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The improvement of the functional respiratory status of students from the University of Bucharest using the means of aerobic gymnastics

Îmbunătăţirea stării funcţionale a sistemului respirator, la studentele Universităţii din Bucureşti prin mijloacele gimnasticii aerobice

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Abstract

Background. Aerobics, due to its content, is one of the most efficient means of physical education for health maintenance. We can assert that the health of the human body depends to a great extent on the amount of oxygen consumed per time unit, amount which is considerably increased as the human body is more trained as a result of the practice of aerobics.

Aims. The objective of this research is to study the development of some respiratory parameters in students from the University of Bucharest.

Methods. The investigated parameters were: respiratory frequency, vital capacity and Lorentz index. The pedagogical experiment took place during October 2012 – April 2013. The sample consisted of 40 students from the University of Bucharest who attended aerobics and the work of the two groups was conducted differently. The control group worked with classical, traditional means, while the experimental group used cardio programs.

Results. In both groups, the final results were better than the initial results recorded at the beginning of the experiment, but in the experimental group, there was a significant increase in all the investigated parameters between the initial and the final testing, compared to the control group, where the rate of increase was lower.

Conclusions. These significant increases recorded in the experimental group confirm the hypothesis formulated at the beginning of the experiment.

Key words: respiratory, aerobics, students.

Rezumat

Premize. Gimnastica aerobică, datorită conţinutului său este mijlocul cel mai eficient al educaţiei fizice de menţinere a sănătăţii. Putem afirma că starea de sănătate a organismului depinde în foarte mare măsură de cantitatea de oxigen consumată pe unitatea de timp, cantitate care este considerabil crescută cu cât organismul este mai antrenat ca urmare a practicării gimnasticii aerobice.

Obiective. Cercetarea are ca obiectiv realizarea unui studiu asupra evoluţiei unor parametri respiratori la studentele Universităţii din Bucureşti. Aplicarea unor programe de gimnastică aerobică va duce la îmbunătăţirea capacităţii respiratorii.

Metode. Indicii investigaţi au fost: frecvenţa respiratorie, capacitatea vitală şi indicele Lorentz. Experimentul s-a desfăşurat în perioada octombrie 2012-aprilie 2013. Eşantionul folosit a fost compus din 40 de studenţi ai Universităţii din Bucureşti, înscrişi la gimnastică aerobică, iar lecţiile celor două grupe s-au desfăşurat în mod diferenţiat. La lotul martor s-a lucrat cu mijloace clasice, tradiţionale, în timp ce la lotul experimental s-au folosit programe tip „cardio".

Rezultate. La ambele loturi rezultatele finale sunt mai bune decât cele iniţiale înregistrate la începutul experimentului, dar la grupa experimentală se constată o creştere semnificativă între testarea finală şi cea iniţială la toţi parametrii investigaţi, comparativ cu grupa martor unde creşterea este mai mică.

Concluzii. Creşterile semnificative, de la grupa experimentală, confirmă ipoteza formulată la începutul experimentului.

Cuvinte cheie: sistem respirator, gimnastică aerobică, studente.

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Introduction

From the first breath that expands the newborn lungs, breathing becomes indispensable for life. We can survive several weeks without food and days without water, but the cessation of respiratory function is limited to a few minutes. Fortunately, our body adapts in an autonomous and automatic manner the rhythm and amplitude of respiration, according to its needs (Albu & Rascarache, 1988).

According to Cordun (2009), ”breathing is a vital function of living organisms, which includes all physical and chemical phenomena that provide gas exchange between the organism and the environment necessary for the development of the metabolic processes of the body”. Bălteanu (2006) argues that ”breathing has on the cardiovascular system mechanical, reflex and neurohumoral effects that are variable in intensity depending on the amplitude, frequency and type of respiration”. While Epuran et al. (2001) support a generally relaxing effect on the body obtained by practising breathing exercises, yogi Hindu Ramacharaka (cited by Nussio, 2009) considers breath as ”the most important function of the human body because undoubtedly all other depend on it”, and Lamboley (2001) states that ”breath is the source of vitality”.

