

EFFICIENCY OF STEP AEROBIC PROGRAM IN YOUNGER WOMEN

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The survey was conducted as an experiment with parallel groups in order to determine the efficiency of step aerobics program on motor abilities, circular dimensionality and body composition in young women. Twenty-four respondents from 18 to 25 years of age participated in the three-month study, divided in two groups: I group of 12 younger women involved in the experimental program of step aerobics (experimental group) and II group of 12 younger women who were not included in any program of regular physical exercise (control group). Measuring instruments for the assessment of research areas consisted of six tests for motor skills, five tests for circular dimensionality and eight tests which evaluated body composition. The measurements were performed before and after the experimental treatment. The analyzing of obtained data was made by analysis of covariance in order to determine the effect of experimental treatment. After statistical analysis, the results showed that the step aerobic program had a statistically significant effect on all three research areas in favor of experimental group of younger women. *Acta Medica Medianae* 2013;52(3):25-34.

Key words: step aerobics, motor skills, circular dimensions, body composition, younger women

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Introduction

There are many different training programs in fitness today, which are called "group guided programs" and they include exercises different in content, purpose, use of equipment and device, but the same in aerobic mode and in group management of training with music. In addition to many types of aerobics that are applied in modern fitness centers, two of them are the most popular: high-low and step aerobics. None of the props has reached the popularity of the bench for step aerobics (110cm long, with adjustable height: 15, 20 or 25 cm), which is characterized by climbing, descending and crossing the sidelines with various steps related to interesting blocks performed with music. It is suitable for all practitioners, regardless of gender, age or physical condition. With activation of large muscle groups in legs and gluteal region, climbing up and going down is alternately performed with various movement structures. It is characterized by gradually increasing the level of functional abilities, shaping and tightening of the muscles with demanding and less demanding choreographies, which are one of the reasons why the step aerobic is so popular. It is an

intense fitness training that uses choreography based on a lot of repetition. This type of aerobics affects mostly the development of cardiovascular and respiratory systems (1).

American Association of Health, Physical Education, Recreation and Dance - AAHPERD (2) cites body composition, among other components of physical fitness, which represents the percentage of fat, muscle and bone tissue in total body weight. Many studies have been performed in order to check the effects of recreational activities on body composition, respectively the fact that they can greatly contribute to reducing weight, reducing size and subcutaneous body fat in women (3, 4).

The percentage of fat and muscle tissue is of the utmost importance in practice. Mistakes are often made equating the correction of body composition and body mass reduction. Weight loss can also occur in the reduction of muscle tissue, and not during the reduction of body fat, which basically is not good. The goal of step aerobics program which leads to the correction of body composition aims to reduce fat tissue, while preserving or increasing muscle tissue. Since the muscle tissue is an actuator of the locomotor system, it is not an impediment in practice.

According to Ostojić et al. (5) the average person has about 40% of muscle tissue, while athletes and advanced amateurs have over 50%. Students of the Faculty of sport and physical education in Belgrade (6) had about 51% of muscle and 14.5% of fat tissue. The volume and body mass are responsible for the overall body

mass and volumes and they represent circular dimensionality, and if they existing on the account of the adipose tissue they may be aggravating factors in the execution of movements. Most women are usually involved in some recreational activities because of the impact on functional abilities (increasing aerobic endurance), the impact on the morphological characteristics (weight loss and body fat loss) and the impact on health status. In addition to health motives, the motives of improving physical appearance and regulation of body weight are very frequent among women who want to engage in recreational exercise (7, 8). Body composition and physical appearance are changing under the influence of recreational exercise, where the development of strength is usually accompanied by increasing of muscle mass, while increasing of aerobic endurance is often accompanied by a decrease of subcutaneous adipose tissue (9). Exercise of moderate intensity (55-70% of maximum heart rate) has a positive effect on body weight, but on the other hand, there are a few scientific data in favor of the necessity of intense exercise (> 70% of maximum heart rate) with the aim of reducing and then maintaining body weight for a long period of time (10). Reducing body fat can be achieved by long lasting cyclical activities of moderate to medium intensity in aerobic conditions, because only after a combustion of phosphate and protein reserves, the fats are next in the line (11, 12).

