

Original empirical article

THE EFFECTS OF KICK AEROBICS ON THE FITNESS ABILITIES OF FEMALE HIGH SCHOOL STUDENTS

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Abstract. *The aim of our work was to assess the effects of Kick aerobics on the fitness abilities of female high school students. Sixty female students participated in the study. They were engaged in physical education classes twice a week, for four months. 30 students (age 16 ± 0.5 years) participated in the experimental program of Kick aerobics and 30 age matched students were the control group that participated in the official high school physical education program. Fitness abilities were assessed by means of a battery of tests. During the initial measuring, the morphological and fitness status of the participants from the experimental and the control group were similar. In the final examination there was statistically significant difference in the fitness abilities between the two examined groups, in favor of the experimental group. The fitness status of the subjects from both groups changed after four months of training, but the changes were dependent on the type of training program. Both groups experienced an improvement in strength of the lower back and flexibility of hamstrings, but the participants from the experimental group improved the strength of the lower body (thigh strength), while the participants from the control group improved the strength of the upper body (strength of the shoulder belt and arms). In addition, the participants that practiced Kick aerobics improved their shoulder flexibility and cardiorespiratory fitness. The Kick aerobics program can be used as an effective tool in physical education, to help the motor skills transformation of high school students.*

Key words: *kick aerobics, female adolescents, fitness abilities.*

INTRODUCTION

Physical activity and physical fitness have been linked to health and longevity since ancient times. Hypokinesia, which is a consequence of high technical and technological

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development of modern society, is one of the three biggest health risk factors of today. Smoking, a poor diet and physical inactivity represent risk factors that often underlie today's leading chronic disease killers: heart disease, cancer, stroke and diabetes, and they are the root cause of around one-third of deaths in developed countries (Hardman and Stensel, 2009). The prevalence of obesity, which is the most frequent negative consequence of hypokinesia, has risen three-fold or more in the last 25 years (Hardman and Stensel, 2009). While adults' physical inactivity and obesity give rise to concern, those for children herald an even more major public health problem because many health-related problems and life-threatening diseases in adulthood have their roots in childhood and adolescence. The summary by the World Health Organization (WHO) that "in many countries, developed and developing, less than one-third of young people are sufficiently active to benefit their present and future health" may well understate the problem (Hardman and Stensel, 2009).

Aerobic endurance is the most significant segment of fitness according to the aspect of health preservation (Maršić & Paradžik, 2005). Adolescents should develop aerobic endurance more than any other skill, so these authors suggest that one of the possible ways of doing this is training to music. There are many different aerobics programs, like Hi-lo, Step, Funky, Aqua, Tae bo etc., the practice of leads towards changes in women's morphofunctional status, especially in terms of fat tissue reduction and muscle shaping (Marković, Marković & Metikoš, 2006). Kick aerobics is a form of Tae bo and presents dynamic activity which uses specific techniques of martial arts, elements and steps from Hi-lo and Step aerobics and specific exercises of strength and endurance, coordination and flexibility. Fast and energetic music is an additional segment of this program whose primary influence is to affect the cardio-respiratory fitness of exercisers.

According to Mandarić (2001), contemporary physical education does not follow contemporary social tendencies or students' needs. The reason for such problems lies in the fact that within schools, problems are solved mainly in a classic and obsolete manner by following old-fashioned organizational forms or models of working and old technologies (Mandarić, 2001). Physical education should provide the satisfaction of bio-psychosocial needs of students and it should permanently encourage students to build these activities in their everyday life and lifestyle.

Thus the aim of our work was to assess the effects of Kick aerobics on the fitness abilities of female high school students, so that the value of aerobics, the worldwide popular recreational activity, could be evaluated as a part of physical education curriculum.

THE METHOD

Participants

The research was carried out on a group of 60 high-school female students, aged 16 ± 0.5 . The participants were classified into a control ($n=30$) or experimental group ($n=30$) on a voluntary basis. All of the participants were healthy and able to exercise. None of them was involved in regular sports training and competition. The girls who were involved in some form of sports activities at the time when the investigation was performed or had trained regularly during their extracurricular activities were not included in the study. Thus major differences in terms of the initial fitness status between

the participants were excluded. All of the participants and their parents gave written informed consent. The study was approved of by the head of the school.

