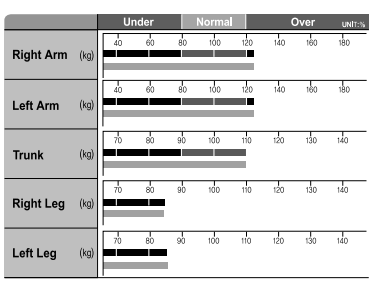
Upper & Lower Body Imbalance ; Strong Lower Body Type

The length of the bar graph for the legs is longer than that of the arms, which falls beyond the standard range. As the length of the bar graph for the arms falls within the standard range, this indicates that the examinee has an adequate degree of muscle development in his/her upper body. This case can be referred to as a Strong Lower Body Type, which indicates that the examinee's lower body is more developed than his/her upper body.



Upper & Lower Body Imbalance ; Weak Upper Body Type

Although the bar graph for the legs is beyond the standard range, the bar graph for the arms falls below the standard level. This case can be referred to as a Weak upper Body Type. This type is often exhibited among persons who seldom exercise.



Upper & Lower Body Imbalance ; Weak Lower Body Type

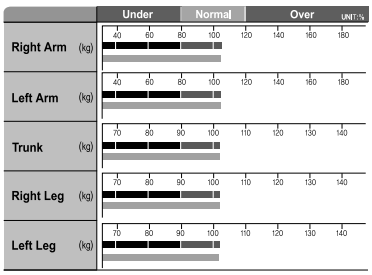
Although the bar graph for the arms is beyond the standard range, the bar graph for the legs falls below the standard level. This case can be referred to as a Weak Lower Body Type. As the lower body must support the body weight, proper muscle development is essential. When the lower body muscles are not sufficiently developed, diseases such as arthritis and osteoporosis become more likely.

B. By comparing the lengths of the top and bottom bar graphs, estimates of muscle strength can be made.

Ideally, the bottom bar graph should be similar in length or longer than the top one. Conversely, situations in which only one of the bar graphs falls within the standard range are not considered to be ideal. Thus, both bar graphs should be included within the standard range.

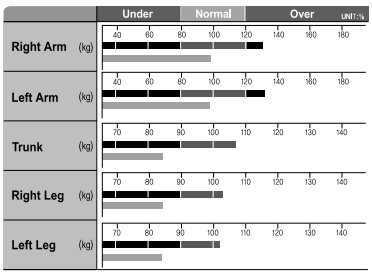
Ideal body strength

The lengths of the top and bottom bar graphs are practically similar. Moreover, they both fall within the standard range. The examinees' muscle mass is ideal, with Lean Mass found to be within the standards for his weight, thus indicating that his muscle strength also falls within the proper range. In addition, muscle strength can also be deemed to be appropriate when both bar graphs fall within the standard range and the bottom bar graph is the same or longer than the top one.



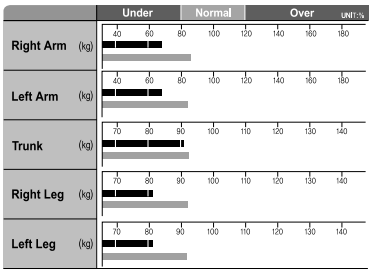
Appears muscular but just overweight

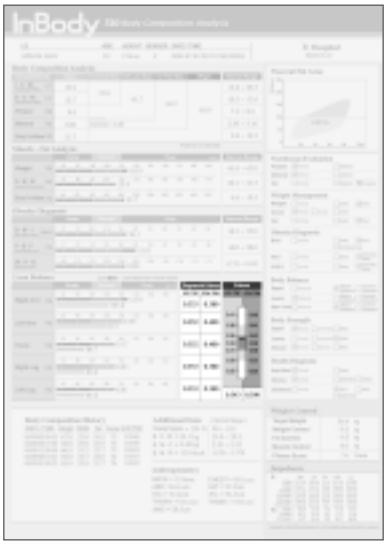
The top bar graph indicates that the upper body is above the standard range while the lower body is within the standard range, thus seemingly displaying an appropriate muscle mass. However, the bottom bar graph demonstrates that the lower body is below the standard range. Although the examinee's muscle mass appears to be appropriate, his/her excess weight has caused it to be overestimated. Moreover, in cases where the bottom bar graph does not fall within the standard range but the top bar graph is above the standard range, the examinee cannot be said to have an appropriate muscle mass.