The preservation of lean body mass - LBM and maintaining of resting metabolic rate - RMR are prerequisite for the preservation of reduced body weight (13, 14).

Aim

After these characteristics and effects of step aerobics on human organism, this study is an attempt to determine the extent to which the step aerobic program affects some motor skills, circular dimensionality and body composition in younger women.

Material and method

Twenty-four respondents from 18 to 25 years of age participated in the three-month study, divided in two groups: I group of 12 younger women involved in the experimental program of step aerobics (experimental group) and II group of 12 younger women who were not included in any program of regular physical exercise (control group). The survey was conducted as an experiment with parallel groups in order to determine the efficiency of step aerobics program on motor abilities, circular dimensionality and body composition in young women.

The measurements were performed before and after the experimental treatment. Measuring instruments for the evaluation of research areas, consisted of the following tests and measures (15-17):

Motor skills: jumping over the horizontal rope (PRHV), hand rotation (KRUŽR), leg rotation (KRUŽN), side-stepping with a baton (ISKR), ankle flexibility (FLSZ), static flexibility of torso and neck (FLTV); Circular dimensionality of the body: upper arm volume (AONL), abdomen volume (AOTR), hip volume (AOKUK), upper leg volume (AONK) and lower leg volume (AOPK); Body composition: body height (TVIS), body weight (TTEŽ), body fat percentage (BFP) body water percentage (TBW%), muscle mass (MM) and basal metabolic rate (BMR).

Experimental treatment

The frequency of exercise was one hour, three times a week. The structure of step aerobic class is divided into introductory, main and final part. The introductory part of the class is characterized by preparation of those muscle groups that will be involved in the main part of the class, with the application of simple co-ordination exercises and small range of motion, with a moderate pace of work, which is preparation of the body for more intense exercises. In the introductory phase, the tempo of music is between 120-134 bpm.

The main part of the class consists of aerobic part and strength training part. Tempo music in aerobic part ranges from 122-140 bpm, more complex coreographies are introduced, and also steps with raising, drops and steps with touch. In the main part of the aerobic part, the choreography whose record contains a number of music blocks and phrases, leg and arm movements, direction of movement and position of practioner's body is practised. After the aerobic part, strength exercises on the ground with a rate of 115-125 bpm are next. In this part of the class, exercises for those muscles that have not been sufficiently involved in the aerobic part of the class are applied, such as exercises for strengthening arm and shoulder muscles, abdominal muscles, back muscles and gluteal muscle region. The aim of these exercises is to increase muscular endurance, repetitive strength and flexibility.

In the final part of the class, which is characterized by calming the body by stretching of those muscle groups that were most involved in the main part, slower music with the pace of 50-90 bpm is used. Since the experimental program lasted three months, the number of repetitions increased each month, with introducing new steps choreographically more complex. Program intensification was realized in aerobic part of the class within body shaping exercises. Within aerobic part, the intensification was carried out in terms of accelerating the music tempo, increasing the number of music blocks and steps, as well as introducing more steps of high intensity, movements in multiple directions and increasing the number of hand movements. As a part of body strengthening exercises, the number of series and repetitions was increased,

physiologically more difficult exercises were introduced.

Authors were engaged in studying of impacts and effects of step aerobics (18- 20, 1), and they have come to the conclusion that this type of recreation has the largest impact on improving cardiovascular fitness, morphological characteristics, functional and motor abilities.