Rodríguez (2007) notes that ”proper breathing is in itself an act that frees us from stress”. Subjects must learn why correct breathing is important in the execution of each exercise, and how to do it: expiration during the contraction phase, inspiration during the relaxation phase (Fardy et al. cited by Thow, 2006).

Breathing is a very effective tool for improving sports top management of emotions, increasing attention and concentration (Gheorghiu & Olăroiu, 1988).

All activities of everyday life that affect respiratory function are according to Becea (2011) ”the main source of inspiration of life”.

Health and sport are two closely linked fundamental notions of life, and the scope of their activities is man (Dumitru 1997).

Aerobic respiration improves overall results (optimal control and energy saving). A visible effect of exercise-induced energy economy is slow, shallow breathing that lowers the values of the resting respiratory rate (Kiss, 2007).

The word ”aerobic” is defined as ”a method of exercise to produce significant changes in the respiratory and circulatory systems by activities which require only a modest increase in oxygen requirement and thus can be maintained for a long time”. These exercises are aimed at a better oxygenation throughout exercise, accompanied by a systematic respiratory rhythm, and therefore are termed ”aerobics” (Stoica, 2004).

Cooper (1982) considers that the most popular type of aerobic exercises are walking, jogging, swimming and dance aerobics.

Aerobic gymnastics is embraced by masses of people who love movement, seeking to improve their physical condition and to maintain health.

It can be practised at any age by both sexes equally, it is an activity that can be adapted to very diverse requirements such as the organizational form and the structure of exercises (Macovei, 2003).

All efforts that exceed 2-5 minutes and whose intensity allows oxygen supply are considered aerobic efforts (Bota, 2000).

Aerobics is the activity that uses the same muscle group, rhythmically, for a period of 15-20 minutes or more, maintaining 60-80% of maximum heart rate (Balbach, 2001). Aerobic exercise involves intake of oxygen to produce energy needed to support it (Smith, 2005).

To be really aerobic, the program must fulfill three important conditions: to be continuous, to be strong, to grow and to keep the heart rate of those who practice it at the best effort rate (Lance, 1988). Gymnastics means movement, movement means health and health is a nation’s greatest asset gained for the benefit of mankind (quoted by Sbenghe Ionescu, 2005).

Indeed, aerobics because of its content is the most effective physical education means for health maintenance. It is very important to keep an optimal ratio between the intensity and duration of exercise, although there is no standard duration, but as a general rule, the more intense the exercise, the shorter the duration (Niculescu, 2008). Pehoiu (2003) shows the contribution of exercise to improve fitness, to increase the productive capacity of those involved in professional activities.

The way you breathe has a special role in maintaining health. Seemingly trivial, this natural function with which we are born disseminates vital energy to the whole body. To neglect this vital function means to endanger one’ mental and physical health.

When we are born, the breathing reflex is the first one, which lasts as long as we live. Children learn to eat, write, read, but no one teaches us how to breathe correctly. Aerobics acts on the respiratory system by increasing the amount of oxygen sent to tissues (Grosu, 2012).

We can say that the health of the body depends heavily on the amount of oxygen consumed per time unit, which is considerably higher as the body is trained as a result of aerobic gymnastics.

Objectives

To conduct a study on the development of respiratory parameters in the students of the University of Bucharest.

Hypothesis

Applying an aerobic cardio program will improve respiratory capacity.

Material and methods

We mention that according to the Helsinki Declaration, Amsterdam Protocol and Directive 86/609/EEC, the approval of the Ethics Commission of the Departement of Physical Education and Sport of the University of Bucharest regarding research on human subjects as well as the subjects’ consent for their participation in the research were obtained.

Research protocol

a) Period and place of the research

The experimental study was carried out at the University

of Bucharest, between October 2012 and April 2013. The initial testing (T1) took place from 1 to 15 October 2012, both in the experimental and the control groups, and the final testing (T2) was conducted between 15-30 April 2013.

b) Subjects and groups

The study sample consisted of 40 students from the University of Bucharest, who performed aerobics and the work carried out by the two groups was conducted differently. The experimental group (E) and the control group (C) included 20 female subjects each, aged between 18 and 25 years.

c) Tests applied

According to Tudor (2005), the assessment consisted of determining the effectiveness of the implemented programs.

