InBody720

Results Interpretation & Application

***B**IOSPACE*

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.

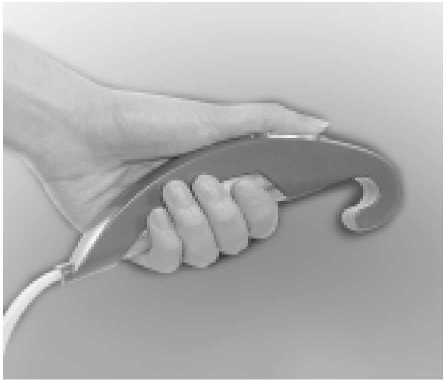
***Weight measurement and how to step on the footpads**

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.*

***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’s body composition may occur. Please assure that proper testing methods are maintained until the test is complete.*

1. 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	
SM2006	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.

2. Body Composition Analysis

Body Composition Analysis

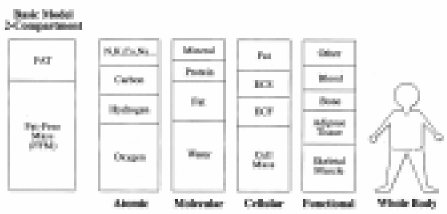
Compartments	Values	Total Body Water	Soft Lean Mass	Fat Free Mass	Weight	Normal Range
ICW (ℓ) *Intracellular Water*	19.9	32.6	41.7	44.2	65.9	16.8 ~ 20.5
ECW (ℓ) *Extracellular Water*	12.7					10.3 ~ 12.6
Protein (kg)	8.6					7.2 ~ 8.9
Mineral (kg)	3.00	osseous: 2.49				2.50 ~ 3.10
Body Fat Mass (kg)	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[1]. 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.*

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)

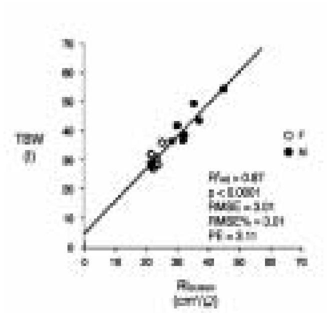


Figure 1. Accuracy of Total Body Water analysis

The right 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.*

FAQ1

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 the 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 H. 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 and 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.

Mineral mass is closely related to soft lean mass. Thus, if you have more lean mass, the weight of bones will increase, which in turn raises the mineral mass accordingly.

According to BIA principle, the mineral mass cannot be calculated in a direct way. It can be obtained from DEXA, a bone density scanner. Therefore, the mineral mass presented by the InBody720 is an estimated value. However, a comparative experiment with DEXA shows a very high correlation so that it can be utilized as a primary screening data.

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 (FFM) 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

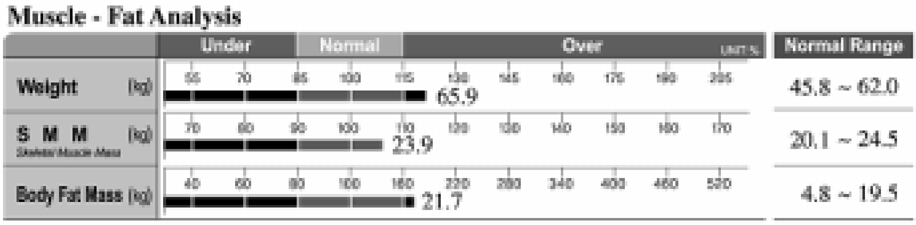
Fat Free Mass consists of the weight of the remaining components once Body Fat Mass has been excluded from body weight.

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

3. 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%.

As a normal range is shown on the right side of the bar graph, you can compare it with your estimated value. If the lengths of bar graphs are alike, it means that your body composition is in balance.

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.

*** BMI Ideal Weight Calculation Method**

Ideal Weight(kg) = Ideal BMI × Height^2 (m^2)

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

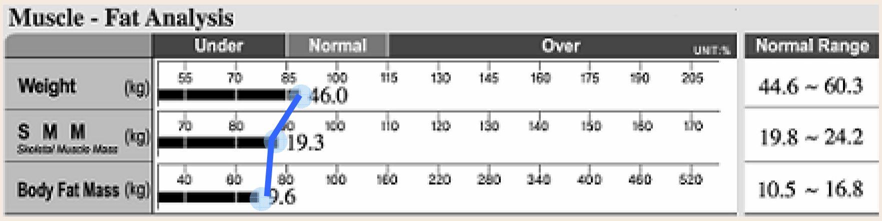
Standard Rage	Males	Females
Weight	85 ~ 115% of ideal weight	85 ~ 115% of ideal weight
Skeletal Muscle Mass	90 ~ 110% of ideal SMM	90 ~ 110% of ideal SMM
Body Fat Mass	80 ~ 160% of ideal BFM	80 ~ 160% of ideal BFM

** Unlike skeletal muscle mass, body fat percentage depends greatly on individual difference. Thus, it has a wider normal range than that of skeletal muscle mass.*

TIP1. 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

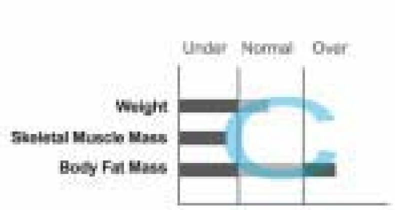


A person is identified as having an ideal body composition when the body composition graphs form a 'D' shape. In such cases, the SMM graph is longer than the weight and Body Fat Mass graph. On the other hand, if the SMM graph is shorter than the Body Fat Mass graph, the body composition graphs form a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

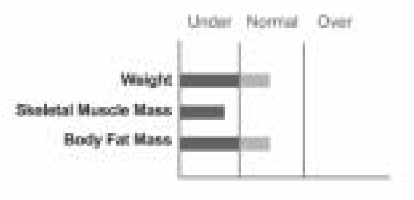
8 different body types, based on a balanced body composition

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.

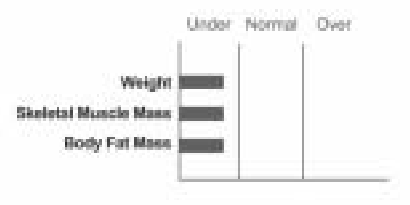
At the opposite end of the health spectrum, we find the following graph shape, a ‘C’ shape. In this case, the examinee’s weight is within the normal range. Although the examinee’s body weight may not be classified as obese, he/she is dissatisfied with the shape of his/her body. As they are experiencing 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 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.