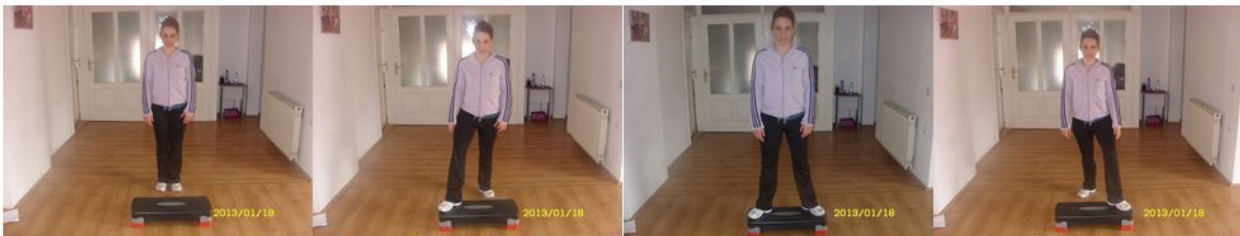
Statistical analysis

In addition to the calculation of basic statistical parameters (Mean and SD), processing of the data was also performed by analysis of covariance (ANCOVA and MANCOVA) in order to determine the effect of experimental treatment with statistical package Statistica 7.0.

Overview of the basic steps and steps with lifting



Basic step



V step



Reverse V step



Over the top step



A step



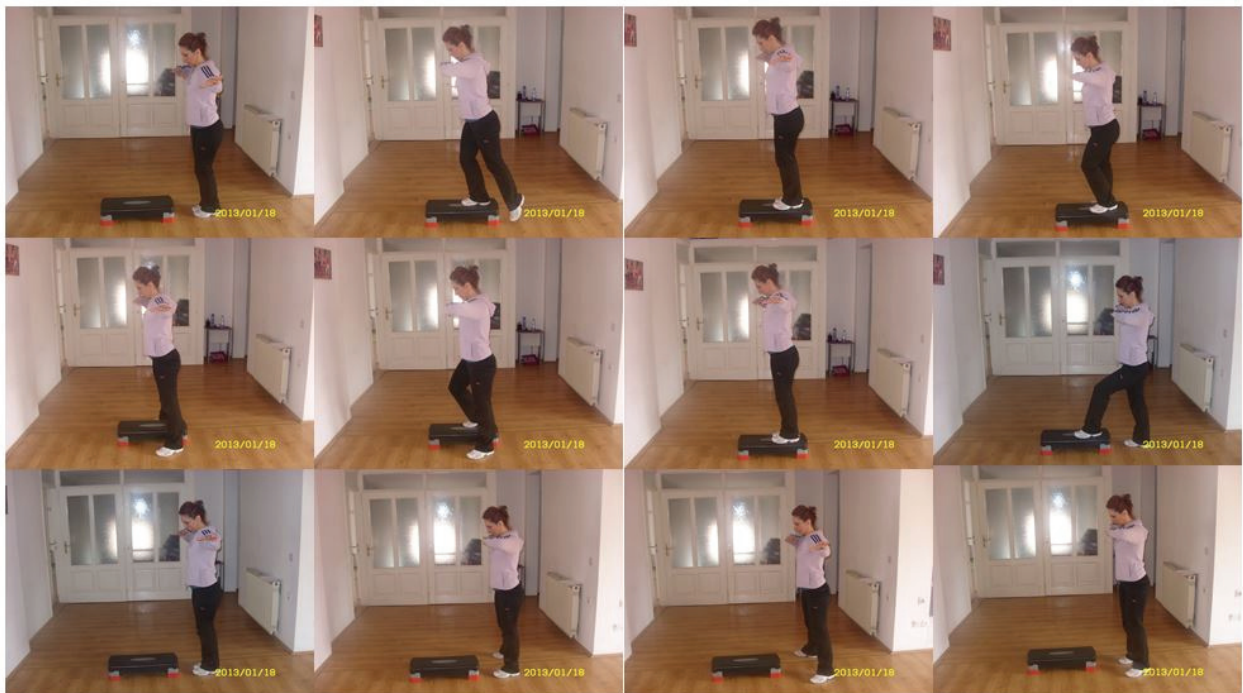
Turn step



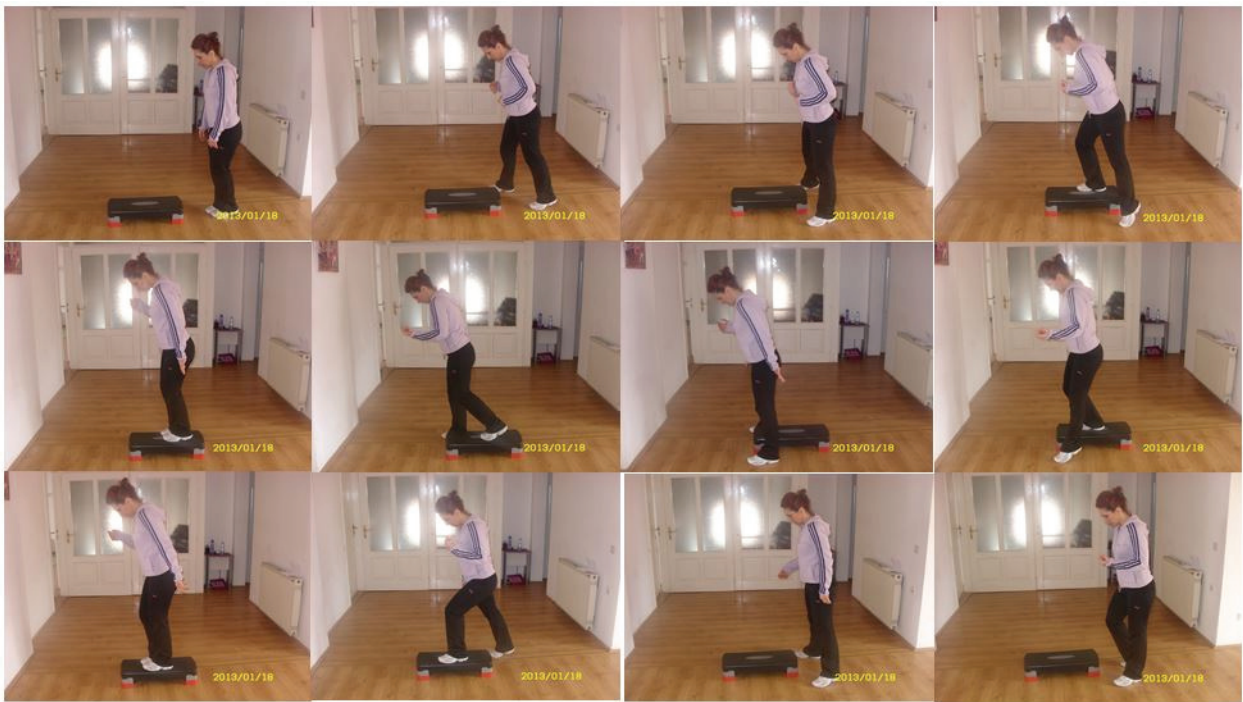
Across the top step



T step



I step



X step



Tap up step



Knee up step



Leg curl step



Leg side step



Step kick



Repeater



L step

Results

Table 1 shows the results of Mean and standard deviation (SD) of respondents of both groups at the initial and final measuring.

Multivariate analysis of covariance (Table 2a) shows a statistically significant effect of the experimental program on the development of motor skills of the experimental group, as indicated by the level of significance $P=0.000$, Wilks' Lambda test (0.099) and the value of Rao-F (16.68). Table 2b shows the univariate values of analysis of covariance. There is a statistically significant intergroup difference ($P \leq 0.01$) in favor of experimental group at all motor tests: jumping over the horizontal rope (PRHV 0.000), hand rotation (KRUŽR 0.000), leg rotation (KRUŽN 0.000), side-stepping with a baton (ISKR 0.000), ankle flexibility (FLSZ 0.000) and static flexibility of torso and neck (FLTV 0.000).

