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Study on the influence of exercises on the body mass index in first year students

Studiu privind influenţa exerciţiilor fizice asupra indicelui de masă corporală la studentele de anul I

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Abstract

Background. More and more studies show the role of exercise in maintaining the health of the individual, a key factor being the control of body weight. This can also be achieved through systematic practice of physical exercises.

Objectives. The research aimed to determine the effect of physical exercises, as aerobic gymnastics, over the female student's body mass in the survey.

Method. The research was conducted over a period of 14 weeks (10.01.2013 - 17.01.2014) with a total of 60 students, aged between 19 and 20 years, from the North University Center of Baia Mare. The group of students was divided into two smaller groups (experimental and control). At the beginning of the semester (T1), female students were measured, height and weight parameters being required to calculate the body mass index (BMI). On the last week of the experiment, the final results were measured and recorded (T2). During this period, the experimental group participated in a weekly aerobics class and the control group attended conventional physical education lessons. At the end, elements of descriptive statistics were calculated, the data obtained being presented using indicators of centralization, location and distribution. To test the normal distribution, we used the Shapiro-Wilk test. Variance was tested with the F or Levene and/or Bartlett tests.

Results. Data recorded at the initial testing were compared with data recorded in the final tests. Through the statistical analysis for *body weight* values, in the case of paired samples (*moments T1-T2*), we observed highly significant differences for both groups ($p<0.01$). On the statistical analysis of *BMI* values (*moments T1-T2*), there were statistically significant differences in the experimental group ($p<0.05$) and insignificant differences in the control group ($p>0.05$).

Conclusions. Exercise practiced as aerobic gymnastics have a greater positive influence on BMI in students in the experimental group compared to the control group, so we deduce that the use of aerobic gymnastics in the gym class for female students is beneficial in terms of improving BMI.

Key words: exercise, aerobics gymnastics, body mass index.

Rezumat

Premize. Tot mai multe studii arată rolul exerciţiilor fizice în menţinerea stării de sănătate a individului, un element cheie fiind controlul masei corporale. Aceasta se poate realiza şi prin practicarea sistematică a exerciţiilor fizice.

Obiective. Cercetarea şi-a propus să evidenţieze efectul exerciţiilor fizice, sub forma gimnasticii aerobice, asupra masei corporale a studentelor participante la studiu.

Metode. Cercetarea s-a desfăşurat pe o perioadă de 14 săptămâni (1.10.2013 - 17.01.2014) şi s-a realizat pe un număr de 60 studente, cu vârsta între 19- 20 ani, din Centrul Universitar Nord din Baia Mare, împărţite în două loturi (experimental şi de control). La începutul semestrului (T_1) s-au măsurat înălţimea şi greutatea studentelor, parametri necesari calculării indicelui de masă corporală (IMC), iar în ultima săptămână s-au măsurat şi înregistrat rezultatele finale (T_2). Pe această perioadă lotul experimental a beneficiat de o oră tip gimnastică aerobică săptămânal, iar lotul de control a beneficiat de lecţia clasică de educaţie fizică. La final au fost calculate elemente de statistică descriptivă, datele fiind prezentate utilizând indicatori de centralizare, localizare şi distribuţie. Pentru testarea distribuţiei normale s-a folosit testul Shapiro-Wilk. Varianţa a fost testată cu testele F sau Levene şi/sau Bartlett.

Rezultate. La analiza statistică a valorilor *masei corporale pentru probe perechi (momentele T1-T2)*, au fost observate statistic diferenţe foarte semnificative pentru ambele grupe ($p<0,01$). La analiza statistică a valorilor IBM (*momentele* T_1-T_2), au fost observate diferenţe statistic semnificative la grupa experiment ($p<0,05$) şi nesemnificative la grupa de control ($p>0,05$).

Concluzii. Exerciţiile fizice practicate sub forma gimnasticii aerobice au avut o influenţă pozitivă mai mare asupra IBM la studentele din lotul experimental, comparativ cu studentele din lotul de control, de unde deducem că folosirea gimnasticii aerobice în ora de sport la studente, este benefică sub aspectul îmbunătăţirii IBM.

