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ORIGINAL SCIENTIFIC ARTICLE

CORRECTION OF POSTURAL DISORDERS OF MATURE AGE WOMEN IN THE PROCESS OF AQUA FITNESS TAKING INTO ACCOUNT THE BODY TYPE

Nataliia Goncharova[1ABCD], Vutalii Kashuba[1ABCD], Anna Tkachova[1ABCD], Tamara Khabinets[1ABCD], Olha Kostiuchenko[1ABCD], Mariia Pymonenko[1ABCD]
[1]National University of Ukraine on Physical Education and Sport

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Corresponding Author: Nataliia Goncharova, E-mail: nataliinfiz@gmail.com
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Abstract

The purpose of the article is to develop and test the effectiveness of aqua fitness exercise program for the posture improvement of women of the first period of a mature age with different body types.

Materials and methods. The pedagogical experiment involved 46 women of the first period of a mature age who had previously consented to participate in the study. The used methods include the analysis and generalization of scientific and methodological literature, Internet data, and mathematical statistics methods, including Fisher's angular criterion, which allows sampling by distribution of the trait (Byshevets et al., 2019). The research included the assessment of the posture condition of women based on the method of visual screening of posture with determination of the total score (Kashuba et al., 2016). A surgeon was also involved in assessing the posture of women. In the process of factor analysis, the data of anthropometric studies, physical fitness assessments, and motor activity level were analyzed.

Results. The distribution of women of the first period of a mature age by types of postural disorders and its changes under the influence of aqua fitness classes taking into account the body type has been established. The study involved 46 women of the mentioned category; 73.9% of them were women of normosthenic body type, 15.2% – of asthenic type, and 10.9% – of hypersthenic type. The research has established that women who were engaged in aqua fitness with regard to body type had positive changes in posture. The proportion of women of asthenic body type with a normal posture increased by 28.6%, of normosthenic type – by 20.6%, and of hypersthenic type – by 20.0%. Changes occurred in the level of the bio-geometric profile of the posture.

Conclusions. The study confirms the effectiveness of the use of aqua fitness in the process of health-promoting classes to prevent and correct postural disorders.

Keywords: women, aqua fitness, posture.

Introduction

The demographic situation in European countries, including Ukraine, is characterized by the presence of persistent crisis tendencies: decrease in population, aging, worsening of the health status, and decline of the birthrate (Afanasieva, 2016; Volovyk, 2017; Andrieieva, Hakman, Kashuba, Vasylenko, Patsaliuk, Koshura, & Istyniuk, 2019).

At the same time, researchers state the deterioration of the physical condition and the decline in the level of health of women of reproductive age caused by a sedentary lifestyle, poor nutrition, adverse social, economic, and environmental factors, which negatively affects the demographic processes in the society (Martyniuk, 2016; Ivanchykova, Saienko, Goncharova, Tolchieva, & Poluliashchenko, 2018; Tkachova, Dutchak, Kashuba, Goncharova, Lytvynenko, Vako, Kolos, & Lopatskyi, 2020).

Considering the health of women of the first period of a mature age as the most important value of the society in the reproduction of the population, experts in physical education and sports are trying to find the most effective means to improve women's health and to develop measures that can motivate them to increase motor activity (Ivchatova, 2010; Bibik, 2013; Sadovnikova, 2018).

One of the most important indicators of health is the condition of the posture, the disorders of which lead to a

number of diseases (Kashuba, Lopatskyi, & Khabinets, 2017; Kashuba, Goncharova, Tkachova, & Prylutska, 2019). The degree of influence of posture indicators on the functioning of organs and organism systems is described in the studies of other authors (Byshevets, Denysova, & Serhiyenko, 2018; Drozdovska, Andrieieva, Yarmak, & Blagii, 2020; Hakman, Andrieieva, Kashuba, Nakonechnyi, Cherednichenko, Khrypko, Tomilina, & Filak, 2020), who have the common opinion of relatively significant pathological changes in the human body against the background of existing disorders of the posture. Conversely, proper posture has a positive effect on women's vitality, gives them self-confidence, and improves their appearance, and therefore their well-being and mood. However, unfortunately, nowadays, an increasing proportion of women of the first period of a mature age are characterized by impaired posture, which provokes backpain (Tomilina & Bishevets, 2018).

