

INDIVIDUAL APPROACH IN THE DEVELOPMENT OF MUSCLE MASS IN FEMALE AGE WOMEN

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Abstracts:

This article deals with the current trend in the work of most fitness clubs - personal training. The description of the work of an individual trainer and the advantages of such classes are given. Emphasis is placed on training in the gym as a fast and high-quality means of gaining muscle mass. The study examines the dynamics of the results of training in the gym with women of mature age up to 40 years with the aim of gaining the desired muscle mass. A description of the approximate method of individual lessons with a personal trainer is given, on the basis of which observation and further research was carried out. Attention is paid to the training load in accordance with the ovarian-menstrual cycle involved. The data of women of mature age, who train independently, and women, who study under the control of a personal trainer of the gym, are compared. It argues the effectiveness of individual lessons with a trainer of women of mature age on the basis of bio-impedance analysis. On its basis, body composition characteristics are calculated, such as fat, lean, cellular and skeletal-muscular mass, volume and distribution of water in the body. During the experiment, waist and hip circumferences were also measured to determine the dynamics of their ratio and weighed on floor scales. In all respects, there is an improvement in the body parameters of women in both groups, however, representatives of the experimental group, who work under the control and guidance of a personal trainer, achieved great results.

Ключові слова:

gym, personal trainer, ovarian-menstrual cycle, body parameters, bio-impedancemetry, mature age.

Індивідуальний підхід при нарощування м'язової маси жінок зрілого віку

У даній статті розглядаються сучасні тенденції в роботі більшості фітнес-клубів - персональні тренування. Дається опис роботи індивідуального тренера і переваги таких занять. Наголос робиться на тренування в тренажерному залі як швидке і якісне засіб для нарощування м'язової маси. У дослідженні вивчається динаміка результатів тренувань в тренажерному залі з жінками зрілого віку до 40 років з метою набору бажаної м'язової маси. Дається опис приблизного методу індивідуальних занять з особистим тренером, на підставі якого проводилося спостереження і подальші дослідження. Увага приділяється тренувальній навантаженні відповідно до оваріально-менструальним циклом. Порівнюються дані жінок зрілого віку, які тренуються самостійно, і жінок, які навчаються під контролем особистого тренера спортзалу. Обговорюється ефективність індивідуальних занять з тренером жінок зрілого віку на основі аналізу біоімпеданса. На його основі розраховуються характеристики складу тіла, такі як жирова, м'язова, клітинна і скелетно-м'язова маса, обсяг і розподіл води в організмі. В ході експерименту вимірювали також окружність талії і стегон для визначення динаміки їх співвідношення і зважували на вагах для підлоги. У всіх відношеннях спостерігається поліпшення параметрів тіла жінок в обох групах, однак представники експериментальної групи, що працюють під контролем і керівництвом особистого тренера, домоглися великих результатів.

тренажерний зал, особистий тренер, оваріально-менструальний цикл, параметри тіла, біоімпедансометрія, зрілий вік.

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Formulation of the problem. Active leisure and sports have become an integral component of modern life. According to statistics, the more developed the country is in economic terms, the greater the number of people who spend time in fitness clubs, stadiums, tennis courts, swimming pools, etc., doing recreational physical culture or any of the sports [9, 12, 15, 17].

In the media: the Internet, television, social networks - more and more often you can see advertisements of a beautiful toned female body with attractive roundness in the chest, thighs and buttocks, which makes the weaker, following the fashion, obey certain diets and, of course, attend gym [1, 3, 6]. At the same time, exercises at the gym are one of the most effective means of a high-quality set of muscle mass and body correction in accordance with the goals and objectives of the students [2, 14].

Increasingly, people, realizing their individuality, turn for help to an individual trainer, whose main task is to strengthen the body and help achieve aesthetically attractive forms and other goals of clients [1, 8, 9, 13, 20]. The main principle of personal training is individual work with client, taking into account the capabilities of his body and the wishes of the client. It is emphasized [5, 7, 11, 12] that personal training is a practical guarantee of maximum effectiveness. Personal training develops with the upgrading of the material base of fitness clubs and methods of monitoring and monitoring clients, and therefore, the requirements for coaching skills, knowledge, skills and abilities are increased, which in turn affects the relevance of the topic selection our research [2].