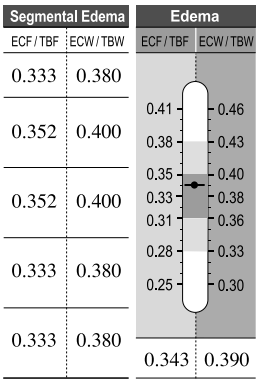
Appears to be very weak as a result of being underweight

As it falls below the standard range, the top bar graph may indicate inappropriate muscle mass. However, the bottom bar graph falls within the standard range. Although the ideal muscle mass appears not to have been achieved, the muscle mass for that examinee's weight may in fact be appropriate. Such cases are the result of the examinee being underweight. This indicates, that the fact that the bottom bar graph falls within the standard range does not automatically mean that the examinee's muscle strength is appropriate. Thus, the top bar graph should be brought within the standard range by increasing the examinee's muscle mass.





Edema



The InBody720 measures Body Water by dividing it into intracellular and extracellular water, and uses the edema index to calculate the Body Water balance. The edema index displays total and segmental edema. A healthy person has a consistent proportion of intracellular and extracellular water. Edema is discovered when extracellular water increases for some reason. The standard range of the edema index(ECW/TBW) is between 0.36 and 0.40. Any score over 0.40 can be considered as an example of edema.

EDEMA = Extracellular Water / Total Body Water

InBody720 s edema index is also used to calculate the proportion of ICF and ECF. Fluid refers to the state in which protein and mineral are mixed in Body Water and with a 2:1 proportion of ICF to ECF, the ideal range of ICF/TBF is between 0.31 and 0.35.

✳ FAQ 3

Under what circumstances can the results of the edema index be higher or lower than the ideal range?

Dialysis or Ascites patients tend to high score on the edema index. However, body composition examination conducted using InBody720 has revealed that lean females, the elderly and morbidly obese patients, although they do not suffer from any specific diseases, also tend to score high on the edema index. When doctors are unable to diagnose a specific disease, the following cases may be possible.

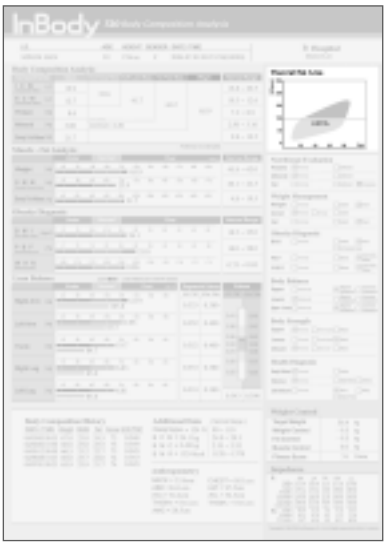
Cases where a high edema index is uncovered using the InBody720

1. Cases where a marked increase in ECW occurs (80%), and cases where ECW and ICW both increase (20%)
2. Elderly, Malnourished Patients : Malnutrition causes muscle cells to contract. As the cells become smaller, the blank spaces between the cells begin to fill with water, which leads to the relative increase in ECW causing the edema index to be higher.
3. Sarcopenic Obesity : People suffering from obesity tend to have relatively higher levels of ECW. Their fat cells contain much less intracellular water that their muscle cells. As such, people suffering from this type of obesity in which there are more fat cells than muscle cells run an increased likelihood of having higher scores on their edema index.

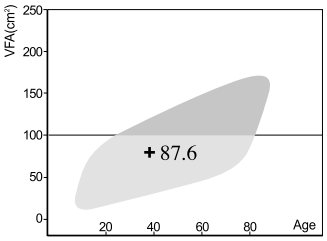
Cases where a low edema index is uncovered using the InBody720.

