

ORIGINAL ARTICLE

PROJECTING OF COMPLEX HEALTH TRAINING FOR MATURE MEN WITH METABOLIC SYNDROME

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ABSTRACT

The aim: To identify risk factors for metabolic syndrome; to model, justify and experimentally test the effectiveness of a program of complex health training for mature men with MS.

Materials and methods: Theoretical – analysis, generalization, pedagogical observation, modelling; empirical – methods of implementation of the results in practice (pedagogical experiment involving 50 mature menwho had no contraindications to training), methods of monitoring and measuring of physical evolvement, body systems functional status (samples: Rufier, Stange), general performance level (Harvard step test), medical indicators (blood glucose level, arterial tension).

Results: A complex organized health training program (graduated, systematic, all-round motor activity managed by an instructor) showed better results (24,5 %) compared an independent health training system(15,2 %). Both types of activity contributed to weight loss(CG2 – 10,1 %; EG2 – 15,5 %) and reduction of body parts overall size; functional improvement of cardiovascular and respiratory systems of the male body, in particular in the indicators of the Stange test (CG2 – 29,8 %,EG2 – 33,9 %), Ruffier index (CG2 – 5,8 %, EG2 – 23,0 %) and step test (CG2 – 15,8 %, EG2 – 26,9 %); positive changes in blood glucose levels (CG2 – 20,7 %, EG2 – 31,5 %) andarterial tension (CG2 – 6,2 %, EG2 – 9,8 %); development of different muscle groupsstrength endurance.

Conclusions: Positive changes according to the studied indicators show the decrease in risk factors for mature men metabolic syndrome and thereby preventingcomplications.

KEY WORDS: health training, mature men, metabolic syndrome

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INTRODUCTION

Health research shows that health is a system of social, mental, genetic and somatic well-being of a person in particular, and of society in general. State of health, its preservation and improvement is a medical and social problem that requires an immediate solution. The current state of health of the population of the Ukraine is accompanied by high early mortality (compared to other European countries the average lifespan of Ukrainians is lower by 10-15 years), significant rates of disablement and morbidity. The biggest problem is diseases of the circulatory system, the mortality of which exceeds the European average twice. Obesity is one of the global problems nowadays. According to the World Health Organization, 58,4 % of Ukrainians of working age in 2016 were overweight and 25 % of Ukrainians were obese. In its turn, the obesity causes the development of lymphostasis in lower limbs, passive congestion, and hence an increased risk of thrombosis. Another obesity complication is the development and progression of respiratory failure. The accumulation of excess visceral fat in the abdomen results in migration of its organs towards the diaphragm which significantly reduces the excursion of the diaphragm and lungs (especially their lower parts), development of passive pulmonary congestion and increase of pulmonary susceptibility to infection, etc.

In recent years, there has been a growing interest in health-improving physical culture that considers human health in close connection with physical activity, genetic preconditions, energy potential and lifestyle. Negative physiological changes in the human body due to hypodynamia and unhealthy diet have been studied in the works of medical researchers. In particular, C. G. D. de Silva and others scientists [1] draw social attention to the problem of the relationship between cardiorespiratory fitness and obesity. In the study, the authors warn that obesity is a chronic disease, a risk factor for other lifelong health conditions and early mortality. S. W. Farrell and other scientists [2] point to the correlation of cardiorespiratory fitness with obesity indicators and risk of death from cardiovascular disease among women. They concluded that high levels of cardiorespiratory fitness lead to lower risk of death from cardiovascular disease among women with healthy weight than the ones with obesity.

T. Hornstrup and others scientists [3] studied the effects of handball training on the cardiovascular system and metabolic health of overweight women and found a significant increase in VO2max (7 +/– 4 %) and intermittent endurance (26 +/– 14 %), as well as a decrease of total body fat weight (4 +/– 6 %), total body fat rate (4 +/– 5 %) and android fat weight (7 +/– 12 %). The results show positive changes in the metabolic health of women during aerobic continuous group training.