Analysis of recent research and publications. In the literature there is little coverage of the results of the work of a personal trainer. For example, some researchers [1, 18, 19] recommend training with a trainer to familiarize themselves with exercise equipment, some exercise techniques, the basics of sports nutrition, etc. Others [5, 6, 16] refer to the differentiation of the load for women by somatic type, but do not take into account the other individual characteristics of the clients of the fitness club. At the same time, there are few studies that give a concrete assessment of changes in body parameters during individual lessons with a personal trainer. At the same time, the number and role of personal trainers in the fitness industry is growing, so we consider this topic as relevant today.

The purpose of the study is to argue the effectiveness of individual lessons with a personal trainer, in comparison with independent classes, based on bio-impedance analysis of body parameters.

Material and research methods. In our experiment, 16 women of mature age up to 40 years old, engaged under the guidance of a personal trainer in the gym of the fitness club "USSR (Network of Sports Facilities of Russia) Sokolniki" (Moscow), took part. The classes were held in accordance with the initial data of the club's clients according to an individual program and were aimed at increasing the muscle mass of the women training as part of the correction. Also, the personal trainer made recommendations on nutrition with observance of a certain ratio of proteins – fats – carbohydrates at each stage of training and the mode of water intake during the day. The study was conducted from January to June 2018.

At the end of the experiment, the experimental group data were compared with the indicators of other clients of the fitness club (control group, n = 14), who practice independently, but also with the primary goal of gaining muscle mass. All subjects, both in the control and experimental groups, were informed about the course of observation and research and agreed to conduct them.

Since the individualization of training involves an individual approach to each student, the following is an approximate method of such exercises for gaining muscle mass and body shaping for women of mature age (taking into account the fact that the standard personal lesson lasts 60 minutes).

So, for warming up the muscles and preventing injuries, cardio trainers were used as a warm-up (elliptical trainer, treadmill, exercise bike - 5–7 minutes) (often this part of the client's work was done by herself to have enough time to do basic exercises with the trainer). Before performing the main part of the occupation, the women performed the summing up exercises without burdening and/or with minimal burdening, and also carried out special stretching exercises.

In the main part, standard exercises with small weights and on simulators were used. Throughout the entire training system, the method of unsaturated efforts with a normalized number of repetitions was predominantly used (burdening 80–90% of the maximum, 8–15 repetitions, 3–5 approaches after 2–3 minutes of rest, the speed of implementation was average).

Based on their own practice, the majority of students have the opportunity to practice 2 times a week, so the distribution of exercises was as follows:

1 day - training for the muscles of the arms, chest and back;

Day 2 - training for the muscles of the legs and shoulders.

At the same time, abdominal exercises and strengthening the muscular corset of the body were used systematically at each workout.

The individual course of the ovarian-menstrual cycle (OMC) and the scientific and methodological recommendations of the orientation of the training sessions during the training session with the female contingent were also taken into account [17, 19]. On this basis, the distribution of loads, their duration, intensity and volume were regulated individually depending on the hormonal background of the female body during the CMC, the phases of which were determined based on the results of a special questionnaire.

At the same time, in the most favorable phases (postmenstrual and postovulatory), the maximal effort method (due to an increase in the level of estrogen in the blood) was used to increase and adapt to new loads and prevent stagnation of muscle mass. In other phases of the individual biorhythms of the body involved, the load (due to well-being) was reduced (due to the effect of increased progesterone on the body of women). Also, after each workout, stretching exercises were used, including elements of MFR (myofascial relaxation).

