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Original Article

The relationship of recovery performance indicators after exercise with indicators of body weight and length of fitness sessions for 24-28-year-old women

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Abstract
The purpose of the study: to reveal the effectiveness of the impact of fitness activities on the restoration of the working capacity of women aged 24-28 with different body mass. *Material and methods.* The study was attended by 62 women aged 24-28 years, whose body weight was in the range of 55-90 kg. Body length was 165-168 cm. The experience of taking sports fitness of the subjects - women ranged from 1 to 2 years. The subjects were tested for endurance and rehabilitation. The heart rate is measured before the test, then the running is carried out in place for 3 minutes, measured by heart rate at the first to fifth minutes of recovery. The impact of body mass and occupational activity on the performance indicators of the subjects was determined. *Results.* It was showed a significant impact of body mass in combination with the experience of fitness exercises on heart rate when recovering after 3 minutes of running in place on the first and fifth minutes of recovery, as well as on heart rate indicators in a state of rest, No fitness experience during year, or body weight, taken separately, do not affect the performance indicators. But if consider the effect of these factors together, one can observe their significant impact on the rate of recovery of disability. *Conclusion*. The best indicators of the effect of fitness experience on work restoration are observed in women with lower body weight. This indicates that the optimal body weight contributes to optimizing the training effect in women during fitness classes.
Keywords: fitness, integrity, recovery, work capacity, women, mass.

Introduction

The modern period is characterized by a critical state of health and a low level of motor activity of the population, it needs to find new means to ensure good health, improve the well-being and restore the internal reserves of the body (Denham, O'Brien, & Charchar, 2016; Doroshenko, Svatyev, Iermakov,., & Jagiello, 2017; Fiuza, Ribeiro, Magalhaes, Sousa, Menezes, Jorge, Pinto, 2016).

In recent years, the emergence of interest in occupations in various sports and motor activity for recreation and restoration has become particularly noticeable (Greenley, Greene, Ward, Reeser, Allen, Baumgartner, ... Hillman, 2016, Izumiya, Onoue, Kimura, Ishida, Yamamura, Hanatani, ... Hokimoto, 2016; Korobejnikov, Korobejnikova, Kozina, 2012). Among these fitness training sessions a special place was taken by fitness classes. Systematic fitness exercises not only increase the level of muscular fitness but also improve the state of the cardiovascular system and get great pleasure from the lessons (Kozina, Iermakov, Bartík, Yermakova, Michal, 2018; Kozina, Shepelenko, Osiptsov, Kostiukevych, Repko, Sobko et al., 2017; Kozina, Nikolayeva, Popov, Oleinik, Glyadya, & Vasilyev, 2018).

For women, fitness classes are a good emotional mood, which is given by rhythmic music, and in the program classes - breathing exercises, elements of choreography, etc. (Shepelenko, Kozina, Cherkesova, Kravchk, Sanzharova, & Golenkova, 2018; Sperlich, Hahn, Edel, Behr, Helmprobst, Leppich, ... Holmberg, 2018; Yukhymenko, Makarchuk, Korobeynikov, Korobeynikova, Imas, Kozina, 2018; Zinner , Sperlich, Born, & Michels, 2017). Fitness classes are gaining popularity from year to year. They have a well-being, develop endurance, coordinate movements, feelings of rhythm, allow to correct posture, to make a more graceful and elegant figure. With the help of fitness activities you can increase your mobile activity and improve your health.

Fitness (English fitness, fitness, endurance ability) is the direction of mass, sport and fitness physical education (Amankwaah, Kim, & Campbell, 2016; Osipov, Kudryavtsev, Kramida, Iermakov, Kuzmin, & Sidorov, 2016). Fitness is aimed at improving the general condition of the human body, the ability to rely on the negative effects of the environment by performing simple and complex exercises in musical accompaniment.