Cuvinte cheie: exerciţii fizice, gimnastică aerobică, indice de masă corporală.

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Introduction

The main objective of physical education and sport is to improve and maintain health. The importance of this objective for every human being emerges from the definition of health; if one has physical, mental and social welfare, one has a comfortable balance in life. This comfort is achieved by physical activity. Almost 2000 years ago, Hippocrates and Galen confirmed the existing relationship between movement and physical and mental health. Preparedness for activity of an individual is closely related to physical condition. The body structure, the proportion of fat and muscle to total weight and height, is important in maintaining optimal physical condition (Dumitrescu et al., 2013).

An improved physical condition motivates one to perform their daily activities with sufficient energy and it also helps maintaining one's body weight within normal parameters, an element of particular importance, especially for young students, from a physical and mental point of view.

The vast majority of young people consider sports as either a casual activity or an activity designed to achieve performance (Ganciu, 2009).

Furthermore, studies have shown that body mass index (BMI) levels correlate with body fat and future health risks. Excess adipose tissue (obesity) has been shown to be deleterious for multiple body organ systems through thrombogenic, atherogenic, oncogenic, hemodynamic and neurohumoral mechanisms and has been linked to multiple medical conditions, such as diabetes, heart disease and several types of cancer (Poirier et al., 2006). BMI, which shows reasonably good correlations with more direct measures of adiposity and consistent linkages with adult overweight- and obesity-related co-morbidities, will likely continue to be the main measure of weight status in children (Must & Anderson, 2006).

A recent review of screening for pediatric overweight undertaken by the US Preventive Services Task Force came to a similar conclusion (Whitlock et al., 2005). Widespread adoption of BMI-for-age will depend upon continued efforts to train individuals in the appropriate use of national and international growth references (Anderson et al., 2006).

Direct but simple measures of body fatness and measures of body fat distribution may be helpful in such individuals to further stratify them according to their level of body fatness (Romero-Corral et al., 2008).

Based on the keywords: exercise, aerobics, body mass index, we will try to define these concepts. Exercise is, in didactic sense, the most important tool with multiple functions and applications in planning and delivering the training process (Hanţiu, 2013).

Aerobics is a physical sports activity with many positive aspects, having as a main reference feature the motor and mental capacity of the individual, with beneficial effects on physical condition and health (Grosu, 2010).

BMI is an indirect anthropometric indicator and also, a method for checking the health status. The body mass index is an appropriate screening test to identify children who should have further evaluation and follow-up, but it is not diagnostic of the level of adiposity (Freedman, 2009). BMI must be interpreted relative to age and sex (Reilly, 2006).

Objectives

The research aims to highlight the effects of exercise, as aerobic gymnastics, on the body mass of the surveyed female students.

Hypothesis

We assume that by applying body styling programs, as part of aerobics, to the experimental group, the body mass index will improve, compared to the control group, who performs regular physical education classes.

Material and methods

Research protocol

We mention that we obtained the approval of the Ethics Commission of the North University Center of Baia Mare to carry out the survey. We also obtained the written consent of the subjects to participate in this research.

a) *Period and place of the research*

The research was conducted at the North University Center in Baia Mare, over a period of 14 weeks (01.10.2013 - 01.17.2014).

b) *Subjects and groups*

The experiment was conducted on a sample of 60 first year students, aged between 19 and 20 years, divided into two groups (experimental and control).

c) *Tests applied*

At the beginning of the semester (T_1), the height and the body mass of female students were measured, these parameters being required to calculate BMI, and on the last week the final results were measured and recorded (T_2). During one semester, the experimental group participated in an aerobics class for one hour weekly, and the control group attended conventional physical education lessons. The complexes of exercises used were a combination of personal ideas and other authors' ideas: Dobrescu, (2008), Grosu, (2012), Stoica, (2011).

The technical content of the operational resources used, the working methods and scientific delineation of the main notions employed were correlated with the latest trends in choreography and music (Moraru, 2012).

d) *Statistical processing*

Statistical indicators: elements of descriptive statistics were calculated, the data being presented by using indicators of centralization, location and distribution.

