

## Fit3D Wellness Metrics Glossary

Gain a more in-depth understanding about each metric.

### Body Shape

#### Body Shape Rating (BSR)

##### Summary

Fit3D extracted SBSI, ABSI, Trunk to Leg Volume Ratio, body fat percentage, and BMI from more than 26,000 scans. Fit3D then evaluated the correlation between each algorithm and calculated the weighted values for the health risk outcomes based on the overall Fit3D user population. This results in a Body Shape Rating (BSR). A user can then understand how their body shape wellness compares with the rest of the Fit3D population.

##### Ways to Improve

The primary way to improve your BSR is to increase the density of your body, build the muscle in your legs, and decrease your waist circumference.

This can be done through a balanced mix of good nutrition and exercise. Consult with your trainer, nutritionist, coaches, or doctors to set up a plan.

##### References

To better understand ABSI, SBSI, Body Fat Percentage and Trunk to Leg Volume Ratio, please refer to the descriptions below or the research from the following links:

- <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0039504>
- <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0144639>
- <http://journals.plos.org/plosone/article?id=10.1371%2Fjournal.pone.0068716>

##### Formula

*Proprietary*

### ABSI

#### Summary

A Body Shape Index (ABSI) is a simple way to evaluate total body shape to avoid health and wellness risks associated with obesity. ABSI is a factor of the roundness of the waist and is associated with Body Mass Index (BMI) and height. The lower this number is, the better.

#### Ways to Improve

To most improve your ABSI, you can either keep your waist circumference value steady and increase your weight or keep your weight steady and decrease your waist circumference. For the most aggressive ABSI improvement, you would want to reduce your waist circumference while increasing your mass. For example, you can make your body leaner or more muscular while maintaining the same weight.

This can be done through a balanced mix of good nutrition and exercise that includes higher intensity interval training with a healthy mix of cardio. Consult with your trainer, nutritionist, coaches, and/or doctors to set up a plan

## References

- <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0039504>
- <http://www.mytecbits.com/tools/medical/absi-calculator> (with target ranges)

## Formula

$$WC / (BMI^2 \times Height^2)$$

- **WC:** Maximum circumference of the waist that can be measured using a tape measure
- **Height:** Height of body
- **BMI:** Body Mass Index

## SBSI

### Summary

Surface-based Body Shape Index (SBSI) is a more complex way to evaluate total body shape. It is used to avoid health and wellness risks associated with obesity. The lower your SBSI score, the less likely you are to suffer early health and wellness-related risks associated with obesity. SBSI compares the amount of mass in your torso to amount of mass in the rest of your body.

### How to Improve

To best improve your SBSI, you will want to establish a program to decrease your waist circumference without sacrificing body surface area (BSA). For example, you will want a program that redistributes mass in your body away from your waist and towards your chest, shoulders, arms, and legs, which should hold your BSA relatively steady.

This can be done through a balanced mix of good nutrition and exercise that includes higher intensity interval training. Consult with your trainer, nutritionist, coaches, and/or doctors to set up a plan.

## References

- <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0144639>

## Formula

$$Height^4 \times WC^5 / BSA \times VTC$$

- **WC:** Maximum circumference of the waist that can be measured using a tape measure
- **VTC:** (Vertical Trunk Circumference) Measurement is taken by threading a tape from the shoulder, through the crotch, and back to the shoulder while the subject stands fully erect with the weight distributed equally on both feet and the arms hanging freely downwards
- **BSA:** Body Surface Area

## Trunk to Leg Volume Ratio

### Summary

Trunk to Leg Volume Ratio compares the volume of your trunk with the volume of your legs. This can generally only be done with some type of body scanning, whether it be Fit3D or more costly and complex scanners like DXA or MRI. Research claims that having a high percentage of your body's volume in your torso compared to your legs increases the likelihood of you experiencing prediabetes, diabetes, high triglyceride (fat) counts, high blood pressure, metabolic syndromes, and other severe health complications.

Weight in your mid-section is highly correlated with visceral fat, which is the unhealthy fat around your organs. If you have a big belly and smaller legs, it is a good assumption that your weight is centered around your midsection and is therefore visceral fat.

### Ways to Improve

This formula is dependent on volume, not weight. The overly simple way to improve your Trunk to Leg Volume score is to decrease the volume of your midsection and increase the volume of your legs.

