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Original article

OBSERVATIONAL STUDY REGARDING THE BODY MASS INDEX IN ADULTS

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Abstract

Purpose. The purpose of this research was to conduct an observational study regarding the body mass index in adults.

Methods. The research methods were established according to the objectives of the research, as follows: the study of the professional literature method, the testing method, the statistical-mathematical method and the graphical representation method (Ababei, 2006).

Results. The results showed that the monitored values, of weight, BMI, muscle mass, metabolic rate, body fat, is related to age, but they presented a positive regression, when the initial and final results are compared, which shows that controlled and monitored exercise has general positive effects on one's health.

Conclusions. At the end of the research, one can conclude that the application of a specific, very well structured prophylaxis program, performed regularly, can lead to a decrease of body weight in adults with this kind of imbalances.

Key words: study, body mass index, weight, adult.

Introduction

Adulthood comprises moments of anatomical and functional transformation that increase in size and intensity, and that at the same time very important for the development of an individual.

The human body is a complex dynamic system composed of subsystems with very different chemical compositions and densities (proteins, water, bones, fat, etc.) maintained under constant proportions and functionally integrated. Any disturbance in their repartition causes functional imbalances that increase the risk of getting sick or generate specific pathologies (obesity, malnutrition, edemas, dehydration) (Cordun, 2009:99-100).

The body composition is the sum of the various components of the human body, expressed through body weight. The distribution and size of these components constitute the body structure and are expressed in absolute or relative values or as percentage. These values express not only the physical characteristics of the body but they also give information regarding the body functions.

A very good method to check one's health is to periodically assess the Body Mass Index (BMI), this being able to indicate if one has a normal weight for one's height.

The Body Mass Index is a scientifically

acknowledged indicator, established as a result of studies of a great amplitude that aimed to reveal a link between the height-weight ratio, and the state of health. The statistics showed that the persons whose BMI is between 18.50 - 25 are healthier. Less or more than these values represents a risk for one's health, the excessive weight deficit being also the cause for various health problems.

The Body Mass Index values are to be taken as guidelines. These values must be used in correlation with other information in order to establish the risks for one's health (<http://www.cdt-babes.ro/articole/indicele-de-masa-corporala-imc.php>).

The obesity rate increase among young people in general is caused by an increase in comfort due to technological innovations, which leads to a lack of exercise and fast food consumption.

Physical therapy plays a major role in improving the health of obese or overweight persons, bringing and maintaining the body within normal weight limits. For this, the therapist will try to apply individual complex exercises, adapted to each patient.

This conception results from the fact that exercise is very important and necessary for a harmonious and healthy development of the body.

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Physical therapy can intervene in the treatment of overweight or obese persons, helping the body eliminate the excess adipose tissue, highlighting the fact that a healthy diet and adequate exercise can greatly help the weight loss.

Methods

Over the course of the research a series of methods were used, both as a scientific foundation, and for the recording of data that would support the study (Ababei, 2006).

This research started from the desire to conduct an assessment of the subjects in order to observe their stage in regard to their weight and height in relation to their age, but also to observe the effectiveness of the physical therapy rehabilitation methods and techniques that can be applied to overweight adults. Considering these premises, the authors aimed to prove the following hypotheses: presumably, by assessing the weight and height and calculating the Body Mass Index, one can spot the adults who could present weight imbalances in relation to their age; presumably, by applying a well structured, organized and regular prophylactic program, one can obtain a decrease in the body weight of the adults with this kind of problems.

This research was conducted at the TNT Sports Club in Bacau, where the investigations and tests were conducted, and the prophylactic programs for adults were applied. The gym was equipped with all of the materials necessary for the research.

The study was conducted on 44 subjects, of which 13 were between the ages of 20 and 30, 19 between 31 and 40, and 12 between 41 and 50. There was an initial recording of the subjects' height and weight, and with the help of the body analysis weighing scale, the following data was also recorded: fat percentage, muscle mass percentage, body fat and metabolic rate. The prophylactic programs were 50 minutes long, being conducted two times a week. They were formed of an initial part consisting in warm-up exercises, a fundamental part comprising dynamic games and specific exercises and a closing part formed of stretching and breathing exercises. The objectives were to prevent bad postures and to maintain a good body posture; to improve / increase the effort capacity; to decrease and maintain the body weight within normal limits and avoid obesity; to adapt the breathing to the walking rhythm; to improve peripheral circulation; to improve muscle tone; to improve the subjects' mental state and general health.

The purpose of these programs was to educate and motivate the subjects to adopt a

healthy lifestyle that would comprise constant and regular exercise in order to maintain an optimal body weight in relation to their age.