The following indicators were investigated: respiratory rate (RR), thoracic elasticity (TE), vital capacity (VC). Vital capacity measures the volume of air exhaled during a forced expiration after a maximal inspiration (Niculescu, 2002) In the study, the maximum amount of oxygen (VO2 Max) consumed by an athlete in the training process was determined, and the Lorentz index was calculated.

The control group worked with traditional means, while the experimental group followed cardio programs, with differentiated instructions for the two groups.

The aerobics programs used in the experimental group were:

- Aerobic circuit training - without objects and devices, with very fast movements taken from self-defense hitting techniques; a mixture of movements used in boxing, karate and fitness with choreography accompanied by music.
- Tae-box - based on martial arts and boxing movements. Intensity is medium to high, and the methods used are the continuous method and the interval method. When a large number of rapid movements are included (using arms and legs), very high intensities are achieved.
- Cardio-tracksuit - cardiovascular workout, bike, treadmill, jumping rope.
- Step - a ”walk” tall model that consists of ascents and descents at a normal walking pace, with turns or jumping on a platform height and level adjustment for each goal.
- PowerStep - is like tobacco and consists of steps, jumping and rocking with links between them, on a platform, at a sustained pace, HIA type.
- HIA - (High Impact Aerobics) - Chaining dance music on X x 8 times at a hard and fast tempo between 140-150 BPM (beats per minute) by mixing the basic steps of LIA, jumping and running (intense and numerous ground impacts: joint and dorsal problems) (Stoica, 2004).
- Zumba - is a very effective body shaping program, covering many genres of Latin dance (Salsa, Merengue, Rumba, Bachata, etc.). Practicing the ”Zumba” leads to visible results both physically and mentally. Zumba uses a fusion of Latin and international dances (from Colombian cumbia to merengue, salsa and calypso, hip hop and reggaeton), creating an effective, dynamic and exciting workout. The program is designed as a mixture of aerobic / fitness toning movements in rapid rhythms (Ganciu, 2009).

The programs are established based on the aerobic fitness level of the practitioners and the training objective, which can be training muscle strength, endurance and flexibility. Regardless of its type, the training must meet the following structure, consisting of three parts (Niculescu, 2008):

- Warm-up time, 5-10 minutes.
- Aerobic exercise, 30-40 minutes.
- Cooling period (cool-down), 5-10 minutes.

In the control group, the aerobics class included a brief warm-up session, which included stretching, complex scapular-humeral joint exercises and upper limb muscles, exercises for the trunk and spine, joint exercises, coxofemoral and leg muscles exercises for waist, abdomen exercises, exercises for buttocks, hips, thighs, Jacobson relaxation exercises. To avoid monotony and in order to improve the programs, exercises were accompanied by music, as a defining element of rhythm.

Both the experimental group and the control group worked on increasing the morphofunctional indices and exercise capacity specific of aerobic gymnastics, and the time of the classes was the same for both groups.

d) Statistical processing

The only way for convincingly establishing the truth is organizing an experiment (Epuran, 2005). The statistical indicators monitored in this study were: arithmetic mean index and significance of the mean difference. The verification of the hypothesis was performed using the Student t-test.

The computer programs used for statistical calculations were: Microsoft Word, Microsoft Excel.

Results

After applying the experiment, the following changes were recorded:

Table I

Examples of lessons applied to the experimental group.

Structure	Lesson 1	Lesson 2
Objectives	-1 Development of the aerobic resistance level under the influence of selective locomotor muscle exercises; -2 Development of segmental coordination	-3 Development of cardio-resistance breathing; -4 Developing of muscle strength under coordination;
Methods	-5 Interval training method	-6 The method of continous efforts
Means	-7 Strength exercises; -8 Complex segmental coordination exercises -9 Stretching exercises; -10 Relaxation and breathing exercises.	-11 Dynamic exercises based on different forms of movement carried out under plurisegmental coordination; -12 Stretching exercises; -13 Relaxation and breathing exercises
Motion content	-1 Specific step variants of aerobic gymnastics; -2 Gymnastic movements localized at every segment level; -3 Stretching positions;	-4 Variants of specific gymnastics and dance steps performed simultaneously with movements in the upper body; -5 Prolonged stretching ; -6 Breathing exercises and relaxation.

