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A COMPARISON OF THE CHANGES IN CARDIOVASCULAR FITNESS FROM TWO MODELS OF WOMEN'S AEROBIC TRAINING

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Abstract. *The research compares the effects of two HI-LO models of aerobic training (aerobic dance) on the cardiovascular fitness of 29 women ages 25 to 30. The experimental program was carried out with the assistance of two experimental groups (E1: n = 15 and E2: n = 14). The "A" HI-LO aerobic dance model was realized over a period of 8 weeks, with fifty-minute training sessions three times a week. The "B" HI-LO aerobic dance model was realized over a period of 8 weeks, with 35-minute training sessions five times a week. The exercise intensity of the A and B models was the same (60-75% of the maximum). Cardiovascular fitness was evaluated by means of the following parameters: resting heart rate, heart rate under strain, systolic arterial blood pressure, and diastolic arterial blood pressure, absolute value of maximal oxygen uptake and relative value of maximal oxygen uptake. The data from the initial and final measurings was processed by means of a canonical discriminant analysis. Between the groups (E1 and E2) at the initial and final measurings there was no statistically significant difference regarding the studied variables. The effects of both of the HI-LO aerobic dance models are, on the basis of the results, statistically significant in their entirety. The variables which contributed in particular to the discrimination of the initial and final measuring results for the E1 and E2 groups are: resting heart rate and the relative value of maximal oxygen uptake. It was concluded that the effects of the two HI-LO aerobic dance models on cardiovascular fitness are equally beneficial, if aerobic dance is practiced over a longer period of time with training sessions three times a week, or if it is practiced five times a week for a shorter period of time, on condition that the intensity of the exercise remains the same.*

Key words: *cardiovascular fitness, aerobic dance, training, women.*

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1. INTRODUCTION

In the fitness or recreation of the young and elderly alike, various activities are usually combined to create the expected effects on health or physical fitness. The effects of various activities are usually researched separately, although there is some research which claims to be all-encompassing.

When it comes to the application of aerobic activities, their effects are evaluated primarily by means of physiological variables (the variables of functional abilities), when the maximal value of oxygen uptake is usually used or the amount of blood lactate, but when the effects of exercise on body composition are not neglected, and when body composition is evaluated by means of anthropometric variables, primarily the amount of fatty tissue and the like.

The effects of strength exercises of various modalities and training methods are studied primarily using measuring instruments, but other motor abilities can be used as well. No matter which activities or exercises are being used, flexibility exercises are always used in training sessions, as they affect the trainee in an appropriate manner, no matter whether entire aerobic sections are being trained or just strength exercises.

Aerobic dance is one of the means used for the development of so-called cardiovascular fitness. During training sessions of that particular kind, the instructors or coaches use various dance steps, jumps, turns, balances and flexing in all different directions and plains in accordance with the fitness and abilities of the person who is exercising, while activating various parts of the body at the same time. Considering that this exercise method is used for group training, in order for everyone to exercise to music of the same rhythm and tempo, the instructor must always begin with simple spatial-rhythmic motions, and then turn them into more complex ones (Kostić, 1999). During training the people exercising are asked to pay attention to the fact that if they have problems remembering the choreography and fitting in with the group exercise, they should not pause, but continue marching in place until they have once again synchronized their motions with those of the group (it is important not to stop moving).

The American College of Sports Medicine has given out the appropriate recommendations for the development and maintenance of cardio respiratory fitness (1. Training frequency of 3-5 days per week. 2. Training intensity from 55/65% to 90% of the maximal heart rhythm – HRmax or from 40/50% do 85% of the maximal value of oxygen reserve uptake - VO2R or HRmax of the heart rhythm reserve - HRR. A lower intensity at the 40-49% VO2R or HRR and 55-64% HRmax level is recommended for individuals who are not in shape. 3. Duration: 20-60 minutes of constant training or several shorter bouts of training. Lower intensity should be used for longer periods of time (30 minutes or more), and a higher level of intensity should last for 20 minutes or more. 4. Activity type: any rhythmic or aerobic activity which activates large muscle groups such as: walking, running, bicycling, riding a stationary bike, aerobic dance, jump rope, rowing, step climbing, swimming, skating, various endurance games and any of their possible combinations).