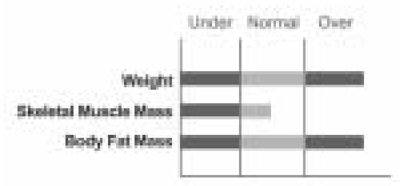


Those people who are diagnosed as belonging to the underweight weak body type, have a lower possibility of developing adult diseases. However, should this poor nutrition continue for a long period of time, many health problems can arise, such as a decrease in the body’s ability to absorb nutrition, poor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

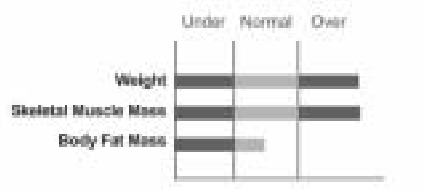


While the weight is below the normal range, it is of a robust build with well-developed skeletal muscle mass. However, body fat not only has an energy-storing function in our body but also assists the absorption of fat soluble vitamins, and maintains healthy skin and hair. In addition, it is an essential building block for cell membranes. Thus, it is necessary to be careful not to lose an excessive amount of body fat.

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.

4. Obesity Diagnosis

InBody720's obesity diagnosis function makes use of BMI(Body Mass Index) and PBF(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.

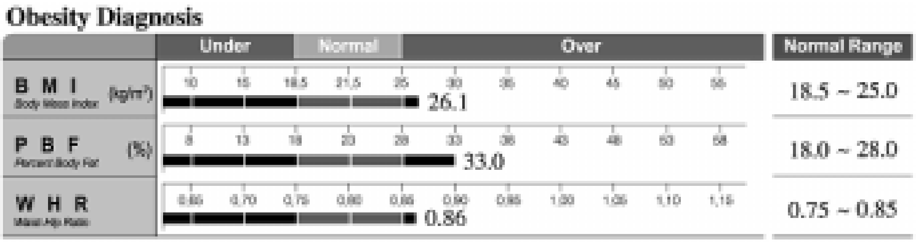


Table 2. Standard ranges of body composition

	Males	**Females**
BMI	Standard range for adults in Asia ：18.5~22.9 Standard range for adults in Europe：18.5~24.9	Standard range for adults in Asia：18.5~22.9 Standard range for adults in Europe：18.5~24.9
Percent Body Fat	10~20%	18~28%
Waist-Hip Ratio	0.80 ~ 0.90	0.75 ~ 0.85

1) BMI(Body Mass Index, kg/㎡)

As we can see from the formula, BMI= Weight (kg)/Height^2 (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.*

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 Percent Body Fat for males is 10-20%, and 18-28% for females.

* ***Ref 4****. Robert D. Lee, David C. Nieman, Nutritional Assessment 2nd, McGraw-Hill, 1998*
* ***Ref 5****. George A. Bray, MD. Contemporary Diagnosis and Management of Obesity, Handbooks in Health Care co., 1998*

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(Skeletal Muscle Mass). This type has a higher possibility of contracting clinical diseases.

**In case of children less than 18 years old, different standards are applied as it is necessary to consider the difference in physical characteristics from adults.*

3) Waist-Hip Ratio

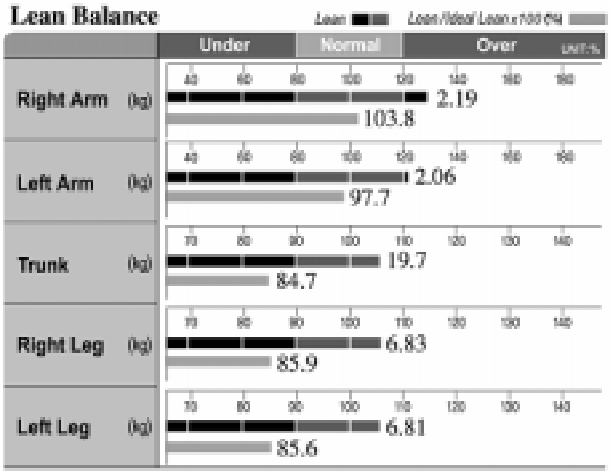
Waist-Hip ratio (WHR)[6,7] is determined by dividing the waist circumference from the navel line by the hip's maximum circumference. It is a useful indicator for comprehending the distribution of body fat. However, it causes the inconvenience of measuring the body and inaccuracy marked by the discrepancy in measurements taken by different measurers. Therefore, in reality, it is hard to measure it with measuring tapes for obesity treatment.

* ***Ref 6****. Vivian H. 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.*

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 0.95 and 0.90 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.

** 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.*

5. Lean Balance



With the InBody720, you can measure the soft lean mass of your body parts. It is achieved through the use of one of the InBody720's measuring principles, bio-electrical impedance measurements of body parts. The measurement of soft lean mass for body parts is based on the following theory.

Segmental Soft Lean Mass $\propto$ ***(Height)^2/(Segmental Resistance)***

Ref 8. Henry C Lukaski, Phyllis E Johnson, William W Bolonchuk, and Glenn I Lykken, Assessment of fat-free mass using bioelectrical impedance measurements of the human body, The American J. of Clinical Nutrition, Vol. 41, pp810-817, 1985

There are two bar graphs for each body part in the Lean Balance graph. The two graphs have different meanings, respectively.

The numbers beside the upper bar graph indicates the actual soft lean mass of a subject. If the upper bar graph reaches 100%, it means that the subject has ideal soft lean mass for his or her ideal weight, which is derived from the subject's height. Therefore, the length of the upper bar graph shows the relative ratio of the ideal soft lean mass for his or her ideal weight.

If the lower bar graph reaches 100%, it denotes the ideal soft lean mass for the subject in relation to his or her actual weight. Therefore, the length of the lower bar graph indicates the relative ratio of the ideal soft lean mass for the actual weight, while the number beside the lower bar graph shows that ratio.

By displaying these two bar graphs, it makes it more effective to diagnose the actual soft lean mass of the subject. The upper bar graph is based on the soft lean mass of the subject's ideal weight, so that the 100% value will not vary unless there is a change in his or her height. Thus, it is easier to see the increase or decrease of the soft lean mass while providing an enduring goal. Since the lower bar graph is only based on the soft lean mass of the actual weight, the 100% value will alter in accordance with the weight change. Hence, though it is not possible to check the increase or decrease of the soft lean mass as with the upper graph, it will directly reflect changes in the subject's weight, thereby allowing you to determine whether or not there is actual soft lean mass appropriate to his or her weight. In addition, you can also see if the subject has appropriate ratio between muscles and body fat in his or her body parts.

Throughout the lean balance muscle graph for body parts, you can see if upper • lower • left • right muscle developments are balanced and if body parts' soft lean mass is appropriate(muscle strength). The normal range of the graph is: for right and left arms, 80~120%; for trunk, right and left legs, 90~110%.

