# INFLUENCE OF THE SOCIAL AND ECONOMICAL FACTORS TO THE ANTHROPOMETRICS OF THE HUMAN BODY

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## ABSTRACT

*Anthropometrics of the human body has been researched since Euclid, 300 years before Christ. Proportions of the human body have been proposed by many scientifics like Cajsing, Neufert, Schmidt, Fritch etc., but nowadays we can measure each dimension on the human body with intelligent measurement systems and so we can get exact proportions. Social and economical factors have a significant influence to the dimensions of the human body like for example annual income of the family as well as the education of the parents. Ages of the human being also have got influence to the anthropometrics of the human body, the year of measurement as well as the place of living. In this paper we analyse anthropometrical characteristics of the human body in relation to the social and economical factors.*
**Keywords:** anthropometrics, human body, income, ages, dimensions

## 1. INTRODUCTION

The nature has created a human body in such a way that the length from chin to the forehead is one tenth of total body height [3,4,7,10,14]. When we look at the hand then the length from its joint to the top of the middle finger is also one tenth of the body height, and the length from top of the nreast to the forehead is one sixth of body height. The length from the middle point of breast to the top of the head is one fourth of the total body length. If we watch only the length of the face then the distance between the chin and nostril is one third of the length of the face [6,14], distance between nostril and eyebrow and from eyebrow to top of the head is also one third of the face length. The length of the foot is one sixth of the total body length, the length of the forearm is one fourth of the total body length as well as breadth of the breast.
Another parts of the body also have got symmetrical proportions, and famous antic painters and sculptors acquired their glory with help of this proportions.

## 2. PROPORTIONS OF HUMAN BODY

None discussion about human body dimensions and proportions wouldn't be completed if we don't mention so called «golden section». This term was given in 19. century for proportion realized by distribution of lines to, how Euklid called it 300 years before Christus, «extreme and middle relation». According to Euclid, line is divided in that relation only if the «length of a whole line refers to the length of larger segment in the same way as length of larger segment to the length of smaller segment». Although for any proportion are needed at least three dimensions, the special thing by

«golden section» is that the third dimension is sum of another two dimensions. By geometrical separating of triangle which was got by division of line into the «golden section», it was achieved an appearance of proportions which help us to analyse many examples of Egypt reliefs, pictures and sculptures (Figure 1).
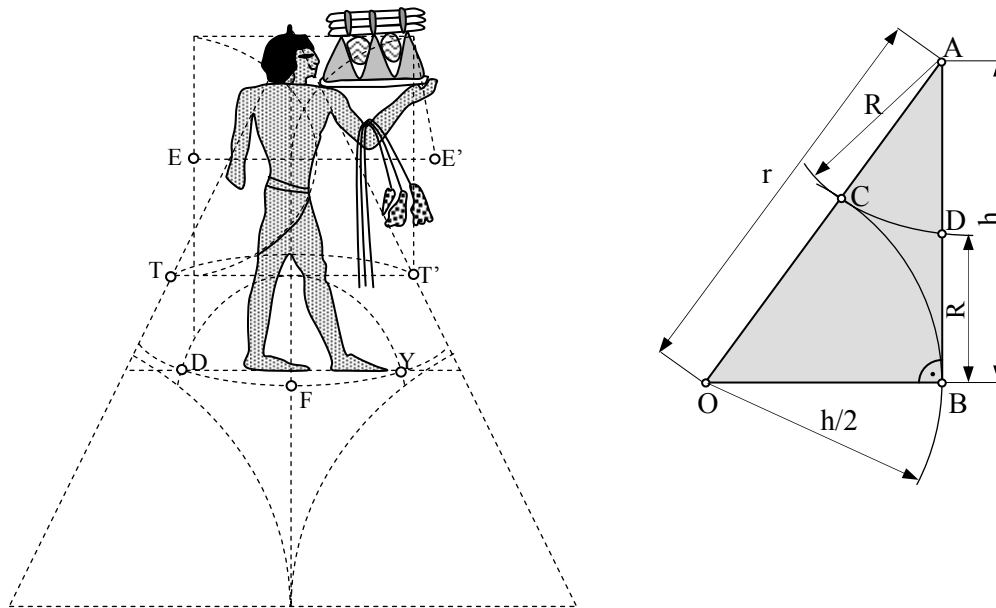