Chest elasticity is an indicator that informs indirectly about the vital capacity, respiratory volume etc. (Balint, 2007).

The initial mean values were relatively close in the two groups.

The degree of homogeneity of values was quite high in both groups.

The growth rate was higher in the experimental group (62.11%) compared to the control group (37.81%).

A value t=13.46, higher than the value estimated for the probability of 1%, was obtained for group E (Table II).

The difference between the means was very significant, the null hypothesis was rejected.

In group C, the mean difference significance (p) had a lower value than for group E.

Table II

Mean values of chest elasticity.

Chest elasticity	T1	T2	T. dependent	p
Experimental group	4.40	7.13	13.46	<0.05
Control group	3.37	5.46	9.56	>0.05

Lorentz index

The mean values at the final test showed a significant difference between the two groups (26.37 vs 24.79 in the experimental group compared to control group).

The degree of homogeneity was high in both groups. In the experimental group, there was a significant increase between the initial and final test (p<0.05). The null hypothesis for both groups was rejected (Table III).

Table III

Mean values of the Lorentz index

Lorentz indez	T1	T2	T. dependent	p
Experimental group	24.14	26.37	2.86	<0.05
Control group	23. 31	24.79	1.29	>0.05

Resting respiratory frequency: This was calculated based on the individual respiratory rate and the statistical indicators were plotted graphs of the variation of the mean values.

The results showed that at the final test, the values decreased significantly (from 16.53 to 13.73) in the experimental group, and slightly (from 16.70 to 15.20) in the control group. Due to the gymnastics aerobic program, the decrease was greater in the experimental group, where cardio programs were used at an intensity of 70% of VO2 max (Table IV).

Table IV

Mean values of respiratory frequence at rest.

Resting respiratory frequency	T1	T2	T. dependent	p
Experimental group	16.53	13.73	2.03	<0.05
Control group	16.70	15.20	0.79	>0.05

At the initial test, vital capacity values did not differ significantly (3412.61 in the experimental group compared to 3429.20 in the control group), which was predictable because the two groups were assigned at random.

There was a significant increase in vital capacity in the experimental group (3784.38) at the final testing, compared to 3582.18 in the control group.

Table V

Mean values of vital capacity (CV).

Vital capacity	T1	T2	T. dependent	p
Experimental group	3412.61	3784.38	2.81	<0.05
Control group	3429.20	3582.18	1.05	>0.05

Discussions

In physical education and sport, the respiratory act is an essential element for improving basic motor skill performance and the ability to maximize performance.

Breathing is one of the vital functions that can be controlled voluntarily. Complete and correct breathing can increase life expectancy, vital capacity, strength and endurance.

Learning proper breathing habits can be achieved using support aerobics.

Practice shows that most female students do not initially know how to breathe optimally during sustained effort. During the lesson, aerobics is aimed at achieving an active breathing and respiratory rate setting, optimal with respect to individual characteristics and tempo movement.

Executed in the first phase by voluntary control, breathing techniques can become automatic by repetition, providing the possibility of transferring skills to other areas of interest. As students acquire the habit of breathing correctly, they can act independently and use the most suitable respiratory rhythm.

In both groups, the results were better than the initial results recorded at the beginning of the experiment.

In the experimental group, there was a significant increase in the Lorentz index (p less than 0.05) between the initial and final testing compared to the control group, where the increase between the initial and final test was not significant (p greater than 0.05).

The results showed that at the end of the academic year, the resting respiratory rate decreased, due to aerobic programs, the decrease being greater in the experimental group, where the cardio program was used at an intensity of 70% of VO2 max.

Changes in resting respiratory rate values were recorded due to differences in the intensity of aerobic exercise.

Improving elasticity chest is the foundation and the very purpose of aerobic gymnastics, namely improving aerobic capacity, vital capacity and respiratory rate, which was very high in the experimental group (62.11%) compared to the control group (37.81%).