The positive effect of physical exercising is proven in the works of a number of researchers. In particular,F. Morales-Palomo and other scientists [4] studied the efficiency of continuous and interval aerobic dancing programs on the improvementof health of people with metabolic syndrome. Scientists concluded that any 16-weekaerobic training program with training frequency three times a week is effective enough to improve health statusof people with metabolic syndrome and low level of physical activity. On the other hand, more intensive, but shorter aerobic dancing program is proved to be less effective, that is why it is not recommended by the scientists for health improvement forpeople with metabolic syndrome and low level of physical activity.

A thorough analysis of special studies showed that obesity is a risk factor for metabolic syndrome; the problem of defining the concept of metabolic syndrome is not solved; the body response to graduated physical exercising of mature men with metabolic syndrome needs further investigation because the indicated age group is at greatest risk.

THE AIM

The aim was to identify risk factors for metabolic syndrome; to model, justify and experimentally test the effectiveness of a program of complex health training for mature men with metabolic syndrome.

Formulating the hypothesis of the study, we proceeded from the assumption that the experimental health training program for men of the middle period of adulthood with metabolic syndrome which requires a systematic comprehensive training process and provides graduated instructor-led physical exercise regimens (moderate, moderate training, training) will be more effective compared to the system of independent training, and therefore will aid weight reduction, reducing body parts circumference, improving cardiovascular system functioning, formation of strength endurance, and general performance increase.

MATERIALS AND METHODS

Experimental work to test the effectiveness of complex health training program for mature men with metabolic syndrome required the use of theoretical and empirical research methods. Among the theoretical methods we used analysis, generalization, systematization, pedagogical observation, direct questioning, and modeling; among the empirical ones we used methods of implementing research results into practice (pedagogical experiment), methods of control and measurement, data processing methods. In order to develop a systematic approach to the study of the problem, methods of analysis, generalization and systematization of literary sources were used at the following stages: analysis of domestic scientific works on somatic health criteria, motor activity control, physiological negative changes caused by hypodynamia and positive changes as a result of motor activity optimization; works related to research in the field of health and fitness. Pedagogical observation was conducted in order to identify means and methods used by the instructors in conducting health training; control over the implementation of the experimental program by men. The modeling method was used to model a complex organized system of fitness training for men of the middle period of adulthood with metabolic syndrome, optimal for meeting their biological needs in physical activity, improving the functional body status and weight loss. Pedagogical experiment is a specially organized study conducted to test the effectiveness of the experimental program and the system of independent recreational training for men, and to determine their somatic health status before and after the experiment. The experiment involved 50 men aged 40-60 years with metabolic syndrome, who had no contraindications to active training, significant motor experience (without training experience) and were divided into two homogeneous groups (the control and the experimental groups) of 25 people in each group. The experimental group performed the tasks of the experimental program at fitness clubs, and the control group trained according to the system of independent recreational and health-improving training in the home area.

ORGANIZATION OF THE EXPERIMENT

On the first stage, literary sources were analyzed, the basic concept of the subject of the research and the organization of the experimental work were substantiated; object, subject, purpose and objectives of the study were established; men polling was conducted (training motivation, needs and health problems were found out); preliminary test on three indicators – physical development, functional status, general performance level (strength endurance) – was conducted; based on the data obtained, the control (25 people) and the experimental (25 people) groups were formed; the experimental training program for the experimental group was set up; instructional guidelines for the control group were elaborated. The second stage of the research involved practical application of a system of fitness training and monitoring the fulfilment of conditions. On the third stage, a control check of the men's health status was carried out according to certain indicators.

In order to obtain reliable data on the health status of men during the experiment we used an integrated assessment and monitoring upon the following indications:

1. Physical development (height, weight, body parts circumference: chest, waist, hips) and physical performance level (strength endurance (arm bending and extension in plank position; squats; lifting the torso to the buttocks from a supine position). To get the data, a set of tools was used – a measuring tape, the scales, and a stopwatch.
2. The functional status of body systems (cardiovascular and respiratory systems). The cardiovascular system status was assessed using the Ruffier index, and the respiratory system status was characterized by Stange test and Harvard step test. To get data we used a stopwatch.
3. Medical parameters – detection of capillary blood glucose level (taken from the finger) and arterial tension.