*Figure 1: Example of human body analysis according to «golden section»*

Geometrical construction of relations of «golden section» is shown in the rectangular triangle. As we can see line $\overline{AB}$ is divided so that line $\overline{AD}$ is shorter then line $\overline{DB} = R_1$. If we say that line $\overline{AB}$ is height $h$ then we have relation $\overline{OB} = \dfrac{h}{2}$. From the rectangular triangle $\Delta OAB$ we get following relations:

$$r = R + \frac{h}{2} \quad ; \quad r^2 = h^2 + \left(\frac{h}{2}\right)^2 \quad ; \quad r = \sqrt{\frac{5h^2}{4}} = \frac{\sqrt{5}}{2}h \quad ; \quad r = 1,1180h \tag{1}$$

From the equation (1) we can get R and the value of the larger part of «golden section»:

$$R = r - \frac{h}{2} \quad ; \quad R = \frac{\sqrt{5}}{2}h - \frac{h}{2} \quad ; \quad R = 0,6180h \tag{2}$$

Value of the smaller part of «golden section» we can get from the equation (3):

$$R_1 = h - R \quad ; \quad R_1 = h - 0,6180h \quad ; \quad R_1 = 0,3819h \tag{3}$$

Proportions of «golden section» can be expressed by approximate values: 3 : 5; 5 :8; 8 : 13; . By human body we use proportions 5:8.
Carl Schmidt gives a very simple practical method of defining proportions, which can be useful for fashion designer, creators and another artists.
His proportions key became a special validity after Gustav Fritch has worked it out and complemented it. For model, he took height of human body (Figure 2) and equivalent of this dimension. This model is very precise for distance between cross section of atlantocipital joint and cross section of both joints in hips, or for more practical for daily use distance between lower edge of nose and upper edge of symphisis. The length of this model is separated in four equal models (submodels). This separation gives us several marked points that make our measurements easier. Those points are following: lower edge of chin (A), middle handle of breastbone (manubrium sterni) (B), processus ensiformisa (C), navel (D), upper edge of groin (E).
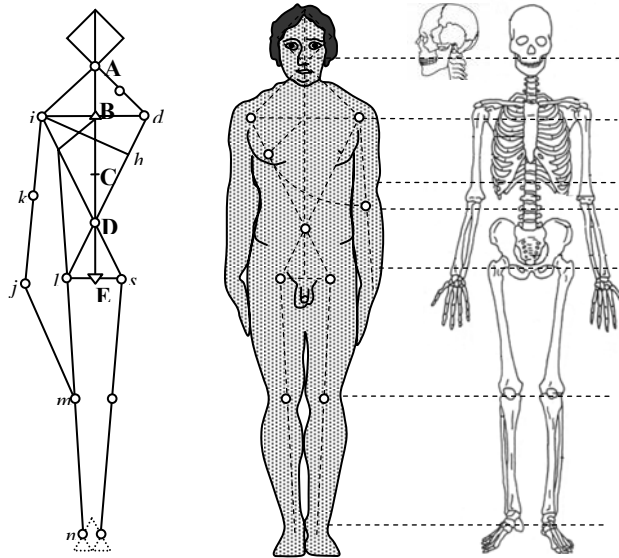
*Figure 2: Proportions of human body by Carl Schmidt and Gustav Fritch*

## 3. INFLUENCE OF VARIOUS FACTORS TO THE ANTHROPOMETRICS OF HUMAN BODY

If someone thinks that the main goal of anthropometrtic measurements is only doing of simply measurements, then it could be made a conclusion that the results can be achieved very simple and fast. But this is not a true. Hier we have a lot of factors that make measuring complex. One of those factors would be that the dimensions of body vary from case to case with ages, sex, racee and even with profession.