The construction of a comprehensive approach to fitness classes is conditioned by growing interest in this type of physical relaxation, maintaining a lasting positive motivation, and the emergence of a large number of fitness areas. All this requires the creation of a scientific base that could more effectively and competently use

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popular means of physical education for the population to increase the level of physical fitness. Among the many dance fitness types there is the most popular step-aerobics, which is an effective means of physical fitness for women (Kozina, Shepelenko, Osiptsov, Kostiukevych, Repko, Sobko, et.al., 2017; Kozina, Nikolayeva, Popov, Oleinik, Glyadya, & Vasilyev, 2018). Steppe aerobics, one of the simplest and most exciting styles and directions of aerobics. "Step" in English translates to "step". A distinctive feature is that it affects the body in a complex way, delicately corrects the shape of the legs and develops all muscle groups. The body becomes more slender, plastic, flexible and durable. It is very important that such aerobics is very effective for those muscle groups that are very difficult to use: the buttocks, the back of the thigh and the drive thigh muscles.

Aerobics on the step-platform is available to almost everyone. The work is performed by legs, which is not complicated, and movements are natural, as when walking on the stairs. To change the intensity of the workout is enough to only change the height of the platform. Thus, one group can deal with people with different levels of training, and physical activity for each individual will be.

Modern sports fitness is a relatively new sport that has many varieties. The method of training in sports fitness is aimed primarily at the development of strength abilities and the formation of muscle relaxation. But at the same time, one of the main problems of modern fitness fitness is the lack of development of the cardiopulmonary system of athletes and the lack of communication apparatus (Amankwaah, Kim, & Campbell, 2016; Blackwell, Atherton, Smith, Doleman, Williams, Lund, & Phillips, 2017) This leads to diseases of athletes from the cardiovascular system, as well as to increased traumatism due to the lack of development of the ligament apparatus. This problem should be broken due to the great popularity of sports fitness among the population.

Among the factors that optimize the training of athletes, the main place is occupied by various means and methods of recovery and improving sports performance. As we know (Kozina, Sobko, Kozin, & Garmash, 2018; Lipski, Abbiss & Nosaka, 2018; Ouerghi, Ben Fradj, Khammassi, Feki, Kaabachi, & Bouassida, 2017), restorative processes in the body of athletes are the most important psycho-physiological processes, the essence of which lies in the fact that after muscular activity, the inverse changes in the work of those functional systems that ensure the implementation of such physical activity. All changes occurring in this period can be combined with the concept of "recovery". Restoration of training loads means not only the return of the organism to the initial or close to it level. The progressive development of the fitness of an athlete is the result of the fact that the trace reactions observed in the body after individual training loads are not completely eliminated, but are preserved and fixed by structural changes in the functional systems of the body of athletes that arise in the recovery period and serve as the basis for increasing trenirovannosti.

The construction of a comprehensive approach to fitness classes is conditioned by growing interest in this type of physical relaxation, maintaining a lasting positive motivation, and the emergence of a large number of fitness areas. All this requires the creation of a good scientific base, which could more effectively and competently use popular means of physical education for the population to increase the level of physical fitness, work ability.

A methodology that allows to develop not only power capabilities, but also to strengthen the connective device and the cardio-respiratory system, with the effective combination of exercises of different orientations, is one of the main in the training process in modern fitness.

Therefore, when applying in the fitness methods of integrated direction requires an individual approach.

The purpose of the study: to reveal the effectiveness of the impact of fitness activities on the restoration of the working capacity of women aged 24-28 with different body mass.

Material and methods

Participants

The study was attended by 62 women aged 24-28 years, whose body weight was in the range of 55-90 kg. The experience of taking sports fitness of the subjects - women ranged from 1 to 2 years. All the test subjects agreed to participate in the experiment.

Organization of research

A group of women trained under the program, where the means of strength endurance and means developing the cardiovascular system and connective tissue were used. There was conducted a test for restoration of work capacity. Duration of fitness classes of integral orientation was from 1 to 2 years.

The subjects were tested for endurance and rehabilitation. The heart rate is measured before the test, then the running is carried out in place for 3 minutes, measured by heart rate at the first to fifth minutes of recovery.

Description of fitness classes of integral orientation

Classes were held 3 times a week. The duration was 1.5 hours. The developed methodology included a complex of power exercises and step aerobics.

In the force part exercises were exercised with their own weight, dumbbells were used to develop the muscle strength of the body, hands, shoulder girdle. Power training takes place in a standing position or lying on

the floor. The load was distributed in intensity: the pace is average, the number of repetitions is high 16-20 times.

Steppe aerobics included dance bands, composed of basic aerobic steps with simple hand choreography. The activities of the step-aerobics classes were organized in a frontal way, that is, all women simultaneously performed the same exercises. To achieve a positive result, the following methodical techniques were used: variation of how exercise was performed; combination of motor skills; variation of accepted information - visual, auditory.