Unlike those suffering from Sarcopenic Obesity, athletes, who possess many muscle cells, have relatively little extracellular water. Accordingly, their edema index may be lower.

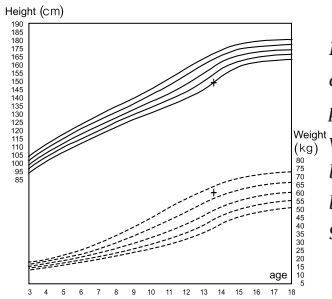
Visceral Fat Area



Visceral Fat Area

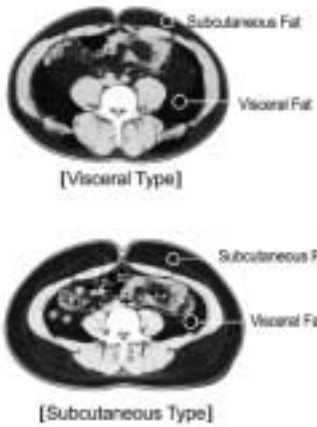


Visceral Fat Area is defined here as the cross-sectional area of visceral fat found in the abdomen. When the area of visceral fat spans more than 100cm^2, this is known as abdominal obesity. Fat, depending on its location, can be divided into visceral, subcutanious and inter-muscle fat. The area of the visceral fat is calculated here. The shadowed part of the graph indicates the cross-sectional area by age group, which reveals that the value of the cross-sectional area of visceral fat is proportionate to age. The area being analyzed is identified with a (+) mark. Usually, children tend to show a smaller cross-sectional area of visceral fat than adults, although the former have a high level of WHR. This is because most children's subcufanious fat is well developed. On the other hand, as people get older they seem to develop a relatively larger cross-sectional area of visceral fat. This may be caused by a physiological function which builds up the fat in the visceral organs as a person gets older.



*Growth Chart

For children under the age of 18, a growth chart is used rather than the visceral fat cross-sectional area graph. This chart shows a child's growth and development patterns for its age, gender, height and weight in the form of a percentile. Children who fall within the 50th percentile are considered to be the standard while those between the 10th and 25th percentiles are deemed to be underdeveloped, and those between the 75th and 90th percentiles as overdeveloped. Any child who falls above the 90th percentile in terms of weight is defined as obese.



FAQ 4

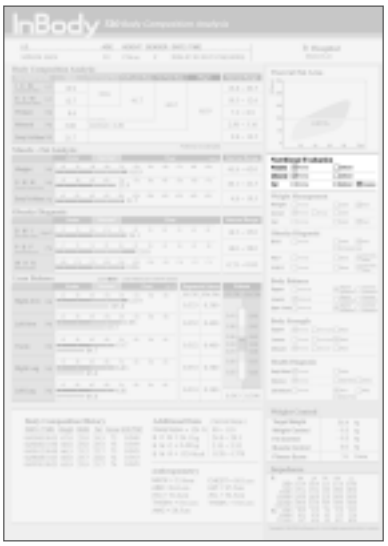
How can the visceral fat area be calculated?

InBody720 calculates the visceral fat area using a regression analysis that involves a comparative analysis with CT. A person's impedance value is measured using InBody720, while the cross-sectional area of his/her visceral fat is estimated using the CT method. The comparison of the above two values results in the formation of the regression equation.

The comparative analysis of the cross-sectional area of the visceral fat area calculated using the CT and InBody720 found a high level of accuracy, as reflected in the equation r=0.922(n=332, SEE=17.3cm^2).

Various Comprehensive Evaluation

This function makes it possible to easily evaluate the results of the body composition examination. Positive evaluations are written on the left side of the readout in blue, while negative ones are written in red on the right. Therefore, an examinee with many ☑ marks in blue is considered to be healthy, while one with many ☑ marks in red may face potential hazards to his/her health.