Multivariate analysis of covariance (Table 3a) shows a statistically significant effect of the experimental program on circular dimensionality of the body of the experimental group, as indicated by the level of significance $P=0.000$, Wilks' Lambda test (0.095) and the value of Rao-F (24.67). Table 3b shows the univariate values of analysis of covariance. There is a statistically significant intergroup difference ($P \leq 0.01$) in favor of experimental group in all measures of circular dimensionality of the body: upper arm volume (AONL 0.001), abdominal volume (AOTR 0.000), hip size (AOKUK 0.000), upper leg volume (AONK 0.000) and lower leg volume (AOPK 0.000).

There is a statistically significant difference at the multivariate level (Table 4a) between the respondents of the experimental and control group at a significance level greater than .01 (P -level 0.000), which confirms the value of Wilks' Lambda test (0.072) and Rao-F (23.73). The current

difference occurs under the influence of the experimental treatment, which effectively acted on the parameters of body constitution of younger women. Table 4b shows the univariate values of analysis of covariance. There was a statistically significant intergroup difference ($P \leq$

0.01) in favor of experimental group in all body composition parameters: body height (TVIS 0.000), body weight (TTEŽ 0.000), body fat percentage (BFP 0.000) body water percentage (TBW 0.000%), muscle mass (MM 000) and basal metabolic rate (BMR 0.000).

Table 1. Mean and standard deviation

Variables	Initial measuring				Final measuring			
	Mean (e)	SD (e)	Mean (c)	SD (c)	Mean (e)	SD (e)	Mean (c)	SD (c)
PRHV	6.83	4.88	5.92	2.15	11	4.05	5.75	1.82
KRUŽR	47	6.74	39.92	5.37	53.83	6.07	40.25	4.99
KRUŽN	31.83	5.67	22.08	4.42	35.75	6.02	21.75	4.43
ISKR	76.5	10.91	77	6.51	68.42	10.15	77.08	6.67
FLSZ	90.58	12.47	81.83	6.55	93.75	13.1	81.83	6.83
FLTV	68.92	8.08	64.42	3.2	72.67	6.87	64.42	3.6
AONL	24.92	1.56	24.42	1.38	23.58	1.44	24.33	1.78
AOTR	70.17	4.47	73.17	3.88	65.17	4.73	73.58	4.06
AOKUK	89.75	4.86	93.17	2.95	86.25	4.41	93.42	3.09
AONK	53.5	2.88	55.33	1.78	50.75	3.19	55.58	1.98
AOPK	36.5	2.39	34.42	2.07	36	2.17	34.5	2.68
TVIS	170.92	5.12	168.92	4.93	171.58	5.45	169.17	5.25
TTEŽ	63.05	4.13	62.8	4.22	61.4	4.57	63	4.34
BFP	27.25	4.32	27.23	4.23	25.01	4.22	27.21	4.1
%TBW	53.08	3.19	53.17	2.81	53.93	3.34	53.09	2.62
MM	35.93	2.63	35.42	2.73	37.77	2.74	35.27	2.68
BMR	1439	67.69	1436.5	72.5	1491	68.2	1431.83	74.06

PRHV - jumping over the horizontal rope; KRUŽR - hand rotation; KRUŽN - leg rotation; ISKR - side-stepping with a baton; FLSZ - ankle flexibility; FLTV- static flexibility of torso and neck; AONL - upper arm volume; AOTR - abdominal volume; AOKUK - hip volume; AONK - upper leg volume; AOPK - lower leg volume; TVIS - body height; TTEŽ - body weight; BFP - body fat percentage; %TBW - body water percentage; MM - muscle mass; BMR - basal metabolic rate.