A series of tests were conducted over the course of the research to gather data in relation to the definition of the "recommended" weight, taking into account the subjects' height and age. The average weight values with deviations of plus or minus 5% are considered normal. In this sense, 5%-10% is considered to be the threshold between normal and pathological, over 10% being pathological (Balint, 2006:68).

The Body Mass Index represents the ratio between the weight in kilograms (W) and height in centimeters (H) to the square. This index establishes the correlation between the subcutaneous adipose tissue and total body fat, being the most useful indicator when screening obesity. If by measuring the BMI we get a value between 19 and 24, this is considered to be the ideal weight; a value between 25 and 30 indicates overweightness, and over 30 indicates obesity. $BMS = W/H^2$, where: BMI = Body Mass Index, W = weight, H = height.

The fat/adipose tissue percentage refers to the quantity of adipose tissue in relation to the total body weight, expressed in percentages. Percentage of adipose tissue (%) = {Adipose tissue mass (kg) / Body weight (kg)} × 100. Normal adipose tissue is between 17% and 26% in men and between 22% and 33% in women. This percentage increases with age.

The muscle mass percentage is 38-54% of the body weight in men and 28-39% in women, according to their fitness and age.

The metabolic rate, expressed in kcal, represents the energy intake the body needs, in a state of complete rest, in order to maintain the vital functions. About 70% of the total human body energy is consumed for the vital functions of the organs. Around 20% is consumed for physical activities, and 10% for digestion.

The body fat is the fat found inside the abdominal cavity, surrounding the organs in the abdominal area. Values between 1-12 are considered normal, while values between 13-59 are correlated to excess body fat and predisposition toward metabolic disorders (www.catenapascupas.ro/informatii-medicale/notiuni-importante-despre-compozitia-corpului-uman).

Results

After analyzing the initial and final assessments, one could see that this methodology led to an improvement of the assessed markers.

Table 1 presents the initial and final values of the markers - weight, Body Mass Index,

fat, muscle mass, metabolic rate and body fat.

Table 1 Initial and final values of the assessed markers

No.	Initials	Age (years)	Height (cm)	Weight (kg)		BMI		%Fat		%Muscle mass		Metabolic rate		Body fat	
				I.	F.	I.	F.	I.	F.	I.	F.	I.	F.	I.	F.
1.	C.A.	23	177	90.7	86	28.6	27.5	27.5	24.6	35.6	37.5	1993	1915	8	5
2.	M.A.	23	168	75.8	64.4	26.9	22.8	44.7	35.5	22.6	26.5	1470	1364	6	4
3.	M.F.	25	163	63	54	23.7	20.3	26.8	20.5	23.2	26.3	1451	1305	7	4
4.	R.B.	26	163	80.2	78.1	30.2	29.4	46.8	46.6	22.5	22.3	1494	1472	9	9
5.	O.D.	27	163	68.8	62.5	25.9	23.5	40	34.8	25.2	27.3	1384	1325	7	5
6.	M.V.	28	156	79.8	67.2	32.8	27.6	49.2	40.8	21.9	25.5	1451	1335	9	7
7.	N.L.	28	164	64.1	59.6	23.8	22.2	34.6	34	27.8	26.6	1348	1304	5	5
8.	B.A.	29	165	54.3	51.8	19.9	19	25.8	21.5	30.6	32.7	1261	1240	3	3
9.	Ş.A.	29	176	73.8	62	23.8	20	44.2	41.9	23.9	25.1	1583	1500	8	6
10.	H.T.	29	167	84.1	75.6	30.2	27.1	48.7	45.1	21.3	22.3	1544	1465	7	6
11.	T.D.	29	178	79.2	70.8	26.5	22.3	28.4	16.9	34.6	40.9	1748	1643	10	5
12.	M.C.	30	164	65.4	60.9	24.3	22.6	33.7	29.2	28.8	30.7	1364	1324	5	4
13.	I.R.	30	166	68.3	63.5	24.8	23	38.8	35.3	25.5	26.7	1391	1347	5	5
14.	I.C.	31	189	98.5	91.1	27.6	25.5	28.1	23.1	33.9	36.8	1986	1894	10	7
15.	D.V.	31	182	113.1	105.3	34.5	31.2	35.8	32.9	30	31.7	2188	2086	14	11
16.	M.T.	32	160	58.1	52.4	22.7	20.5	30.1	23.5	30.1	32.8	1272	1220	4	3



