INFLUENCE OF STRENGTH FITNESS BASED ON EXERCISES WITH BODY WEIGHT OVER CHANGES IN BODY COMPOSITION PARAMETERS AMONG WOMEN AGED 21 TO 55 YEARS

Titova H.V.[1], Bodnar A.I.[2], Chaban I.O.[3], Minenko O.V. [4], Tvelina A.O.[5], Abramov K.V.[6]

[1,2,3,4,5,6] Petro Mohyla Black Sea National University, m. Mykolaiv
Email: chernozub@gmail.com

Abstract

Results of the research on determining impact of experimental models of training in strength fitness on body composition parameters among women aged 21 to 55 years are represented in the article. To perform the task and achieve the aim of the study we have formed two research groups: 1) women aged 21 to 35 years; 2) women aged 36 to 55 years. As a result we have discovered that studied parameters of bioelectrical impedance analysis (BIA) during the usage of proposed models of training for three months show the same dynamics in both groups, but with rather different progression. The body fatindex of women aged 21 to 35 years reduced by 7.9% (p <0.05) during the experiment compared with the initial data. This indicator in the group of people aged 36 to 55 years also shown a decline, but only by 3.8% (p <0,05) over the same period of time. This dynamics was also fixed while examining other indicators of the body composition through out the experiment period. Thus, we can assume that women of the first group consume more energy in these conditions of intense muscular activity in comparison with those of the other group. At the same time, the analysis of the results of the experiment shown that the level of primary adaptation to loads of strength character was higher in the members of the second group regardless of their age and significantly higher initial parameters of body composition.

Keywords: strength fitness, adaptive changes, women of mature age, load, body composition, bioelectrical impedance analysis.

Introduction

The problem of finding new approaches to the human body improvement using various forms of motor activity has been one of the priority directions of scientific research in physical culture and sports, human physiology, sports medicine in recent years [6, 13, 1, 5].

At the same time, therearisesanacute problem of determining the adequacy of physical training systems, training loads parameters and a person's gender characteristics, age, functional capabilities of the organism by virtue of considerable popularization of fitness and countless numbers of its variations in the world [12, 2].

Most studies presented in the scientific literature [6, 9, 12, 15] are mainly aimed at determining the impact of fitness on the morphometric indices of the examined contingent (anthropometricdata), the development of strength capabilities of the organism, the dynamics of heart rate in response to acute physical activity and duration of its retrieval to a level at the state of rest. However, the problem concerning introduction of integrated control (on the basis of biochemical and physiological criteria) over the adequacy of the training load and functional capabilities of the human body during high intensity loads is not fully studied. This does not permit to determine the effectiveness of adaptive changes in the organism in the process of intense motor activity.

Thus, the main purpose of our research is to determine the peculiarities of changes in body composition parameters among women of different age in the process of long-term fitness exercises using an experimental model of training based on exercises with body weight.

Connection of the study with scientific programs, plans and themes

The article is a fragment of scientific work "Development and implementation of innovative technologies and correction of the functional state of people during physical activity in sports and rehabilitation" (StateRegistryNo. 0117U007145).

Material and research methods

During the research we examined 51 practically healthy mature women (aged 21 to 55 years) who had not previously been engaged in fitness and other sports. Taking into account the purpose and objectives of the study two experimental groups were formed: women aged 21 to 35 years (the first group) and women aged 36 to 55 years (the second one).

An experimental model of muscle activity consisted in using a load of strength character during three months of training. Women had three lessons per week. Exercises were performed with own body weight to full muscle fatigue of the working muscle group in each set. The rest interval between the sets varied from 30 to 50 seconds. Physical exercises were carried out according to the technology we have determined (amplitude, duration of concentric and eccentric phases of motion), which allowed to involve only those muscle groups that took an active part in exercises of the same type using training apparatuses. This method of load optimization allowed us to develop experimental training programs without the use of specialized complex training apparatuses. It positively influenced the number of participants who could simultaneously perform physical exercise of the same type. These circumstances made it possible to substantially simplify the mechanism of technical control over the training process.