Table I. General characterization of the metabolic syndrome

Metabolic syndrome (MS) is a set of four pathologic processes: overweight (obesity), high blood glucose (hyperglycemia), disorders in the qualitative and quantitative composition of various types of cholesterol (dyslipidemia), high arterial tension (hypertension). The greatest danger for people with MS is a high risk of death, mainly from cardiovascular disease.
Characterization of MS risk factors
Obesity is an excess body weight, mostly due to the accumulation of visceral fat in the abdomen. Dangerous signal is men's waist circumference > 94 cm.
Hyperglycemia is a significant(40 %) decrease in tissue sensitivity to insulin, which gradually stops lowering blood glucose levels. Blood glucose concentration > 5,8 mol/l is dangerous.
Dyslipidemia is a violation of the proportions of the lipid profile – an increase in triglycerides and low-density lipoprotein (LDL-cholesterine), while reducing the content of high-density lipoprotein (HDL-cholesterine), that carries a risk of cardiovascular disease. Triglycerides > 1,7 mol/landLDL-cholesterine< 1,03 mol/l are dangerous for men.
Hypertension is an increase in the volume of circulating blood and peripheral vascular resistance that gradually leads to a stable increase in blood pressure and atherosclerosis development. The danger is blood pressure increase to 130/85 mm Hg.
The most dangerous complications of MS: stroke, heart attack, type II diabetes.
Treatment of MS is aimed at elimination of excess body weight through the use of, inter alia, drug-free modalities: rationalization and reduction of caloric intake, systematic physical activity.

Table II. Health training program for mature men with metabolic syndrome

Session №	Exercise №	Session №	Exercise №	Session №	Exercise №
1-2	1, 17, 3, 6, 10	7-8	18, 10, 5, 14,8	13-14	8, 13, 6, 1, 10
3-4	2, 8, 19, 11, 12	9-10	4, 15, 13, 19, 8	15-16	11, 15, 8, 2, 19
5-6	3, 16, 8, 5, 9	11-12	7, 13, 20, 14, 6	17-18	5, 9, 3, 14, 13

Table III. Comparative analysis of somatic health status of men of the middle period of adulthoodwith metabolic syndrome, in the control (n=25) and the experimental (n=25) groups before and after the experiment

Indicators, tests, measurement units	CG1 -> CG2 M± m				EG1 -> EG2 M± m				CG2 -> EG2 M± m
	CG1	CG2	Growth	D	EG1	EG2	Growth	D	Change
Age (yrs)	54,8	54,8			53,8	53,8			
Body weight (kg)	121,6±2,1	109,3±2,1	10,1%	>0,05	122,7±2,15	103,7±1,8	15,5%	>0,05	5,4%
Chest circumference (cm)	111,1±3,8	107,1±3,5	3,6%	>0,05	112,9±4,15	102,8±3,9	9%	>0,05	5,4%
Waist circumference (cm)	122,3±2,7	114,9±2,6	6,0%	>0,05	124,5±2,95	110,1±2,5	11,5%	>0,05	5,5%
Hips circumference (cm)	103,8±3,2	97,7±3,1	5,9%	>0,05	105,9±4,2	96,8±4,3	8,6%	>0,05	2,7%
Push-ups	5,2±1,34	6,4±1,86	23,1%	>0,05	6,1±0,98	8,3±1,95	26,5%	>0,05	3,4%
Squats	16,2±2,34	21±2,34	29,6%	>0,05	16,3±1,33	25,4±2,5	55,8%	>0,05	26,2%
Sit-ups	13,2±1,7	16,7±2,32	26,5%	>0,05	14,0±2,1	19,8±1,83	41,4%	>0,05	14,9%
Ruffier index (c.u.)	12,0±0,9	11,3±0,71	5,8%	>0,05	11,3±0,8	8,7±0,63	23,0%	>0,05	17,2%
Stange test (sec)	32,2±1,9	41,8±3,06	29,8%	>0,05	35,4±1,7	47,4±3,1	33,9%	>0,05	4,1%
Harvard step test (c.u.)	74,6±1,46	86,4±1,67	15,8%	>0,05	77,2±1,7	98±1,7	26,9%	>0,05	11,1%
Blood glucose levels	8,7±0,9	6,9±1,7	20,7%	>0,05	8,9±1,3	6,1±1,6	31,5%	>0,05	10,8%
Arterial tension	145/94±1,6	136/87±2,3	6,2%	>0,05	148/97±1,9	132/85±2,1	10,8%	>0,05	4,6%

Statistical processing of empirical data was performed by the calculating the value of the Student's t-test, the difference between the sample averages was taken with a probability of 95 % ($p < 0,05$).