The state of human posture, which determines the distribution of individual bio-links of the human body in space, depends on the type of physique (Ivchatova, 2010; Shankovsky, 2018). According to (Ivchatova, 2010; Shankovsky, 2018) pedagogical means of influence in the process of health fitness should be differentiated by body type, taking into account the state of posture.

The issue of correction of postural disorders of different population groups by means of health fitness has been repeatedly raised in scientific circles (Kashuba, Tomilina, Byshevets, Khrypko, Stepanenko, Grygus, Smoleńska, & Savliuk, 2020).

The experts indicate a special role of aquatic exercise for the prevention and correction of postural disorders and state its positive impact on the joints and spine (Shutova, Rybakova, & Sharaveva, 2015). Nowadays, aqua aerobics has gained considerable popularity among women. It is a system of water physical exercises borrowed from gymnastics, choreography, aerobics, sports and artistic swimming, performed to the rhythmic and intense music, and conducted in shallow, medium, and deep-water pools, which promotes the fitness of those involved (Lutsenko, Shepelenko, & Luchko, 2014).

However, despite the widespread discussion by health professionals about the health effects of recreational exercising in water on the musculoskeletal system of the population, the vast majority of research is aimed at establishing the effectiveness of training for the physical education of student youth (Balamutova, Polozhiy, & Kyselev, 2011; Usova, Romanyuk, & Kopitina, 2014). Therefore, in our opinion, studies aimed at establishing the impact of aqua fitness on the posture of women of the first period of a mature age taking into account the body type require further research.

The purpose of the research is to develop and test the effectiveness of aqua fitness exercise program for the posture improvement of women of the first period of a mature age with different body types.

Material and methods

Study participants

The research involved 46 women of the first period of a mature age, who gave their written consent to participate. The distribution of participants by age showed that the majority of women involved in the pedagogical experiment were aged 26 to 30 years, which amounted to 58.7% (n = 27). At the same time, there were 23.9% (n = 11) participants up to 25 years, and 17.4% (n = 8) older than 30. 15.2% of them had asthenic (ectomorphic), 73.9% – regular (mesomorphic), and 10.9% – hypersthenic (endomorphic) body type. At the beginning of the study, 23.9% of participants had normal posture, 23.9% had round back, and 19.6% had round-concave back, and scoliotic posture – 32.6%.

Considering the mathematical rules of setting up and conducting a pedagogical experiment (Borisova, 2019), a sample of women of the first period of a mature age engaged in aqua fitness was made in a simple random way, i.e. each of the subjects had the same probability to participate in the experiment. This selection of subjects ensured the representativeness of the sample taking into account the nature of social objects (Tulebaeva, 2010). On the other hand, the further distribution of women by body type, taking into account the natural variability that characterizes this contingent of women (Adler, 2016), confirmed that the proportion of women by body type generally corresponds to scientists' views about the body type of women of the first period of a mature age.

All women had previously consented to participate in the study. The pedagogical experiment was conducted in fitness club "Yunist" in Kyiv.

Research methodology

To achieve the goal of the research, the following methods were applied: analysis and generalization of data of scientific and methodological literature, data of the Internet, anthropometry, pedagogical methods of research, the method of visual screening of posture with determination of the total score (Kashuba, Bondar, Goncharova, & Nosova, 2016), and estimation of the level of motor activity by the method of Framingham study (Krutsevich, Vorobyov, & Bezverkhnya, 2011).

