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EVALUATION OF THE EFFECTIVENESS OF THE PROGRAM OF INDEPENDENT PREVENTIVE AND HEALTH-ENHANCING EXERCISE CLASSES FOR MIDDLE-AGED OVERWEIGHT WOMEN

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Abstract

The paper addresses the effects of independent preventive and health-enhancing exercise classes on the indicators of morphological status in middle-aged overweight women. The **objective** of the study was to examine the effects of independent preventive and health-enhancing exercise classes on the indicators of morphological status in middle-aged overweight women. **Methods.** The following methods were used: theoretical analysis of special scientific and methodological literature; anthropometric and pedagogical methods; and the methods of mathematical statistics. The study involved 62 middle-aged women with an average age of 38.5 years. The duration of the transformative pedagogical experiment was nine months. **Results of the study.** During the pedagogical experiment, significant changes occurred in the morpho-functional status of the women. The most significant changes occurred in the following indicators: waist circumference decreased by 18.4% ($p < 0.01$); abdominal circumference decreased by 12.0% ($p < 0.01$); and waist-to-hip ratio decreased by

8.2% ($p < 0.01$). At the end of the experiment, the individual values of morphological parameters were within physiological ranges in the vast majority of women. In particular, the individual BMI results corresponded to the "normal body weight" according to the gradation scale in 93.5% of women. Individual measures of waist and abdomen circumference and circumference ratios were within physiological norms and indicated the absence of abdominal obesity in middle-aged women. **Conclusions.** A comparative analysis of the physical condition indicators of overweight middle-aged women, who were participated in the proposed exercise program for nine months, allowed to determine the features of its cumulative effect and to demonstrate the effectiveness of the proposed means and methods that best met the physiological and individual characteristics of women.

Keywords: women, middle age, excess body weight, effectiveness, program, preventive and health-enhancing exercise classes.

Problem formulation. The problem of inappropriate body weight poses a potential danger to the health of the population of various countries around the world [16]. The risk of overweight and obesity is increasing due to the negative impact on somatic health and on the development of comorbidities that affect the most vital systems of the body [2, 15]. The global overweight and obesity prevalence is growing every year. Studies in Ukraine showed that people over 45 have a high prevalence of obesity (52%) and overweight (33%). Normal body weight was found in only 13% of the adult population of Ukraine [2]. Most experts agree that overweight and obesity have a multifactorial etiology [7, 9, 11]. However, given that the energy balance is determined not only by caloric intake, but also by energy expenditure, it is logical to assume that hypokinesia, which is characteristic of most adults, along with eating disorders can play a significant role in the development of this pathology [2, 11, 14]. The studies conducted in Ukraine have shown that adults have low levels of physical activity and require the development of preventive and health-enhancing measures focused on increasing the degree of their involvement in regular exercise [1, 4, 8, 10, 11]. Nevertheless, it

should be noted that, despite the large number of theoretical and practical developments aimed at managing overweight and obesity, many of them have not received scientific confirmation, and this determines the relevance of the topic related to assessing the effectiveness of prevention and health-enhancing exercise programs for middle-aged overweight women.

Analysis of recent research and publications. Analysis of modern publications on the management of overweight and obesity has identified some trends in the use of popular technologies for maintaining a healthy weight [3, 6, 9, 11, 13]. Recognizing the fact that the most effective of them are based on the dietary management and optimization of physical activity, scientists also emphasize the individualization of risk factors that requires the search for various solutions to this problem. The authors examine the possibility and feasibility of using modern molecular genetic markers in health fitness programs for overweight middle-aged women [6, 10]. A lot of studies reports that people who actively spend their free time or regularly participate in physical activity are more likely to maintain a healthy body weight throughout heir lives [1, 17]. The need for the use of physical exercise in weight management programs that makes possible an increase in energy expenditure today is beyond doubt. However, the issue of the degree of effectiveness of addressing this problem through the use of different types of physical exercise remains controversial. Most studies on weight management programs have addressed the problems of obesity. In contrast, the number of studies that paid attention to the management of body weight in individuals close to obesity is limited. The question of which of the physical activities are the most effective for managing different types of inappropriate body weight remains uncertain. Such questions presuppose the necessity of research aimed at developing, evaluating, and substantiating an effective weight management program for middle-aged women.