Table 2a. Multivariate level

Wilks Lambda	Rao-F	P-level
0.099	16.68	0.000

Table 2b. Univariate level

Tests	Adj. means (e)	Adj. means (c)	F	P-level
PRHV	10.67	6.08	48.8	0.000
KRUŽR	50.97	43.11	71.96	0.000
KRUŽN	30.85	26.65	241.43	0.000
ISKR	68.56	76.94	42.3	0.000
FLSZ	89.47	86.11	254.65	0.000
FLTV	70.75	66.33	101.04	0.000

PRHV - jumping over the horizontal rope; KRUŽR - hand rotation; KRUŽN - leg rotation; ISKR - side-stepping with a baton; FLSZ - ankle flexibility; FLTV- static flexibility of torso and neck;

Table 3a. Multivariate level

Wilks Lambda	Rao-F	P-level
0.095	24.67	0.000

Table 3b. Univariate level

Measures	Adj. means (e)	Adj. means (c)	F	P-level
AONL	23.36	24.56	6.88	0.001
AOTR	66.9	71.85	96.57	0.000
AOKUK	88.12	91.54	156.64	0.000
AONK	51.2	55.13	54.92	0.000
AOPK	34.68	35.82	35.51	0.000

AONL - upper arm volume; AOTR - abdominal volume; AOKUK - hip volume;
AONK - upper leg volume; AOPK - lower leg volume;

Table 4a. Multivariate level

Wilks Lambda	Rao-F	P-level
0.072	23.73	0.000

Table 4b. Univariate level

Measures	Adj. means (e)	Adj. means (c)	F	P-level
TVIS	170.45	170.3	731.81	0.000
TTEŽ	61.41	62.99	48.28	0.000
BFP	25.07	27.15	207.81	0.000
%TBW	53.82	53.19	80.13	0.000
MM	37.4	35.64	114.62	0.000
BMR	1482.33	1440.5	22.08	0.000

TVIS - body height; TTEŽ - body weight; BFP - body fat percentage;
%TBW - body water percentage; MM - muscle mass; BMR - basal metabolic rate.

Discussion and conclusion

We all presently witness the technological progress at all levels and in all spheres of society through urbanization, industrialization, improvement of the communication plan. It performs immeasurable impact on human life and work and it makes people slaves of the new era. Everyday life is characterized by automaticity in executing the goals and needs, which inevitably influences our free time that should be used to satisfy the needs of the organism, both in spiritual, and in physical way. Therefore, that period is not fully used for much needed recovery after a hard day, but the man indulges too much in everyday comforts of modern society, making himself a passive enjoyer of everything that is offered by television, Internet and other means of active and interactive communication. Sedentary lifestyle prevails and moves us away from the basic needs given at our birth, and that is the need for locomotion.

Reduced physical activity affects the number of negative factors that continue to threaten our health. Obesity as a disease of modern society together with stress, that is the result of fast living, has been manifested by silent decline of organ systems which are not protected at all because of the poor nutrition and insufficient physical activity.

In order to change the consciousness of the working man, it is necessary to seriously pay attention to constant pieces of advice given by experts that we are currently witnessing, and who increasingly point to the alarming situation in which we find ourselves. With avoiding various vices (immoderate consumption of alcohol, tobacco, etc.), and with proper nutrition, avoiding stressful situations, sufficient physical activity is also strongly recommended.

One of the most popular activity from which the human body benefits is surely aerobics, which is based on the development of aerobic endurance. This is the kind of physical activity which is effective against the elimination of consequences of modern life through the harmonious development of body and mind. Author of aerobics Kenneth Cooper (21) used to say, "Achieve physical fitness ... maintain it ... and you will be able to fully enjoy the benefits of life".

Aerobics can be practiced with every age category, both with women and men, as studies have shown that age and sex do not constitute an obstacle in dealing with this type of exercise that gives yields results (18, 22-24).

This investigation focused on a variant of aerobics, known as the step aerobics, which is characterized by the use of steppers and dynamic music that gives energy to exercise and often helps us to overcome difficult efforts with ease. Step aerobics is not monotonous, it allows

changes and gradually increases the exercise intensity that makes it very useful in terms of fitness. Numerous studies indicate that this type of aerobics is very effective in increasing aerobic endurance, motor skills and it helps in improving body constitution in all age groups (25-29). In this case, the benefits of step aerobics are also confirmed as a recreational physical activity. In all observed areas, a statistically significant effect of the three-month recreational exercise of step aerobics was recorded in younger women in

comparison to the women who were not engaged in any aspect of organized recreational physical exercise.