This can be done through a balanced mix of good nutrition and exercise that includes higher intensity interval training. Consult with your trainer, nutritionist, coaches, and/or doctors to set up a plan

### References

- <http://journals.plos.org/plosone/article?id=10.1371%2Fjournal.pone.0068716>

### Formula

$$\text{TrunkVolume} / (\text{RightLegVolume} + \text{LeftLegVolume})$$

## Body Composition

### Body Fat Percentage (BFP)

#### Summary

Through research partnerships with public and private institutions, Fit3D has scanned thousands of people with Fit3D and DXA systems side by side. Fit3D has subsequently created algorithms that utilize hundreds of measurements automatically extracted from these body scans to calculate a user's body fat percentage.

Body fat percentage is the user's total fat mass divided by the total body mass. Fat is an essential component of the body and is necessary to maintain life and reproductive functions; however, too much body fat can negatively affect overall health or hormone levels. It also serves as an indicator of more serious health problems that could potentially be faced in the future. The essential body fat (fat that is required to maintain life functions) is generally 10-13% for women and 2-5% for men (referenced through NASM).

#### Ways to Improve

You can decrease your body fat percentage through a balanced mix of good nutrition and exercise that includes higher intensity interval training and cardio. Consult with your trainer, nutritionist, coaches, and/or doctors to set up a plan.

## References

- [https://en.wikipedia.org/wiki/Body\\_fat\\_percentage](https://en.wikipedia.org/wiki/Body_fat_percentage)
- <https://www.acefitness.org/acefit/healthy-living-article/60/112/what-are-the-guidelines-for-percentage-of-body-fat>

## Weight

### Summary

Body weight is a person's mass or weight. This is probably the easiest metric to measure on a human and is therefore a part of our primary assessment metrics; however, the body shape makeup and body composition is a much more real mechanism to determine the health of an individual.

### References

- [https://en.wikipedia.org/wiki/Human\\_body\\_weight](https://en.wikipedia.org/wiki/Human_body_weight)

## Fat Mass

### Summary

- Fat mass is also known as adipose tissue within the body. This loose connective tissue is primarily composed of adipocytes (fat cells). Its main role is to store energy in the form of lipids. It also cushions and insulates the body.
- Body fat is primarily made up of three types of fat:
  - **Epicardial Adipose Tissue (EAT):** EAT is a particular form of visceral fat deposited around the heart and is found to be a metabolically active organ that generates various bioactive molecules, which may significantly affect cardiac function.
  - **Subcutaneous Fat:** The fat that is generally stored just below the surface of the skin. Subcutaneous fat is not related to many of the classic obesity-related pathologies, such as heart disease, cancer, and stroke and is generally a protective fat.
  - **Ectopic Fat:** The storage of triglycerides (fats) in tissues other than adipose tissue that are only supposed to contain small amounts of fat, such as the liver, skeletal muscle, heart, and pancreas. These fats can interfere with cellular function. The cause for accumulation of Ectopic fat is unknown.

## Ways to Improve

You can decrease your body fat percentage through a balanced mix of good nutrition and exercise that includes higher intensity interval training and cardio. Consult with your trainer, nutritionist, coaches, and/or doctors to set up a plan.

### References

- [https://en.wikipedia.org/wiki/Adipose\\_tissue](https://en.wikipedia.org/wiki/Adipose_tissue)
- <https://www.acefitness.org/acefit/healthy-living-article/60/112/what-are-the-guidelines-for-percentage-of-body-fat>

## Formula

The mass of the adipose tissue within the body is given by:

$$\text{FatMass} = \text{TotalBodyMass} \times \text{BodyFat\%}$$

## Lean Mass

### Research Description

The 2-component model, which consists of fat mass and lean mass calculations, is widely used to determine body composition. Fat mass is the mass of the adipose tissue in the body. Lean mass is the muscle tissue, skeletal tissue, and water in the body. In 3- and 4-component models, skeletal tissue and water are drawn out as isolated measurements.

### Ways to Improve

You can increase your lean mass by participating in fitness programs that include weight training. You can also talk with your nutritionist to develop a nutrition program that will effectively build lean mass. If you are simply looking to build lean mass, but not necessarily lose fat mass, your program may be quite different than a program that is geared towards a more balanced fat percentage reduction. Consult with your trainer, nutritionist, coaches, and/or doctors to set up a plan.