1) Nutritional Evaluation

Nutritional Evaluation

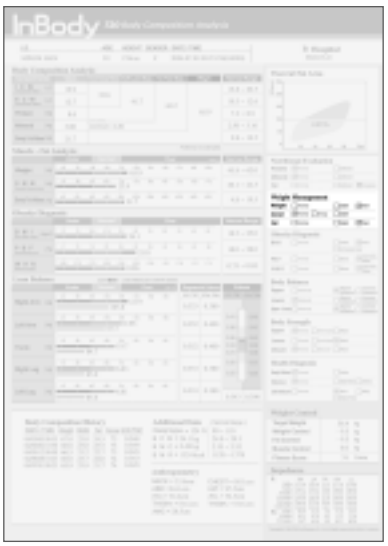
Protein	☑ Normal	☐ Deficient	
Mineral	☑ Normal	☐ Deficient	
Fat	☐ Normal	☐ Deficient	☑ Excessive

The body's nutritional state is evaluated based on the protein, fat and mineral components. Although protein, minerals and fat represent nutritional elements which a person acquires from food, these are considered to be part of the body's composition during the Body Composition Analysis.

Protein | An examinee found to have less than 90% of the desired protein level is considered to suffer from protein deficiency, a common occurrence among underweight people. Such a score is also indicative of a lack of muscle mass or poor nutrition.

Mineral | Minerals are estimated based on their ratio to weight. When minerals account for less than 3.5% of the person's weight based on his body composition, age and gender, he/she is deemed to suffer from mineral deficiency. A lack of minerals increases the risk of arthritis, bone fractures or osteoporosis.

Fat | The amount of body fat is identified as deficient, normal, or excessive after having been compared with muscle mass. In general, in excess of 160% body fat is considered to be excessive, while 80% or less is considered to be deficient, and anywhere between these two numbers is considered to be normal.



2) Weight Management

Weight Management

Weight	☐ Normal		☐ Under	☑ Over
SMM	☑ Normal	☐ Strong	☐ Under	
Fat	☐ Normal		☐ Under	☑ Over

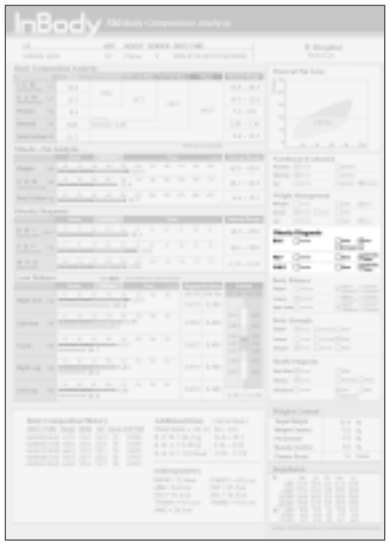
A weight management program is used to evaluate the person's weight, skeletal muscle and body fat mass.

Weight | Anywhere between 85 to 115% of the standard value is regarded as being appropriate, while 85% of the standard value or less is regarded as underweight and 115% or more as overweight.

SMM | Anywhere between 90 to 110% of the standard value is regarded as being appropriate, 90% or less as a low muscle mass type, and 100% or more as a high muscle mass type.

Fat | Anywhere between 80 to 160% of the standard value is regarded as being appropriate, 80% or less as insufficient, and 160% or more as excessive.

3) Obesity Diagnosis



Obesity Diagnosis

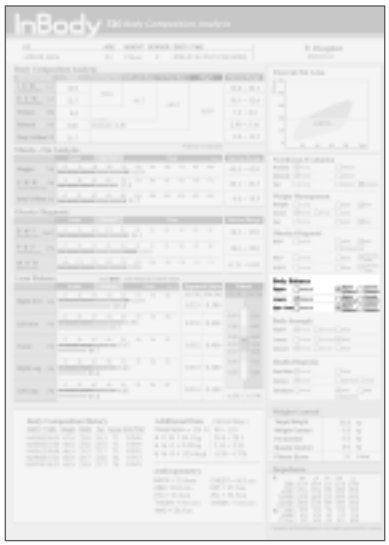
BMI	☐ Normal	☐ Under	☑ Over
		☐ Extremely Over	
PBF	☐ Normal	☐ Obese	☑ Extremely Obese
WHR	☐ Normal	☐ Obese	☑ Extremely Obese

BMI A BMI of 18.5 to 24.9 is considered to be normal, while persons with BMI of 18.5 or less are considered to be underweight, 25 ~ 30 overweight, and 30 or more excessively overweight.