To determine the effectiveness of training, an instrumental method of bioimpedancemetry was used, based on measuring the electrical conductivity of biological tissues, making it possible to estimate a wide range of morphological and physiological parameters of the body [4, 10]. In bioimpedance analysis, active and reactive resistances of the human body or its segments are measured at various frequencies. Based on the data obtained, body composition characteristics are calculated, such as fat, lean, cellular, and skeletal muscle mass, volume and distribution of water in the body [6, 10].

Measurements of the waist and hip circumference of all subjects were made with a centimeter tape (to further determine the waist/hip ratio), and weighed on floor electronic scales with an accuracy of 0,1 kg and measurement of the body length of the women studied using a stadiometer (with an accuracy of 1 cm).

All measurements in the control and experimental groups took place in the postmenstrual phase of the ovarian – menstrual cycle.

The calculation of averages and the determination of statistically significant differences using Student's t-test was performed by the automatic calculation of the MicrosoftOfficeExcel program.

The results of the study. Table 1 presents data on changes in body parameters in accordance with the bio-impedance measurement in the control and experimental groups (in%–or ratio to the norm of 100%).

Table 1

Dynamics of body parameters of women of mature age (in%-ratio, the norm is 100%)

Indicators (%)	Control group			Experimental group		
	Before experiment, $\bar{X}_1 \pm \sigma$	After experiment, $\bar{X}_2 \pm \sigma$	p	Before experiment $\bar{X}_3 \pm \sigma$	After experiment, $\bar{X}_4 \pm \sigma$	p
Body mass index	94,1 ± 5,3	97,7 ± 4,3	<0,05	92,5 ± 5,7	100,3 ± 3,2	<0,05
Waist / Hip ratio	109,1 ± 5,6	104,0 ± 3,5	>0,05	110,2 ± 5,7	99,6 ± 5,1	<0,05
Fat mass	110,5 ± 5,8	107,6 ± 5,2	<0,05	107,7 ± 5,1	102,4 ± 4,8	<0,05
Skinny mass	100,8 ± 7,2	103,2 ± 6,8	>0,05	105,2 ± 6,2	100,1 ± 6,3	>0,05
ACM	98,3 ± 7,1	105,6 ± 6,2	<0,05	92,5 ± 9,2	107,6 ± 6,4	<0,05
Share ACM	100,5 ± 5,8	107,4 ± 6,8	<0,05	94,5 ± 4,5	112,7 ± 7,0	<0,05

<i>Continuation of table 1</i>						
Skeletal muscle mass	90,3 ± 4,7	97,2 ± 4,6	<0,05	91,8 ± 5,3	105,5 ± 6,4	<0,05
General fluid	95,6 ± 5,5	97,8 ± 5,7	>0,05	93,5 ± 3,2	101,7 ± 5,5	<0,05
Extracellular fluid	94,3 ± 3,2	97,0 ± 4,3	<0,05	94,1 ± 5,0	100,1 ± 4,5	<0,05

Following the results of monitoring the representatives of the control (CG) and experimental groups (EG) and analyzing the data in the table, we can see that the body mass index, calculated from the ratio of body weight and height, tells us about the normal physique in women of both groups. However, taking into account the indicators of fat mass of the body also in both groups (110,5% in the control and 107,7% in the experimental one), it can be concluded that along with the increase in muscle mass, which the studied clients of the fitness club sought, it was necessary to reduce a certain percentage of fat mass.

Evaluating the initial indicators of waist and hip circumferences, it should be noted that some of the subjects are prone to accumulation of visceral fat of the android type (6 people in the CG (43%), 8 in the EG (50%)), some are prone to ginoid obesity (KG - 3 (21%), EG - 4 (25%)), the rest have a mixed type of fat deposition (CG - 5 (36%), EG - 4 (25%)). There are five such women in the CG (36%), in the EG - four (25%).