### References

- <http://jap.physiology.org/content/85/1/238>

### Formula

Lean mass is the mass of muscle, skeletal tissue, and water. In a 2-component model, where water and skeletal tissue are both included in lean mass, the formula is:

$$\text{LeanMass} = \text{TotalBodyMass} \times (1 - \text{BodyFat\%})$$

## Medical

### Waist Circumference

#### Summary

- Waist circumference (WC) provides a prediction of risk independent of BMI. WC is particularly useful for patients who are categorized as normal or overweight on the BMI scale as a measurement associated with visceral fat and overall body shape.
- High risk is associated for men with WC > 102 cm and for women where WC > 88 cm.
- WC is the circumference measurement taken at the small of the back.

### Ways to Improve

You can decrease your body fat percentage through a balanced mix of good nutrition and exercise that includes higher intensity interval training and cardio. Consult with your trainer, nutritionist, coaches, and/or doctors to set up a plan.

### References

- [http://www.nhlbi.nih.gov/health-pro/guidelines/current/obesity-guidelines/e\\_textbook/txgd/4142.htm](http://www.nhlbi.nih.gov/health-pro/guidelines/current/obesity-guidelines/e_textbook/txgd/4142.htm)

## Waist to Hip Ratio

### Research Description

- The waist to hip (WHR) ratio is obtained from dividing the circumference of the waist (the narrowest point between the hips and ribs) by the circumference of the hips (the widest part of the hips).
- WHR is a ratio generally used to evaluate whether the individual is at high risk of obesity, diabetes, coronary heart disease, and/or high blood pressure. The measurement evaluates body shape in the midsection of the body.
- This ratio as a health metric is extremely limited, but it is an easy way to try to evaluate the level of visceral fat one may have.

### Ways to Improve

While you cannot spot reduced fat mass throughout your body, you can still work with your coaches to reduce the amount throughout your body, which will generally decrease the circumference of your mid-section. WHR is extremely limited in scope, but is widely used as a metric of health.

We suggest that you consult with your trainer, nutritionist, coaches, and/or doctors to set up a plan before focusing solely on your WHR.

### References

- <http://resources.hwb.wales.gov.uk/VTC/2012-13/22032013/hsc/cym/unit-4/u5-ioph/unit-4-waist-to-hip-ratio.htm>

### Formula

$$WHR = WC / HC$$

- **WC:** Waist Circumference
- **HC:** Hip Circumference

## Additional

### Basal Metabolic Rate (BMR)

#### Summary

Basal Metabolic Rate (BMR) is the amount of energy expended while at rest in a neutrally temperate environment and in the post-absorptive state. In this state, the digestive system is inactive, which is usually achieved by about twelve hours of fasting. Furthermore, BMR is the amount of energy expressed in calories that a person needs to keep the body functioning (i.e. breathing, blood circulation, controlling body temperature, cell growth, brain and nervous function, and contraction of muscles). BMR affects the rate at which a person burns calories and ultimately affects whether that individual maintains, gains, or loses weight.

### Ways to Improve

You can increase your BMR by participating in fitness programs that include high intensity interval training or lifting weights to build muscle. You can further increase your BMR by eating more protein, eating many smaller-portioned meals per day, and staying hydrated. The rule of thumb here is that muscle requires more energy to survive—the

more lean muscle you have on your body, the higher your BMR. Consult with your trainer, nutritionist, coaches, and/or doctors to set up a plan.

### **References**

- [https://en.wikipedia.org/wiki/Basal\\_metabolic\\_rate](https://en.wikipedia.org/wiki/Basal_metabolic_rate)

### **Blood Pressure**

#### **Summary**

Blood pressure is the pressure exerted by circulating blood upon the walls of blood vessels. "Blood pressure" usually refers to the arterial pressure in the systemic circulation. Blood pressure varies depending on the environment, activity, and disease states and is regulated by the nervous and endocrine systems.

### **References**

- [https://en.wikipedia.org/wiki/Blood\\_pressure](https://en.wikipedia.org/wiki/Blood_pressure)

### **Heart Rate**

#### **Summary**

Heart rate is the speed of the heartbeat measured by the number of contractions of the heart per minute (bpm). The heart rate can vary according to the body's physical needs, including the need to absorb oxygen and excrete carbon dioxide. The normal resting adult heart rate ranges from 60-100 bpm.

### **References**

- [https://en.wikipedia.org/wiki/Heart\\_rate](https://en.wikipedia.org/wiki/Heart_rate)