Comment

Abbreviations of tests and measures related to motor skills, circular dimensionality of the body and the first two measures of body composition are written in the original form in Serbian.

References

- American Alliance for Health, Physical Education, Recreation and Dance. Physical best – The AAHPERD guide to physical fitness education and assessment. Reston, VA: AAHPERD; 1989.
- Brick LG. Fitness Aerobics. Champaign, IL: Human Kinetics; 1996.
- Catenacci VA, Wyatt HR. The role of physical activity in producing and maintaining weight loss. *Nat Clin Prac Endocrinol Metab* 2007; 3(7): 518-29. [[CrossRef](#)] [[PubMed](#)]
- Clary S, Barnes C, Bemben D, Knehans A, Bemben M. Effects of ballates, step aerobics, and walking on balance in women aged 50-75 years. *J Sports Sci Med* 2006; 5(3): 390-9.
- Cvetković M. Efekti različitih programa aerobika kod studenata fakulteta sporta i fizičkog vaspitanja [dissertation]. Novi Sad: Fakultet sporta i fizičkog vaspitanja; 2007.
- Doroshenko VV, Bogdanovskaya NV, Malikov NV. Experimental estimation of efficiency of application of step-aerobics in the complex program of optimization physical capacity and functional state of organism of youths and girls 15-16 years with vegetates vascular distony. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2008; 7: 50-4.
- Hallage T, Krause MP, Haile L, Miculis CP, Nagle EF, Reis RS, Da Silva SG. The effects of 12 weeks of step aerobics training on functional fitness of elderly women. *J Strength Cond Res* 2010; 24(8): 2261-6. [[CrossRef](#)] [[PubMed](#)]
- Jakicic JM, Clark K, Coleman E, Donnelly JE, Foreyt J, Melanson E, et al. American college of Sports Medicine – Position Stand. Appropriate intervention strategies for weight loss and prevention of weight regain for adults. *Med Sci Sports Exerc* 2001; 33(12): 2145-56. [[CrossRef](#)] [[PubMed](#)]
- Kin-Isler A, Kosar SN. Effect of step aerobics training on anaerobic performance of men and women. *J Strength Cond Res* 2006; 20(2): 366-71. [[PubMed](#)]
- Kostić R, Đurašković R, Miletić Đ, Mikalački M. Changes in the cardiovascular fitness and body composition of women under the influence of the aerobic dance. *Facta Universitatis, Series: Physical Education and Sport* 2006; 4(1): 59-71.
- Kuper K. Putevima aerobika. Beograd: NIP Partizan; 1979.
- Kurelić N, Momirović K, Stojanović M, Radojević Ž, Viskiće-Štalec N. Struktura i razvoj morfoloških i motoričkih dimenzija omladine. Beograd: Institut za naučna istraživanja. Fakultet za fizičku kulturu; 1975.
- Liang MT, Braun W, Bassin SL, Dutto D, Pontello A, Wong ND, et al. Effect of high-impact aerobics and strength training on BMD in young women aged 20-35 years. *Int J Sports Med* 2011; 32(2): 100-8. [[CrossRef](#)] [[PubMed](#)]
- Lockwood CM, Moon JR, Tobkin SE, Walter AA, Smith AE, Dalbo VJ, et al. Minimal nutrition intervention with high-protein/low-carbohydrate and low-fat, nutrient-dense food supplement improves body composition and exercise benefits in over weight adults: A randomized controlled trial. *Nutr Metab (Lond)* 2008; 5:11. [[CrossRef](#)] [[PubMed](#)]
- Mandarić S. Efekti programiranog vežbanja uz muziku kod učenica sedmih razreda osnovne škole [dissertation]. Beograd: Fakultet sporta i fizičkog vaspitanja; 2003.
- Moore MS. Interactions between physical activity and diet in the regulation of body weight. *Proc Nutr Soc* 2000; 59(2): 193-8. [[CrossRef](#)] [[PubMed](#)]
- Ostojić S, Mazić S, Dikić N. Telesne masti i zdravlje. Beograd: Udruženje za medicinu sporta Srbije; 2003.
- Sekulić D. Mogućnost primjene modificiranog programa u treningu eksplozivne snage tipa skočnosti (Zbornik radova). Zagreb: Fakultet fizičke kulture i Zagrebački športski savez; 1997.
- Šoše H, Rađo I. Mjerenje u kineziologiji. Sarajevo: Fakultet za fizičku kulturu; 1998.
- Stiegler P, Cunliffe A. The role of diet and exercise for the maintenance of fat-free mass and resting metabolic rate during weight loss. *Sports Med* 2006; 36(3): 239-62. [[CrossRef](#)] [[PubMed](#)]
- Stojiljković S, Mitić D, Mandarić S, Nešić D. Fitnes. Beograd: Fakultet sporta i fizičkog vaspitanja; 2005.
- Stojiljković S. Motivation of women who participate in three recreational programs, the most attended in Belgrade. 2nd International Congress on Physical Education & Sport, Abstract book (pp. 7). Komotini (Greece): Exercise & Society