PBF In case of males, persons with a body fat rate of 10 ~ 20% are considered to be normal, 20 ~ 25% of body fat are considered as obese, and those with 30% or more as extremely obese. In the case of females, persons with a body fat rate of 18 ~ 28% are considered to be normal, while those with 28 ~ 33% of body fat are considered as obese, and those with 33% or more as extremely obese.

WHR Males with a WHR of less than 0.90 are considered to be normal, while those with WHR of 0.90 ~ 0.95 are considered to be obese, and those with 0.95 or more are seen as extremely obese. Females with a WHR of 0.85 or less are considered to be normal, while those with WHR of 0.85 ~ 0.95 are considered to be obese, and those with WHR of 0.95 or higher as seen as extremely obese.

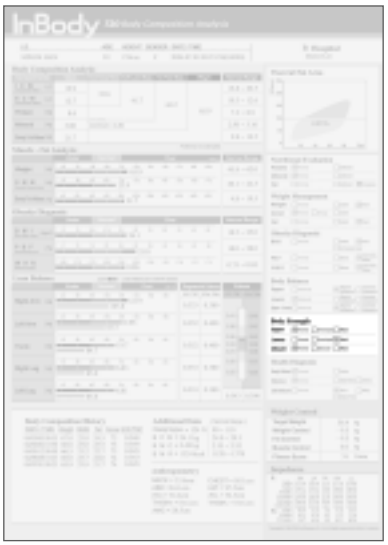
4) Body Balance



Body Balance

Upper	☐ Balanced	☑ Slightly Unbalanced	☐ Extremely Unbalanced
Lower	☑ Balanced	☐ Slightly Unbalanced	☐ Extremely Unbalanced
Upper-Lower	☐ Balanced	☑ Slightly Unbalanced	☐ Extremely Unbalanced

The Body Balance function verifies that the muscles in each part of the body are developed in a balanced manner, examining differences between the muscles in both arms to evaluate the upper body balance, and in both legs to evaluate the lower body balance.

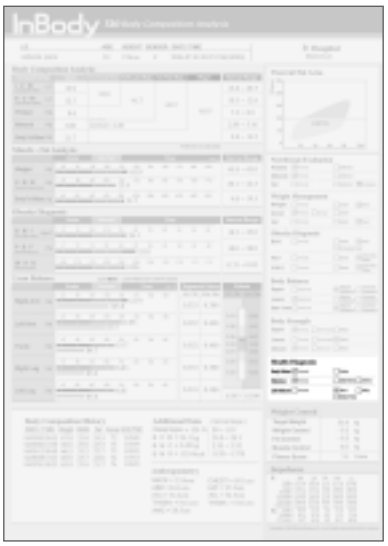


5) Body Strength

Body Strength

Upper	☑ Normal	☐ Developed	☐ Weak
Lower	☐ Normal	☐ Developed	☑ Weak
Muscle	☑ Normal	☐ Muscular	☐ Weak

The Body Strength function verifies that the examinee's muscle mass is developed enough to support his/her weight. Those whose bottom Lean Balance bar graph falls within the standard range are considered to be "**Normal"**. However, those whose bottom bar graph falls below the standard rage are recorded as **"Weak"**, while those above the standard are considered to be **"Developed"**.



6) Health Diagnosis

Health Diagnosis

Body Water	☑ Normal	☐ Under		
Edema	☑ Normal	☐ Slight Edema	☐ Edema	
Life Pattern	☐ Normal	☑ Alert	☐ Risky	☐ Highly Risky

Body Water | Those who are found to possess 90% of more of the Body Water needed for their ideal weight, which is based on their height, are considered to be Normal, while those with less than this are considered to suffer from a Body Water deficiency.

