

## Study regarding the correlation between the level of physical development and the state of health of the students

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Published online: November 30, 2018

(Accepted for publication November 20, 2018)

DOI:10.7752/jpes.2018.s5301

### Abstract:

Health, physical development, physical condition are favorable elements for improving the quality of life. According to WHO, waist circumference, waist to hip ratio and body mass index are directly related to the degree of illness. It has been found that: waist circumference and waist to hip ratio are related to increased mortality risk of all causes; waist circumference and waist to hip ratio are strong prediction indicators for mortality risks at the age of youth and adult and less in the case of the elderly and those with a low BMI; waist circumference could replace the waist-hip ratio and BMI, as a single risk factor for all-cause mortality. This research is part of a wider experiment which aimed to find out the level of young people's quality of life. Through this study, we have managed to outline a complex picture of the physical development of the young and the degree to which some indices can be correlated with the state of health. Assessing the level of physical development and calculating the proportional relationships of the body has given us the possibility to achieve the proposed goal. Measurements were performed on 172 female, aged between 18-23 years, students at the Faculty of Economics and Public Administration at the „Stefan cel Mare” University of Suceava. In this research we started from the hypothesis that because of the students' lack of involvement in physical activities in a conscious and systematic way, the level of physical condition and harmonious physical development is low. Experimenting some measurements and calculating some indices have provided us with information about the level of physical development of young students as well as the correlation between the values obtained with the health status and the risk of certain diseases.

**Keywords:** students, assessment, body mass index, waist to hip ratio, waist circumference, metabolic complications, health risk

### Introduction

Health, physical development and fitness are elements that favor the growth of quality of life. The concept of fitness is a complex one with difficulties both in terms of meaning determination and in terms of enumeration of characteristic elements. Although there are many authors who describe „fitness” differently, there are some constants. Sbenghe, T., (1999, p.314) emphasizes that fitness in stricto sensum is a general term that indicates the level of functioning of the cardiovascular system as a result of high energy reserves and *largo sensum* refers to optimal performance and a good health and state. In many specialized books, when describing the effects of exercise, many authors no longer refer to the fact that they are beneficial to health but to the quality of life. The term "health" has been replaced with the "quality of life" due to the complexity of this concept. Sbenghe, T. (2002, p.448) presented the fact that health was defined by the WHO in 1948 as not only the absence of the disease but the presence of a physical, mental and social well-being. Gradually, we have come to understand the link between lifestyle and this "wellbeing," and then studies have shown that health is in direct relation to quality of life ("health-related quality of life").

Rusu, F., (2008), quoted by Cretu, M., (2013, p.33) says that there are two types of fitness, general and specific. General fitness is associated with health and has the indicators: aerobic resistance, muscle strength, vigor, strength, flexibility, speed, body composition. Another approach to fitness and its components is made by Ganciu, M., and Ganciu, O., M., (2013, pp.157-158) which presents the general fitness of the man discovered in:

- physical fitness: optimizing physical condition;
- emotional fitness: psychological comfort, emotional stability, self-confidence;
- mental fitness: optimizing mental processes, positive thinking, creativity;
- social fitness: human relationships, respect, professional success, social status;
- aesthetic fitness: the appearance, the body shape, according to the trends of the society;
- physiological fitness: optimizing the vital functions of the body.

Tancred (1995, p.136, quoted by Ciulea, L., E., 2015, pp.244-25) described nine components that further define the concept of fitness:

- force: the level of response of the muscles to a force against which they resist;
- power: the ability to exercise maximum force through a sudden movement;
- agility: the ability to achieve sudden and rapid movements in opposite directions;
- equilibrium: control of the body position in motion and stationary;
- flexibility: the ability to perform a wide range of movements;
- local muscular endurance: the ability of a single muscle to sustain a long effort;
- cardiovascular endurance: the ability of the heart to deliver blood to active muscles;
- strength of force: the ability of a muscle to perform maximum effort repeatedly;
- coordination: the ability to integrate all of the above components in order to achieve efficiency.

Regarding fitness components related to health presented by the Council of Europe (1996, p.20) they are: body mass index, body composition, subcutaneous adipose tissue distribution, abdominal visceral adiposity, bone density, strength of abdominal and dorsal muscular muscles, heart and lung function, blood pressure, maximum aerobic strength and capacity, glucose and insulin metabolism, lipid and blood lipoprotein.

**Material and method**

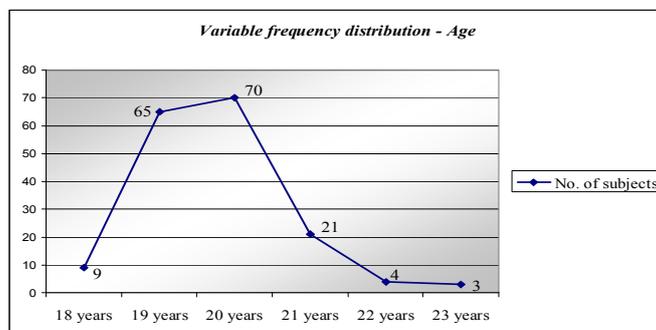
*Hypotheses of the research:* Due to the non-involvement of students in physical activities in a conscious and systematic way, the level of physical condition and harmonious physical development is low. Experimenting a set of measurements and calculating some indices can provide us with information about the physical condition and physical development of young students.