In order to test the normal distribution, the Shapiro-Wilk test was used. Variance was tested with the F or Levene and/or Bartlett tests.

We used the t (Student) test for normal distribution data, and for uneven distribution rank values, we used the non-parametric Mann-Whitney test (U) for two unpaired samples, or the Wilcoxon test for paired samples.

To detect the correlation between two continuous quantitative variables with normal distribution (uniform), we used the Pearson correlation coefficient (r). For the uneven distribution of variables, we used Spearman's rank correlation coefficient (ρ). The analysis of correlation

coefficients was performed using Colton's rule.

Results

Indicator analysis

The data recorded at the initial testing (T1) and final testing (T2) for the two groups were summarized in Table I.

Discussion

On the statistical analysis of body mass values for paired samples (moments T_1-T_2), highly statistically significant differences were observed for both groups ($p < 0.01$), as shown in Table I.

On the statistical analysis of body mass values for unpaired samples, no statistically significant differences were observed between the two groups.

Between moments T_1 and T_2, there were no changes in height in the two groups of athletes. For unpaired samples, statistically significant differences were observed between the two groups in both time points.

On the statistical analysis of paired samples for BMI values (moments T_1-T_2), statistically significant differences were observed in group I (experimental) ($p<0.05$) and insignificant differences were seen in group II (control) ($p>0.05$). For the unpaired samples, there were no statistically significant differences between the two groups in either of the two points.

Correlation analysis

Statistical analysis. The correlation data in the two studied groups are found in Table II.

Moment analysis

a) According to the results presented in Table II, it is apparent that at moment T_1, for the first group, the statistical analysis of the correlation between the indicator values evidences, as shown in Figure 1a, that there is a good positive correlation between BM and BMI (r2=0.7228).

For group II, the statistical analysis of the correlation between the values of the studied indicators, presented in Figure 2a, shows a good positive correlation between BM and BMI (r^2=0.6934).

b) At moment T_2: For group I, the statistical analysis of the correlation between the values of the studied indicators, presented in Figure 1b, reveals a very good positive correlation between BM and BMI (r^2=0.701).

For group II, the statistical analysis of the correlation between the values of the studied indicators, presented in Figure 2b, shows a good positive correlation between BM and BMI (r^2=0.6548).

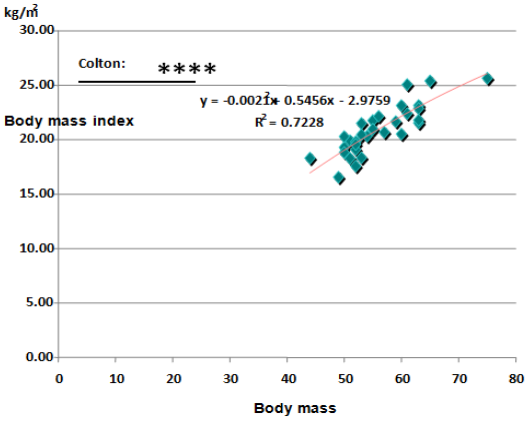

Fig. 1a – Group I, moment T1: BM – BMI correlation.

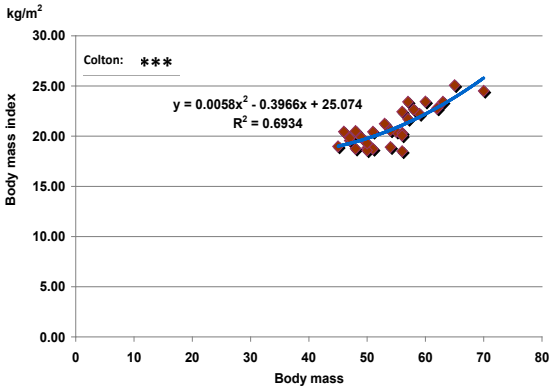

Fig. 2a – Group II, moment T_1: BM - BMI correlation

Table I

The comparative analysis of the values in the two study groups, and statistical significance.