FAQ2

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.

FAQ3

How precise is the soft lean mass for the body parts?

The precision data of the soft lean mass for the body parts can be obtained from DEXA (Dual Energy X-ray Absorptiometry) and the InBody precision test. The following is the result of a comparative study that shows that the R^2 is above 0.86. This indicates that the precision of body part measurement is high.

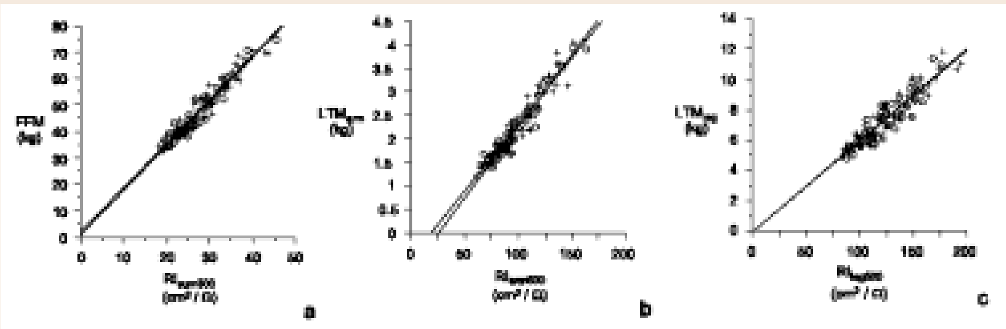


Table 4. Prediction of fat-free mass and appendicular lean tissue mass from eight-polar BIA.

Y	X	a_0	a_1	R^2_{adj}	RMSE kg (%)	Y by DXA (kg)	Y by BIA (kg)	D Y (BIA − DXA) (kg)
FFM	RI_{sum500}	2.4	1.6	0.92	2.80 (6)	48.0 ± 10.1	48.0 ± 9.7	0.0 ± 2.8
LTM_{arm}	RI_{arm500}	−0.6	0.03	0.93	0.18 (8)	2.3 ± 0.7	2.3 ± 0.7	0.0 ± 0.2
LTM_{leg}	RI_{leg500}	−0.06	0.06	0.86	0.63 (8)	7.5 ± 1.7	7.5 ± 1.6	0.0 ± 0.6

Abbreviations: a_0, intercept; a_1, slope; R^2_{adj}, adjusted coefficient of determination; RMSE, root mean square error; BIA, bioelectrical impedance analysis; DXA, dual-energy X-ray absorptiometry; FFM, fat-free mass; LTM, lean tissue mass; RI_x, resistance index at x kHz; sum, sum of segmental resistances (arms, trunk and legs).

* ***Ref 9***. *G. Bedogni et al, Cross-calibration of eight-polar bioelectrical impedance analysis versus dual-energy X-ray absorptiometry for the assessment of total and appendicular body composition in healthy subjects aged 21-82 years, Annals of human biology, Vol. 30, No. 4, pp. 380-391, 2003*

TIP2. Comprehending two muscle bar graphs in the lean balance

1. Find out more about the lean balance and body strength.
   A. Compare the length of the soft lean mass graph for body parts to see if muscle distribution is balanced.
   B. Evaluate the appropriateness of soft lean mass (muscle strength) by the length of the below bar.
2. Find out the relationships among weight, upper and lower bar graphs in the Lean Balance.
   A. If the actual weight is close to the ideal one
   B. If the actual weight is higher than the ideal one.
   C. If the actual weight is lower than the ideal one
3. Observe the trend of Lean Balance graph.

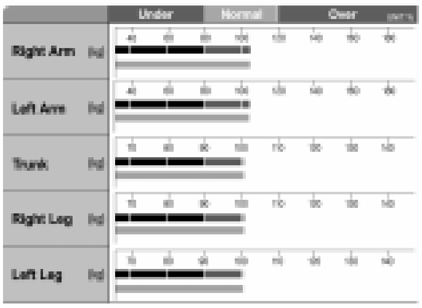
1. Find out more about the lean balance and body strength.

By comparing the lengths of the body part graphs, see if each body part has proportionally developed. The lean balance of the comprehensive evaluation will be based on the lower bar graph.

A. Compare the length of the soft lean mass graph for body parts to see if muscle distribution is balanced.

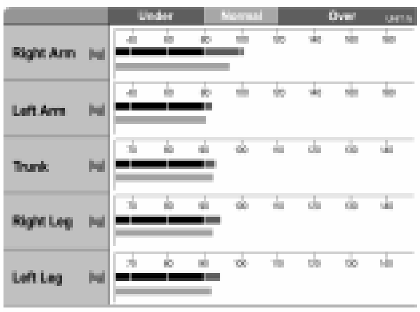
Balanced development of the upper & lower body and of the left & right side of the body

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.



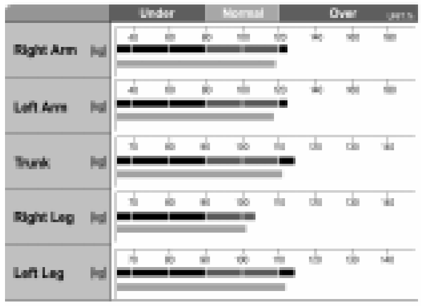
Left-right imbalance in the upper body

There is about one-cell difference in length between right and left arms in the upper body. This subject does not have proportionally-developed arms. He or she must have a habit of using the right arm more or a history of not using his or her left arm due to some reason such as injury.



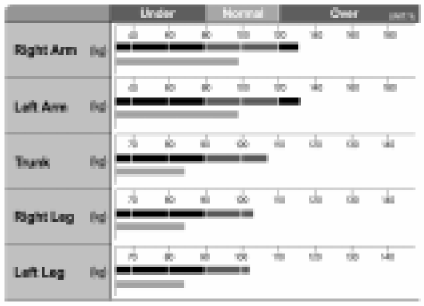
Left-right imbalance in the lower body

The bar graph of the right leg is shorter than that of the left. This subject does not have proportionally-developed lower body. He or she must have a habit of using the left leg more or a history of not using his or her right leg due to some reason such as injury.



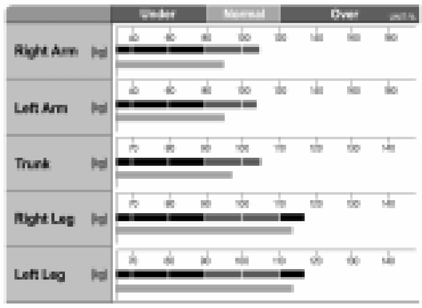
Upper & lower body imbalance – strong upper body type

The length of the arm bar graph is longer than that of the leg and falls above the normal range. In addition, although the bar graph for legs is within the normal range, the difference in length of the upper and lower body graphs is more than one cell. Therefore, it can be categorized as the strong upper body type, which is marked by the better-developed lower body.