*The purpose of the research:* This research is part of a wider experiment which aimed to find out the level of young people's quality of life, physical condition and physical development. Through this study, we have managed to outline a complex picture of the physical development of the young and the degree to which some indices can be correlated with the state of health. Assessing the level of physical development and calculating the proportional relationships of the body has given us the possibility to achieve the proposed goal.

*Subjects of research:* Measurements were made on a number of 172 subjects, female. They are aged between 18-23 years and are students at the Faculty of Economics and Public Administration at the „□tefan cel Mare” University of Suceava.

Table 1. Data about the subjects

<i>Data about the subjects</i>	<i>No. of subjects</i>	<i>Percent %</i>
<b>Gender</b>		
Female	172	100%
<b>Areas</b>		
Urban area	56	32.56%
Rural area	116	67.44%
<b>Medical affections</b>		
Scoliosis	6	3.49%
Lumbar discopathy	1	0.58%
Hypertension	1	0.58%
Tachycardia	1	0.58%
Anemia	1	0.58%
Spasmophiliacs	1	0.58%
Gallbladder	3	1.74%
Diabetes	1	0.58%
<b>Muscular dystrophy</b>	1	0.58%



Graph 1. Variable frequency distribution - age

*The research methods:* study of specialized literature method, observation method, analysis method, graphical method, tabel method, statistical - mathematical method.

*Morphological indices evaluated:* we used the following measurements to determine the level of physical condition development: height, weight, Body Mass Index, waist circumference, hip circumference, Waist-Hip-Ratio. WHO said that BMI should be supplemented by measuring the waist circumference. Waist circumference is a very important indicator that identifies people with a high risk of morbidity due to the accumulation of abdominal fat. (WHO, december 2008,p.1).

The degree of danger of fat is given by the indicator circumference of the waist. A waist circumference greater than 95 centimeters in males and more than 80 centimeters in women is above the acceptable limit and is an aspect that we should worry about and deal with it. (Walker, R.,2012,p.181).

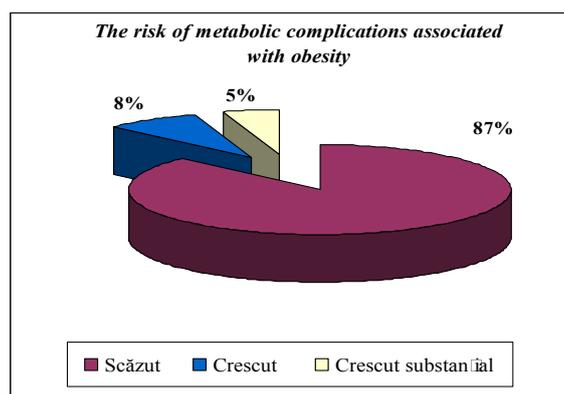
In addition to the BMI and waist circumference, WHO highlights the importance of the waist to hip ratio, as an effective way to calculate the distribution of the body fat. The waist-to-hip ratio is one of the most important indicators that can determine degrees of health risk. Many estimates of the different risks of disease occurrence were based on the calculation of this report (WHO, december 2008, pp.1-19).

**Results and discution**

After the recording and analysis of the results collected by performing anthropometric measurements and calculating the proportional relations of the body, several statistical indicators were calculated. The results were then interpreted and compared with specialized data presented by the World Health Organization.

Tabel 2. Values of the students

Statistical indicators	Height	Weight	BMI	Waist circumference	Hip circumference	Waist-Hip-Ratio
Average	164.90	57.83	21.24	68.25	94.40	0.71
Median	165	56	20.95	66	93	0.72
Mode	165	56	21.3	63	93	0.72
Min	150	43	16.1	57	81.5	0.59
Max	180	93	29.0	98	127	0.88
Amplitude	30	40	12.9	41	45.5	0.29
Standard deviation	6.06	8.42	2.72	7.75	7.73	0.04
CV	0.03	0.14	0.12	0.11	0.08	0.06
<b>Risk of metabolic complications</b>	<b>Waist circumference</b>	<b>No. of subjects</b>				
<b>Lower risk</b>	< 80	150				
<b>Increased</b>	≥ 80	14				
<b>Very high risk</b>	≥ 88	8				



Graph 2. Percentage of recorded values - Waist circumference

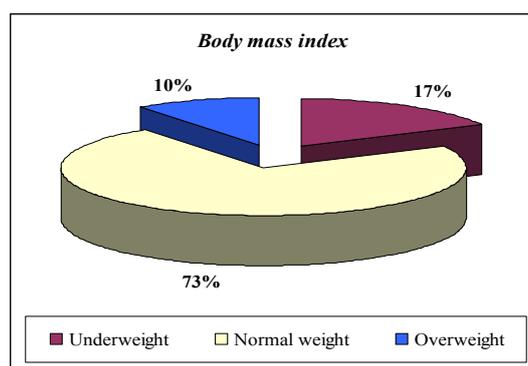
One of the important indicators of health and predictor for mortality risk at any age is waist circumference. Regarding the waist circumference of female students, we notice that the average of 68.25 cm is a good one. But by looking at the other statistical indicators and the individual results of the young, things are different. The highest recorded value of the perimeter was 98 cm, and the smallest of 57 cm. The calculated amplitude was 41 cm.