RESULTS

Metabolic syndrome is a pathogenetically interrelated metabolic disorder in health status of a patient. The definition of metabolic syndrome has changed several times in recent years. There is currently no well-established definition of the syndrome, so there is no common valid ICD-10 code for documentation. The current classification is based either on insulin resistance (insulin resistance syndrome, WHO classification, 1999), or clinical manifestations (NCEP-ATP-III). Thus, for proper documentation of the syndrome, codes for obesity, high blood pressure,

hyperglyceridemia and impaired glucose tolerance are established. This is understandable, because the metabolic syndrome is not considered to be an independent disease, but a group of risk factors for the cardiovascular system (table I).

The study found that physical exercising in MS is used at all rehabilitation stages. The therapeutic effect of physical exercising is showed in the trophic effect on the body, improving redox processes that occur due to increased blood and lymph circulation, supply of oxygen and nutrients to cells for more efficient assimilation, intensification of removal of metabolic products. Metabolic syndrome is treated comprehensively, including increasing amount of training load and limiting the energy value of food, mainly due to carbohydrates and fats. If necessary, hormonal drugs and medications that reduce appetite or are aimed at treating comorbidities are prescribed.

The main tasks that will contribute to weight normalization are: increasing energy assumption, redox and metabolic processes; gradual increase in physical activity, the use of physical exercises for medium and large muscle groups in alternation with respiratory ones that causes increased energy expenditure and oxygen uptake, promotes to consumption of large amounts of carbohydrates, as well as leaving that depot and lipolytic digestion. Contraindications are exacerbation of comorbidities; hypertensive and diencephalic crises.

The course of exercises is divided into two periods. In the first training period physical exercises are used to restore person's movement skills and adapt to physical activity. In the second training period that includes moderate training and training movement regimens, the intensity of physical load gradually increases. Considerable attention should be paid to exercises that strengthen core muscles, corrective and breathing exercises. The training density should reach 60-70 %,and the duration of physical exercising should reach 45-60 min.The training program is recommended for people with alimentary and endogenous forms of obesity, in which there are no significant changes in the organs and systems that limit the amount of exercise. However, with the endocrine-cerebral form of obesity the overall physical training load is reduced; there are more exercises for the middle muscle groups and breathing exercises, the pace of performance is slow to medium, and the training duration is shorter. Exercise dosage is controlled by subjective and objective indicators: well-being, blood and urine glucose levels, body weight.

The analysis of special literary sources the specifics of the disease and the peculiarities of the organization of training sessions and rehabilitation of people with metabolic syndrome prompted us to develop the experimental health training program for men of the middle period of adulthood with metabolic syndrome. The physical exercises of the program are divided into three difficulty levels (moderate, moderate training, training) according to fitness levels and health status of the men.

Exercise 1. *Moderate regimen.* From thepreparatory position(hereafter –p.p.) – narrow leg rack cut to perform a half-squat, then straighten up and raise on toes. Put your hands together in front of your chest. *Moderate training regimen.*Same exercise, but when bending the legs, lower the arms down, and when stretching the legs, raise the arms up. *Training regimen.*When performing a squat, keep your hands on your hips, and straighten up to jump up. Exhale when stretching the legs. This exercise strengthens the quadriceps muscle of thigh and Achilles tendons, anterior and posterior femoral ligaments, sciatic and calf muscles.

Exercise 2. *Moderate regimen.*P.p. – sitting on the edge of a high bench so that your feet don't touch the floor. Weights (dumbbell or bag with stones) should be attached to the right of left foot. The leg with the weight must be straightened and then bent. The exercise strengthens the quadriceps muscle of thigh and knee ligaments. Exhale when stretching the leg. *Moderate training regimen.*Same exercise, but more weight.*Training regimen.* Extending the legs with an exercise machine. The exercise strengthens the thigh extensor muscles.