- Journal of Sport Science and Department of Physical Education & Sport Science – Democritus University of Thrace; 1994.
23. Stojiljković S. Programi rekreacije u sportsko rekreativnim centrima Beograda i motivacija učesnika za vežbanje. *Fizička kultura* 1996; 50(1-2): 42-54.
 24. Stojiljković S. Efekti trčanja u različitim zonama intenziteta. Beograd: Zadužbina Andrejević; 2005.
 25. Sudarov N. Testovi za procenu fizičkih performansi. Novi Sad: Pokrajinski zavod za sport; 2007.
 26. Zaletel P, Furjan-Mandarić G, Zagorc M. Differences in heart rate and lactate levels at three different workloads in step aerobics. *Kineziologija* 2009; 41(1): 97-104.
 27. Živković J. Istraživanje efekata redovnih oblika rekreativnih aktivnosti kod žena [dissertation]. Niš: Fakultet fizičke kulture; 2005.
 28. Radovanović D, Aleksandrović M, Stojiljković N, Ignjatović A, Popović T, Marinković M. Influence of physical training on cardiorespiratory endurance in preadolescent age. *Acta Medica Medianae* 2009; 48(1): 37-40.
 29. Marinković M. Muscle strength in unstable conditions. *Acta Medica Medianae* 2011; 50(2): 53-6. [\[CrossRef\]](#).

EFIKASNOST STEP AEROBIK PROGRAMA KOD MLAĐIH ŽENA

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Istraživanje je sprovedeno kao eksperiment sa paralelnim grupama sa ciljem utvrđivanja efekata step aerobik programa na motoričke sposobnosti, cirkularnu dimenzionalnost i telesnu kompoziciju kod mlađih žena. U istraživanju koje je trajalo tri meseca učestvovala su 24 ispitanice, starosti od 18 do 25 godina, podeljene na dve grupe: 1. grupa od 12 mlađih žena uključenih u eksperimentalni program step aerobika (eksperimentalna grupa) i 2. grupa od 12 mlađih žena koje nisu uključene ni u jedan program redovnog fizičkog vežbanja (kontrolna grupa). Merni instrumenti za procenu istraživanih prostora sastojali su se od šest testova motoričkih sposobnosti, pet mera cirkularne dimenzionalnosti i osam mera kojima je procenjivana telesna kompozicija. Merenje je vršeno pre i posle eksperimentalnog tretmana. Analiziranje dobijenih podataka izvršeno je analizom kovarijanse za utvrđivanje efekata eksperimentalnog tretmana. Rezultati su nakon statističke obrade pokazali da je step aerobik program imao statistički značajan efekat na sva tri posmatrana prostora kod eksperimentalne grupe mlađih žena. *Acta Medica Medianae* 2013;52(3):25-34.

Ključne reči: *step aerobik, motoričke sposobnosti, cirkularna dimenzionalnost, telesna kompozicija, mlađe žene*