The research was carried out in accordance with the plan of scientific research of the NUPESU for 2016–2020 within the thematic research of the department of health, fitness, and recreation “Theoretical and methodological principles of health-enhancing and recreational physical activity of different population groups” (state registration number 0116U001630).

The **objective** of the study was to examine the effects of independent preventive and health-enhancing exercise classes on the indicators of morphological status in middle-aged overweight women.

Methods and organization of the study. The following methods were used: theoretical analysis of special scientific and methodological literature; anthropometric and pedagogical techniques; and the methods of mathematical statistics [5].

A group of 62 women with an average age of 38.5 was formed to determine the effectiveness of the proposed proprietary 9-month program for weight management. The subjects did not have any functional disorders and health conditions that could result in negative consequences during exercise. The vast majority of women 90.3% (n = 56) had an O-shaped body type that was accounted when choosing the means and methods for weight management. Exclusion criteria: diabetes mellitus; grade 2-3 obesity and other endocrine diseases; acute infectious diseases; acute and chronic kidney and liver diseases; hematological, oncological and systemic inflammatory diseases; acquired and congenital heart defects; and pregnancy. Since the vast majority of women had an O-shaped body type, we used aerobic exercise of moderate or medium intensity. The individual training program for each participant of the experiment included a set of mainly strength-training bodyweight exercises, i.e. exercises that use the individual's own weight to provide resistance against gravity. It is important to note that the essential approach of the authors to the development of the training program was to use only exercises with the individual's own body weight (without any additional equipment). This facilitates the perception of the developed program as affordable and easy to exercise at home. The choice of exercises and designing of the training program was based on the questionnaires provided by the participants. This personalized approach to the formation of a set of exercises contributed to the principle of specificity of the training process as one of the main in the development of strength training programs.

Results. To access objectively the proposed individual programs of preventive and health-enhancing exercises and nutritional recommendations for middle-aged women, we conducted a comparative analysis of the physical condition at the beginning and at end of the experiment. The results of this analysis are presented in tables 1 and 2.

Comparison of morphological parameters of women before and after the experiment revealed significant ($p<0.05$; $p<0.01$) positive changes.

Table 1 - Average values of physical development parameters of middle-aged women at the beginning and at the end of the experiment (n = 62)

Parameter	Before		After		p
	$\bar{x}$	S	$\bar{x}$	S	
Age, years	38.5	1.99	39.3	1.37	
Height, cm	167.9	6.12	167.9	6.12	>0.05
Body weight, kg	81.4	10.87	73.6	5.3	<0.05
BMI, $kg \cdot m^{-2}$	27.5	2.80	22.9	2.12	<0.01
CC, cm	92.7	7.00	88.4	4.8	>0.05
Inspiratory CC, cm	96.3	6.62	94.3	5.28	>0.05
Expiratory CC, cm	89.8	7.11	88.4	5.64	>0.05
Chest excursion, cm	5.8	2.98	6.1	1.86	>0.05
Waist circumference, cm	87.5	6.93	73.9	3.42	<0.01
Abdomen circumference, cm	89.5	9.59	79.9	3.84	<0.01
Hip circumference, cm	110.8	8.40	101.4	5.64	<0.01
Waist-to-hip ratio (WHR), arb. units	0.79	0.06	0.73	0.06	<0.01
Waist-to-height ratio (WHtR), arb. units	0.53	0.05	0.44	0.04	<0.01
Grip strength (dominant hand), kg	30.4	6.78	31.3	4.75	>0.05
Grip strength (nondominant hand), kg	28.1	6.68	29.3	3.65	>0.05

The proposed proprietary program contributed to the normalization of the morphological status of middle-aged women. Since the significance of the differences was observed in the indicators such as body weight (BW), body mass index (BMI), and body circumferences, as well as in the anthropometric measurements that indicate the harmony of the body, we can talk about the obvious health-promoting effects of the proposed methods and tools. Furthermore, comparing the data obtained before and after the nine-month exercise program revealed that the most significant ($p<0.05$; $p<0.01$) changes occurred in the following indicators: the waist-to-height ratio (WHtR) decreased by 20.5%; BMI decreased by 20.1%, waist circumference decreased by 18.4%, abdomen circumference decreased by 12.0%, BW decreased by 10.6%, hip circumference decreased by 9.3%, and the waist-to-hip ratio (WHR) decreased by 8.2%.