The research involved three stages of implementation. At the first stage, we analyzed scientific and methodological literature in the field of physical fitness of women of the first period of a mature age; also, we made the research of the level of physical development, physical fitness, and level of motor activity of 46 women of the first period of a mature age.

Anthropometric studies included the determination of body weight (kg), longitudinal body sizes (cm), circumferential body sizes (cm), body diameters (cm), size of skin and fat folds (mm) by conventional methods, with subsequent determination of body type (Martirosov, Nikolaev, & Rudnev, 2006).

The posture of women was assessed using an improved map of express control of the bio-geometric profile of posture (Kashuba et al., 2016). The distribution of the studied by the levels of the bio-geometric profile of the posture was carried out taking into account 11 indicators in the frontal (5) and sagittal (6) planes. The evaluation of each indicator was performed according to a three-point scale by comparing the individual posture in the photo and the standard graphical options. Score "1" corresponded to the grade "bad", "2" – "satisfactory", "3" – "good". The maximum amount of points that corresponds to the normal state of posture is 33 points.

The study of the level of motor activity of women involved fixing the time to perform motor activity of different levels (high, medium, low, sedentary, basic) (Krutsevich et al., 2011).

Assessment of physical fitness of women included determination of static force endurance of muscles while maintaining static postures, and spine flexibility and elasticity of hamstrings (Earl & Baechle, 2012).

Also at the second stage of the research, we performed the analysis of the obtained data using the methods of mathematical statistics with the determination of the most informative indicators. The the significant influence of indicators of body composition and condition of musculoskeletal system in the factor structure of indicators of physical development, physical activity and physical fitness of women of the first period of a mature age. They were defined as the criteria for the effectiveness of aqua fitness activities. At this stage, a program of aqua fitness for women of the first period of a mature age was developed.

At the third stage of the research, the influence of the developed training program on the posture of women of the first period of a mature age with different body types was determined. The study involved 46 women of this age. The duration of the training program was nine months.

Statistical analysis

In the course of the research, mathematical statistics methods were applied, including Fisher's angular criterion, which allows sampling by distribution of the trait (Byshevets, Denysova, Shynkaruk, Serhiyenko, Usychenko, Stepanenko, & Syvash, 2019). If the conditions of application of Fisher's angular criterion were not met when comparing the shares of women according to the level of the state of the bio-geometric profile of posture before and after the pedagogical experiment, Fisher's exact test was used. To compare the overall assessment of the bio-geometric profile of the posture of the subjects before and after the experiment, Student's t-test was used for dependent samples in the case when according to the Shapiro-Wilk test the initial data were subject to the normal distribution law and Wilcoxon test in the opposite case.

In the process of factor analysis by the method of principal components with varimax rotation, the data of anthropometric studies, physical fitness assessments, and motor activity level were analyzed. The total number of indicators for factor analysis was 56 variables, which allowed identifying six factors (60.03% of the total variance) in the structure of the studied indicators. Data processing was performed using programs MS Excel (Microsoft, USA), Statistica 8.0 (StatSoft, USA).

Results

The results of factor analysis of indicators of physical development, physical fitness and physical activity allowed defining the factor structure of six factors. The first factor is "Physical fitness" with 20.32% of the total variance, the second factor is "Fat component of body composition" – 12.56%, the third factor is "Chest development" – 8.34%, the fourth factor is "Posture condition" – 7.80%, the fifth and sixth factors respectively were the "Posture type" (5.56%) and the "Body type" (5.46%).

These factors include indicators that are the most informative in relation to the physical development, physical activity, and physical fitness of women. The factor analysis was further refined by differentiation of the factor structure depending on the body type (Table 1).

For example, analyzing the results of factor analysis, the factor structure of women of the first period of a mature age with regular body type was detailed as the most representative of the studied contingent.

