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Research article

Comparative study on the importance of physical activity on body composition in adults

Elena Vizitiu[1]*, Mihai Constantinescu[1]

[1] University "Stefan cel Mare" of Suceava, Suceava, Romania; mihai.constantinescu@usm.ro (M.C.)
* Correspondence: elenav@usm.ro (E.V.) Tel.: 0755038200

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Abstract: Introduction. In the last decade, we are witnessing a transformation in the dynamics of the development of human morpho-functional structures, influenced by the socio-economic system. Among the harmful factors of contemporary civilization we list the lack of physical exercise as well as the inadequate diet. We start from the premise that by practicing constant physical activities we can demonstrate the influence of the morphological status of the adults under study. The aim of this work is to analyse some body composition parameters of adults who are moderately physically active. Results. The objectives of the study are: to identify how subjects practice physical activity, to raise awareness of the importance of the effects of physical exercise on health, to analyse and interpret the data recorded on body composition parameters using the Tanita apparatus. Conclusions: The practice of constant activities on adults leads to beneficial morpho-functional changes in the body, giving it a capacity to adapt to effort and increased resistance to pathogenic factors.

Keywords: adult, physical activities, morphological status, body composition structure, health.

1. Introduction

In the current context, studies show that physical and psycho-emotional health in the ontogenetic course is in a continuous state of change.
Physical activity is a form of body control in the bio-psycho-social context of health and disease, especially in the context of the COVID-19 pandemic, can maintain and increase functional capacity and can be optimized and individualized according to age, gender, body mass index, functional capacity, comorbidities [1].
The OMS recommends that adults should engage in a minimum of 30 minutes/day of moderate-intensity aerobic activity every week in the interest of health and well-being. According to recent studies, the obesity rate is 25% and 50% of Romanians are overweight [2]. Other studies have concluded that "While adult obesity figures are worrying, those for children are an even more important public health problem - perhaps one of the most significant in the 21st century. Serious weight problems that could lead to life-threatening diseases in adulthood are already being diagnosed in obese adolescents" and "Lastly, programming that provides access to vulnerable populations is necessary because throughout a child's life, low SES is an influence on later development of adult obesity." [3,4]. Physical activity can reduce pain in musculoskeletal conditions, increase joint mobility, thus functional capacity, and play a role in improving femoral bone health, preventing osteoporosis [5, 6, 7]. There are studies that show that 2 out of 3 obese people can develop osteoarthritis of the knee, the incidence of this pathology depends on the increase in body mass index. The increase in body mass index values correlates with increased mechanical stress on the joints, especially during walking [8]. The main cause leading to obesity is the "energy imbalance between the calories assimilated from food and their burning throughout the day" [9]. „Over-consumption of high-energy foods and a lack of physical activity

are the main behavioural risk factors for people to develop obesity"[10]. In its broadest sense, body composition represents those adipose tissues that are located mainly subtegumentary to the middle of the omentum and retroperitoneum. Adipose tissue comprises white adipose tissue, which protects the internal organs and is an insulator for maintaining a constant body temperature. The yellow tissue contains carotene, while the brown adipose tissue is found in small quantities in adults, in the scapular and subscapular region. In recent studies, specialists have discovered and described that there is also beige adipose tissue, which does not have a specific location, unlike white or brown adipose tissue. It is claimed that this tissue originates from white adipose tissue and is under the influence of several stimuli, a process called 'browning' of white adipose tissue [11]. The distribution of adipose tissue is controlled primarily by genetic factors, then age, gender and environmental factors.

The literature distinguishes two subtypes of obesity, the gynoid type which is characterised in women as pear-shaped, fat cells deposited around the thighs and buttocks. The android type is more common in men and the distribution of fat cells is in the abdomen. Current research shows different methods of regulating body weight in both children and adults, with the aim of maintaining it within certain normal BMI values.

Body mass index is an indicator of nutritional status and plays a role in the diagnosis of obesity. It is known that the basal metabolic rate decreases by about 10 kcal/per decade of age. It is therefore important that the diet contains plenty of fibre, carbohydrates, fruit, vegetables and a low amount of animal fat. Lack of physical activity leads to changes in body mass index and a decrease in muscle mass [12].

In this regard, we propose the practice of physical activities as a potential means of regulating body composition in adults, in order to understand the value of their practice. It is important to know the physiological parameters of exercise as well as the influences they have on adaptation and regulation mechanisms.

By practicing physical activity on a regular basis and students tried to reduce stress, tone their body muscles, especially the respiratory muscles to cope with the COVID-19 pandemic [13].

Variants of physical activity in water (Aqua gym and Aqua Jogging) have beneficial effects on multiple levels (stimulation of blood circulation, thermoregulation, improving balance and coordination, rehabilitation of structures affected by injuries, etc.) [14].