In initial testing, vital capacity values did not differ significantly (3412.61 in the experimental group compared to 3429.20 in the control group), which was predictable because the two groups were assigned at random.

There was a significant increase in vital capacity in the experimental group (3784.38) at the final testing, compared to 3582.18 in the control group.

Conclusions

1. In both groups, the final results were better than those recorded at the beginning of the experiment, but in

the experimental group, significant increases were found in all the three indicators used for testing compared to the control group, where the increases were not significant.

2. These significant increases in the experimental group confirm the hypothesis formulated at the beginning of the experiment.

3. Aerobic respiration determines an overall improvement. A visible effect of exercise-induced energy economy is slow, shallow breathing that lowers respiratory rate values at rest in trained subjects compared to untrained subjects.

4. The experiment could lead to a system of action effective in improving respiratory function, which was one of the objectives of this work.

5. Knowing some simple ways to regularly assess the functional status of the organism may be for this age group an effective means of tracking the self-investigation level and functional capabilities, turning students into actors of their own becoming.

6. The training of the groups with cardio programs at an intensity of 50-70% of the maximum effort capacity (VO2 max) was more effective than that of the subjects of the control group.

Conflicts of interests

No conflicts of interest

References

Albu C, Rascarache L. Ştiţi să respiraţi corect? Ed. Sport Turism, Bucureşti, 1984.

Balbach L. What is aerobics exercise and What should I do. Ed. Sounders College Publishing, New-York, 2001.

Balint T. Evaluarea aparatului locomotor. Ed. Pim, Iași, 2007.

Bălteanu V. Rolul exerciţiilor de respiraţie în tratamentul hipertensiunii arteriale. Revista Română de Kinetoterapie, 2006; 18(84):8-10

Becea L. Odihna activă, respiraţie şi stretching. Ed. Discobolul, Bucureşti, 2011.

Bota C. Fiziologie generală. Aplicaţii la efortul fizic. Ed. Medicală, Bucureşti, 2002.

Cooper K. The Aerobics Program For Total Well-Being. M Envans and Company. Inc.New-York, 1982.

Cordun M. Kinesiologie medicală. Ed. Axa, Bucureşti, 1999.

Dobrescu T. Gimnastica aerobică. Strategii pentru optimizarea fitnessului. Ed. Pim, Iași, 2008.

Epuran M Metodologia cercetării activităţilor corporale. Ed. FEST, Bucureşti, 2005.

Epuran M, Holdevici I, Toniţa F. Psihologia sportului de performanţă: teorie şi practică. Ed. FEST, Bucureşti, 2001.

Ganciu M, Gimnastica aerobică de întreținere. Ed. Universităţii din Bucureşti, 2009.

Gheorghiu AL, Olăroiu M. Investigaţii funcţionale în practica medicinii de familie. Ed. ALL, Bucureşti, 1988.

Grosu EF. Gimnastica aerobică, Ed. GMI, Cluj-Napoca, 2012.

Kiss I. Fizio-kinetoterapia şi recompensarea medicală. Ed. Medicală, Bucureşti, 2007.

Lamboley D. Respiră corect şi vei fi sănătos. Ed. Teora, Bucureşti, 2001.

Lance K. Low impact aerobics. Crown Puublishers, New-York, 1988.

Macovei S. Gimnastică aerobică de întreţinere. Ed. FRSPT, Bucureşti, 2003.

Niculescu G. Gimnastica aerobică. Ed. Fundaţiei România de mâine, Bucureşti, 2008.

Niculescu M. Metodologia cercetării ştiinţifice în educaţie fizică şi sport. Ed. ANEFS, Bucureşti, 2002

Nussio EM. Yoga pentru femei. Ed. Teora, Bucureşti, 2009.

Pehoiu C. Educaţia fizică şi sportul în prevenirea consecinţelor vieţii moderne. Analele Universităţii din Oradea, Fascicula de educaţie fizică şi sport, 2003:652-665.

Smith G. Impact aerobics. Elisavaros Publishing, Bucharest, 2005.