All participants who took part in the research had passed medical examination and biochemical laboratory control (16 indicators). According to the results, women had no medical contraindications for participation in the research.

The dynamics of the studied parameters of bioelectrical impedance analysis (BIA) (human body composition) was estimated at the beginning of the study and within three months of systematic fitness exercises at one month intervals. To evaluate the above mentioned indicators we used a BIA analyzer: the diagnostic computerized hardware and software complex KM-AP-01 "Diamant-AST" (body composition analyzer)(VJUSK. 941118.001 PE) [3].

Statistical processing of the results was carried out using the statistical software IBM * SPSS * Statistics 20. To characterize the studied parameters, the arithmetic mean of the sample population (M) was calculated. Indicators of the variation of the results obtained were the standard deviation (σ) and m –the representation error (general average). The test of normality was carried out using the Kolmogorov-Smirnovtest. If the normal distribution of data was confirmed, then the reliability of the differences was estimated using the parametric Student's t-test for connected and noncontiguous samples at the level of significance p <0,05-0,001 [10].

Results of the research and their discussion.

During the experimental research on determining the peculiarities of changes in the indices of bioelectrical impedance analysis in the process of systematic going in for strength fitness and using our models of training by the examined contingent, we have obtained the results that demonstrate a rather diverse inter group tendency of controlled indicators (Fig. 1-4).

