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Peculiarities of the Heart Rate in Women Excercising Fitness in Response to the Standardized Muscular Load

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Abstract: In women of the control group during standardized muscular exercise within the first 2 min, the heart rate reaches the maximum and at the 3rd min of doing physical exercises the heart rate is reduced. During the recovery period upon completion of muscular loading the heart rate is not reduced to initial values. In women of the experimental group by performance of the Harvard step-test the heart rate gradually increases during three minutes of muscular exercises. At that the heart rate by muscular loading appeared to be much lower than in women of the control group. Upon completion of muscular loading already during the two minutes of rest the heart rate in these women is significantly reduced and by the 4th min reaches the initial values.

Key words: Fitness, women, heart rate, systematic exercise, muscular

INTRODUCTION

Today, fitness is especially popular among teenagers and adults. This is due to the fact that the exercisers are proposed a wide range of methods and forms of training. One of the most efficient training forms aimed at fat-burning is tracing (Guskov and Degtyareva, 1998).

Tracing (method by Tracy Anderson) is a mixture of Pilates, aerobics and personal experience of Tracy Anderson, famous fitness trainer of hollywood stars. She invented special exercises that involve fine sets of muscles and allow achieving the maximally harmonic development of the entire body (Anderso, 2010). This is a training system for women of any age with different level of training (Antipenkova, 2002; Alexandrovna and Pavlovich, 2014). The program includes dancing-aerobics warm-up, a power routine aimed at working out the muscles of the entire body as well as stretching exercises (Bushma, 2010; Gortsev, 2001; Davydov *et al*., 2003). In the aerobic part of training, the main means are sets of classical aerobic exercises causing high performance of the respiratory and cardiovascular systems (Zefirova and Platonova, 2006). In the strength part of the routine exercises are done using the own weight. These exercises are focused on development of the strength endurance and are distinguished by localization when a limited set of muscles is engaged in research. As the result, the load is more concentrated, fatigue is felt faster (Faleyev, 2009).

All ensures: fat-burning, body sculpting, training the cardiovascular system, development of strength and endurance, flexibility and joint mobility (Dorokhov, 2002; Anonymous, 2015).

Positive effect of this trend of the exercisers' body is needless to say. However, the impact of tracing on the cardiovascular system of women remains to be underinvestigated.

Accordingly, the objective of our study was investigation of peculiarities of the heart rate response in women going in for fitness to performing standardized muscular exercise.

MATERIALS AND METHODS

The studies were performed in the fitness studio 'Malina' in Kazan. In the research, women aged 22-35 years with different experience in going in for fitness three times a week participated. The total amount of those tested made 55 persons among which 29 women systematically exercising tracing for about a year and 26 beginners.

The heart rate figures were recorded in the state of relative rest and by doing standardized muscular exercise in the form of the Harvard step test using the Tetrapolar Chest Rheography Method (Kubicek, 1966).

According to the procedure, electrodes were put as follows: 2 current electrodes; the first one, on the head at the forehead area: the second one, on the crus above the ankle joint, 2 measuring electrodes: the first one, at the neck area at the level of the seventh cervical vertebra; the second one, in the area of the chest at the level of the xiphoid appendix. The rheogram record was automatically reproduced by the reo-attachment for computer analysis RPKA 2-01 TY 9442-002-00271802-95 designed to research

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as part of the medical hardware and software complexes. The device is recommended for use in the medical practice by the committee on the new medical technology at the Ministry of Health of the Russian Federation.

RESULTS AND DISCUSSION

As our studies showed, in women of the control group aged 22-35 years starting the exercise tracing the heart rate at rest made 78.8±1.8 bpm (Table 1). At the 1st min of doing the standardized muscular exercise in the form of the Harvard step test the heart rate was increased by 65.7 bpm and reached 144.5±2.1 bpm ($p<0.05$). Increase in the heart rate was also observed at the 2nd min of doing muscular exercise. At that the heart rate increased up to 151±0.9 bpm ($p<0.05$). However, at the 3rd min, the heart rate fall by 7.7 bpm was recorded in these women as compared to the heart rate values recorded at the 2nd min and made 144.3±1.9 bpm ($p<0.05$). Thus, in women of the control group during the first 2 min of the muscular exercise the heart rate is increased but later on, i.e., at the 3rd min significant decrease of this indicator proceeds.