In an extensive study published in 2022, Mocanu, Murariu and Onu, demonstrated that postural stability is a factor that conditions the motor performance of athletes and different categories of the population involved in activities requiring physical effort. Sudiul highlighted the differences that occur in terms of balance performance in students according to their classification by BMI levels. They followed 109 students from the Faculty of Physical Education and Sport, who were divided by anthropometric assessment into 3 groups based on BMI levels: underweight, normal, and overweight. They have shown that underweight and overweight have better mean scores than overweight, and the lack of statistical significance of these differences can be explained by the specialization of the students, constant involvement in performance, curricular or leisure physical activities improving balance test performance for the overweight category [15,16]. Experts point out that both nationally and internationally there are public politics in place to implement "primary prevention is the first step to be taken, through nutrition education and encouragement of physical activity [17]. "At least in developed countries, socio-economic conditions have changed greatly, and there has been an overall improvement in living standards, which is likely to have contributed to the upward shift in adiposity"[18].

The main reason for attracting overweight adults to physical activity can be presented by explaining the benefits in terms of maintaining and improving morphofunctional parameters. Regarding the assessment of body composition, in the authors' work it can be determined by several methods: underwater weighing and DEXA, but they are expensive and inaccessible [19]. Another non-invasive assessment device is called "TANITA", and it can analyse body composition by bioimaging, providing personalised data of some

morphofunctional parameters. This information helped us in the statistical analysis of the data obtained from the subjects' assessment.

2. Materials and Methods

The participants in the study were adult men and women, aged 26-55 years, who had no contraindications to physical activity and who gave their consent to the use of the data recorded by the Tanita for scientific purposes. The evaluation was carried out in accordance with the ethical and deontological rules in force.

One group was made up of 15 people, who participated in the Suceava Cross Country event, edition VII 2022, training for it and another group was also made up of 15 people, practicing different sports activities (aquagym, fitness, etc.), 2 days/week. The tests with the TANITA apparatus were carried out at the Suceava Crossroads for group no.1 and for group no.2 the tests were carried out at Railway Hospital Iasi - Specialty Ambulatory of Suceava.

1. Hypothesis of the paper: it is assumed that constant physical activity can influence the morphological status of the adult subjects.
2. Purpose and objectives:

The aim of this study is to carry out an analysis based on the TANITA apparatus aimed at evaluating some body composition parameters of adults who practice moderate physical activities.

The objectives of the study are; to identify the way in which the subjects practice physical activity, to make the participants aware of the importance of the effects of physical exercise on their health, to analyse and interpret the data recorded on body composition parameters using the TANITA apparatus

3. For the comparative analysis between the two groups, body composition was revealed by the following indicators: BMI, body water percentage, fat mass percentage and muscle mass percentage. The study period lasted approximately 3 months (August-October 2022).

3. Results and discussion: To better understand and visualize the recorded data we used tabular and graphical methods. Table 1 shows the results of the body composition parameters selected from the Tanita apparatus sheet.

Table 1. Group participating in the Suceava Cross event -VIIth edition

	Age (years)	Height (cm)	Weight (kg)	BMI (uc)	Percentage of body water %	Fat mass percentage %	Percentage of muscle mass %
x	41,60	166,93	69,53	24,47	52,53	27,60	45,93
σ	10,30	6,89	13,78	3,50	6,99	9,99	10,65
Cv%	24,76	4,13	19,82	14,30	13,31	36,20	23,20
min	27,00	161,00	48,00	18,00	39,00	12,00	30,00
max	55,00	182,00	100,00	30,00	64,00	47,00	65,00
median	41,00	171,50	74,00	24,00	51,50	29,50	47,50

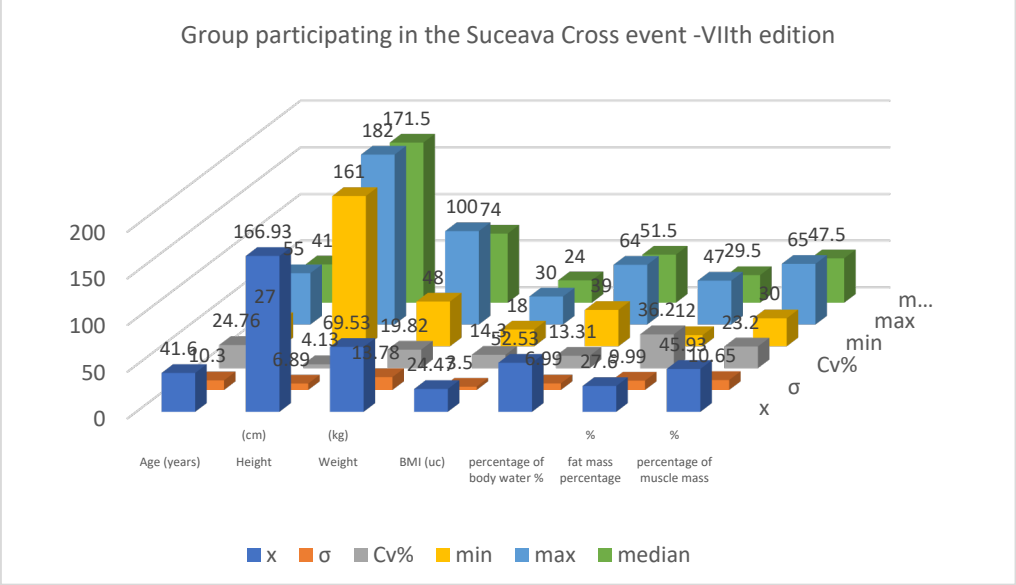

Figure 1 Results of the statistical indicators for the group participating in the event Suceava Cross Country Run -VII edition

Figure 1 shows a group average age of 41.60 years, the age at which the adult moves towards Presenescence, a period in which the organism undergoes a series of morpho-functional deconditioning transformations. In the height test the group average height is 166.93 cm, weight 69.53 kg, and the calculation of the group average between height and weight results in a BMI of 24.47 uc. According to the BMI value the group is at a weight-normal status.