Exercise 3. *Training regimen.* P.p. – right leg sitting support, left leg back. The angle in the knee joint is straight, the knee does not go beyond the foot "projection"; body weight should be evenly distributed between the hands and feet. From this position, jump up and swap legs. Exhale when changing the position of the legs. This exercise strengthens sciatic muscles, quadriceps muscles of thigh, ligaments and thigh extensor muscles.

Exercise 4. *Moderate regimen.*P.p. – lying on the right side, bend the right leg, straighten the left leg, straighten the right arm up, put your head on the arm. From this position lift the left leg up, then return to p.p. Perform the same exercise with the right leg. *Moderate training regimen.* Same exercise, butattach 1-3 kg ankle weightsto the legs. Exhale while lifting. The exercise strengthens the muscles of inner and outer thighs.

Exercise 5.*Moderate regimen.*P.p. – wide rack legs apart, hands behind head. Bow to the right and to the left. The hips when bowing should not deviate from the main center of gravity. *Moderate training regimen.*Same exercise, but hold 3-5 kg dumbbells in your hands. *Training regimen.* Same exercise, buthands with dumbbells at the top are connected; the weight of the dumbbells is 1-2 kg. Exhale when straighten the body. This exercise strengthens and tones the oblique and transverse abdominal muscles.

Exercise 6. *Moderate regimen.*P.p. – lying on the back, legs bent, arms behind the hand. Round the back, slightly lift your body up, stretch your chin forward without pitching the thyroid gland, then return to p.p. *Moderate training regimen.*P.p. – the same, buthold one 1,5-2 kg dumbbell in your hands, hands up (alongside the body).Sit up, press your body against the floor, hold your arms with a dumbbell forward, then return to p.p. *Training regimen.* Same exercise, but more weights. The exercise strengthens abdominal muscles.

Exercise 7. *Moderate regimen.*P.p. – stand legs apart, hold a barbell weighting up to 10 kg on the shoulders. Lean forward to the right angle, bend at the back, lift the chin, then return to p.p. *Moderate training regimen.*Same exercise, but

the weight of the barbell is more. Exhale when stretching the body. The exercise strengthens biceps muscle of thigh, sciatic and back extensor muscles.

Exercise 8. *Moderate regimen.*P.p. – lying on your back on the bench, legs bent on the floor, arms holding 2-3 kg dumbbells forward. Spread your arms out to the sides so that your shoulders are horizontal to the floor (don't allow overextension in the shoulder joint), then return to p.p. *Moderate training regimen.*Same exercise, but more weights. The exercise strengthens greater pectoral muscles.

Exercise 9. *Moderate regimen.* P.p. – stand legs apart, arms holding 3-5 kg dumbbells down. Raise your shoulders up, then return to p.p. *Moderate training regimen.*Same exercise, but more weights. Exhale when lifting the shoulders. This exercise strengthens trapezius muscle.

Exercise 10. *Moderate training regimen.* P.p. – standing on the bench in front of the crossbar at chin level, hands on a pole shoulder-width apart, grip from above, chin lightly above the crossbar. Holding on to the pole, slowly descend from the bench to the height of the crossbar. Going down you need to control the body so that it doesn't fall down, then step up on the bench. Exhalewhen stretching the arms. *Training regimen.*Pull-ups (hanging lying down) on the crossbar. The exercise strengthens shoulder muscles.

Exercise 11. *Moderate training regimen.*P.p. – stand in the kneeling position, hands narrowly on the floor or bench, lower hips. Bend your arms while touching the bench, then unbend your arms. *Training regimen.* Same exercise, butknees don't touch the floor. Exhale when stretching the arms. The exercise strengthens shoulder muscles, triceps and abdominal muscles.

Exercises with an athletic tubular shock absorber (possible with a medical tourniquet), the dosage is regulated by the amount of repetition and the amplitude of movement.

Exercise 12. P.p. – stand feet apart, the ATSA forward. Spread your arms out to the sides, stretch the ATSA and exhale, then return to p.p.andinhale. Rhomboid and deltoid muscles are active.

Exercise 13. P.p. – lunge right forward, clamp the ATSA with right foot, hold the ends of the ATSA in right hand, palms out, the left hand on the waist. The right arm-pumping. Exhale when bending the arm. Perform the same exercise with left arm. Focus on the biceps muscle of arm.