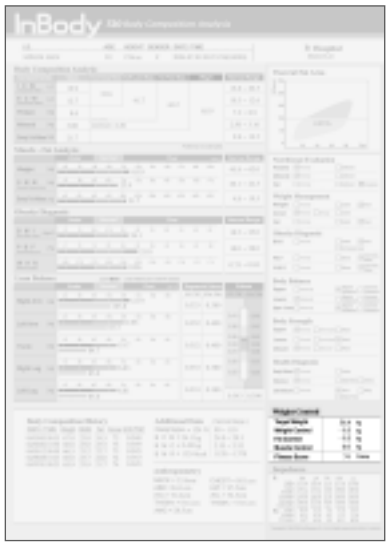
Edema | An edema(ECW/TBW) graph falling between 0.36 and 0.40 is evaluated as being Normal, while 0.40 ~ 0.43 is classified as Slight Edema, and 0.43 or more as Edema.

Life Style | This function does much more than simply verify Body Fat Mass. The reason that this section is named 'Life Style' is because visceral fat and lower body muscle mass are closely related to aspects of people's lifestyles such as their diet, their exercise regimen, and whether they drink or smoke. This function helps the examinees improve or change their lifestyle in accordance with the results of their evaluation.

This evaluation is based on the results of the analyses of the visceral fat area and lower body muscle mass, as well as the edema index. In other words, this evaluation is based on a comparison of the visceral fat and the development of the lower body muscle mass.

Weight Control

Weight Control		
Target Weight	56.4	kg
Weight Control	- 9.5	kg
Fat Control	- 9.5	kg
Muscle Control	0.0	kg
Fitness Score	74	Points



This weight control function is offered as a means of optimizing the examinee's body composition rather than simply increasing or decreasing his/her weight. The target weight set by the InBody720 is different from the standard weight calculated according to one's height.

'+' refers to the amount of mass that must be increased, while '-' refers to the mass which should be decreased. These unique indexes offered by InBody720, show how for example an examinee "should lose 00kg body fat mass and gain 00kg of muscle mass through exercise." **The reality is that two people of the same height and weight who have different body compositions will have different target weight.**

For example, although two people may be of the same height and weight, the person with a larger muscle mass will have a higher target weight than someone who has more Body Fat Mass. This is because a person with a larger muscle mass does not have to lose any muscle, even when it is beyond the 100% level.

Some people who undergo treatment for their obesity simply give up halfway when they see that they have not lost any weight. This is because muscle increases in inverse proportion to the fat that is decreased during the treatment of obesity, thus making it difficult to see any change in weight.

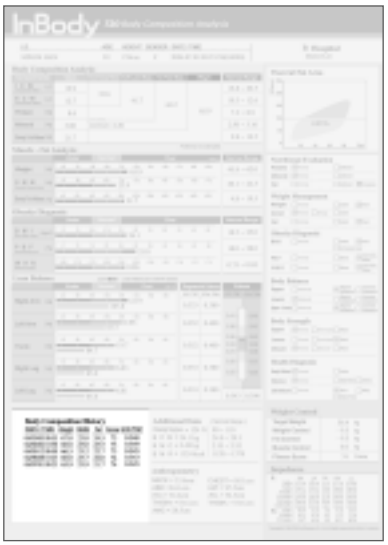
The InBody720 allows examinees to clearly see how their treatment brings about changes in their fat and muscle mass and helps them to monitor their obesity diagnosis and treatment process, which serves to increase the patient's faith in the treatment.

✳ Fitness Score

The Fitness Score is an index used to help the examinee easily understand the state of his/her body composition.

70 or less	Weak Type, Obese Type
70 ~ 90	Normal, Healthy Type
90 or more	Strong Type

As an examinee's body composition begins to improve, he/she can see his/her score improving as their body fat mass get closer to the standard range, and their muscle mass increases.