17.	N.C.	33	172	81.6	68.3	27.6	23.1	40.9	29.5	25.8	30.9	1564	1448	6	4
18.	S.D.	33	169	89.1	80.6	31.2	28.2	35	24.1	29.9	37.4	1712	1784	7	11
19.	N.C.	34	169	81.9	80.5	28.7	28.4	26.4	25.7	36.1	36.5	1799	1780	12	11
20.	F.P.	34	168	95.8	88.2	33.9	31.3	44.7	43.9	25	26.2	1716	1619	8	7
21.	E.D	35	160	84.9	68	33.2	26.6	46.4	34.8	23.9	29	1538	1383	9	6
22.	A.C.	36	166	91.1	87.6	33.1	31.8	46.4	45.3	23.8	24.2	1635	1597	9	8
23.	P.O.	36	155	64.2	57.1	26.7	23.8	43.2	38.8	23	23.6	1297	1239	7	6
24.	R.S.	36	174	70.2	64.9	23.2	21.4	29.6	23.1	30.9	33.9	1481	1439	4	3
25.	D.I.	36	160	64.9	64.6	25.4	25.2	32.6	31.4	29.9	30.6	1352	1354	6	6
26.	C.C.	36	189	120.3	110.4	33.7	30.9	36.9	34.4	28.8	30.1	2250	2121	16	12
27.	G.R	37	165	88.5	77.9	32.5	28.6	46.4	41.1	23.7	25.9	1599	1395	9	7
28.	O.S.	38	178	97.7	91.3	30.8	28.8	27.4	24.5	33.5	34.9	1947	1863	15	12
29.	T.R.	38	154	82.8	72.5	34.9	30.6	54.2	48.9	18.7	20.9	1466	1370	10	8
30.	T.A.	39	180	117.9	98.4	36.4	30.4	37.4	26.5	28.8	34.7	2154	1984	9	7
31.	I.C.	39	163	80.2	71.3	30.2	26.8	47.2	41.8	22.3	24.5	1490	1407	8	7
32.	L.P.	40	167	69.7	65	25	23.3	36.3	31.9	27.4	29.4	1419	1370	5	5
33.	P.M.	42	164	91.3	76.2	33.9	28.3	48.3	40	22.7	26.3	1622	1480	11	8
34.	O.M.	42	164	86.7	79.6	31.8	29.6	45.7	44.2	23.9	24.1	1583	1500	10	8
35.	O.S.	43	178	111.2	102.6	35.1	32.4	33.8	30.2	30	31.9	2117	2009	19	15
36.	A.R.	43	162	92	82.6	35.1	31.5	49.2	44.8	22.5	24.4	1619	1528	10	8
37.	S.A.	43	179	108.1	98.4	33.7	30.7	41.8	31.6	26.4	31.6	1945	1565	9	11
38.	A.L.	44	170	93.6	85.8	32.4	29.6	38.5	38.1	28	27.8	1751	1638	9	8
39.	C.A.	44	162	92	82.6	35.1	31.5	49.2	44.8	22.5	24.4	1619	1528	10	7
40.	A.D.	45	174	62.5	58.9	20.6	19.5	26.6	24.5	30.9	31.3	1393	1357	4	3
41.	M.A.	46	164	90.3	84.7	33.6	31.5	48.9	45.7	22.3	23.8	1606	1556	10	9
42.	Z.D.	47	163	92.6	80.8	34.9	30.4	53.3	45.4	19.7	23.6	1609	1506	11	8
43.	C.L.	47	156	78.2	72.9	32.1	30	49.4	46.	21.	22.	1438	1388	11	1

									8	4	2				0
44.	M.S.	48	178	129. 6	111. 7	40.9	35.3	44.4	32. 7	25. 4	30. 7	2234	2127	12	1 0

Using the initial and final results presented in table 1, the authors calculated the initial and final average values of the markers on age categories, found in table 2.

Table 2 Initial and final average values of the markers on age categories

Markers	Assessment	Age category		
		20-30 years old	31-40 years old	41-50 years old
Weight	Initial	72.8	86.8	94
	Final	65.8	78.7	84.7
BMI	Initial	26.2	30.06	33.2
	Final	23.6	27.1	30
Fat	Initial	37.6	38.1	44.09
	Final	32.8	32.9	39
Muscle mass	Initial	26.4	27.6	24.6
	Final	28.4	30.2	26.8
Metabolic rate	Initial	1498	1677	1711
	Final	1426	1597	1598
Body fat	Initial	6.8	8.8	10.5
	Final	5.2	7.4	8.7