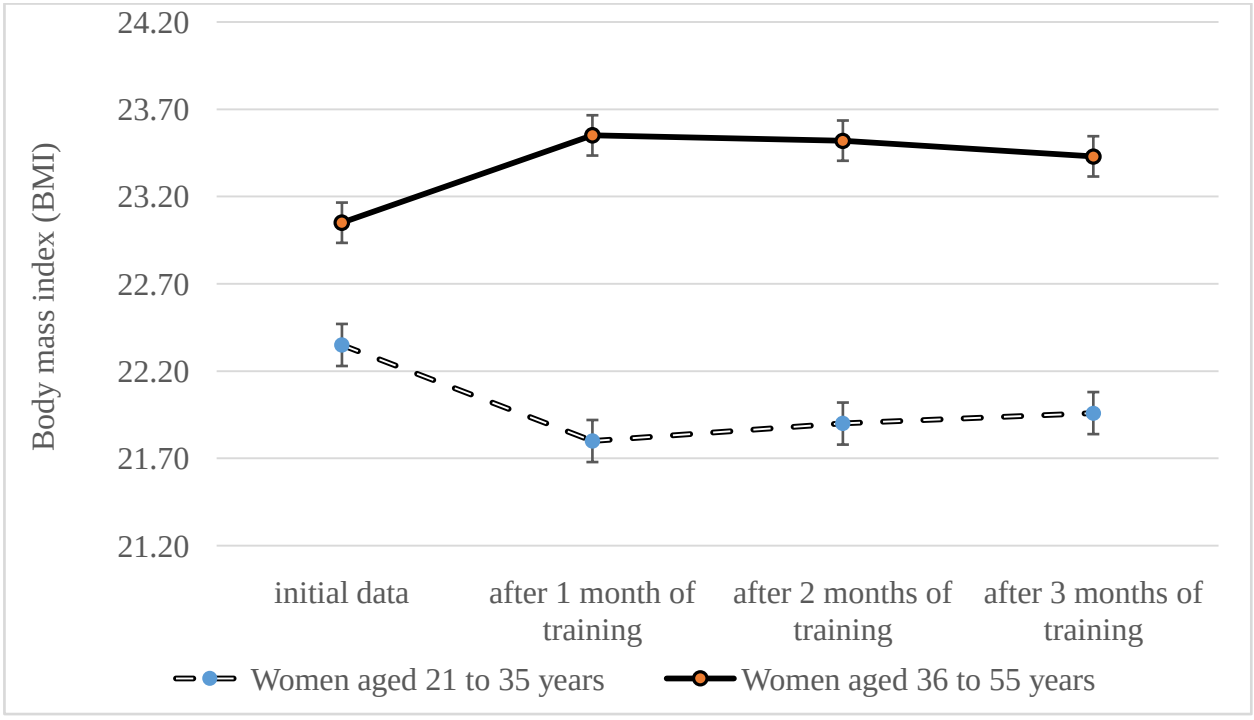

Fig. 1. Change in the body mass index (BMI, units of measurement) of women of different ages in the process of 3-month strength fitness training, n=51

Fig. 1 shows the results of the dynamics of the body mass index of women from both groups in the process of 3-month strength fitness training. It has been established that at the beginning of the experiment we did not observe significant differences in the studied indicators among the participants from both groups, which would allow more accurately assess the effectiveness of the proposed training program. Thus, we have found out that women from the first group got a decrease in the index of body mass by 1.8 % during all stages of the study. At the same time, among representatives of the other age group this indicator increased by 1.6 % over the same period of time.

Thus, the obtained results indicate that the use of the given model of fitness training more positively affects the level of fitness of women from the second group (aged 36 to 55 years) and demonstrate their adaptive potential.

Evaluating the changes in fat mass of the body of the participants we have detected a significant discrepancy in the controlled parameters at the beginning of the experiment. However, the findings did not correspond to the generally accepted parameters of bioelectrical impedance analysis according to the age characteristics of the contingent [8].Thus, at the beginning of the experiment, the fat mass index in women of the second group was higher by 4.6% ($p < 0.05$) compared with the other experimental group.