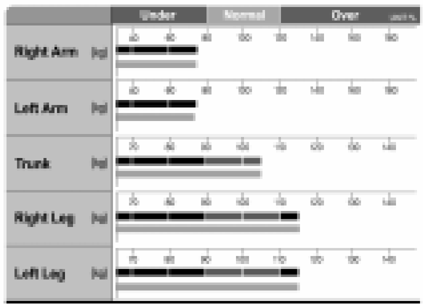
Upper & lower body imbalance – strong lower body type

The length of the leg bar graph is longer than that of the arm and falls above the normal range. In addition, although the arm's bar graph is in the normal range, the difference in length of the upper and lower body graph is more than one cell. Therefore, it can be categorized as the strong lower body type, which is marked by the better-developed upper body.



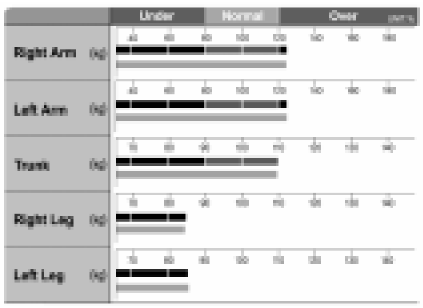
Upper & lower body imbalance ; weak upper body type

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. Evaluate the appropriateness of soft lean mass(body strength) by the length of the lower bar.

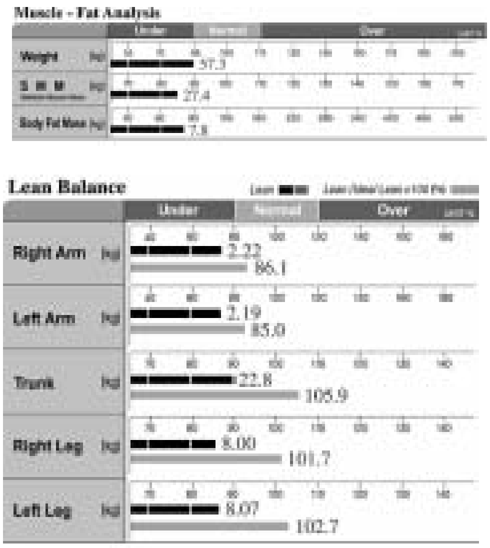
The upper bar graph presents the ideal weight to which each subject should aspire. As the length of the upper bar graph encompasses the concepts of ideal weight and soft lean mass, it provides the goal to keep the ideal soft lean mass, while considering the ideal and actual weights. Since the lower bar graph compares the soft lean mass in relation to the actual weight, it checks if there is an appropriate, ideal amount of soft lean mass for each body part in relation to the actual weight. At that time, the body strength index item in the comprehensive evaluation is determined according to whether or not the lower bar graph falls in each category: below average, average, or above average. Thus the body strength will differ in accordance with the range to which the length of bar graph belongs. It would be ideal for both the upper and lower bar graphs to be in the normal or above average range, in particular, both to be more than 100%.

In addition, depending on whether the lower bar graph is bigger or smaller than 100%, it is possible to determine if soft lean mass and body fat amounts are appropriate. In other words, if one has a soft lean mass ideal for the actual weight, it should be near 100%. It can be seen that the soft lean mass and body fat in body parts are well balanced. On the other hand, if soft lean mass is smaller, it will be short of 100%. The smaller the bar graph is, it can be said that the person is either a weak type with low muscle or a type with more body fat and less lean muscle. Lastly, if there is more muscle, the lower body graph will exceed 100%. The higher the bar graph is raised above 100%, the more muscles the person has developed than body fat. Therefore, the length of the lower body graph allows you to see the ratio between muscles and body fat.

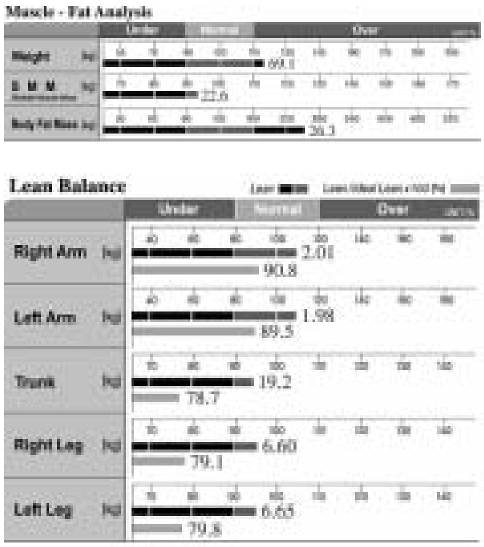
Let's look at the following examples.

Male, 25 years old, 175cm, 57.3kg (Ideal weight: 67.4kg)

Currently, this man has yet to reach his the ideal weight. If you look at the upper bar graphs in the Lean Balance, you can see that they are all below the normal range. The shortness of the graph may be caused by his actual weight falling behind the ideal weight or just by an actual insufficiency of the soft lean mass. If you see the lower bar graph, the arms are within the normal range while legs are above 100%, indicating that he has an appropriate soft lean mass for the actual weight.



Female, 68 years old, 163cm, 69.1kg (Ideal weight: 55.8kg)



This female's actual weight is higher than the ideal weight. If you look at the upper bar graphs in the Lean Balance, they all fall in the normal range. So it seems that she has an appropriate soft lean mass. However, there are two possible explanations for that. It may be caused by her higher actual weight to the ideal one. Or she may just be well muscled. At that time, if you see the lower bar graph, the arms are about 90% while the legs are within the 79% range, indicating that it is below the normal range. In other words, although she appears to have appropriate muscles due to her higher actual weight than the ideal one, she lacks a certain amount of soft lean mass appropriate to her actual weight. In particular, in case of the legs, the lower bar graph is short of 100% so that she has more body fat and less soft lean mass.

2. Find out the relationships among weight, upper and lower bar graphs in the Lean Balance.

As the concepts of ideal weight and actual weight are included in the standards of determining the lengths of upper and lower bar graphs in the lean balance, the length type of upper and lower bar graphs will vary depending on the difference between subject's actual and ideal weight.

