Anthropometrical assessment is a scientific specialization concerned with the application of measurement to appraise human size, shape, proportion, composition, maturation and gross function. It is a basic discipline for problem-solving in matters related to growth, exercise, performance and nutrition.

The area has been defined as the quantitative interface between anatomy and physiology. It puts the individual athlete into objective focus and provides a clear appraisal of his or her structural status at any given time, or, more importantly, provides for quantification of differential growth.

There are plenty of methods used in distinguished countries. Martin-Saller method (Lehrbuch der Antropologie, 1957) is mostly being used in middle Europe and other countries.

Anthropometry appears deceptively simple. Mastery, however, is somewhat analogous to playing a musical instrument with style and grace. With some formal training and persistent practice, it can be easy and enjoyable and can produce amazingly accurate data. The development of an anthropometrist’s touch is seldom achieved without extensive practice.

In assessing individual status with respect to a particular norm, it is necessary that a high level of precision and accuracy be attained by the measurer. Precision is a matter of how consistent a measurer is with him or herself (intra-observer reliability) or with other measurers (inter-observer reliability). Accuracy is a matter of how closely obtained measures conform to true or ideal measures. In the measurement sequence, only right side values of the subject are taken in surveys. When there is a question of bilateral asymmetry, however, both sides should be taken.

References
Anthropometrie the individual and the population – edited by Ulijaszek L.J. and Marcie-Taylor C.G.N.

Methods of classical anthropometry hold and important place in common routine practice because they are non-invasive, relatively cheap, saving time and suitable for field work.
We use two basic ways of anthropometric measurement of living persons:
  a) cephalic parameters
  b) body parameters
a) **Cephalic parameters** are important in examination of head growth, especially in period from birth to 6 years of age. Use: plastic surgery, stomatology, stomatosurgery.
b) **Body parameters** (length, height dimensions, breath parameters, circumferences, skilfold thicknesses) are used for monitoring of the growth, body composition components assessment (Matiegka’s equations, Drinkworker-Ross method), somatotype assessment (Heath-Carter method), examination of proportionality (e.g. Z-score, Percal’s indices, important reference standards). Use: pediatry, endocrinology, obesitology, orthopedics, ergonomy, etc.

**Basic anthropometric instrumentarium:**
  Anthropometer (0-2100 mm); scale; Sliding caliper (Martin Type), length: 0 – 200 mm, depth: 0 – 50 mm; Spreading Caliper with rounded ends (0-300 mm); Spreading Caliper with rounded ends (0-600 mm); Steel measuring Tape (0-2000 mm); Harpenden Caliper, Best Caliper.

Quality recording paper is important.
Definition of anthropological points (landmarks)
Because the body can assume a variety of postures, anthropometric description is always in reference to the anatomical position. This is where the subject is oriented to a standing position with head and eyes directed forward, upper limbs hanging by the sides with the palms forward, thumbs pointing away from the sides with fingers pointing directly downward, and the feet together with the toes pointing directly forward.

Skinfolds thicknesses
The most often used data from anthropometric measurement is that obtained from skinfolds. It has been very popular to use the sum of varying numbers of skinfolds to calculate percentage body fat. Any combination of skinfolds can be used, but if a realistic assessment of subcutaneous fat is to be gained, sites must be chosen from both the upper and lower body. The most commonly used combination features six sites – triceps, subscapular, supraspinale, abdominal, front thigh and medial calf.

Mostly used types of caliper are Best and Harpenden (this type are much variations).

We use methods of classical anthropometry in common routine practice, because they are non-invasive, suitable for field work, saving time and relatively cheap. We use anthropometric examination by standardized technique according to Martin and Saller. The skinfold thickness was assessed with Best type caliper and Harpenden type caliper.

The anthropometric examination comprises: 11 length and height parameters, 11 width parameters, 13 circumference parameters and 14 skinfolds thicknesses.

Matiegka´s Equations
90 years ago, the Czechoslovakian anthropologist Jindřich Matiegka proposed method for the anthropometric fractionation of body mass into four main components:

- skeletal mass
- fat mass
- muscle mass
- residual or vital organ/visceral mass

Matiegka´s formulas for estimation of body components:

\[ W = O + D + M + R \]

W – body weight in grams
O – skeletal mass in grams
D – mass of the skin and subcutaneous adipose tissue in grams
R – residual mass in grams

References

The Heath-Carter somatotype methods
A somatotype is a classification of physique based on the concept of shape, disregarding size. The pre-eminent system of somatotype classification is the Heath-Carter somatotype. This shows the relative dominance of Endomorphy (relative fatness), Mesomorphy (relative musculo-skeletal robustness) and Ectomorphy (relative linearity). Each component is identified in the sequence endomorphy-mesomorphy-ectomorphy and, when anthropometrically-derived, expressed to the nearest one-tenth rating, e.g. 1.4-6.0-3.2, an ectomorphic mesomorph, or ecto-mesomorph. Ratings of 2 to 2.5 are considered low, 3 to 5 are moderate, 5.5 to 7 are high and 7.5 and above are very high (Carter, 1996). The derivation equations for each component are as follows.

**Endomorphy.**

\[ \text{Endomorphy} = 0.7182 + 0.1451 \times \Sigma SF - 0.00068 \times \Sigma SF^2 + 0.000014 \times \Sigma SF^3 \]
where \( \Sigma SF \) = sum of triceps, subscapular and supraspinale skinfolds multiplied by (170.18/height in cm)

**Mesomorphy.**

0.858*humerus breadth + 0.601*femur breadth + 0.188*corrected arm girth + 0.161*corrected calf girth – height*0.131 + 4.5

**Ectomorphy.** One of three equations is used depending on the value of the calculated Height Weight Ratio (HWR) of the subject. [HWR is height/body mass \(^{33}\).]
- If HWR is greater than, or equal to 40.75 then ectomorphy = 0.732*HWR – 28.58
- If HWR is less than 40.75 and greater than 38.25 then ectomorphy = 0.463*HWR -17.63
- If HWR is equal to or less than 38.25 then ectomorphy = 0.1

**Computer programme ANTROPO**

Data are processed by the PC computer programme “ANTROPO”. Print output and commentary are available in both Czech and English versions and comprise:

1) selected length and height measures, width and girth measures,
2) values of 16 indices chosen including body mass indices,
3) somatotype by modified Heath-Carter method,
4) body composition according to Matiegka’s equations or Drinkwater-Ross method,
5) data on the mass of segments of upper and lower extremities,
6) proportional biological age by means of KC and KEI indices / till 18 years of age /,
7) values of z-score of 41 chosen body characteristics in figures and tables and 41 Perkal’s indices in figures and tables.

Programme ANTROPO is possible to use for both sexes ranged from 3 to 75 years and for an individual or a group of probands.

PC programme ANTROPO is universal to process anthropological data but interpretation and annotation have to be done by anthropologist only.