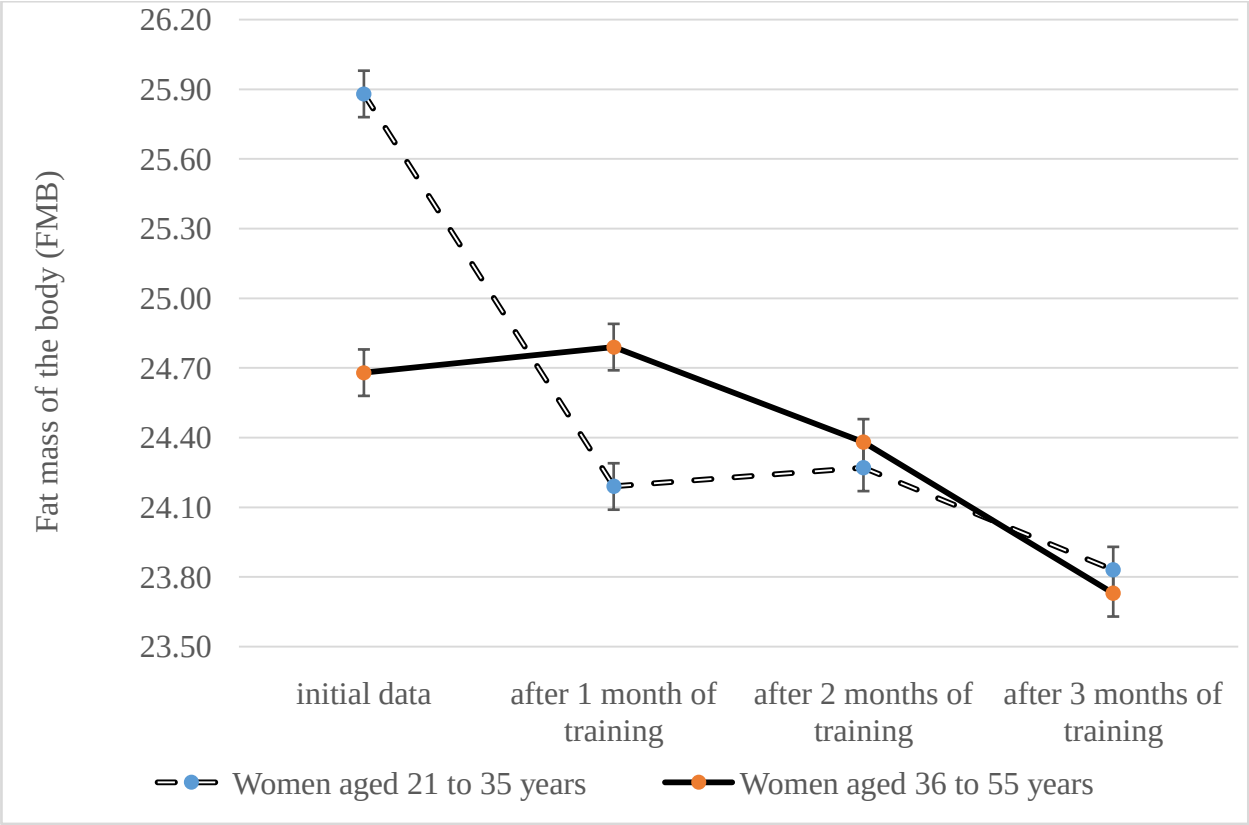

Fig.2. Change in the fat mass of the body (FMB, %) of women of different ages in the process of 3-month strength fitness training, n=51

At the same time, the analysis of the results of the examination conducted over a period of three months suggests that the body fatindex of women aged 21 to 35 years and who went in for fitness systematically was reduced by 7.9% ($p < 0.05$) compared with the initial data. This indicatorin the group of people aged 36 to 55 years alsos hown a decline, but only by 4.3% ($p < 0,05$) over the same period of time.

This fact indicates that the members of the second age group have higher level of the organism adaptation to the given loads, which are typical for strength fitness, compared to the capabilities of the first group representatives.

The results of studying the peculiarities of changing the parameters of the fat-free mass of the body (part of the body weight, which includes every thing that does not contain fat: muscles, all internal organs, bones, nerve cells, all liquids that are in the body [3, 8]) are graphically depicted in Fig. 3.