Improving VO2-max is directly connected to the frequency, intensity and the duration of the training session (Gettman, Pollock, Durstine, Ward, Ayres and Linnerud, 1976; Hartung, Smolensky, Harriet, Rangel and Skovran, 1977; Hickson and Rosenkoetter, 1981; Gossard, Haskell, Taylor et al., 1986; Wenger and Bell, 1986; Gossard, Haskell, Barr Taylor et al., 1986; Takeda, Tanaka and Asamo, 1994; Shephard, 1969 (according to

ACSM, 1998). Considering the fact that many men and women exercise, apart from everything else, for aesthetic reasons as well, and that exercising is connected primarily to calorie burning, there exists much research with the aim of determining which exercise program is most effective for which category of people. In this sense, the researched program models differ in duration, intensity and their extent.

The hypothesis is that based on the number of burnt calories, the effects of aerobic training of longer duration and lesser intensity will be the same as those of a training of shorter duration and greater intensity.

It is also assumed that the effects will be similar if the training is continuous or in bouts, or to be more precise if a person trains more frequently but for shorter bouts but with the same intensity (Debusk, Stenestrand, Sheehan and Haskell, 1990).

Research exists which has been carried out on subjects who are members of the younger and older population, including elderly men and women, which checked the effects of concrete aerobic exercise models.

Grant, Corbett, Davies, Aichison, Mutrie, Byrne, Henderson, Dargie (2002) researched the effects of two different aerobic models on the functional abilities of women aged 68.

One model had as its content aerobic dance, while the other had walking. The group which trained aerobic dance showed it had a better effect on VO2 max and maximal cardiac function which was not the case for the group that walked.

Aerobic exercise has a positive effect on the decrease of hypertension (Hagberg, Montain, Martin, et al. (1989) and other illnesses.

In the research of the physiological responses to aerobic dance of different intensity, the effects are usually compared to the exertion that is being felt (perceived rate of exertion – PRE), (Grant, Davidson, Aitchison et al., 1998). The intensity of aerobic training based on the PRE method ranges from 10 to 17 on a scale of 6 to 20. This intensity determining method is most easily applied to a large number of people since while they are analyzing and observing their body they synchronize their exertion and their abilities. An exertion level of 13 is considered equal to a 135 bpm. exercise. The PRE usually matches the objectively evaluated exercise intensity, and can be used in the process of an individual's dosage of the duration and intensity of the exercise, in the absence of other objective indicators.

A moderate training intensity program of a longer duration is recommended for most adult men and women. The minimal intensity necessary for the improvement of VO2 max is thought to be 55-65% of the maximal cardiac function.

Eickhoff, Thorland and Ansorge (1983) researched the effects of aerobic dance on the physiological and psychological changes of 29 women. The experimental procedure lasted for 50 minutes. The female subjects of the experimental group trained for ten weeks, three times a week. The effects of the exercise were positive and significant for the physiological changes, primarily in the case of the female subjects who at the beginning were classified as requiring a lower level of cardiovascular exercise.

In order to assist in understanding the potential benefits of hand-held weights during aerobic dance exercise training, 30 female subjects ages 18 to 25 were assigned randomly to one of two groups (Thompson, Goodroe, Johnson and Lamberth, 1991). One group (of 15 subjects) trained to an aerobic dance program, and the other (15 subjects) trained to an aerobic dance program accompanied by routines for upper body strength performed with hand–held weights weighing around 0.5 kg. The following variables were used: VO2 max, systolic pressure, diastolic pressure, blood lactate accumulation. Better VO2 max results (31.65 ml/kg/min) were found in the group of subjects who trained aerobics with hand-held weights than in the group which trained without the weights (27.38 ml/kg/min). There was no difference in heart rate, blood pressure or blood lactate between the groups.