When we refer to the values and degrees of risk of metabolic complications WHO data, we note that 8% of students have a waist circumference between 80 and 88 centimeters. This involves an increased risk of metabolic complications. Then 5% of girls waist area greater than or equal to 88 centimeters, which means that is much increased risk of metabolic complications associated with obesity.

We note that 150 (87%) of the 172 students have normal waist values and have a low risk of developing metabolic complications. It is worth mentioning that 23 of the students (13.37%) have the waist circumference more than 70 cm although many of them have a normal weight or are even underweight.

Tabel 3. BMI categories

BMI categories	Normal values	No.of subjects
<b>Underweight</b>	under 18,5	30
<b>Normal weight</b>	18,5 - 24,9	125
<b>Overweight</b>	25,00 – 29,9	17
<b>Obese Class I</b>	30- 34,99	0
<b>Obese Class II</b>	35 – 39,99	0
<b>Morbidly Obese</b>	over 40	0

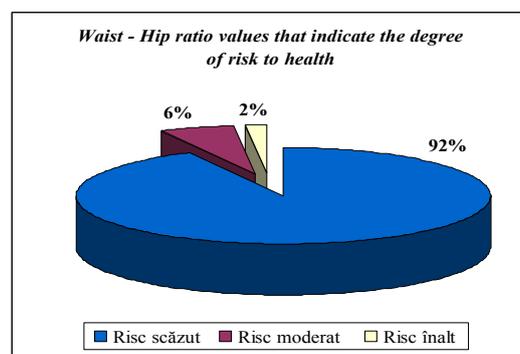


Graph 3. Percentage of recorded values – BMI

By calculating BMI, we determined the weight-to-height proportionality relationship. According to the statistical interpretation of the data, the average body mass index of the 172 students was 21.24, the mean height was 164.90 cm and the weight was 57.83 kg. (the smallest weight was 43 kg and the highest of 93 kg). The results are good, the index average being framed at normal weight. Like the waist circumference, BMI is considered an indicator of health status and a risk factor for all-cause mortality (if the values are not normal). Comparing the results obtained by us from the values given by WHO, we note that 73% of students have a normal weight, 10% are overweight and 17% are underweight. Other research on students has come to similar results to ours. Of the 160 students, 23.1% are underweight, 65.6% are normoponderal and 10.6% are overweight (Pop, C., L., Ciomag, R., V, 2015, p.14).

Tabel 4. Health risk

Health risk	Values	No.of subjects
<b>Lower risk</b>	< 0,80	159
<b>Moderate risk</b>	0,80 – 0,85	10
<b>High risk</b>	> 0,85	3



Graph 4. Percentage of recorded values - Waist-Hip-Ratio

According to the WHO, the waist-to-hip ratio indicates the degree of risk to health. In addition to BMI and Waist Perimeter, WHO highlights the importance of RTS as an effective way of calculating the distribution of body fat. The arithmetic mean waist-to-hip ratio was 0.70. This value is normal and indicates the absence of risk for comorbidities. Also, the more frequent values was 0.72.

By reporting our results to the risk score table, we note that 2% of students have an increased risk for their health due to their waist-to-hip ratio being greater than 0.85. Then, 6% of the other girls have a moderate health risk because their values are between 0.80 and 0.85. 92% of students have normal ratio of waist - hip which means that their health condition does not pose a risk.

### Conclusions

The waist to hip ratio is an important indicator for health. Many doctors see in a good report, a sign of superior general health, a low predisposition to diseases such as diabetes and cardiovascular disease. Over the years the relationship ideal values change, so the risk of illness increases. (Forsythe, J., W., 2011, p.153). All of these three parameters: waist circumference, waist to hip ratio, body mass index according to the WHO, are directly related to the degree of illness.

After making anthropometric measurements (height, weight, hip circumference, waist circumference) and calculating proportionality relationships we reached the following main conclusions:

- waist perimeter is considered by WHO to be one of the most important indicators of health and strongly predictive of mortality. 13% of the 172 students have the waist circumference over 80 cm. This involves an increased risk of metabolic complications due to abdominal fat;
- BMI indicates the state of health and risk factors for mortality from all causes. 10% of the 172 students are overweight and 17% are underweight;
- waist-hip ratio is another indicator that we can analyze the degree of risk to health. Of the 172 young women, 8% have a moderate risk even increased for their health due to the fact that their waist-to-hip ratio values are higher than 0.80.

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