

Anthropometric indexes

1. Body mass index (BMI) = $\frac{\text{body weight (kg)}}{\text{height (m}^2\text{)}}$

Normal values: according to tables.

2. Waist-hip ratio (WHR) = $\frac{\text{waist circumference (cm)} \times 100}{\text{hip circumference (cm)}}$

Normal waist circumference: men <94 cm (<102 cm), women <80 cm (<88 cm)

Normal values: according to tables.

3. Body roundness index (BRI):

$$\text{BRI} = 364.2 - 365.5 \times \sqrt{\left(1 - \left(\frac{\text{WC (cm)}}{2\pi}\right)^2 / (0.5 \times \text{height (cm)})^2\right)}$$

(WC: waist circumference, $\pi = 3.14$)

Values: 1-16 (the higher value, the higher cardiovascular risk)

4. Body surface area, BSA (m²): $\text{BSA} = \sqrt{\frac{\text{h[m]} \cdot \text{m[kg]}}{36}}$

h = height, m = body weight

Women: 1.65 – 1.80 m² – normal range (lower values: underweight, higher values: overweight)

Men: 1.80 – 2.00 m² – normal range

Women - mean value: 1.70 m²

Men – mean value: 1.90 m²

Adolescents – mean value (12-13 y.): 1.33 m²

Children (10 y.): 1.14 m²

Children (9 y.): 1.07 m²

Children (2 y.): 0.5 m²

Newborn: 0.25 m²

5. Broca index, BI (%): $BI = \frac{m[kg] \cdot 100}{h[cm] - 100}$

h = height, m = body weight

Ideal body weight = Broca index (BI) in the range of 90-110%, lower values: underweight, higher than 155%: overweight

6. Estimation of % body fat according to Covert Bailey (using a tape measure):

Men younger than 30 years:

% body fat = (waist + 0.5 x hips – 3 x forearm – wrist)/2.54

Men older than 30 years:

% body fat = (waist + 0.5 x hips – 2.7 x forearm – wrist)/2.54

Women younger than 30 years:

% body fat = (hips + 0.8 x thigh – 2 x calf – wrist)/2.54

Women older than 30 years:

% body fat = (hips + thigh – 2 x calf – wrist)/2.54

Instructions to estimation of % body fat:

The highest circumference is measured in each place.

Waist — measured in standing position, keep your waist relaxed, don't inspire deeply.

Hips — measured in standing position, keep your legs about 10 cm from each other and measure the highest circumference of hips.

In the next measurements, the left-handed person will measure the circumferences of the left upper and lower extremity, the right-handed person will measure the circumferences of the right upper and lower extremity.

Thigh — Stand with a distance of 30 cm between the legs and measure the circumference of the upper part of thigh where is the widest.

Calf — Stand with a body weight evenly distributed to both lower extremities. Measure the circumference of the calf in the middle distance between the knee and ankle (there should be the widest).

Forearm — Stretch a forearm so that you make a fist. Measure the widest circumference of the forearm.

Wrist — Measure the circumference just behind the protrusion of radius bone in the direction to palm.

(adjusted according to: <https://caloriebee.com/diets/Five-Methods-to-Calculate-your-Body-Fat-Percentage-by-Using-a-Tape-Measure>)

7. Ideally proportionate figure:

A proportionate figure is defined by proportionality of all the parts of the body:

- circumference of hand making a fist is equal to the length of foot;
- circumference of neck is a half of the circumference of chest;
- circumference of wrist is a half of the circumference of neck;
- length of foot is equal to the length of forearm;
- wideness of shoulders is equal to 1/4 of the body height.

8. Type of body habitus (body shape/physical type) according to circumference of the wrist:

Measure the *circumference of the wrist* using a tape measure. If the value is lower than 15 cm, the body shape (physical type) is ***asthenic***. If the value is between 15 - 17 cm, the body shape (physical type) is ***normosthenic***. If the value is higher than 17 cm, the body shape (physical type) is ***hypersthenic***.