For the parameter, percent body water, the group average is 52.53% falls within a normal value of percent body water mass. The group mean for the parameter percentage of fat mass is 27.60%, is considered normal and as is known increases with age, and for the parameter percentage of muscle mass is 45.93% is within normal parameters. Results Cv % at tested parameters where is ≤ of 35 % the group is considered homogeneous (Table no. 2).

Table no.2 Group participating in various sports activities

	Age (years)	Height (cm)	Weight (kg)	BMI (uc)	Percentage of body water %	Fat mass percentage %	Percentage of muscle mass %
x	36,93	172,40	74,93	25,07	56,33	25,20	53,20
σ	8,13	7,72	13,31	2,86	9,75	5,69	9,59
Cv%	22,01	4,48	17,77	11,42	17,32	22,60	18,03
min	26	158	55	20	41	15	39
max	54	188	99	30	75	35	71
median	40	173	77	25	58	25	55

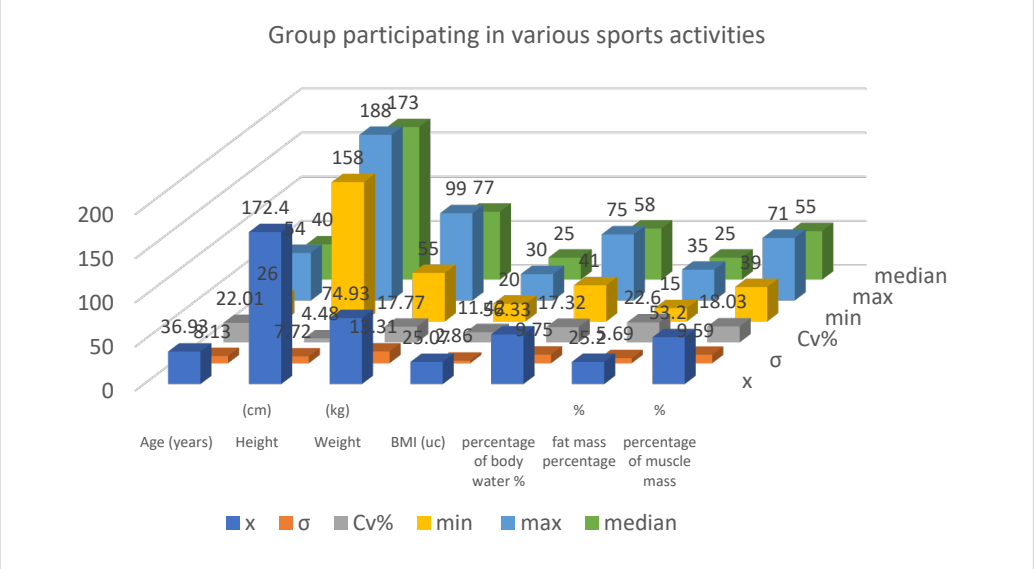

Figure 2 Results of statistical indicators for the group participating in different sports activities

Figure 2 shows that the average age of the group is 36.93 years, the age at which they are aware of the need to exercise. When testing height, the group average is 172.40 cm, weight 74.93 kg, and calculating the group average between height and weight results in a BMI of 25.07 uc.

According to the BMI value the group is slightly overweight. For the parameter, percent body water, the group average is 56.33% falls within a normal value of percent body water mass.

The group mean for the parameter percentage of fat mass is 25.20%, is considered normal and as is known increases with age, and for the parameter percentage of muscle mass is 53.20% is within normal parameters. Results Cv % at tested parameters where is ≤ of 35 % the group is considered homogeneous. As for the average age difference between the two groups is 4.67 years, the average difference in height parameter is 5.47 cm, in weight is 5.4 kg, BMI results 0.6 uc, water percentage 3.8%, fat mass 2.4% and muscle mass 7.27%.

The group in which the subjects participate in various sports activities twice a week is found to have a higher percentage of muscle mass than the group that participated in cross-country resulting in a higher BMI within normal parameters.

4. Conclusions

1. Specialists in the field consider that aspects of body composition need to be assessed when developing a work plan involving sports activities and their effect on health;
2. The influence of constant activity on adults leads to beneficial morphofunctional changes in the body, making it more adaptable to stress and more resistant to pathogenic factors;
3. Subjects participating in various sports activities twice a week showed a higher percentage of muscle mass (7.27%) than the group that participated in cross-country running;
4. Analysis of the parameter, the percentage of fat mass shows a lower percentage of 2.4% in the group practicing different sports activities compared to the group participating in cross-country.

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