Fat mass (FM) decreased markedly in both groups, but in the experimental group, which was under the guidance of a personal trainer, the decrease in the fat component exceeds that in the control group. At the same time, the dynamics of lean mass is not so significant in both groups and amounts to 2,4% in the control and 5,1% in the experimental groups. The latter may be due to the fact that by the mean value of the representatives of the control and experimental groups can be attributed to the normal condition (indicators of lean weight of 100,8±7,2% and 105,2±6,2%, respectively), as well as with a slight excess fat mass at the beginning of the study, which did not affect this parameter of the body parameter of the subjects at the end. For the same reason, in both groups there was no statistical significance of differences for the 5% level of significance.

A different situation is observed in the dynamics of active cell mass (ACM). Before the experiment, the group engaged with the trainer had low indices of this component, which may indicate a lack of protein intake of its representatives. At the end of the study, active cell mass data increased in both groups. However, the excess in the experimental group is more than 2 times greater than the ACM changes in the control group (15,1% and 7,3%, respectively), which is a direct consequence of insufficient protein intake (one of the main nutrients when building muscle) during the observations in the control group. Recall that in the experimental group, women were engaged in an individual training program using a personalized diet and nutritional recommendations.

As for the percentage of the share of the active cell mass in the lean mass, there are also obvious changes for the better. Thus, in the control group, the increase was 6,9, and in the experimental group, 18,2 percent. It follows from this that the level of working capacity of those who work with a personal trainer grows much more intensively (2,5 times!) Than that of those who study independently. It can be stated that methodically constructed lessons under the guidance of a coach are better and safer for health.

Since the main purpose of classes for women of mature age in both groups was to increase muscle mass, it will be necessary to note that the skeletal muscle mass index (SMM), which most clearly characterizes the dynamics of interest to us, changed significantly in the experimental group (by 13,7%) , compared to the original data. In the control group, this indicator increased by only 6.9%. This may be due both to the incorrect method of independent study by representatives of the control group, and to the inadequacy or irrationality of their chosen diet.

The dynamics of indicators of total fluid in the control group has no significant changes, which is associated with the sufficiency of body hydration at the beginning of the study, therefore, after the experiment, there was no statistically significant significance of differences ($p>0.05$). In the

experimental group, the indicators of the total body fluid data increased by 8,2% in a big way and on average per group were 101,7%, which brought the data closer to the normal values.

A definite increase in the extracellular body fluid was also noticeable only in the experimental group and amounted to 6.0%. It can be concluded that these changes are related to the rational intake of water in the daily mode and workouts recommended by the personal trainer for each of the clients. It is known [4, 10, 12, 16] that extracellular and intracellular fluids are the most important participants in gas exchange, transfer of nutrients, excretion of end products of metabolism, etc., and this directly affects the metabolic processes and quality of life of the human body.

Evaluating the results of the experiment in the framework of body mass dynamics, we do not notice significant changes in this parameter in the control group ($68,1 \pm 6,7 - 66,7 \pm 5,9$, $p > 0,05$) (Table 2). However, taking into account the changes in the above indicators after the experiment, it can be concluded that all the same, along with a decrease in fat, there was an increase in skeletal muscle mass. The negative dynamics of body mass (on average - 1,4 kg) suggests that the set of muscle mass was not as obvious as a decrease in the fat component of the body.

Table 2

Dynamics of body parameters of women of mature age

Indicators	Control group			Experimental group		
	Before experiment, $\bar{X}_1 \pm \sigma$	After experiment, $\bar{X}_2 \pm \sigma$	p	Before experiment, $\bar{X}_3 \pm \sigma$	After experiment, $\bar{X}_4 \pm \sigma$	p
Body mass (kg)	$68,1 \pm 6,7$	$66,7 \pm 5,9$	$>0,05$	$61,4 \pm 7,6$	$65,5 \pm 4,7$	$<0,05$
Phase angle (°)	$6,08 \pm 0,42$	$6,41 \pm 0,27$	$<0,05$	$6,12 \pm 0,43$	$6,78 \pm 0,22$	$<0,05$
Basal metabolism (kcal / day)	$1337,3 \pm 37,2$	$1409,3 \pm 35,0$	$<0,05$	$1344,3 \pm 43,6$	$1460,3 \pm 45,1$	$<0,05$

In the experimental group, however, the increase in body weight averaged 4.1 kg ($61,4 \pm 7,6 - 65,5 \pm 4,7$; $p < 0,05$). Analyzing the already obtained data on the dynamics of FM and SMM in this group, it is obvious that body weight has grown due to an increase in muscle mass, with a simultaneous significant decrease in the amount of fat mass.