During the whole period, the steppe platforms of Reebok Company with adjustable height from 15 cm to 25 cm were used.

Statistical analysis

The digital material obtained during the study was processed using traditional methods of mathematical statistics. For each indicator, the arithmetic mean value of X was determined, the mean square deviation S (standard deviation).

A dispersion analysis was also applied. The impact of body mass and occupational activity on the performance indicators of women was determined.

Mathematical data processing was carried out using the Microsoft Excell 2013 Data Analysis Program, SPSS-17. Differences were considered to be reliable at a significance level of $p < 0.05$.

Results

It was found a significant impact of body mass in combination with the experience of fitness exercises on heart rate during recovery after 3 minutes of running in place at the first and the fifth minutes of recovery, as well as on heart rate indicators in a state of rest (Table 1). This indicates that neither the experience of fitness during the year, nor the weight of the body, taken separately, does not affect the indicators of recovery of disability. But if we consider the effect of these factors together, one can observe their significant impact on the rate of recovery of disability. The best indicators of the effect of fitness experience on work restoration are observed in women with lower body weight. This suggests that optimal body weight contributes to optimizing the training effect in women during fitness classes (Fig. 1).

Table 1

Effect of body weight and fitness experience on the level of functional capabilities of athletes (heart rate at rest, at restoration after 3 minutes of running)

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	HR at rest, beats·min^{-1}	9192.603a	53	173.45	1.40	0.31
	HR on 1 min recovery after 3 min of running on the spot, beats·min^{-1}	40045.714m	53	755.58	1.13	0.46
	HR on 2 min recovery after 3 min of running on the spot, beats·min^{-1}	21855.429n	53	412.37	1.65	0.21
	HR on 3 min recovery after 3 min of running on the spot, beats·min^{-1}	21684.000o	53	409.13	0.67	0.82
	HR on 4 min recovery after 3 min of running on the spot, beats·min^{-1}	16592.857p	53	313.07	0.71	0.79
	HR on 5 min recovery after 3 min of running on the spot, beats·min^{-1}	18530.000q	53	349.62	0.91	0.62
Intercept	HR at rest, beats·min^{-1}	234041.59	1	234041.59	1893.09	0.00
	HR on 1 min recovery after 3 min of running on the spot, beats·min^{-1}	643511.25	1	643511.25	961.42	0.00
	HR on 2 min recovery after 3 min of running on the spot, beats·min^{-1}	398574.15	1	398574.15	1598.56	0.00
	HR on 3 min recovery after 3 min of running on the spot, beats·min^{-1}	332271.99	1	332271.99	547.70	0.00
	HR on 4 min recovery after 3 min of running on the spot, beats·min^{-1}	297286.47	1	297286.47	674.63	0.00
	HR on 5 min recovery after 3 min of running on the spot, beats·min^{-1}	274700.10	1	274700.10	714.13	0.00
Massa	HR at rest, beats·min^{-1}	1304.03	8	163.00	1.32	0.34
	HR on 1 min recovery after 3 min of running on the spot, beats·min^{-1}	5424.28	8	678.03	1.01	0.49
	HR on 2 min recovery after 3 min of running on the spot, beats·min^{-1}	3507.22	8	438.40	1.76	0.21
	HR on 3 min recovery after 3 min of running on the spot, beats·min^{-1}	3957.12	8	494.64	0.82	0.61
	HR on 4 min recovery after 3 min of running on the spot, beats·min^{-1}	5266.15	8	658.27	1.49	0.28