In one study, Mosher, Underwood, Ferguson and Arnold (1994) researched the effects of a combined aerobic and strength training program on the maximal value of oxygen uptake, body composition and muscle strength in the case of a sample of 33 subjects (17 of them made up the experimental group, and 16 the control group). The workout was in the form of turn-taking, lasting 45 minutes and encompassing 30 activities, among which were 5 aerobic exercises, lasting for 3 minutes, and 25 – 30 seconds of intense training or callisthenic exercises. The female subjects exercised at an intensity of 40 – 50 % of 1RM at each of the strength stops, and at the aerobic stops exercised at 75 – 80 % of their maximal cardiac function. By means of the ANOVA, a statistically significant difference was determined to exist for VO2 max, upper body strength, lower body strength, skin creases and the percentage of body fats.

The reduction of cardiovascular fitness occurs after a two-week break in training. From the initial level of the VO2 max, 50% is lost after a 4 – 12 week break in training. Yet, people who have previously in their lives been exposed to continuous training will maintain the reached VO2 max value for a longer period of time. When the intensity of the training does not change, and the frequency and duration do, the VO2 max can remain unchanged for a period of up to 15 weeks. Or when there is a decrease in intensity, and the frequency and duration do not change, then the VO2 max can change significantly (Hickson, and Rosenkoetter, 1981; Hickson, Kanakis, Dasvis, Moore and Rich, 1982; Hickson, Foster, Pollock, Galassi and Rich, 1985).

The subject matter of this research is based on the effects of two aerobic dance models (the HI-LO concept). The models differ in regards to duration, or in other words, continuity, and frequency during the week. It is necessary to research the kinds of cardiovascular fitness changes that will occur after an independent implementation of the two models and whether statistically significant changes will be take place on the evaluated variables of the two samples of examinees. The research should answer the question of whether it is more efficient to continuously exercise for longer periods of time, or in the form of bouts (more frequently) for shorter periods of time, when the intensity of the exercise in both cases is the same.

The aim of the research is to study the effects of two aerobic dance models on the cardiovascular fitness of a number of female subjects.

The hypothesis is that the effects of the two different models will be similar for either sample of examinees, or in other words, that there will be no statistically significant difference between the groups at the final measuring.

2. METHODS

The Sample of Examinees

The sample numbered 29 women ages 25 to 30 who trained in the fitness clubs in Niš. They were either employed or were students. Fifteen of them made up the first experimental group which trained according to the A model, and 14 of them made up the second experimental group which trained according to the B model. All the female subjects had occasionally trained in fitness clubs or in their own homes prior to the research. For the purpose of this experiment they mainly attended the training sessions regularly, and were motivated to exercise. All the female subjects who did not show up for over a week to training were excluded from the sample at the end of the program.

The sample of measuring instruments

For the evaluation of cardiovascular fitness the following parameters were used: (1) resting heart rate (min), (2) heart rate under strain (min), (3) resting systolic pressure (mmHg), (4) resting diastolic pressure (mmHg), (5) the absolute value of maximal oxygen uptake (l/min), (6) the relative value of maximal oxygen uptake (ml/min/kg).

A description of the experimental program.

The basic characteristics of the applied aerobic dance model are shown in Table 1.

Table 1. The basic characteristics of the aerobic dance model

	A model (E1 group)	B model (E2 group)
Overall number of training sessions	24	40
Overall training time per week	150 min	175 min
Number of sessions per week	3	5
Intensity	60 – 75%	60 – 75%
Number of weeks	Eight	Eight
Duration of the session	50 min	35 min
Duration of each individual aerobic dance	35 min	20 min
Overall duration of the aerobic dance model	840 min	800 min

The structure of each individual workout included: the warm-up, the main (cardio) part and the cool-down.