The sample of measuring instruments

The research was designed as a prospective study. All of the participants were subjected to a battery of fitness tests at the beginning and at the end of the research.

The battery of fitness tests was designed to assess muscle strength and flexibility, and estimate the aerobic power of the participants. It included the following tests:

- Push-ups (Corbin & Lindsey, 1997)
- Back extensions (Corbin & Lindsey, 1997)
- Sit-ups (Anspaugh et al., 1997)
- One leg semi-squat (Corbin & Lindsey, 1997)
- Hamstring flexibility (Kurelić et al., 1975)
- Leg flexibility (Šadura et al., 1974)
- Shoulder flexibility (Kurelić et al., 1975)
- „Queens college step test“ (Chatterjee et al., 2005)

A description of the experimental program

The research lasted for 4 months during which the participants attended two different exercise programs twice a week for 45 minutes (a total of 32 training sessions). The control group attended physical education classes that were programmed according to the official plan and program of the Serbian Ministry of Education and Sports, while the experimental group was subjected to programmed kick aerobics classes.

The experimental program, i.e. Kick aerobics program, can be defined as training directed towards the development of cardiovascular endurance by using movement structures of aerobics, dance and martial arts combined into a unique, aesthetically shaped choreography. Additionally, exercises for strength and flexibility development were performed. The training sessions consisted of three parts: the warm up (7 min), main part (33 min) and cool down (5 min). Every part of the training session was performed in accordance with the appropriate music; the music tempo during the warm up was 120-135 beats per minute, while the main part was performed along to 125-155 beats/min music tracks, and cool down to 60-90 beats/min music tracks. General and specific warm ups were followed by the first part (15min) of the main part of the training session i.e. low intensity exercise (60-85% of maximal heart rate). This part of the training was reserved for learning new kick techniques and dance movements that are part of the choreography, while the second part (18min) of the main part of the training session was reserved for practicing the entire choreography at a high intensity (>85 of HRmax). The main part of the training session included standard aerobics moves (side to side, step touch, V step, grapevine, shuffle), running, jumping, dance moves (mambo, cha-cha-cha, jazz square, twist), hand kicks (jab, cross jab, hook, uppercut) and leg kicks (front kick, back kick, side kick, knee kick, jumping snap kick from basic or fighting stance), blocks (front high block, outside middle block, inside middle block, low block) (Stojanović-Tošić, 2010). The parts of the choreography were first learned during 4 and 8 music tacts, and then the entire choreographed sequence was performed 8 to 10 times. Cool down consisted of flexibility exercises, yoga and specific tai chi exercises and breathing exercises.

The exercise program of the control group included tests of physical abilities (5 classes), athletics – running, jumping and throwing techniques (8 classes), general physical conditioning (5 classes), volleyball (7 classes) and basketball techniques (7 classes).

Statistics

The statistical analysis was performed using the statistical package SPSS for Windows 10.0. The results are shown as means±standard deviation (median). Statistically significant differences in fitness status between the experimental and the control group in the initial and the control testing were assessed by a multivariate analysis of variance, while the difference between the groups in certain fitness tests was assessed by using the univariate analysis of variance (ANOVA). To determine the effects of the exercise protocol on the fitness status of the participants, the multivariate analysis of covariance (MANCOVA) was performed. The univariate analysis of covariance (ANCOVA) was used to assess the effects of the exercise protocol on the results in a single fitness test.

RESULTS

At the beginning of the research, the participants from the experimental and the control group did not significantly differ in terms of their morphological characteristics (Table 1).

Table 1 The morphological characteristic of the participants

Characteristic	Experimental group (n = 30)	Control group (n = 30)	Test
Height (cm)	164.6±6.1 (164.5)	167.3±5.7 (167.0)	MANOVA P=0.273
Weight (kg)	58.6±12.3 (55.9)	57.6±9.2 (56.1)	
Body mass index	21.8±4.7 (20.7)	20.8±2.9 (20.5)	

Table 2 shows the results achieved on the fitness tests by both the experimental and the control group during both measurements.

The multivariate analysis of variance (MANOVA) showed that there was no statistically significant difference in the fitness status between the examined groups at the initial testing ($p=0.141$). At the final testing, the fitness status of the experimental and the control group was statistically different ($p=0.002$), and the results of the univariate analysis of variance (ANOVA), i.e. the analysis of the between-group differences in individual fitness tests are shown in Table 2.