	HR on 5 min recovery after 3 min of running on the spot, beats·min^{-1}	3168.44	8	396.06	1.03	0.48
Experience	HR at rest, beats·min^{-1}	341.84	1	341.84	2.77	0.13
	HR on 1 min recovery after 3 min of running on the spot, beats·min^{-1}	1604.94	1	1604.94	2.40	0.16
	HR on 2 min recovery after 3 min of running on the spot, beats·min^{-1}	117.44	1	117.44	0.47	0.51
	HR on 3 min recovery after 3 min of running on the spot, beats·min^{-1}	1160.36	1	1160.36	1.91	0.20
	HR on 4 min recovery after 3 min of running on the spot, beats·min^{-1}	542.67	1	542.67	1.23	0.30
	HR on 5 min recovery after 3 min of running on the spot, beats·min^{-1}	915.23	1	915.23	2.38	0.16
Massa * Experience	HR at rest, beats·min^{-1}	832.13	1	832.13	6.73	0.03
	HR on 1 min recovery after 3 min of running on the spot, beats·min^{-1}	4612.80	1	4612.80	6.89	0.03
	HR on 2 min recovery after 3 min of running on the spot, beats·min^{-1}	202.80	1	202.80	0.81	0.39
	HR on 3 min recovery after 3 min of running on the spot, beats·min^{-1}	691.20	1	691.20	1.14	0.31
	HR on 4 min recovery after 3 min of running on the spot, beats·min^{-1}	691.20	1	691.20	1.57	0.24
	HR on 5 min recovery after 3 min of running on the spot, beats·min^{-1}	2116.80	1	2116.80	5.50	0.04
Error	HR at rest, beats·min^{-1}	1112.667	9	123.63		
	HR on 1 min recovery after 3 min of running on the spot, beats·min^{-1}	6024	9	669.333		
	HR on 2 min recovery after 3 min of running on the spot, beats·min^{-1}	2244	9	249.333		
	HR on 3 min recovery after 3 min of running on the spot, beats·min^{-1}	5460	9	606.667		
	HR on 4 min recovery after 3 min of running on the spot, beats·min^{-1}	3966	9	440.667		
	HR on 5 min recovery after 3 min of running on the spot, beats·min^{-1}	3462	9	384.667		
Total	HR at rest, beats·min^{-1}	378156	63			
	HR on 1 min recovery after 3 min of running on the spot, beats·min^{-1}	1032696	63			
	HR on 2 min recovery after 3 min of running on the spot, beats·min^{-1}	686916	63			
	HR on 3 min recovery after 3 min of running on the spot, beats·min^{-1}	560376	63			
	HR on 4 min recovery after 3 min of running on the spot, beats·min^{-1}	504216	63			
	HR on 5 min recovery after 3 min of running on the spot, beats·min^{-1}	480744	63			
Corrected Total	HR at rest, beats·min^{-1}	10305.27	62			
	HR on 1 min recovery after 3 min of running on the spot, beats·min^{-1}	46069.71	62			
	HR on 2 min recovery after 3 min of running on the spot, beats·min^{-1}	24099.43	62			
	HR on 3 min recovery after 3 min of running on the spot, beats·min^{-1}	27144	62			
	HR on 4 min recovery after 3 min of running on the spot, beats·min^{-1}	20558.86	62			
	HR on 5 min recovery after 3 min of running on the spot, beats·min^{-1}	21992	62			

a. R Squared = ,892 (Adjusted R Squared = ,256)
m. R Squared = ,869 (Adjusted R Squared = ,099)
n. R Squared = ,907 (Adjusted R Squared = ,359)
o. R Squared = ,799 (Adjusted R Squared = -,386)
p. R Squared = ,807 (Adjusted R Squared = -,329)
q. R Squared = ,843 (Adjusted R Squared = -,084)

The reliable impact of body mass of women was found in combination with the experience of fitness exercises on the heart rate during recovery after 3 minutes of running in place on the first and the fifth minutes of recovery, as well as on the indicators of heart rate in a state of rest. Optimal body weight helps optimize the training effect in women during fitness classes.

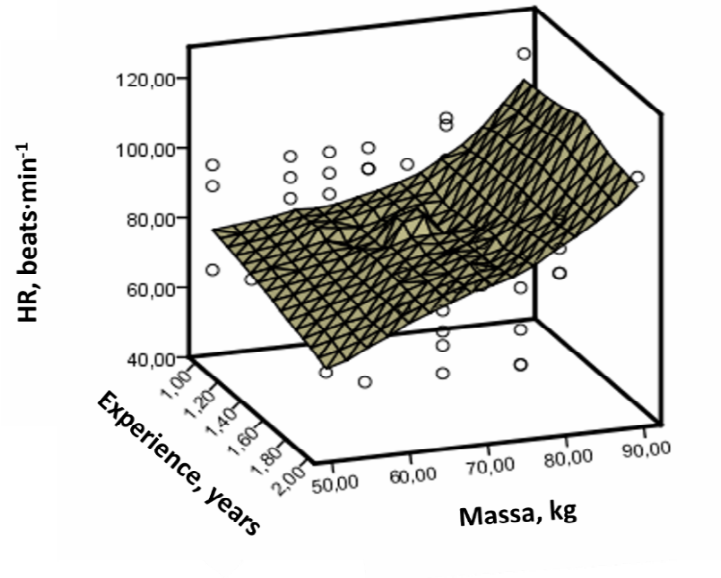

Рис. 1. Взаємозв'язок частоти серцевих скорочень, маси тіла і стажу занять фітнесом жінок