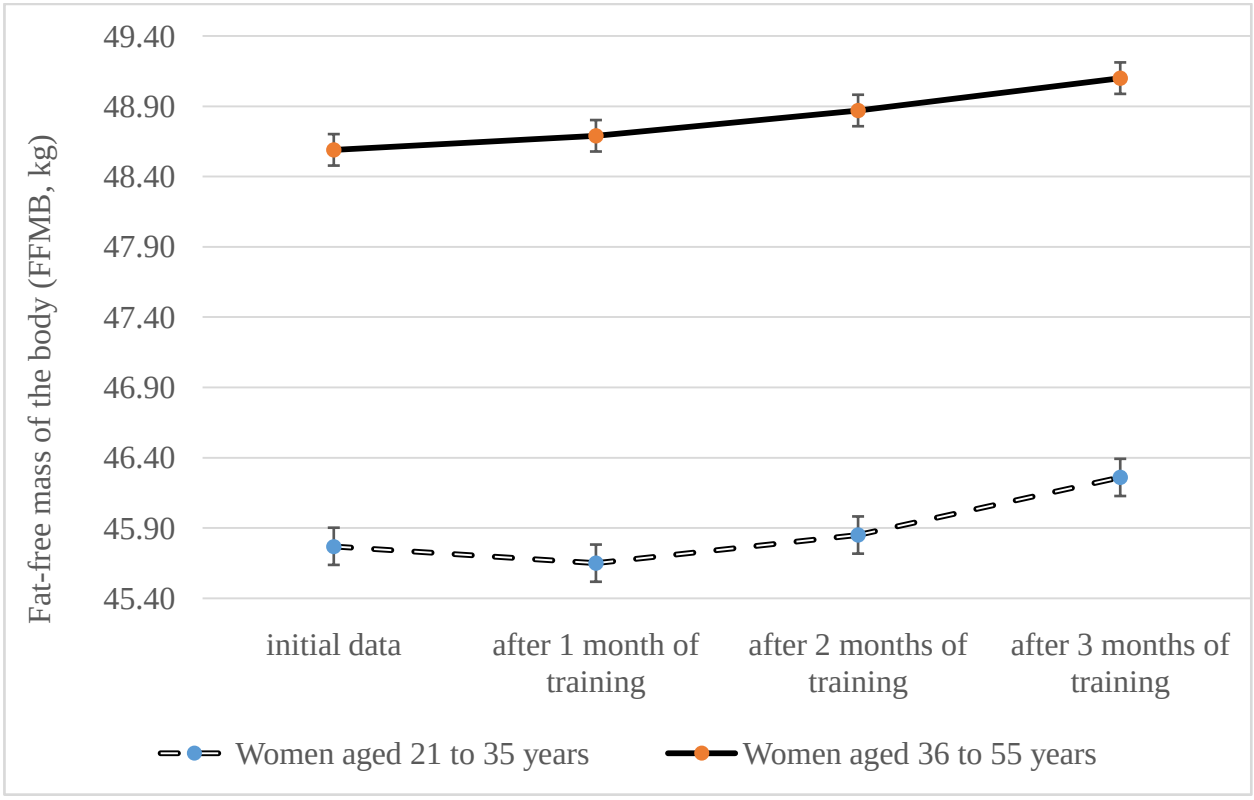

Fig.3. Change infat-free mass of the body (FFMB, kg) of women of different ages in the process of 3-month strength fitness training, n=51

The results show that even the initial data obtained at the beginning of the experiment indicate that the fat-freemass index of women in the second group was by 6.2% ($p < 0.05$) higher than those fixed in representatives of the other research group. This indicates again that the fitness level of women aged 36 to 55 years is significantly higher compared with the group of women of a younger age (from 21 to 35 years old).

At the same time, studying the dynamics of the parameters of fat-free mass of the body we have discovered that the controlled indicators show a slight increase regardless of the age of the examined contingent.

Fig. 4. depicts quantitative indicators of bio-active cell mass (BCM,%) of the body established in representatives of these groups during the three-month control. According to the results obtained, at the beginning of the research (initial data) the indicators shown almost identical parameters among women from both groups.