Exercise 14. P.p. – lunge left leg forward, press the ATSA in the center with the right foot, arms bent up, the ATSA behind the back, grip at both ends (perform the exercise with a long ATSA or a medical tourniquet). Extend your arms up and exhale, then bend and inhale. The triceps muscle of the shoulder is active.

Exercise 15. P.p. – stand with both feet in the center of the ATSA,squat legs apart, and grab the ends with both hands. Pull arms backwards andexhale, then lower hands and inhale. In this exercise involves the posterior cords of deltoid muscle and trapezius muscle.

Exercise 16. P.p. – stand legs apart, standing in the center of the ATSA, arms bent to the sides, grasping both ends of the ATSA. Extend your arms up – exhale, bend – inhale. The deltoid and trapezius muscles are active.

Exercise 17. P.p. – the same. Bringing the bent arms forward – exhale, p.p. – inhale. The greater pectoral muscles are active; anterior cords of deltoid muscle work statically.

Exercise 18. P.p. – the same (ATSAis slightly stretched). Bend your legs – inhale;spread your legs, arms up – exhale;lower your arms through the sides down. The quadriceps and deltoid muscles are active.

Exercise 19. P.p. – the same, but transfer body weight to the left leg (ATSAis slightly stretched). The right leg abduction to the side – exhale, leg in p.p. – inhale. Repeat the same exercise with the left leg. The sciatic muscles are active.

Exercise 20. P.p. – lunge with the right leg, press the ATSAto the floor with the right foot, grab both ends with your hands. Bend your legs, arms to the sides – exhale. P.p. – inhale. The quadriceps muscles of thigh, sciatic muscles and middle deltoids are active.

Due to the peculiarities of men's health, we have developed and implemented a program to normalize weight and maintain results, increase muscle tone and performance capability. For the effectiveness and safety of exercising, the program is developed to focus on strengthening of the relevant muscle groups. The amount of repetition of each exercise of the set is 10-20 (duration – 30-60 sec), depending on the individual ability of the man to perform it in the maximum amount in the specified time and start performing another exercise, but training another muscle group. As men trained, we included exercises with a load that slightly exceeded the physical capabilities of the men, but didn't overload them.

The program begins with a warm-up that includes walking and running exercises,combined developing exercises for the muscles of the neck, pectoral arch, upper body and lower extremities. The main part is built up on the system of circuit training. One circle consists of 5 weight-lifting exercises that should be performed in the sequence specified in the program. A set of exercises should be performed three times, each time maintaining a certain speed of movement. The relatively fast tempo of performance of exercises and short rest breaks between the sets (stations) can increase physical load, increase oxygen uptake by the body and give the effect of a full-fledged functional aerobic training. Active rest after the exercise is a transition to the next type of movement, after one circle – rest for 30 sec. After performing the program of weight-lifting exercises for the third time, it is necessary to perform a set of cool down exercises for stretching. The exercises for stretching are performed on the principle of progressive static stretching. They should be performed slowly until you feel a slight pain from tension; this position should be hold for another 10-20 sec. It is not recommended to make abrupt movements, so as not to injure muscles and ligaments.

The program is designed for 18 sessions – three sessions per week, so the full cycle lasts 6 weeks. The results of exercising (the amount of repetitions in a set, the weights, an amplitude of movement, an exercise heart rate, general physical state, etc.) should be recorded in a diary (table II).

Therefore, the developed program was implemented by the members of the experimental group. The men of the control group took part in recreational and health-improving training that don't include regulated physical activity; they independently chose activities that meet their subjective needs and capabilities. They trained at a convenient time, without taking into account the time to perform the exercises and a third-party consultation.

Abbreviations: CG1 – the control group before the experiment; CG2 – the control group after the experiment; EG1 – the experimental group before the experiment; EG2 – the experimental group after the experiment; n – sample number; M – arithmetic mean; m – standard error of the arithmetic mean; D – validity of difference according to Student's t-tes (table III).

DISCUSSION

Obesity is a chronic disease, a risk factor for other chronic conditions and early mortality. This conclusion was reached by scientists de Silva CGD et al. [1]. Their study was based on comparing the frequency of visits of patients with obesity to the doctor. Scientists have found that annual costs among obese people are at least 30% higher than those of their peers with normal weight. When conducting our study, the economic side of the organization of training was not taken into account. When organizing the experiment, we took in to account only the idea of finding out the relationship between cardiorespiratory endurance and obesity.