This positive changes in the indicators of morphological status of women can be explained by the specifics of classes design that was taking into account the body type; we have found the similar approaches in [4, 11]. The main part of the lesson lasted at least 30 minutes and consisted of a set of mainly strength-training exercises with the participant's own

body weight. The positive changes in the waist and abdomen circumferences in the middle-aged women was influenced by rotational core exercises in the abdominal press.

Thus, in the framework of the pedagogical experiment significant positive changes were established in the indicators of the morphological status of middle-aged women that evidence the effectiveness of the proposed program.

Changes in body composition were monitored by analyzing the total amount of fat and muscle tissue in the body; the results are presented in table 2. In women, the percentage of fat mass decreased significantly ($p < 0.01$) over nine months; in contrast, the percentage of muscle mass increased significantly ($p<0.05$).

Table 2 - Average values for the body composition of middle-aged women at the beginning and at the end of the experiment (n = 62)

Parameter	Before		After		p
	$\bar{x}$	S	$\bar{x}$	S	
Fat mass, kg	29.5	17.89	23.1	3.05	<0.01
Fat mass, %	33.0	5.76	25.9	2.69	<0.01
Muscle mass, kg	27.7	3.27	30.4	1.15	<0.05
Muscle mass, %	36.1	2.80	39.7	1.65	<0.05
Basal metabolic rate, kcal	1698.0	235.10	1508.3	85.35	<0.05

Analysis of individual values of body fat percentage at the end of the experiment revealed that this indicator was within the normal range in 75.8% of subjects and slightly excessed the normal values in 24.2% of the women. The average measurements of body fat decreased by 27.7% and 27.4% after participation in the proprietary program and was in the normal range. On the other hand, average muscle mass increased by 8.9% and 9.1%. In our opinion, the changes in body composition were the result of the combined use of mainly aerobic and mixed aerobic-anaerobic exercises, where the individual training heart rate zone was determined based on the physical condition level. Furthermore, regular updating of the program allowed to maintain women's motivation to exercise and to prevent habituation to exercise loads at the level of intermuscular coordination.

Comparative analysis of sample variances at the beginning and at the end of the pedagogical experiment reflects the trend of reduction in the variation of morphological status parameters, which indicates positive changes toward the normal range as well as the homogeneity of the sample.

Thus, through the use of rational combination of a wide range of tools and methods of health-enhancing fitness, nutritional adjustment, and motivational focus and taking into account the body's individual characteristics of the participants, we were able to significantly improve the morphological characteristics of middle-aged women.

Conclusions. A comparative analysis of the physical condition indicators of overweight middle-aged women, who were participated in the proposed exercise program for nine months, allowed to determine the features of its cumulative effect and to demonstrate the effectiveness of the proposed means and methods that best met the physiological and individual characteristics of women.

Over the period of the pedagogical experiment, significant changes occurred in morpho-functional indicators of the women. The most significant ones were found in the following indicators: waist circumference decreased by 18.4% ($p < 0.01$); abdominal circumference decreased by 12.0% ($p < 0.01$); and waist-to-hip ratio decreased by 8.2% ($p < 0.01$). At the end of the experiment, the individual values of morphological parameters were within physiological ranges in the vast majority of women. In particular, the individual BMI results corresponded to the "normal body weight" according to the gradation scale in 93.5% of women. Individual measures of waist and abdomen circumference and circumference ratios were within physiological norms and indicated the absence of abdominal obesity in middle-aged women. This indicates the effectiveness of the proposed exercise program.

Further research prospects include an assessment of the effectiveness of the proposed program of independent preventive and health-enhancing exercise classes based on the indicators of the functional state of the cardio-respiratory system, physical health, and physical fitness of middle-aged overweight women.

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