The structure of the A and B HI-LO models was the same on the whole. The warm-up was the same in the A and B models. The devices used are: rotating all the joints in both directions (repeated 8 to 10 times) and stretching the large muscle groups (repeated twice for a period of 10 seconds). The warm-up lasted for 10 minutes.

The main part differed for the A and B models.

The main part of the workout in the A model had the following structure: three choreographed sequences of motion and movement which lasted for around 10 minutes, according to the HI-LO concept. The main part lasted for a total of 35 minutes. The intensity of the exercise in each choreographed sequence was 60%, 70% or 75% of the maximum, depending on whether it was low-impact, moderate-impact or high-impact. The maximal heart rate was calculated for each female subject along with the target heart rate. Each of the subjects independently monitored her heart rate. The HI-LO concept necessarily involves low-impact, high-impact and moderate-impact. The content of the low-impact choreographed sequence: "step -touch", "side-to-side", "V-step", walk back and forth, combinations without jumping or skipping. The content of the moderate-impact: "hand to hand", "new york", "cuban break", "split cuban break", mambo or various combinations including hand and body motions. The content of the high-impact: samba basic, "whisk", "bota-fogo", "single", "double" and "triple" step jive, "kick-change", skipping in place and within a combination, jumping and other elements. The steps chosen came from various group dances which could easily be modified and adapted to a monotonous and simple rhythm, and could be performed forwards and backwards and left to right. Each choreographed aerobic dance sequence was performed to music of an appropriate tempo (120, 130 and 140 bpm). Mainly Latin music was used (Cha-cha-cha, Mambo, Samba) or the Jive and Boogie Woogie.

The main (conditioning) part of the B model had the following structure: three choreographed sequences of motions and movement which lasted for around 6 minutes. The overall duration of the main part of the workout was 20 minutes. The exercise intensity for each choreographed sequence was 60% (low), 70% (moderate) or 75% (high) of the maximum. The maximal heart rate and the target heart rate were calculated for each individual subject. Each female subject independently monitored her own hear rate. The contents of the low-impact choreographed sequence: "step -touch", "side-to-side", "V-step", walk back and forth, combinations without jumping or skipping. The content of the moderate-impact: "hand to hand", "new york", "cuban break", "split cuban break", mambo or various combinations including hand and body motions. The content of the high-impact: samba basic, "whisk", "bota-fogo", "single", "double" and "triple" step jive, "kick-change", skipping in place and within a combination, jumping and other elements. Each choreographed aerobic dance sequence was performed to music of an appropriate tempo (120, 130 and 140 bpm). Mainly Latin music was used (Cha-cha-cha, Mambo, Samba) or the Jive and Boogie Woogie.

The cool-down part of the training session was the same in the A and B models. Its content: stretching exercises which simultaneously activated several body parts, repeated 3 to 4 times with stretches in the final position for 10 to 20 seconds. The duration of the final part of the session was around 5 minutes.

Method of Data Analysis

For all the obtained data, the basic statistical parameters were calculated: the mean, standard deviation, minimal value, maximal value and the distribution parameters: kurtosis and skewness. In order to determine the differences between the initial and final measurings of the E1 group, the initial and final measurings of the E2 group, the initial measuring of the E1 and E2 groups and the final measuring of the E1 and E2 groups, a canonical discriminant analysis was calculated.

The data was processed by means of the SPSS 8 statistics program.

3. THE RESULTS

The basic descriptive statistics coefficients of the implemented variables are shown in Table 2.

Heart rate under strain and systolic blood pressure had the same numerical values at the initial and final measurings of the E1 and E2 groups. That is a very interesting piece of information which is very hard to explain, especially the fact that the value of heart rate under strain did not change. The value for the kurtosis of the absolute value of maximal oxygen uptake at the initial measuring of the E1 group significantly differs from normal distribution, but at the final measuring the value of the same coefficient was within the normal range. The value of kurtosis (the measure of the homogeny of the results) for resting heart rate at the initial measuring differs from normal distribution, but at the final measuring is within the normal range. The remaining coefficients for the evaluation of homogeny and the asymmetry of the results do not deviate from normal distribution.