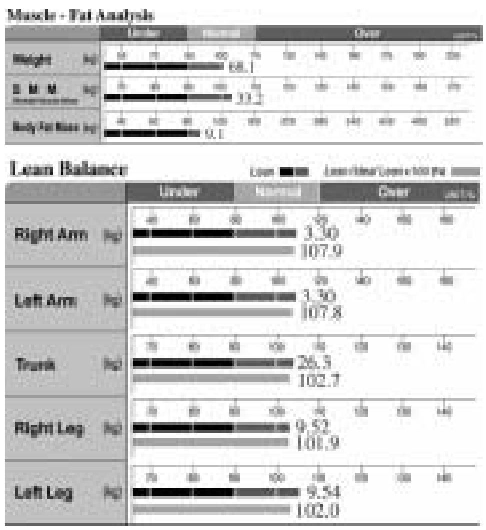
A. If the actual and ideal weights are alike, the upper and lower bar graphs will not be much different.

As the discrepancy between the actual and ideal weight is insignificant, the 100% standard value is similar to each other. Therefore the lengths of the graphs are similar.

a) If the lower bar graph exceeds 100%

It is a desirable health state in terms of both ideal weight and actual weight.

Male, 28 years old, 175cm, 68.1kg



Actual weight (68.1kg) ≒ ideal weight (67.4kg)

As the discrepancy between the actual and ideal weight is insignificant, the lengths of the two bar graphs are similar. As the lower bar graph of the lower body falls in the normal range, the upper and lower body strength is in the average range. Especially, as it exceeds 100%, the balance between muscles and body fat is met.

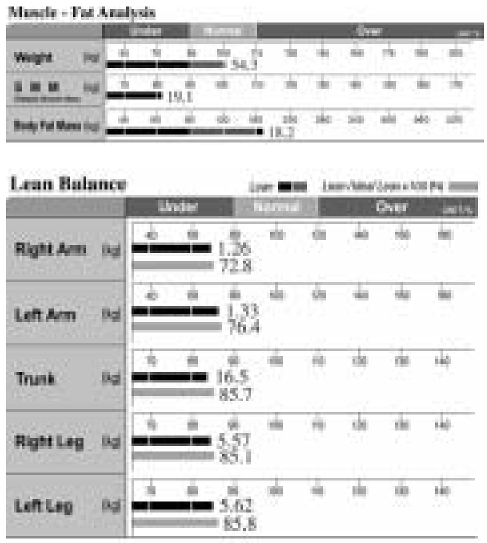
b) If the lower bar graph does not exceed 100%

Based on the actual weight, the subject is weak in health with insufficient soft lean mass.

Female, 28 years old, 160cm, 54.3kg

Actual weight (54.3kg) ≒ ideal weight (53.8kg)

Again, the lengths of the two bar graphs are similar. As the lower bar graph is below the normal range, the upper and lower bodies are weak. Especially, as they fail to reach 100%, it can be said that the subject has more body fat and less soft lean mass.



B. If the actual weight is higher than the ideal weight, the lower bar graph is shorter than the upper bar graph.

If the actual weight is higher than the ideal weight, the soft lean mass required by the actual weight is greater than that required by the ideal weight. Therefore, if the actual weight is higher than the ideal weight, the lower bar graph is always shorter than the upper bar graph. So what is crucial here is whether or not the length of the lower bar graph is above 100%. To determine whether one is a well-muscled type or body fat type, you can also refer to the length of the lower bar graph.

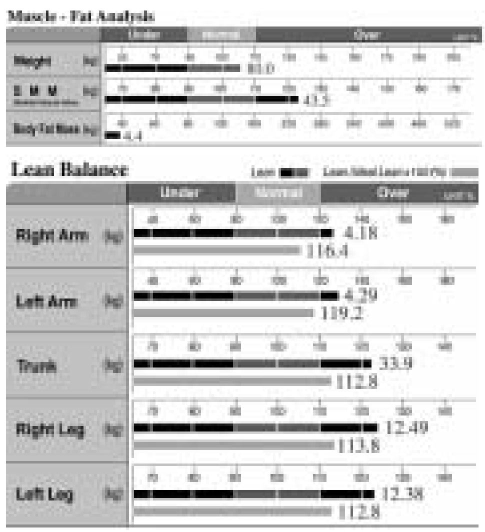
a) If the lower bar graph exceeds 100%

It is a desirable health state with sufficiently developed muscles in terms of the actual weight.

Male, 23 years old, 183cm, 80kg

Actual weight (80.0kg) ＞ ideal weight (73.7kg)

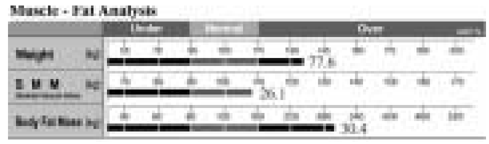
The lower bar graph is shorter than the upper bar graph. This is a natural phenomenon arising from the fact that the actual weight is higher than the ideal one. If you look at the lower bar graph, you can see that it is either in or above the normal range with an average upper and lower body strength. As it is above 100%, he has a desirable health state with more muscles than body fat. This type is often found in the sportsman figures.

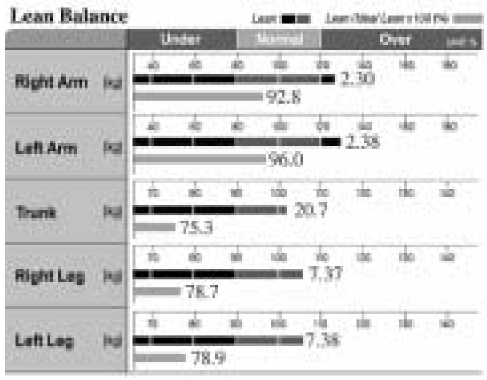


b) If the lower bar graph does not exceed 100%

The muscles are insufficient in relation to the actual weight.

Female, 27 years old. 165cm, 77.6kg





Actual weight (77.6kg) > ideal weight (57.2kg)

The lower bar graph is shorter than the uppe r one. It is a natural phenomenon. Though she appears to have sufficient muscle mass in the upper bar graph, it is solely because of her higher actual weight than ideal weight. In other words, if you look at the lower bar graph, the upper body is in the normal range, indicating her upper body strength is average. On the other hand, her lower body falls below the normal range so that the lower body strength denotes a weak state. Especially with the lower body, the lower bar graph lags much behind 100%, showing that she has more body fat than muscles.

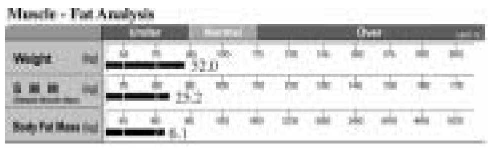
C. If the actual weight is lower than the ideal weight, the lower bar graph is longer than the upper one.