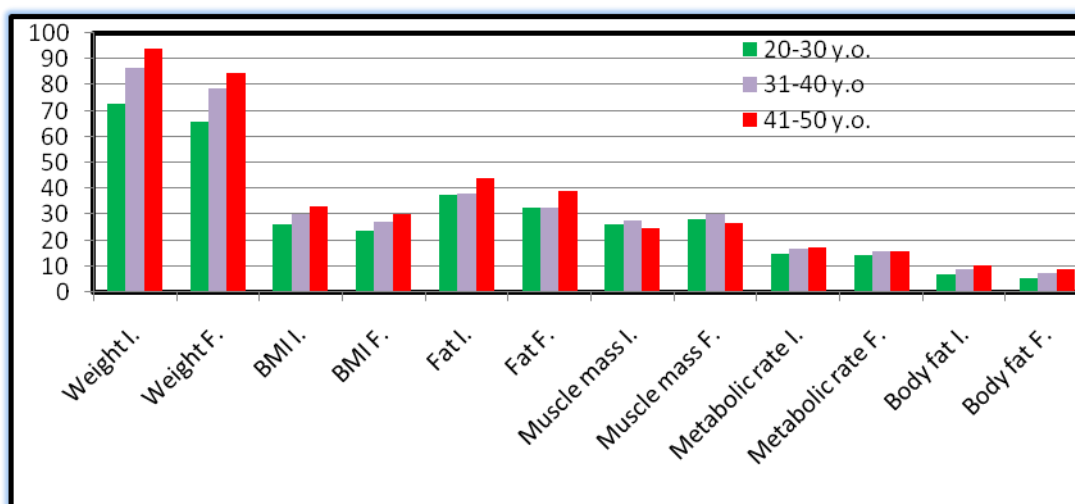


Figure 1 Graphical representation of the initial and final average values of the markers on age categories

Figure 1 highlights the average progress of the subjects' monitored markers.

As one can see in figure 1 and table 2, there is a progress from the initial to the final tests of the markers - the weight, Body Mass Index, fat, muscle mass, metabolic rate and body fat, as follows:

- for the 20-30 age category, the initial average weight was 72.8 kg, and the final one, 65.8 kg, with a difference of 7 kg. For the 31-40 age category, the initial

average weight was 86.8 kg, and the final one, 78.7 kg, with a difference of 8.1 kg. For the 41-50 age category, the initial average weight was 94 kg, and the final one, 84.7 kg, with a difference of 9.3 kg. One can observe, in both the initial and the final assessment that the body weight has increased with age.

- In regard to the Body mass Index, there is the same increase with age. For the 20-30 age category, the initial BMI value was of

- 26.2, and the final one, 23.6; for 31-40, the initial BMI value was of 30.06, and the final one, 27.1; for 41-50, the initial BMI value was of 33.2, and the final one, 30;
- the fat percentage values were as follows: for the 20-30 age category, 37.6% (initial) and 32.8% (final); for 31-40, 38.1% (initial) and 32.9% (final); for 41-50, 44.09% (initial) and 39% (final), which shows a decrease in the adipose tissue as a result of the controlled physical activity;
 - the muscle mass percentage values were as follows: for the 20-30 age category, 26.4% (initial) and 28.4% (final); for 31-40, 27.6% (initial) and 30.2% (final); for 41-50, 24.6% (initial) and 26.8% (final), which shows an increase in the muscle mass;
 - In regard to the metabolic rate, there is the same increase with age. For the 20-30 age category, the initial value was of 1498, and the final one, 1426; for 31-40, the initial value was of 1677, and the final one, 1597; for 41-50, the initial value was of 1711, and the final one, 1598.
 - For the 20-30 age category, the average body fat values were 6.8 (initial) and 5.2 (final). For the 31-40 age category, the average body fat values were 8.8 (initial) and 7.4 (final). For the 41-50 age category, the average body fat values were 10.5 (initial) and 8.7 (final). One can notice a decrease in the average body fat value.

Discussions

Mârza, D. (2005) thinks that there is an universally accepted truth that in order to maintain and optimize your health, you must exercise. She also states that the psycho-somatic integrity and functioning needs a rational and continuous that must go beyond the average individual possibilities.

Thus, it can be said that the exercise programs must be compatible with the individual particularities connected to health, age, gender, and personal goals. An important role in the prophylactic programs is played by collaboration and open communication with the patients, the coach and the physical therapist; one needs their trust and conviction that through sustained physical activity, performed correctly and regularly, this weight imbalance can be remedied, providing the patients a state of well-being.

Conclusions

Based on the results that were recorded, analyzed and interpreted, one can draw the following conclusions:

The following hypotheses were confirmed: by assessing the weight and height and calculating the Body Mass Index, one can spot the adults who could present weight imbalances in relation to their age; by applying a well structured, organized and regular prophylactic program, one can obtain a decrease in the body weight of the adults with this kind of problems.

The results showed that the monitored values, of weight, BMI, muscle mass, metabolic rate, body fat, is related to age, but they presented a positive regression, when the initial and final results are compared, which shows that controlled and monitored exercise has general positive effects on one's health.

Physical activity, in general, leads to maintaining and strengthening one's health, prolonging one's life, and erasing the effects of daily stress.

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