The values of the phase angle, as an indicator of the state of cell membranes, reflecting the level of overall performance, fitness and metabolic rate [4], increased in both groups. Thus, in the control group, a positive increase amounted to an average of $0,33^\circ$ ($6,08 \pm 0,42 - 6,41 \pm 0,27$), in the experimental one - $0,66^\circ$ ($6,12 \pm 0,43 - 6,78 \pm 0,22$).

Since it is considered to be the norm to consider the range of phase angle values from $5,4^\circ$ to $7,8^\circ$ [10], it is possible to state a good level of performance of all subjects before and after the experiment. It should also be noted the increase in efficiency during the study and the general improvement in the metabolism of the representatives of the two groups, which in turn reflects the indicator of the basal metabolism. The latter is closely related to the amount of active cell mass and the higher this indicator, the more energy is spent on blood circulation, metabolism and other vital functions [6, 10, 16, 20]. So, along with the increase in ACM in both groups, the indicators of the main metabolism improved - an increase of 5.39% in the control group ($1337,3 \pm 37,2 - 1409,3 \pm 35,0$) and 8,62% in the experimental ($1344,3 \pm 43,6 - 1460,3 \pm 45,1$). In this case, the rate of basic metabolism in healthy women is considered to be from 1300 kcal to 1500 kcal per day [4, 10].

Discussion. The results of this study concern fitness classes for women of mature age. Many authors [2, 6, 7, etc.] paid attention to this contingent of students, highlighting, for example, the somatotype of women for further individualization of classes [5, 17]. In our turn, in this article we spoke about the need to take into account the complex of these clients by a personal trainer: characteristics of living conditions and training for women of mature age, initial parameters of their body, diet and water intake, features of health status and phase of OMC, etc. - for a successful set

of the desired muscle mass. For the first time, an individualized method of personal training for women aged 21-35 years was proposed, which gave a positive dynamic in gaining muscle mass and correcting body parameters, in comparison with self-employed visitors of a fitness club. This biorhythmic body involved.

However, working with any contingent of people has important nuances, such as accounting for diseases and other features of the body (for example, pregnancy and lactation, anatomical features of the muscles and joints, joint mobility), which can also be systematized and examined in further observations and studies.

The research results make it possible to draw the following **conclusions**:

1. Despite the fact that the body mass index indicated the available proportions of the length and body mass of the subjects, which is normal, the indicator of fat mass was slightly above the norm, and this indicates an insufficient amount of muscle mass in the representatives of both groups before the experiment.

2. In accordance with the increase in the share of AKM in the experimental group by more than 2,5 times compared with the control group, it is possible to speak about a significant increase in the efficiency of women working under the guidance of a personal trainer, which has a positive effect on overall health during the day.

3. The SMM, which most vividly reflects the increase in muscle mass we are interested in, in the experimental group statistically significantly increased by 13,7%, which is 2 times higher than this indicator in the control group (6,9%).

4. For all indicators, there is an improvement in physical performance and body parameters of women in both groups, but the representative group of the experimental group, who work under the control and guidance of a personal trainer, achieved great results.

Thus, individual selection of exercises, methods of training, diet and fluid intake, included in the services of a personal trainer, lead to the most effective solution of problems related to the recruitment of muscle mass and normalization of body parameters of women of mature age. At the same time, the direction and intensity of the training effects, depending on the individual biorhythmological features of the body of a particular athlete, is important.

The prospect of further research may be concluded in the study of groups of representatives of the weaker sex of different ages for further systematization and differentiation of the load in the framework of personal training.

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