During the recovery period upon completion of muscular exercise in this group of women the heart rate slowed down significantly. At the 1st min of recovery, the heart rate in women of the control group decreased by 19.3 bpm as compared to the values recorded at the 3rd min of muscular exercise and made 123±3.6 bpm ($p<0.05$). During the next minutes of recovery sustainable heart rate fall was also observed. However, this reduction proceeded much slower. At the 2nd min of recovery the heart rate slowed down to 109.9±2.4 bpm ($p<0.05$). At the 3rd min, this indicator fell down by another 7.5 bpm and made 102.4±2.1 bpm ($p<0.05$).

During the next 2 min in these women the heart rate was reduced insignificantly and at the 5th min of recovery this indicator made 100±4.0 bpm. Thus, in this group of women with each next minute of recovery, we observed the heart rate fall. At that by the 5th min of the recovery period the heart rate had not fallen down to the initial values.

In the experimental group of women systematically exercising tracing during 1 year the heart rate at rest made 68.1±2.2 bpm. This value appeared to be by 10.7 bpm lower than values of women from the control group ($p<0.05$). By doing muscular exercise at the 1st min, the heart rate was increased and reached 122.7±4.5 bpm ($p<0.05$). However, if in women of the control group this indicator at the 1st min of the muscular exercise was increased by 65.7 bpm then in women systematically exercising tracing during a year the heart rate increased by 54.6 bpm only which is by 11.1 bmp lower as compared to the heart rate in the control group ($p<0.05$). At the 2nd min of performing the Harvard step test in women exercising tracing for over a year the heart rate was increased by 9.1 bpm as compared to the values recorded at the 1st min of doing muscular exercise and made 131.8±2.1 bpm ($p<0.05$). At the 3rd min this indicator was increased insignificantly and made 133.1±5.5 bpm. Thus, in women systematically exercising fitness during a year in the process of doing muscular exercise in the form of the Harvard step test increase in the heart rate takes place whereas in women of the control group the heart rate was increased only at the first 2 min of doing muscular exercise and it fell down by the 3rd min. At that the most significant increase in the heart rate was observed in women of the control group at the 1st min of doing muscular exercise than in women exercising fitness during 1 year.

During the recovery period upon completion of muscular exercise in women of the experimental group systematically exercising tracing during 1 year significant deceleration of heart rate was observed. At the 1st min of the recovery process in this group of women, we observed slowing of the heart rate by 16 bpm as compared to the values recorded at the 3rd min of doing muscular exercise which made 117.1±3.7 bpm ($p<0.05$). The maximum heart rate fall took place at the 2nd min. This value was reduced 18.5 bpm and made 98.6±4.5 bpm ($p<0.05$). At the 3rd min the heart rate fell down to 82.18±4.7 bpm ($p<0.05$). At the 4th min of recovery the heart rate kept on falling and made 71.6±3.8 bpm ($p<0.05$) and at the 5th min this indicator insignificantly reduced to 69.4±3.5 bpm. Thus, in women systematically exercising tracing within 1 year during the recovery period, we observed faster heart rate fall as compared to the control group.

Table 1: Changes in the heart rate values in women by exercising fitness

Heart rate (bpm)									
		Loads			Recoveries				
Tested (group)	Rest	1	2	3	1	2	3	4	5
Control	78.8±1.8	144.5±2.1*	151±0.9*	144.3±1.9*	123±3.6*	109.9±2.4*	102.4±2.1	101.3±3.6	100±4.0
Experimental	68.1±2.2#	122.7±4.5*#	133.1±5.5	131.8±5.1*	117.1±3.7*	98.6±4.5*	82.18±4.7*	71.6±3.8*	69.4±3.5*