Indicator	Group	Moment	Mean	SE	Median	SD	Min.	Max.	Statistical significance (p)	
									Unpaired samples	Paired samples
Body mass	I	T1	56.07	1.1636	54.50	6.3731	44	75	T_1: 0.3439	Group I: 0.0052
		T2	55.63	1.1012	53.50	6.0314	44	72		
	II	T1	54.50	1.1232	54.5	6.1518	45	70	T_2: 0.4286	Group II: 0.0089
		T2	54.23	1.0512	54.5	5.7577	45	68		
Height	I	T1	163.83	0.9161	163.00	5.0178	155	172	T_1: 0.0572	Group I: –
		T2	163.83	0.9161	163.00	5.0178	155	172		
	II	T1	161.23	0.9775	161.5	5.3542	150	174	T_2: 0.0572	Group II: –
		T2	161.23	0.9775	161.5	5.3542	150	174		
BMI	I	T1	20.90	0.4094	20.60	2.2425	16.56	25.65	T_1: 0.7663	Group I: 0.0156
		T2	20.74	0.3923	20.38	2.1488	16.56	24.98		
	II	T1	20.94	0.3482	20.45	1.9069	18.50	25.08	T_2: 0.9211	Group II: 0.2394
		T2	20.84	0.3260	20.45	1.7854	18.50	24.69		

Table II

Statistical analysis of correlation between the values of the indicators studied in the two groups of athletes.

Moment / Indicator	T1				T2			
	Group I		Group II		Group I		Group II	
BM - height	0.2262	*	0.5700	***	0.2293	*	0.5753	***
BM – BMI	0.7228	****	0.6934	***	0.701	****	0.6548	***
Height – BMI	-0.2049	*	-0.0589	*	-0.2350	*	-0.1064	*

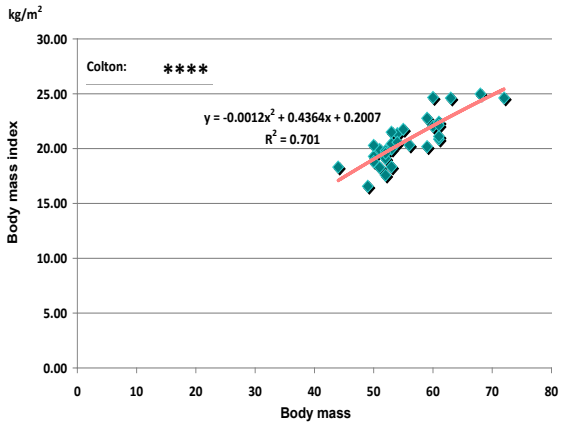

Fig. 1b – Group I, moment T_2: BM - BMI correlation.

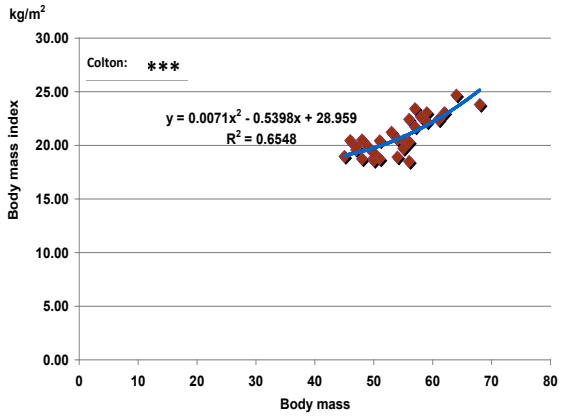

Fig. 2b – Group II, moment T_2: BM - BMI correlation.

Conclusions

1. By comparing the values obtained at the initial testing (T_1) to final values (T_2), following statistical processing, an improvement in the body mass of the experimental group to the detriment of the control group can be seen.

2. The positive results achieved on the statistical significance test allow us to conclude that the statistical differences obtained between the two experimental and control groups are due to the means used as an independent variable in the experiment.

3. The significant differences of the results validate the research hypothesis.

4. The good and very good correlations obtained from the statistical analysis of the Spearman correlation coefficient for the studied indicators, at the two moments T_1 and T_2, enable us to conclude that exercise introduced in the experiment proved its efficacy, which confirms the research hypothesis.

Conflicts of interests

Nothing to declare.

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