Discussion

Analyzing the results obtained, it can be noted that the detection of the dependence of the state of the recovery system on women at the initial stage of preparation from the combination of body mass action and probation is essential for an individual approach to training. This is important for the practice of fitness training in women, because taking into account the fact that it is more difficult for women with greater body weight to adapt the cardiovascular system to loads, it is an important element of the strategy of personalization in fitness.

Researches are expanding the concept of an individual approach (Kozina, Shepelenko, Osiptsov, Kostiukevych, Repko, Sobko et al., 2017; Kozina, Nikolayeva, Popov, Oleinik, Glyadya, & Vasilyev, 2018). The study found that when individualizing the training process it is necessary to take into account the different rate of adaptation to the loads of women with different body mass. Especially it becomes noticeable at the duration of studies for more than two years. The obtained data are relatively new in terms of detecting different rates of adaptation to the loads of women with different body mass. The obtained data confirm the results of other authors, that in order to increase the efficiency of adaptation processes, a cardio load in fitness should be used.

This is due to the fact that the strength training focuses on the development of muscle tissue and, accordingly, increase in strength. But with all this, there is absolutely no attention to the connected device and the cardio-respiratory system. Therefore, fitness fitness remains a rather traumatic sport. In this case, most commonly injured are articular ligaments, intramuscular tendons, tendon attachments. When applying loads only to the force direction, the process of adaptation by the cardiovascular and respiratory systems (Stoner, Matheson, Perry, Williams, McManus, Holdaway, ... Maiorana, 2017; van der Ster, Bennis, Delhaas, Westerhof, Stok, & van Lieshout, 2018). But these are the main systems for ensuring the normal level of human life.

As for the research of the cardiovascular system of women engaged in sports fitness, it should be noted that the detection of the dependence of the condition of the recovery system on women at the initial stage of preparation from the combination of body mass action and occupation is also new knowledge. This is important for the practice of training in women's fitness fitness, because taking into account the fact that women with greater body weight are more difficult to adapt the cardiovascular system to loads is an important element of the strategy of individualization in fitness fitness.

Considering the expediency of using the developed complex of power exercises in conjunction with step aerobics, it is important to note the fact that the application of the developed complex in the training process provides (Kozina, Shepelenko, Osiptsov, Kostiukevych, Repko, Sobko, et.al., 2017; Kozina, Nikolayeva, Popov, Oleinik, Glyadya, & Vasilyev, 2018) not only a high growth of power indicators, but a number of other, no less important effects. It should be noted that the detection of the dependence of the condition of the recovery system on women at the initial stage of preparation from the combination of body mass action and occupation is essential for an individual approach to training. This is important for the practice of fitness training in women,

because taking into account the fact that it is more difficult for women with greater body weight to adapt the cardiovascular system to loads, it is an important element of the strategy of personalization in fitness.

Conclusions

It is shown that in modern systems of fitness fitness attention is paid, mainly, to the development of the muscular system. In this case, it remains completely unaffected the question of the means and methods of development of the ligament apparatus, cardio-respiratory system and psychophysiological state. Meanwhile, the level of development of the ligament apparatus, the state of cardio-respiratory and nervous systems determines the frequency of occurrence and the severity of injuries.

A methodology has been developed that allows to develop not only power capabilities, but also to strengthen the ligamentous device, positively affect the state of the cardio-respiratory system and mental functioning in a sufficiently effective way, for example, by means of force exercises in combination with cardio-loads (step - aerobics)

There was a significant impact of body mass in combination with fitness experience on heart rates when recovering after 3 minutes of running in place at the first and the fifth minutes of recovery, as well as on the indicators of heart rate in a state of rest. Optimal body weight helps optimize the training effect in women during fitness classes.

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Conflict of interest

The authors declare that there is no conflict of interest.

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