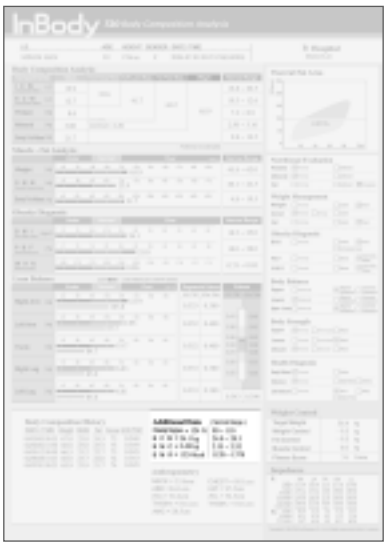


Body Composition History

Body Composition History

DATE / TIME	Weight	SMM	Fat	Score	ECF/TBF
04/03/05 09:55	67.0	23.0	24.5	73	0.348
04/04/02 10:30	66.8	23.0	23.5	73	0.349
04/05/12 09:50	66.5	23.2	22.7	73	0.345
04/06/08 10:23	66.0	23.7	22.0	74	0.343
04/07/01 09:23	65.9	23.9	21.7	74	0.345

The dates on which the Weight, SMM, Fat, Score, and ECF/TBF was measured can be seen. By inputting their I.D., the examinee can see printouts of the 10 most recent data measurements.



Additional Data

Additional Data	(Normal Range)
Obesity Degree = 124 %	90 ~ 110
B C M = 24.1 kg	24.0 ~ 29.3
B M C = 2.49 kg	2.35 ~ 2.52
B M R = 1324 kcal	1128 ~ 1378

1) Obesity Degree

Obesity Degree is the ratio of the current weight to the standard weight, and also serves as an index with which to evaluate the examinee's obesity level in accordance with their height and weight. The standard weight is calculated using the BMI method.

$$\textit{Obesity Degree (\%)} = (\textit{Current Weight} \;/\; \textit{Standard Weight}) \times 100$$

Obesity Degree is an index used to evaluate an examinee's obesity based solely on their overall weight, and as such does not take into consideration the individual's body composition. Therefore, it is not of much help in evaluating the real state of an examinee's obesity, and only allows one to know if he/she is overweight. 90 ~ 110% is considered to be the standard, while 110 ~ 120% is considered to be overweight and 120% or more obese.

2) BCM (Body Cell Mass)

Body Cell Mass is the sum of the cells containing intracellular water and protein found in the organs, and serves as one standard with which to evaluate the state of an examinee's nutrition. The main role of this index is to evaluate the state of the nutrition of an unhealthy patient. A normal person's nutrition state can be evaluated using the BMI, or Free Fat Mass. However, a patient's extracellular water abnormally increases due to ascites or edema have emerged. In such cases, Free Fat Mass cannot be accurately estimated because of the increased water. Therefore, Body Cell Mass is a more reliable way of evaluating nutrition levels than Fat Free Mass.

3) BMC(Bone Mineral Content)

This index is used to measure minerals in bones. BMC is calculated using DEXA (Dual Energy X-ray Absorptiometry), which is an equipment used to diagnose Bone Mineral Density.

4) BMR(Basal Metabolic Rate)

Basal Metabolic Rate (BMR) indicates the minimun energy required to sustain vital functions while at rest. InBody720 makes it possible to estimate BMR using a known regression equation based on FFM. FFM is known to be closely related to BMR.

BMR is usually calculated using indirect Calorimetry, which in turn, employs oxygen demand. However, InBody720 calculates BMR based on Fat Free Mass as follows:

$$REE = 21.6 \times FFM(kg) + 370 \quad (FFM=Fat\ Free\ Mass,\ kg)$$ [8, 9]

For example, if the examinee gained FFM during the weight control program, BMR would also increase. This is a desirable result in any weight management program, as it indicates that Fat Mass stored in the body has been decreased as a result of the increase of BMR.

*Ref 8. John J Cunningham. Body composition as a determinant of energy expenditure : a synthetic review and proposed general prediction equation. Am J Clin Nutr. Vol. 54, 963-969, 1991.

*Ref 9. Eric Ravussin and Clifton Bogardus. Relationship of genetics, age, and physical fitness to daily energy expenditure and fuel utilization. Am J Clin Nutr. Vol.49, 968-975, 1989

✳ FAQ 5

When can I use BMR?