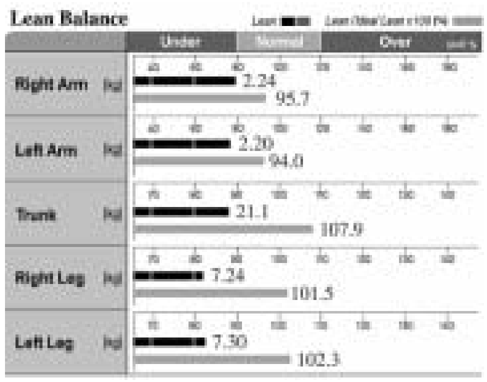
If the actual weight is lower than the ideal weight, the subject’s soft lean mass required by the actual weight is smaller than that required by the ideal weight. Therefore, if the actual weight is lower than the ideal weight, the lower bar graph is always longer than the upper bar graph. So what is crucial here is whether or not the length of the lower bar graph exceeds 100%. To determine if the subject is a well-muscled type or body fat type, you can simply refer to the length of the lower bar graph.

a) If the lower bar graph exceeds 100%

Based on the actual weight, it is a desirable health state with sufficient muscle mass.

Male, 32 years old, 170cm, 52kg



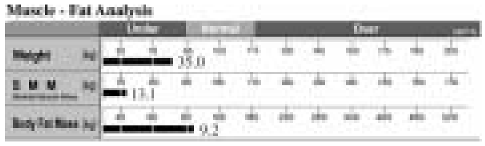


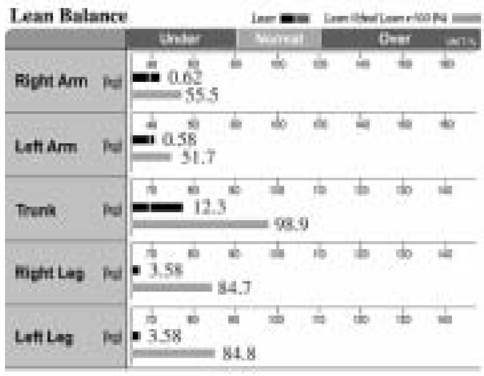
Actual weight (52.0kg) < ideal weight (63.6kg)

The lower bar graph is longer than the upper one. It is a natural phenomenon arising from the fact that his actual weight is lower than the ideal weight. In terms of the upper bar graph, he appears to have insufficient muscles as his upper and lower bodies fall below the normal range. However, it is due to the lower actual weight than the ideal weight. If you look at the lower bar graph, they are all in the normal range with average body strength. Especially in the case of the lower body, the lower bar graph exceeds 100%, indicating that he is in a desirable health state with a bit more muscle than body fat.

b) If the lower bar graph does not exceed 100%

Based on the actual weight, it is a weak state with a lack of muscles.





Female, 50 years old, 145cm, 35.0kg

Actual weight (35.0kg) ＜ideal weight (44.2kg)

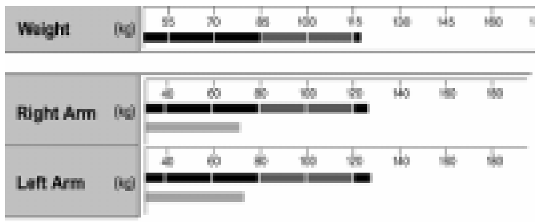
The lower bar graph is longer that the upper one and it is due to the lower actual weight than ideal weight. In terms of the upper bar graph, her soft lean mass is scarce. If you look at the lower bar graphs, they are all below the 100%. Based on the actual weight, she is in a weak state with insufficient muscles.

3. Observe the trend of lean balance graph with regular measuring.

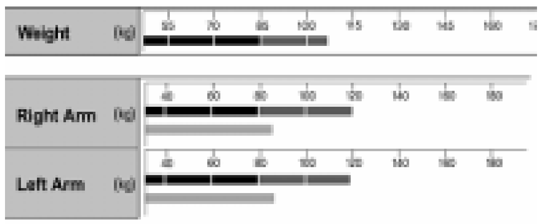
If you carry out the InBody test not only once but on the regular basis, you can see how the lean balance graph changes over time. Throughout the following examples, let’s observe the trend.

1) Overweight obesity type

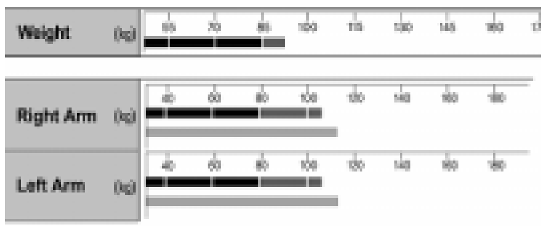
In this case, it is advisable to employ methods that can reduce the weight while maintaining the soft lean mass.



It falls in the category of overweight obesity type, which is characterized by high weight that is above the normal range with a lot of body fat. In terms of the upper bar graph, it appears to be well muscled, however, the lower bar graph is far below 100%. It is the type that has more body fat and less lean muscle in each body part.



As weight has been reduced, there must be less body fat and the soft lean mass. As a result, the upper bar graph also turns out to be a bit shorter. However, if you look at the lower bar graph, you actually can see that the lower bar graph is more extended than before due to the weight loss.



As the weight loss continues, there must be a bit of a decline in body fat and soft lean mass. The upper bar graph becomes a bit shorter. At the same time the lower bar graph is either close to 100% or longer owing to the weight loss accompanied by the maintaining of soft lean mass.

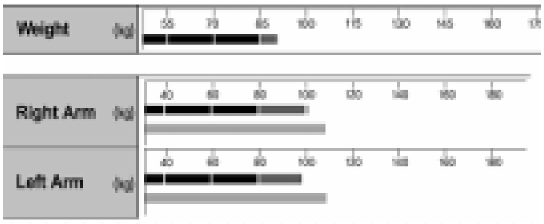
* During the above process, if there is no change in the lower bar graph even after treatment, it can be explained by the incomplete manifestation of the effects of treatment.

2) Weight in the normal range but wants to have more firm body shape

If a person is not overweight but looks sluggish due to more body fat and less lean muscle, it is recommended to apply methods to earn appropriate soft lean mass for the weight.

Though the weight is in the normal range, it is above the ideal weight and the muscle strength for body parts falls below the average. So the person may appear sluggish due to less lean muscle and more body fat. If you look at the lean balance graph, the upper bar graph exceeds 100%, whereas the lower bar graph is below the average, indicating that there is more body fat in each body part.