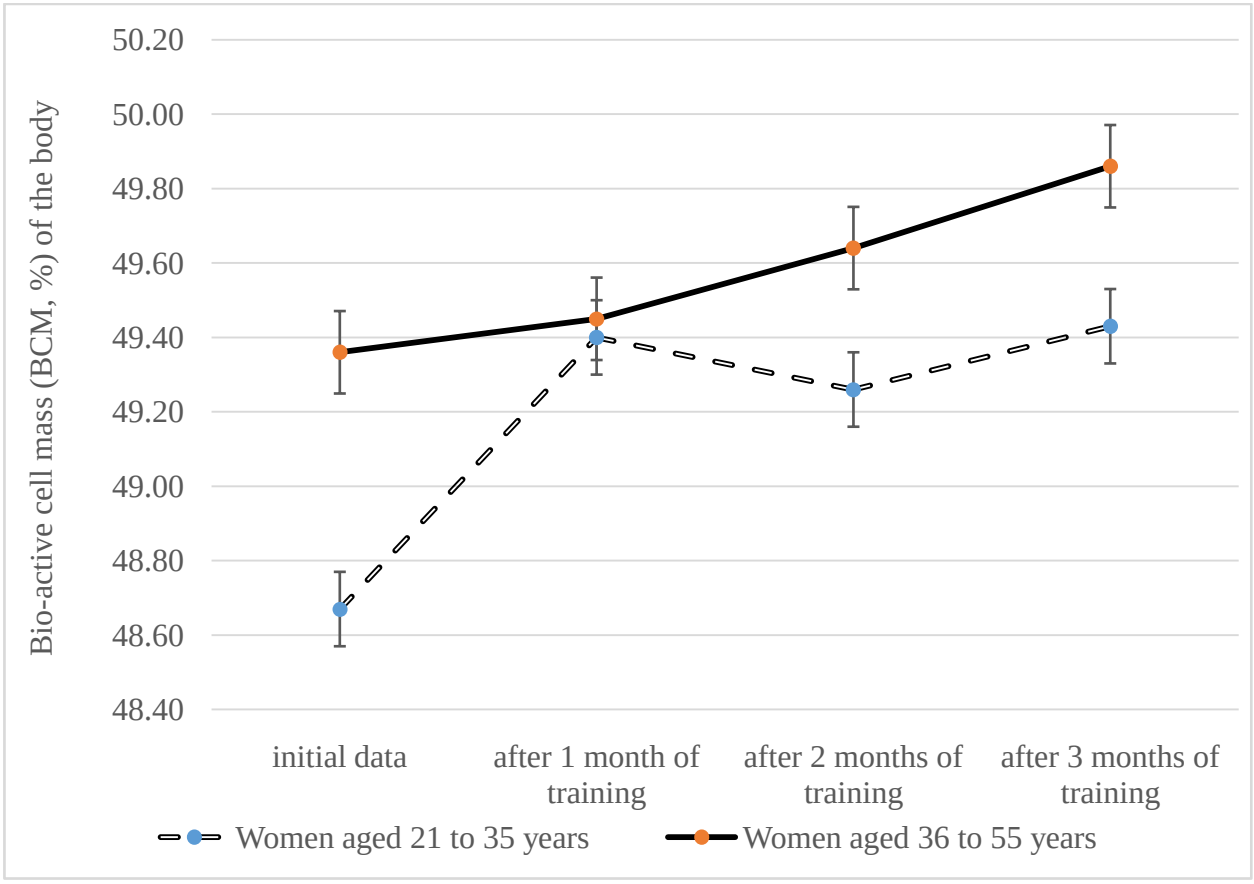

Fig.4.Change in bio-active cell mass (BCM,%) of women of different ages in the process of 3-month strength fitness training, n=51

We have revealed that BCM of women from the second group increased, but with a minimum dynamics of from 0,1 to 0.5%after three months of systematic doing fitness and using our model of training. At the sametime, we have discovered that the investigated indicator had a tendency both to increase and to decrease among the representatives of the other group. Although it is not reliable.

Thus, during the experimental research we have ascertained that the use of exercises with body weight, the technique of which completely repeats the biomechanics of using specialized training apparatuses, the effectiveness of which is proved by a large number of studies [6], has a positive effect on the dynamics of BIA indicators of women from both groups despite the fact that the primary level of fitness is higher in the group of women aged 36 to 55 years.

Conclusions

1. We have found that the initial fitness level, taking into account the initial data of active body weight index and parameters of fat-free mass of the body, is significantly higher in women of the second group (36-55 years old) compared with representatives of the other group.

2. Continued use of the experimental model of strength fitness training, based on the method of interval use of exercises with body weight which completely repeat the biomechanics of using specialized training apparatuses, has a positive effect on body composition parameters of the human body, as well as the well-known techniques. However, these well-known techniques are more technically complicated and less suitable for general use in order to make people feel healthy.

3. Our model of training consisted of using experimental physical exercises and techniques inherent in strength fitness increases the effectiveness in the group of women aged 21 to 35 years compared with the contingent of the other group.

Prospects for further research

Now a days we need more informative comprehensive diagnostic methods for determining adaptive changes in the organism of people of all ages and sex in conditions of intense muscular activity. Complex biochemical methods for diagnostics of adaptive changes in the will allow to clearly ascertain the efficiency of any model of muscle activity. Additional comprehensive research is necessary to explore this problem more thoroughly.

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