* Significance of differences as compared to the previous value ($p<0.05$); # Significance of differences as compared to the value of previous group ($p<0.05$)

Moreover, in women of the control group, i.e., going in for fitness during 1 month the difference between the heart rate values recorded at the 5th min of recovery and the initial figures at the rest made 22.2 bpm ($p<0.05$). Whereas in women going in for fitness for 1 year this difference appeared to be twice less as compared to the control group and made 8.9 bpm. It shall also be noted that in women of the control group the heart rate figures within 5 min of the recovery period were maintained at a high level and the heart rate was not reduced to its initial values while in women of the trained group, i.e., going in for tracing for a year the heart rate reduced to initial values already by the 4th min of the recovery period.

By comparing the heart rate figures at rest in women of the control and experimental groups, we revealed that systematic exercises in tracing during 1 year promote to significant heart rate fall. Thus, if in women of the control group the heart rate made 78.8±1.8 bpm then in women of the trained group this value was by 10.7 bpm lower and made 68.1±2.2 bpm ($p<0.05$).

By performing the Harvard step test in women of the experimental group exercising tracing during 1 year the heart rate was increased maximally up to 133.1±5.5 bpm only. Whereas in women of the control group the heart rate reached the maximum values already at the 2nd min of doing muscular exercise. Besides, at the next minutes of performing the Harvard step test, we observed persistent tending to the heart rate fall. Thus, at the 3rd min of performing the Harvard step test in women of the control group the heart rate was reduced as compared to the 2nd min by the significant value and made 6.7 bpm. In women of the experimental group, the heart rate by performance of the Harvard step test increased gradually and reached its maximum values by the 3rd min of doing muscular exercise.

During the recovery period in women of the experimental group the heart rate was reduced the fastest and already by the 4th min had fallen down to the initial values. Whereas in women of the control group, the heart rate fall is not recovered to the initial values.

Summary: As our studies showed, in women systematically exercising tracing during 1 year, we revealed significantly lower heart rate values at rest. Thus, if in women not doing physical exercises and sports the heart rate values at rest made 78.8±1.8 bpm then, in women exercising tracing during 1 year, this value made only 68.1±2.2 bpm ($p<0.05$). Therefore, systematic exercising one of the kinds of fitness-tracing-promotes to steady formation of bradycardia of training. By performing the Harvard step test in women not going in for sports the heart rate at the first 2 min of doing standardized muscular exercise was maximally increased and reached over 150 bpm. However, in these women at the 3rd min of doing muscular exercise the heart rate kept on falling and reached about 140 bpm. Therefore, the women of the control group respond to the minor muscular load with the maximum heart rate increase. At that the maximum heart rate values are maintained only during the first 2 min of doing muscular exercise. Further on, i.e., at the 3rd min of performing the Harvard step test due to lack of training the heart rate of these women slows down significantly. Whereas in women systematically exercising tracing the heart rate by doing muscular exercise did not exceed 130 bpm and was maintained at this level over the entire duration of the Harvard step test. Therefore, women of the experimental group respond to the minor physical load which the Harvard step test is with the minimal heart rate changes. Moreover, in women of the experimental group upon completion of the Harvard step test the heart rate had recovered to the initial values already by the 5th min of rest. Whereas in women of the control group upon completion of muscular exercise the heart rate was maintained at high level during the entire 5 min of rest (100-102 bpm) and the heart rate was recovered to initial values much later. Thus, in women systematically exercising tracing the heart rate values by doing muscular exercise change insignificantly and upon completion of the exercise are recovered much faster as compared to the women of the control group. Therefore, systematic exercising one of the kinds of fitness-tracing-promotes to improvement of the heart functional capabilities of exercisers.

CONCLUSION

Systematic tracing exercises during 1 year promote to formation of bradycardia of training in women. In women systematically exercising tracing during one year the heart rate response by performing the Harvard step test is significantly lower than in the control group of women. In women of the experimental group upon completion of muscular exercise the heart rate is reduced up to initial values already by the 4th min whereas in women of the control group the heart rate is not recovered to initial values.

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