Table 2. The basic statistical parameters of cardiovascular fitness

Coefficients	PULSR	PULSS	SISTP	DIAP	AOU	ROU
E1 initial measuring						
Mean	71.60	159.73	116.00	70.33	2.58	38.27
Min	63.00	143.00	100.00	60.00	1.50	33.00
Max	81.00	175.00	130.00	80.00	5.50	44.00
StdDev	5.00	8.53	9.46	5.50	.94	3.61
Kurtosis	.17	.08	-.74	-.68	6.97	-1.29
Skewness	.27	-.09	-.21	-.15	2.27	.07
E2 initial measuring						
Mean	70.71	165.36	110.71	69.64	2.56	39.64
Min	62.00	149.00	90.00	60.00	1.18	37.00
Max	81.00	175.00	130.00	80.00	3.20	44.00
StdDev	4.18	8.37	12.54	7.71	.46	2.10
Kurtosis	3.10	-.03	-.87	-1.60	-1.22	-.37
Skewness	.54	-.87	.12	.14	-.30	.61
E1 final measuring						
Mean	67.57	159.73	116.00	68.33	2.54	41.07
Min	64.00	143.00	100.00	65.00	1.80	39.00
Max	70.00	175.00	130.00	75.00	3.20	45.00
StdDev	1.91	8.53	9.46	3.09	.41	2.43
Kurtosis	.03	.08	-.74	-.40	-.42	-1.08
Skewness	-1.05	-.09	-.21	.31	.06	.80
E2 final measuring						
Mean	67.36	165.29	110.71	67.86	2.64	42.14
Min	63.00	149.00	90.00	60.00	1.90	39.00
Max	71.00	175.00	130.00	75.00	3.30	46.00
StdDev	2.59	8.31	12.54	5.45	.43	2.28
Kurtosis	-.72	.01	-.87	-1.27	-.65	-1.25
Skewness	-.55	-.89	.12	.20	-.47	.02

Legend
PULSR – resting heart rate, PULSS - heart rate under strain,
SISTP – systolic blood pressure, DIAP - diastolic blood pressure
AOU – absolute value of maximal oxygen uptake, ROU - relative value of maximal oxygen uptake,
Mean – the mean, StdDev - standard deviation, Min - minimal value, Max - maximal value,
Kurtosis – the degree of roundness of the curve peak (for the evaluation of homogeneity),
Skewness – deviation from the normal distribution (asymmetry)

The difference in cardiovascular fitness between the initial and final measurings of the E1 group are shown in Table 3 and were obtained by calculating the canonical discriminant analysis coefficients (summary, structure, centroids and test of equality of group mean). Wilk's Lambda (.46) is significant at the .004 level and indicates that a statistically significant difference on whole exists between the values of the cardiovascular fitness parameters at the initial and final measurings of the E1 group. Wilk's Lambda of the individual parameters points out the value of resting heart rate (.83, Sig .02) and the relative value of maximal oxygen uptake (.86, Sig .05).

Table 3. Canonical discriminant analysis of cardiovascular fitness of the E1 group

Sumary of canonical discriminant function: Eigenvalues and Wilk's Lambda

Function	Eigenvalues	% variance	% cummulative	CanCorr
1	.73	75.3	75.3	.65
2	.24	24.7	100	.44
	Wilk's Lambda	CHI	Df	Sig
1	.46	28.65	12	.004
2	.80	8.07	5	.152

Structure matrix function

	Function 1	Function 2
1	-.50 *	.26
4	-.17 *	.12
5	-.12 *	.04
2	-.28	-.55 *
6	.38	-.47 *
3	.13	.41 *
Function at group centroids		
1	-.50	.57
2	-.64	-.54
3	1.18	-4.99