Scientists Farrell SW et al. [2], whos estudies we relied on, note the correlation of cardiorespiratory fitness with rates of obesity and the risk of mortality from cardiovascular diseases in women. Studies show that higher levels of cardiorespiratory endurance are associated with lower risks of cardiovascular death in normal weight women than in obese women. Interesting for us was the choice of research methodology by scientists, which made it possible to carry out accurate measurements. In our study, we used a measurement experience including body mass index, waist circumference, body-to-skinfold ratio. However, we focused not only on objective indicators of weight loss, but also on the dynamics of the functionalstate of men. To obtain data in this cluster, we used the Rufier index, Stange index, step-test, measured blood glucose levels and blood pressure. This, in our opinion, should most accurately convey the results of a cohort study.

An important contribution to the study of the effect of aerobic training on the state of the cardiovascular system and metabolic health in women was made by scientists T. Hornstrup et al. [3]. The results obtained indicate positive changes in the health status of women during group training, which are of a continuous aerobic nature. These studies attracted attention in that scientists achieved a significant reduction in fat mass in women through a continuous loading method. Therefore, we use this method of organizing a lesson in our study. A distinctive feature of our study is the emphasis not on sports and gaming practice, but on an integrated approach to physical improvement based on exercises of a general developmental nature.

Scientists Morales-Palomo F. et al. [4]. Focus their attention on the use of continuous and interval methods to improve health during the metabolic syndrome. Their results show that for people with metabolic syndrome, any aerobic training program lasting 16 days, three times a week is effective. Scientists have proven that a shorter high-intensity workout is not effective for this group of individuals. Listening to the recommendations, we have selected physical exercises so that men with metabolic syndrome and different levels of fitness can perform them with the appropriate frequency, pace, amplitude and intensity. Accordingly, the complexes of exercises were distributed by us into sparing, sparingly training and training modes, which gave a significant healing effect.

In general, in comparison with the results of studies of other scientists on this issue, we have proved the effectiveness of differentiation of general developmental physical exercises in three modes of work (sparing, sparing-training and training), which werecarried out by a continuous method. This made it possiblein a short time (6 weeks) to switch from a sparing exercise regimen, the purpose of which was adaptation to physical exertion and weight loss, to a training regimen – body shaping, normalization and stabilization of weight, body circumference.

In particular, body weight, chest circumference, waist circumference in the experimental group decreased by an average of 5.5% compared with CG2, which contributed to the correction of the physique. Indicators of formation of strength endurance increased both in CG2 and EG2. But, we can note a significant increase in the indicators of EG2 in the test exercises: «Squats» (by 55.8%) and «Raising the torso into a sitting position from a supine position» (by 41.4%), in CG2 by 29.6% and 26.5% respectively. Positive changes occurred in the functional state of the body systems of men, including in terms of the Stange test (CG2 - 29.8%, EG2 - 33.9%), the Rufier index (CG2 - 5.8%, EG2 - 23.0%) and step test (CG2 - 15.8%, EG2 - 26.9%), indicating an improvement in the activity of the cardiovascular and respiratory systems. We also note positive changes in blood glucose levels (CG2 - 20.7%, EG2 - 31.5%) and blood pressure (CG2 - 6.2%, EG2 - 9.8%). In the course of the study, it turned out that the methodology we chose to check the health status of men turned out to be effective and efficient.

CONCLUSIONS

In the course of the study we identified risk factors for metabolic syndrome, modelled, justified and experimentally tested the effectiveness of the program of complex health training for mature men with metabolic syndrome. In general, the training program helped to reduce body weight, reduce the circumferences of body parts, improve cardiovascular and respiratory systems, increase general performance level, reduce blood glucose levels and lower arterial tension that proves the effectiveness of a systematic approach to training of the men with metabolic syndrome in this age group. It is important to note that the advan-

tages of the program under the guidance of an instructor over the independent training which is more significantly reflected in the indicators. At the same time, the positive dynamics, according to the studied indicators, shows a decrease in risk factors for metabolic syndrome for mature men, thus preventing the development of MS and related complications.

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