The fitness status of the participants in both groups significantly changed after four months of programmed physical activity (MANOVA; $p=0.000$ for the experimental group, $p=0.009$ for the control group). The changes which occurred in particular fitness abilities can be seen in Table 2.

The effects of the experimental exercise protocol were confirmed by a multivariate analysis of covariance (MANCOVA, $p=0.008$). The univariate analysis of covariance (ANCOVA) showed that the experimental exercise protocol induced changes in the push-ups ($p=0.050$), semi-squats on the left leg ($p=0.023$), semi-squats on the right leg ($p=0.039$), shoulder flexibility ($p=0.005$) and aerobic capacity ($p=0.050$).

Table 2 The differences between the experimental and control group at the initial and final measuring of the fitness abilities

	X±SD (med)		Test Differences between 2 measuirngs
	Initial measuring	Final measuring	
Push-ups (n)			
Experimental group (n = 30)	6.5±6.9 (3.5)	7.6±7.7 (6.0)	P=0.128
Control group (n = 30)	6.1±5.8 (5.0)	9.8±6.0 (9.0)	P=0.002**
Test	/	ANOVA	
Difference between the groups		P=0.232	
Back extensions (n)			
Experimental group (n = 30)	32.8±17.2 (27)	37.7±18.2 (34.0)	P=0.016*
Control group (n = 30)	30.9±13.3 (28.5)	34.7±10.7 (34.0)	P=0.022*
	/	ANOVA	
		P=0.440	
Sit-ups (n)			
Experimental group (n = 30)	35.5±10.5 (37.5)	37.3±10.9 (38.0)	P=0.333
Control group (n = 30)	31.0±12.0 (31.5)	33.2±11.8 (36.0)	P=0.210
	/	ANOVA	
		P=0.172	
Semi-squat on the left leg (n)			
Experimental group (n = 30)	13.6±6.6 (15.0)	17.4±6.8 (17.0)	P=0.000**
Control group (n = 30)	12.8±5.9 (13.0)	13.6±7.7 (13.5)	P=0.461
	/	ANOVA	
		P=0.046*	
Semi-squat on the right leg (n)			
Experimental group (n = 30)	16.5±7.8 (17.0)	18.7±6.6 (19.5)	P=0.023*
Control group (n = 30)	13.2±5.2 (13.0)	14.0±6.2 (13.0)	P=0.582
	/	ANOVA	
		P=0.006**	
Hamstring flexibility (cm)			
Experimental group (n = 30)	47.0±7.5 (49.0)	48.3±7.7 (49.5)	P=0.011*
Control group (n = 30)	43.3±5.7 (44.5)	45.6±6.1 (47.0)	P=0.007**
	/	ANOVA	
		P=0.138	
Leg flexibility (cm)			
Experimental group (n = 30)	29.1±6.1 (28.5)	29.1±5.4 (30.0)	P=1.000
Control group (n = 30)	34.1±4.8 (34.0)	34.3±6.3 (34.5)	P=0.785
	/	ANOVA	
		P=0.001**	
Shoulder flexibility - side-stepping (cm)			
Experimental group (n = 30)	75.4±15.8 (75.5)	66.1±13.2 (66.5)	P=0.000**
Control group (n = 30)	80.3±14.9 (80.0)	77.9±16.3 (75.5)	P=0.369
	/	ANOVA	
		P=0.003**	
Queens college step test - Maximal oxygen uptake (ml/kg/min)			
Experimental group (n = 30)	39.2±5.7 (38.5)	41.6±4.8 (41.1)	P=0.002**
Control group (n = 30)	40.4±5.3 (39.6)	40.0±6.6 (38.5)	P=0.245
	/	ANOVA	
		P=0.286	

DISCUSSION

The aim of our study was to determine the effects of Kick aerobics on the fitness status of female high school students. The effects of the training program were assessed by comparing the fitness status of the participants before and after a four-month training process, as well as by comparing the fitness status of the participants who practiced kick aerobics with the fitness status of the participants who attended regular a physical education program consisting of general conditioning, basketball, volleyball and athletics techniques.

At the beginning of the study, the two groups did not differ in morphological characteristics. The BMI of our subjects was within normal ranges, which can be explained by the fact that this experimental sample is random.