Tests of Equality of Group Mean

Variable	Wilk's Lambda	F	Df1	Df2	Sig
1	.83	4.10	2	40	.02
2	.88	2.71	2	40	.07
3	.94	1.10	2	40	.34
4	.97	.50	2	40	.60
5	.98	.24	2	40	.78
6	.86	3.22	2	40	.05

Legend:

Eigenvalues – the square of the determinant coefficient (represents the shared variance of the factors which make possible the differentiation of the groups on the basis of the function)

CanCorr – the canonical correlation coefficient (represents the maximal correlation between the linear function of the predictor variables and the liner function of the variables which denote group affiliation),

Wilk's Lambda - the discriminative intensity criterion

CHI – the extent of Bartlett's HI-square test for the determination of the significance of the isolated function

Df – the degree of freedom, Sig – significance, *- the largest absolute correlation between variable and any discriminant function

Structure matrix: pooled within-groups correlations between the discriminating variables and the standardized discriminant function.

Centroids: unstandardized canonical discriminant functions evaluated at group mean.

At the univariate level, the coefficients of the F-test were calculated, along with its significance (Sig) and the degree of freedom (Df1 and Df2).

The difference in cardiovascular fitness between the initial and final measurings of the E2 group is shown in Table 4 and was obtained by calculating the canonical discriminant analysis coefficients (summary, structure, centroids and test of equality of group mean). Wilk's Lambda (.43) is significant at the .034 level and indicates that a statistically significant difference on the whole exists between the values of the cardiovascular fitness parameters at the initial and final measurings of the E2 group. Wilk's Lambda of the individual parameters points out the value of resting heart rate (.78, Sig .00) and the relative value of maximal oxygen uptake (.82, Sig .02) and heart rate under strain (.86, Sig .05).

Table 4. Canonical discriminant analysis of cardiovascular fitness of the E2 group

Sumary of canonical discriminant function: Eigenvalues and Wilk's Lambda

Function	Eigenvalues	% variance	% cumulative	CanCorr
1	.68	65.6	65.6	.63
2	.37	34.4	100.0	.51
	Wilk's Lambda	CHI	Df	Sig
1	.43	30.15	12	.03
2	.73	11.15	5	.48

Structure matrix function

	Function 1	Function 2
1	-.61 *	- .21
4	-.15 *	- .08
5	-.32	.50 *
2	-.43	.49 *
6	-.08	.34 *
3	.16	-.26 *
Function at group centroids		
2	-1.50	-.15
3	.73	-.61
4	.37	.76

Tests of Equality of Group Mean

Variable	Wilk's Lambda	F	Df1	Df2	Sig
1	.78	5.35	2	39	.00
2	.86	3.15	2	39	.05
3	.95	.85	2	39	.43
4	.98	.37	2	39	.68
5	.95	.92	2	39	.40
6	.82	4.18	2	39	.02

Legend:

Eigenvalues – the square of the determinant coefficient (represents the shared variance of the factors which make possible the differentiation of the groups on the basis of the function)

CanCorr – the canonical correlation coefficient (represents the maximal correlation between the linear function of the predictor variables and the liner function of the variables which denote group affiliation), Wilk's Lambda - the discriminative intensity criterion

CHI – the extent of Bartlett's HI-square test for the determination of the significance of the isolated function

Df – the degree of freedom, Sig – significance, *-the largest absolute correlation between variable and any discriminant function

Structure matrix: pooled within-groups correlations between the discriminating variables and the standardized discriminant function.s

Centroids: unstandardized canonical discriminant functions evaluated at group mean.

The difference between the values of the other cardiovascular fitness parameters of the E1 and E2 groups at the initial and final measurings are shown in Table 5 and were obtained by calculating the summary of the canonical discriminant function (Wilk's Lambda).