If you maintain soft lean mass with a decline in body fat and weight, the upper bar graph will either remain the same or be decreased a bit. As the weight becomes lower than the ideal weight with the loss of body fat, the lower bar graph will be longer than the upper one, approaching or exceeding 100%. Consequently, the physical figure will be transformed into a firm-looking one as there is a proper ratio of lean muscle and body fat in each body part.



*In the above result, if the lower bar graph does not show any changes or fails to exceed 100%, it cannot be considered a desirable result. If the lower bar graph exceeds 90%, it can be said to be a standard. Still, however, the ideal ratio between lean muscle and body fat is achieved at 100%.

3) Weak physical state, wants to increase more lean muscle

As the weight is less than the ideal weight with insufficient lean muscle, it is necessary to introduce a process of increasing soft lean mass.

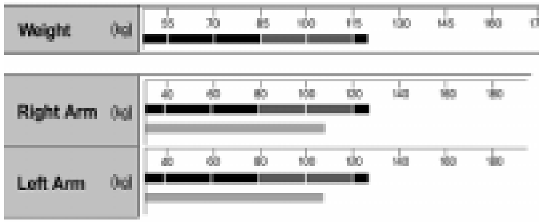
As the actual weight is lower than the ideal one, the lower bar graph is longer than the upper one. However, the upper and lower bar graphs are below the average indicating a weak physical state with insufficient muscle.

With the increase in soft lean mass, the upper bar graph is elongated. Also the lower bar graph is elongated accordingly and exceeds 100%. That’s the desirable result.

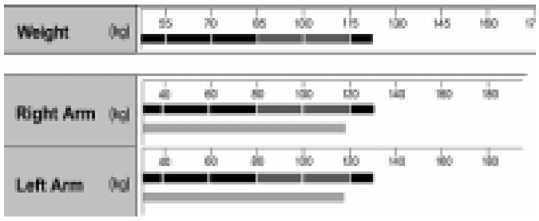
4) Sportsman type but wants to increase more lean muscle.

If a person is well muscled and overweight and continues to build muscle, the increase in soft lean mass can be observed.

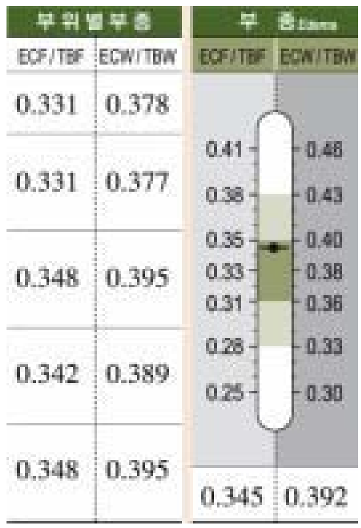
Currently, the person is well muscled and overweight, which is a type frequently found in sportsmen. As the actual weight is higher than the ideal weight, the upper bar graph is longer than the lower one. However, both bar graphs exceed 100%, so that he or she is in ideal physical condition with more lean muscle in relation to the actual weight.



If soft lean mass is increased due to continuous exercises, the upper bar graph will be elongated. As the actual weight increased a bit with the rise in soft lean mass, the basic value of the lower bar graph will be increased. However, with the increase in soft lean mass, you can see the length of the lower bar graph is increased accordingly.



6. 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 4

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.

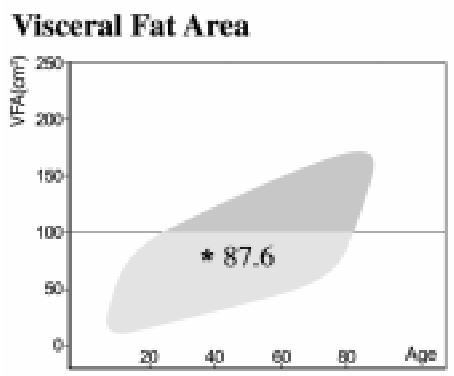
3. Sarcopenic Obesity : People suffering from obesity tend to have relatively higher levels of ECW. Their fat cells contain much less intracellular water that their muscle cells. As such, people suffering from this type of obesity in which there are more fat cells than muscle cells run an increased likelihood 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.

7. Visceral Fat Area

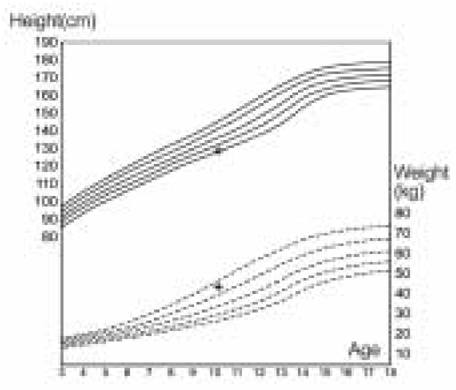
Visceral Fat Area is defined here as the cross-sectional area of visceral fat found in the abdomen. When the area of visceral fat spans more than 100cm2, this is known as abdominal obesity. Fat, depending on its location, can be divided into visceral, subcutaneous and inter-muscle fat. The area of the 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 subcutaneous 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 people under 18 years old, it is common to use a child growth chart rather than a cross-section graph of visceral fat. Throughout the age- and gender-specific height and weight percentile graphs, the growth state can be obtained. The percentile is a score that shows an individual's relative position in his or her group. 50th percentile signifies the medium value. So the closer to 50th percentile, the closer he or she grows to the medium. However, if one's percentile is not 50th percentile, he or she does not need to worry as long as his or her position is between the bottom line (10th percentile) and the top line (90th percentile)

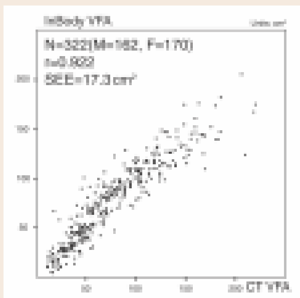


While the percentile of the height and weight is important, it is also critical to draw a growth curve by regularly measuring the height and weight. If the shape of the curve has an abrupt bend or steep sag, it signals that there is some health problem.

FAQ5

Accuracy of the cross-section area of visceral fat

An accuracy comparison study of the cross-section area of visceral fat presented by the InBody720 with CT is r=0.922 (n=332, SEE=17.3cm^2) indicating a high accuracy. In actual clinical settings, if you use the InBody720 instead of an expensive CT tomography, you can obtain your visceral fat data in an economic and simple way. Throughout monitoring, you can also check out the effect of obesity treatment through the cross-section area of visceral fat.