The fitness abilities of the participants from the experimental and the control group also did not differ in a statistically significant manner at the initial measuring, but that was not the case at the final testing. The results show that the fitness status of the participants from both groups changed after four months of training, but the changes were dependent on the type of training protocol. Both groups experienced an improvement in strength of the lower back and flexibility of the hamstrings, but the participants from the experimental group improved the strength of the lower body (thigh strength), while the participants from the control group improved the strength of the upper body (strength of shoulder belt and arms). The improvements seen in the results achieved on the back extension and the semi-squat on both leg tests, as well as on the depth reach and shoulder flexibility test, support the value of Kick aerobics as a form of physical activity useful for adolescents' growth and development.

The most significant change in the fitness status of the participants from the experimental group was the change in aerobic capacity, which proved the assumption that a Kick aerobics program would lead towards positive changes in the cardio-respiratory endurance of young females. The results regarding the improved aerobic capacity of our participants are in agreement with the results obtained by other authors (Purcell and Hergenroeder (1994); Kostić & Zagorc (2005); Kostić et al. (2006). It is obvious that applied intensity of the aerobic activity significantly influences cardio-respiratory fitness which was also confirmed in similar studies performed by Baquet et al. (2003) and Jamner et al. (2004). The kinds of training methods that are used in the program to develop cardio-respiratory fitness are very important (Jones & Carter, 2000; Heyward 2006). Purcell and Hergenroeder (1994) suggested that adolescents can improve their aerobic fitness if they are involved in activities with an intensity of 60% to 90% of maximum heart rate for a duration of approximately 20 minutes, four times a week. The exercise intensity of the Kick aerobics program (from 60% to 85% of maximum heart rate during 33 minutes of class) improved cardio-respiratory fitness, which is presented by the results on the "Queens college step test". Thus, Kick aerobics can certainly be classified as a form of endurance training that induces numerous health benefits (Faigenbaum et al., 2009).

CONCLUSION

Summing up the results of this research, it can be concluded that the Kick aerobics program improved the majority of the studied fitness abilities. Most important of all is that it transformed cardio-respiratory fitness in a positive way, while the traditional physical education program did not.

We suggest that one part of the curriculum may be altered to include modern aerobics performed to music, like kick aerobics, because this form of exercise does not only develop aerobic fitness as a major health-related component of physical fitness, but also coordination, strength and flexibility, as well as the body composition of the exercisers.

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EFEKTI KIK AEROBIK PROGRAMA NA FITNES SPOSOBNOSTI UČENICA SREDNJE ŠKOLE

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Cilj studije bio je da se utvrde efekti Kik aerobik programa na fitnes sposobnosti učenica srednje škole. U studiji je učestvovalo 60 učenica. One su pohađale nastavu fizičkog vaspitanja dva puta nedeljno tokom četiri meseca. 30 učenica (starosti 16 ± 0.5 godina) činilo je u eksperimentalnu grupu koja je vežbala Kik aerobik, a 30 učenica istog uzrasta je činilo kontrolnu grupu koja je vežbala po planu i programu predviđenom za srednju školu. Fitnes status ispitanica je procenjivan baterijom testova. Na inicijalnom merenju grupe se nisu razlikovale ni po morfološkim ni po funkcionalnom statusu, što nije bio slučaj na finalnom merenju: na finalnom merenju postojala je značajna razlika u fitnes statusu između grupa, u korist eksperimentalne grupe. Fitnes status obe grupe značajno se poboljšao nakon četvoromesečnog programa vežbanja, ali promene su zavisile od tipa trenažnog protokola. U obe grupe zapaženo je poboljšanje snage leđnih ekstenzora i pokretljivosti zadnje lože buta, ali je kod ispitanica iz eksperimentalne grupe došlo do značajnog povećanja snage mišića nadkolenice, dok je kod ispitanica iz kontrolne grupe došlo do značajnog poboljšanja snage mišića ruku i ramenog pojasa. Takođe, kod ispitanica koje su vežbale Kik aerobik poboljšana je pokretljivost u ramenu, kao i kardiorespiratorni fitnes. Kik aerobik program mogao bi se koristiti kao efikasno sredstvo u nastavi fizičkog vaspitanja, a u cilju transformacije motoričkih sposobnosti učenika srednje škole.

Ključne reči: *kik aerobik, adolescentkinje, fitnes sposobnosti.*