Table 5. Summary of the canonical discriminant function of the initial and final measurings of the E1 and E2 groups

Groups	Wilk's Lambda	CHI	Df	Sig
E1-E2 initial	.73	7.52	6	.27
E1-E2 final	.67	8.90	6	.17

Legend:
Wilk's Lambda - the discriminative intensity criterion
CHI – the extent of Bartlett's HI-square test for the determination of the significance of the isolated function
Df – the degree of freedom, Sig – significance

Considering the fact that no statistically significant difference between the groups at the initial and final measurings was found, a further presentation of the canonical discriminant analysis is not necessary. On the basis Wilk's Lambda coefficient it can be concluded that there is no statistically significant difference between the E1 and E2 groups at the initial measuring and the E1 and E2 groups at the final measuring.

4. THE DISCUSSION

By means of the canonical discriminant analysis of the initial and final measurings of the E1 group (Table 3) two discriminant functions were isolated, of which the first is statistically significant. It indicates the significant difference between the initial and final measurings of the variables of cardiovascular fitness of the first experimental group of female subjects.

On the basis of the structure of the discriminant function it can be concluded that the variables for the evaluation of resting heart rate and the relative value of maximal oxygen uptake (Table 3) make the greatest contribution to the difference between the evaluated variables between the two measurings. The value of these parameters is statistically significant. In Table 2 we can note that resting heart rate is smaller at the final measuring, that heart rate under strain and systolic blood pressure are without change, that diastolic blood pressure and the absolute value of maximal oxygen uptake are smaller and that the relative value of maximal oxygen uptake is greater.

On the basis of the obtained results some interesting data can be observed related to systolic and diastolic arterial blood pressure of the E1 group. Systolic blood pressure is unchanged at both measurings, and the diastolic one decreased after the experimental procedure. This piece of information should be emphasized as the decrease to the diastolic blood pressure is around 2mmHg. Similar results, related to arterial blood pressure were obtained from the E2 group as well.

The canonical discriminant analysis of the initial and final measurings of the E2 group (Table 4) isolated a statistically significant discriminant function which discriminates the results of the initial and final measurings in the area of cardiovascular fitness of the second experimental group. The greatest contribution to the difference between the tested variables between the two measurings of the E2 group was made by the variables for resting heart rate and the relative value of maximal oxygen uptake. These values are statistically significant. It should be pointed out for the E2 group that the values of heart rate under strain at the final measuring are somewhat smaller, but that the value is statistically significant at the .05 level (Table 4).

Between the E1 and E2 groups which exercised following different aerobic dance models no statistically significant difference of the variables for cardiovascular fitness was found at the initial and final measurings (Table 5). On the basis of the significance of Wilk's Lambde it can be concluded that the levels of functional ability of the female subjects were approximately equal, the same as they were prior to the experimental procedure and after the procedure, or in other words, in can indirectly be concluded that the effects of the applied aerobic dance models are similar.

The E1 group (the A aerobic dance model) in relation to the E2 group (the B aerobic dance model) had fewer training sessions as part of the model, but a longer effective aerobic dance time overall. The results have shown almost imperceptible differences in the degree of significance of the values of individual variables of cardiovascular fitness in favor of the E2 group, or to be more precise, the B aerobic dance model. For this particular research the longer actual dance time was not the deciding factor for the obtained results. The effects of the "B" aerobic dance model are, unlike those of the "A" aerobic dance model, different in their statistical significance of the values of heart rate under strain at the final measuring. Within the B model the overall exercise time per week was longer. The hypothesis is that the overall weekly exercise time could be the reason for the indicated differences between the two groups at the final measuring. This is yet another of the contributions to the hypothesis that the overall exercise time should be added up and that exhausting a person with long workouts without pause is unnecessary.

Another contribution to this hypothesis is the opinion of Debusk et al. (1990) who assumed that similar exercise effects will be obtained if the training takes place over a longer period of time without interruption (continuously) and if the training takes place over several shorter periods of time.