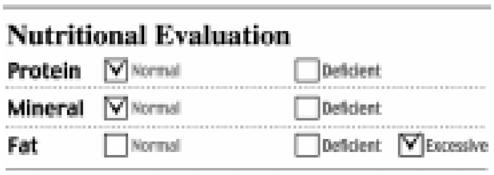


8. Various Comprehensive Evaluation

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, if most V marks are on the blue area, you are in a healthy state. On the other hand it you have many V marks in the red area, you need to take care of your health.

1) Nutritional Evaluation

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.



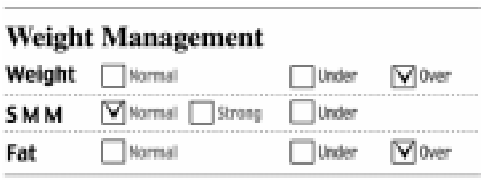
Protein] An examinee found to have less than 90% of the desired protein level is considered to suffer from protein deficiency, a common occurrence among underweight people. Such a score is also indicative of a lack of muscle mass or poor nutrition.

Mineral] Mineral mass will be insufficient when you have less than 90% of mineral mass in relation to your ideal weight. 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

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

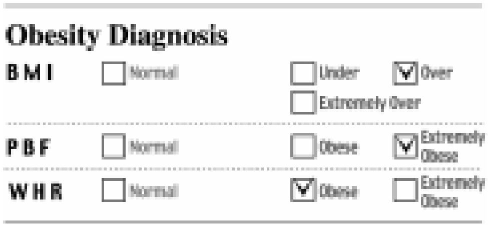


Weight] Anywhere between 85 to 115% of the standard value is regarded as being appropriate, while 85% of the standard value or less is regarded as underweight and 115% or more as overweight.

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

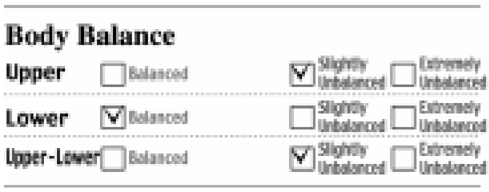


BMI ㅣA BMI of 18.5 to 24.9 is considered to be normal, while persons with BMI of 18.5 or less are considered to be underweight, 25 ~ 30 overweight, and 30 or more excessively overweight.

PBF ㅣIn 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.

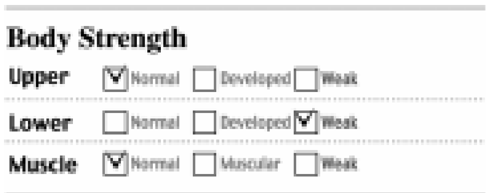
WHR ㅣMales with a WHR of less than 0.90 are considered to be normal, while those with WHR of 0.90 ~ 0.95 are considered to be obese, and those with 0.95 or more are seen as extremely obese. Females with a WHR of 0.85 or less are considered to be normal, while those with WHR of 0.85 ~ 0.90 are considered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

4) Body Balance



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

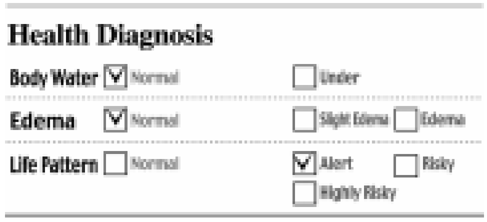


The Body Strength function verifies that the examinee's muscle mass is developed enough to support his/her weight. Those whose bottom Lean Balance bar graph falls within the standard range are considered to be 'Normal'. However, those whose bottom bar graph falls below the standard rage are recorded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

If the lower bar graph in the lean balance falls in the normal range, it will be marked as 'Development' . However, even if you are above the normal range, it does not guarantee that the mark will be at 'development' for edema index is also in consideration.

If the lower bar graph in the lean balance is above the normal range, it will be marked as 'developed' or 'muscular'. However, even if you are above the normal range, it does not guarantee that the mark will be at 'developed' for edema index is also in consideration.

6) Health Diagnosis



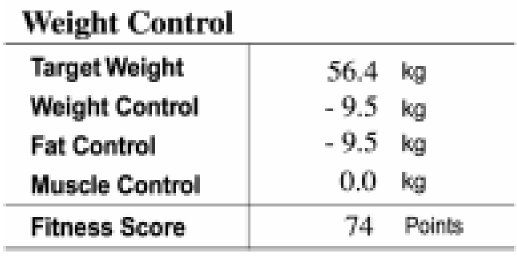
Body Water | Those who are found to possess 90% of more of the Body Water needed for their ideal weight, which is based on their height, are considered to be Normal, while those with less than this are considered to suffer from a Body Water deficiency.

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 Pattern | This function does much more than simply verify Body Fat Mass. The reason that this section is named 'Life Pattern' 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.

9. 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. This is because an ideal weight only considers the height, whereas appropriate weight also takes into account soft lean mass and body fat mass.

'+' 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 or obese type that need exercise and diet control
70~90	Normal, Healthy Type
90 or more	Robust type with well-developed muscle

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.

10. Body Compositon History

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.

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

11. Additional Data

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.

Obesity Degree (%) = (Current Weight / Ideal Weight) × 100

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
A C = 34.3cm	
A M C = 28.5cm	

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 minimum energy required for 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 x FFM(kg) + 370 (FFM=Fat Free Mass, kg) [10,11]

**Ref 10*. *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 11*. *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*

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.

FAQ6

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, InBody720's BMR function can be very useful.

Daily Reference Value = BMR x Activity factor

In the case of patients, multiply them by injury factor to figure out a daily energy requirement.

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

Injury Factor

Minor surgery	1.0 - 1.1
Serious surgery	1.1 - 1.3
Minor infection	1.0 - 1.2
Moderate infection	1.2 - 1.4
Severe infection	1.4 - 1.8
Degree of burn <20% Body surface area	1.2 - 1.5
Degree of burn 20~40% Body surface area	1.5 - 1.8
Degree of burn >40% Body surface area	1.8 - 2.0

5) AC(Arm circumference)

It is the circumference of the upper part of the left arm. It is used for determining protein nutrition status. Rather than a one-time measurement to determine whether or not it is in the normal range, a continuous monitoring on numeric value changes to decide the nutritional status.

6) AMC(Arm muscle circumference)

It is the circumference of the upper muscle of the left arm. The soft lean mass of the upper arm is the fastest reflection of an individual’s nutritional status. In nutrition, AMC has been a popular means to determine the nutritional status.

Normally, if the nutrition status is not in a good condition, the AMC figure will be gradually diminished. In other words, AMC does not decide whether or not one is in the normal range by a single test but determines it though numeric changes during monitoring processes.

12. Impedance

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.

Impedance

		RA	LA	TR	RL	LL
Z	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