The age is very important factor for body dimensions. Body dimensions reach their height at the end of the teenager time or at the early twenties by the males and little earlier by females. After that the dimensions are again getting smaller as shown on figure 3.
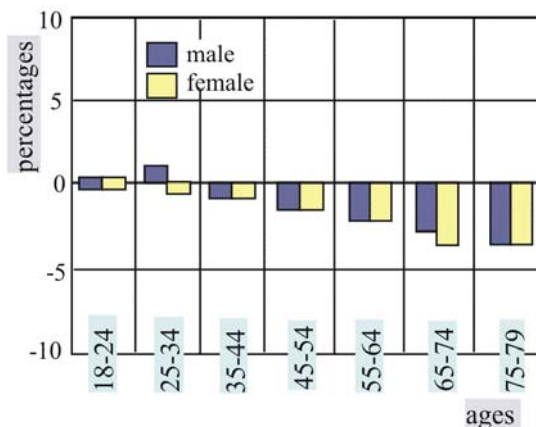


*Figure 3: Relative changes of body height depending on ages*
*(for males and females between 18-79) [12]*

Social and economical factors have also got a huge influence to the dimensions of human body. The families with higher income have got better body development and lower possibility to get become ill (Figure 4 and 5). Social and economical factors also have got influence to the education of a person. Therefore the researches shown that the students are taller then a people which do not study. Still, inside one group body dimensions can vary so that the average value must not be significant. We also have to consider physical conditions. Was the person dressed or undressed. If he was dressed was the clothing light or heavy. Was the person barefoot.

Therefore styding of this problem must contain description of used method as well as all necessary drawings to define the real points where the measuring was led out. No doubt that anthropometric researches are not less complex or monotonous then any other researches in biological sciences. When we consider the fact that anthropometricer have to know statistic metodology, complexity and monotony of this science discipline is even larger. It is obvious that persons who take and note body dimensions have to be adequate qualified.
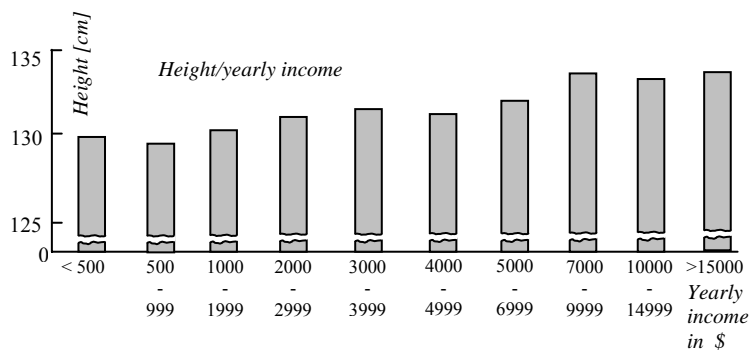


Figure 4: Average height of boys
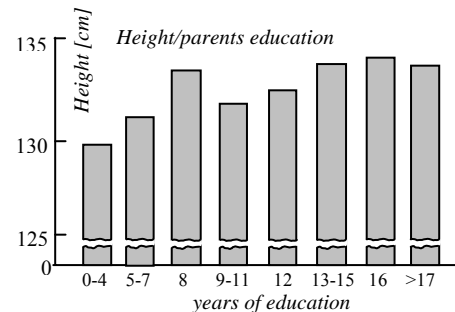in USA ages 6-11 depending on yearly income



Figure 5: Average height of boys
in USA ages 6-11 depending on
parents education

## 4. CONCLUSION

After all researches we got to the conclusion that the anthropometrics of human body iss very important scientific discipline. Dimensions of human body are important for human clothing, his workplace, work environment, way of living, dimensions for means of transportations, etc. There is huge number of factors that influent anthropometric of human body. As presented in this paper we can see that the anthropometric of human body depends on ages, family yearly income, parents education, social status of family and some other factors not being analyzed in this paper.

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