1. Obesity Treatment

Despite having similar weight conditions, examinees found to have more FFM also have higher BMR. Therefore, the weight management programs for obese individuals should be focused on maintaining FFM, and promoting BMR while decreasing only Body Fat Mass. In addition, when a examinee undergoes a weight management program, if the amount of exercise is increased while the food intake level remains the same, that is, under a person's standard BMR range, the Body Fat Mass stored in the body is used as an energy source, thus, eventually resulting in weight loss.

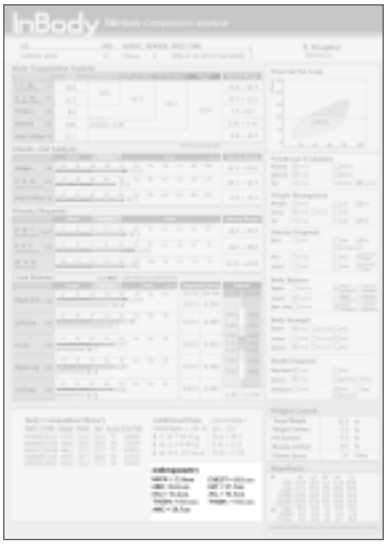
2. Daily Reference Value

When individuals prepare the menu for their diets, the necessary daily amount of energy should be calculated. In this regard, our InBody720's BMR function can be very useful.

$$Daily\ Reference\ Value = BMR \times Activity\ factor$$

Activity Factors Used Account for the Thermic Effect of Exercise

Confined to bed	1.2
Ambulatory, low activity	1.3
Average activity	1.5 ~ 1.75
Highly activity	2.0



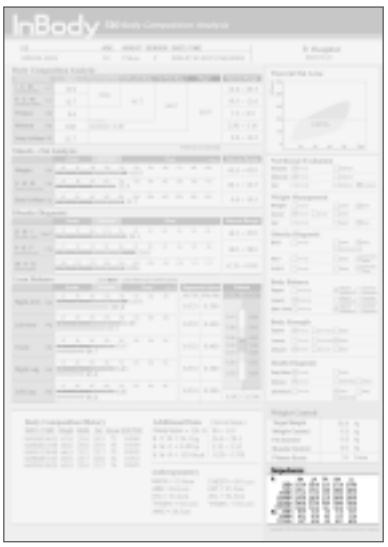
Anthropometry

Anthropometry	
NECK = 33.6cm	CHEST = 95.1cm
ABD = 84.1cm	HIP = 97.5cm
ACR = 34.4cm	ACL = 34.3cm
THIGHR = 54.1cm	THIGHL = 54.1cm
AMC = 28.5cm	

This is used to constantly monitor the changes in the girth found in each part of the body.

NECK	Circumference in neck, ascertained by measuring the part just below the larynx.
CHEST	Circumference in chest, ascertained by measuring the width of the chest.
ABD	Circumference in waist, ascertained by measuring the navel line.
HIP	Circumference in the most protruding part of the hip.
ACR	Circumference in the right upper arm, ascertained by measuring from the acromion to the 1/2 point of the elbow.
ACL	Circumference in the left upper arm.
THIGHR	Circumference in the right thigh, ascertained by measuring from the parallel line of the navel to the 2/3 point of the knee bone.
THIGHL	Circumference in the left thigh.
AMC	Circumference in the left upper arm muscles.

Impedance



R		RA	LA	TR	RA	LL
	1kHz	373.0	370.0	31.2	277.0	278.0
	5kHz	362.1	359.3	29.6	266.0	266.0
	50kHz	314.0	313.0	25.6	229.0	230.0
	250kHz	279.0	283.0	21.6	204.0	204.0
	500kHz	269.0	275.0	20.6	198.0	199.0
	1000kHz	248.0	254.0	18.1	194.0	195.0
Xc	5kHz	98.9	34.0	3.0	51.8	49.5
	50kHz	56.2	91.9	9.5	11.3	12.8
	250kHz	18.7	49.8	5.9	83.1	80.8

Impedance is the vector sum of resistance and reactance, in other words the body's resistance. InBody720 offers segmental impedance indexes within the ranges of 1, 5, 50, 250, 500, and 1000kHz. In addition, it also offers reactance indexes.