In their research, Clearly, Moffatt, and Knutzen (1984) have shown that a longer effective training time causes significant difference to the VO2 max in comparison to shorter periods of time when the training sessions last the same amount of time.

The results of the cardiovascular fitness variables were statistically improved in the research of Watterson (1984) after 18 hours of experimental aerobic dance exercise, which is significantly shorter than the time spent exercising in the case of our models.

Considering the fact that the A and B aerobic dance models have the same individual training session structure, the same exercises for the warm-up and the cool-down, the same dance elements as part of aerobic dancing, as well as the same exercise intensity, the conclusion is that the indicated differences between the groups should be looked for in the overall exercise time per week no matter whether or not the exercise was performed for a longer period of time, continuously, with lesser frequency or for shorter periods of time, continuously, but with greater frequency.

5. CONCLUSION

As the female subjects of the E1 and E2 groups in our research trained similar aerobic dance contents with the same intensity but with different frequency and duration during the week, the results indicate that under the influence of the A HI-LO model and the B HI-LO aerobic dance model, similar effects can be expected. This research has confirmed the hypothesis that the effects of the two HI-LO aerobic dance models on cardiovascular fitness are equally beneficial, if the training takes place continuously over a longer period of time, up to three times a week, or if it is carried out five times a week, for shorter periods of time, under the condition that the exercise intensity in the models is 60-75% of maximal cardiac function. Both models can be recommended for practical use. The A model belongs to the so-called classical HI-LO aerobic dance models, which are primarily used in fitness clubs, and the other HI-LO model (B) is a good choice for all the people who have less time to exercise continuously during the day, but have the need and will to do it more frequently during the week.

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KOMPARACIJA PROMENA KARIOVASKULARNOG FITNESA DVA MODELA AEROBNOG VEŽBANJA ŽENA

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U istraživanju se upoređuju efekti dva HI-LO modela aerobnog vežbanja (plesnog aerobika) na kardiovaskularni fitnes 29 žena starih od 25 do 30 godina. Eksperimentalni program su realizovale dve eksperimentalne grupe (E1:n=15 i E2:n=14). "A" HI-LO model plesnog aerobika realizovan je osam nedelja, tri puta nedeljno sa pojedinačnim trajanjem treninga 50 minuta. "B" HI-LO model plesnog aerobika realizovan je osam nedelja, pet puta nedeljno sa pojedinačnim trajanjem treninga 35 minuta. Intenzitet vežbanja A i B modela je bio isti (60-75% maksimalnog srcanog rada). Kardiovaskularni fitnes je procenjen sa sledećim parametrima: puls u miru, puls u opterećenju, sistolni arterijski krvni pritisak, dijastolni arterijski krvni pritisak, apsolutna vrednost maksimalne potrošnje kiseonika i relativna vrednost maksimalne potrošnje kiseonika. Podaci sa inicijalnog i finalnog merenja su obrađeni kanoničkom diskriminativnom analizom. Između grupa (E1 i E2) na inicijalnom i na finalnom merenju nije postojala statistički značajna razlika u primenjenim varijablama. Efekti oba modela HI-LO plesnog aerobika na kardiovaskularni fitnes su, na osnovu rezultata, statistički značajni u celini. Varijable koje su posebno doprinele diskriminaciji rezultata inicijalnog i finalnog merenja E1 grupe i E2 grupe su: puls u miru i relativna vrednost maksimalne potrošnje kiseonika. Zaključeno je da su efekti dva HI-LO modela plesnog aerobika na kardiovaskularni fitnes podjednako dobri, ako se plesni aerobik u kontinuitetu vežba duže vreme, a tri puta u nedelji, ili ako se vežba pet puta u nedelji, a kraće vreme, uz uslov da je intenzitet vežbanja isti.

Ključne reči: *kardiovaskularni fitnes, VO2-max, plesni aerobik, trening, žene.*