Table 1. Eigenvalues in the factor structure of the studied indicators of women of the first period of a mature age depending on the body type, (n = 46)

Body type	Separate factors	Calculation of eigenvalues			
		Eigenvalues	Total variance, %	Total eigenvalues, %	Accumulated frequencies, %
Asthenic	1. Physical development and sedentary motor activity	16.23	31.21	16.23	31.21
	2. Diameters and circumferential body sizes	10.14	19.49	26.36	50.70
	3. Equilibrium state and basic motor activity	8.90	17.11	35.26	67.81
	4. Posture condition and physical fitness	6.97	13.40	42.23	81.21
	5. Diameter of the forearm, skin and fat folds on the thigh and physical fitness	5.96	11.47	48.19	92.68
	6. Flexibility and mid-level motor activity	3.81	7.32	52.00	99.99
Regular	1. Physical fitness and basic motor activity	12.15	23.37	12.15	23.37
	2. Skin and fat folds	7.52	14.47	19.68	37.84
	3. Longitudinal body sizes	4.33	8.34	24.01	46.18
	4. Body diameters	3.38	6.51	27.39	52.68
	5. Posture condition	3.17	6.09	30.56	58.77
Hypersthenic	1. Anthropometric indicators and physical fitness	23.41	45.03	23.41	45.03
	2. Longitudinal body sizes and posture condition	16.69	32.09	40.10	77.12
	4. Physical fitness and motor activity	7.82	15.03	47.92	92.15
	5. Knees breadth, physical fitness and motor activity	4.08	7.85	52.00	99.99

It has been established that the structure of physical development, motor activity and motor abilities of women of the first period of a mature age of regular type includes 5 factors, which describe 58.77% of the total variance. The general factor "Physical fitness and basic motor activity" with a share in the total variance of 23.37% was made up of flexibility indicators, such as the magnitude of maximum bending ($r = 0.86$; $p < 0.05$) and the value of forward bending with folded leg ($r = 0.78$; $p < 0.05$), which has an inverse correlation with the duration of holding the shoulders up lying on the abdomen ($r = -0.81$; $p < 0.05$), holding the legs up lying on the abdomen ($r = -0.83$; $p < 0.05$), holding the torso lying on the back ($r = -0.81$; $p < 0.05$), holding the torso lying on the back with bent knees at an angle of 90 ($r = -0.85$; $p < 0.05$); lifting the shoulders lying on the abdomen, arms near the chest ($r = -0.81$; $p < 0.05$), equilibrium ($r = -0.89$; $p < 0.05$) and basic physical activity index ($r = -0.73$; $p < 0.05$), as well as sitting body length ($r = -0.80$; $p < 0.05$) and shoulder width ($r = -0.78$; $p < 0.05$). The unipolar factor two "Skin and fat folds" with 14.47% in the total variance includes the size of skin and fat folds on the shoulders' back ($r = 0.78$; $p < 0.05$), on the thighs ($r = 0.77$; $p < 0.05$) and on the back under the shoulder blade ($r = 0.77$; $p < 0.05$) and indicate an increase in the size of the folds on the thighs and on the back as they increase on the shoulders. The factor "Longitudinal body sizes" includes body length ($r = 0.71$; $p < 0.05$, ridge body diameter ($r = 0.71$; $p < 0.05$) and chest circumference with maximal inhalation ($r = 0.74$; $p < 0.05$) and explains 8.34% of the total variance. The fourth factor "Body diameters" with 6.51% includes the transverse diameter of the distal part of the thigh ($r = 0.77$; $p < 0.05$) and the shin ($r = 0.75$; $p < 0.05$) indicating an increase in one indicator along with an increase in another. Factor five "Posture condition" includes independent indicators of the state of bio-geometric profile of women in the frontal ($r = 0.77$; $p < 0.05$) and sagittal ($r = 0.70$; $p < 0.05$) planes and explains 6.09% of the total variance.

In the defined factor structure of women of the first period of a mature age with different body types, there are general patterns of separation of informative indicators. Among the studied groups of women of asthenic and hypersthenic body types, the first two factors separate the indicators of physical development, as those with the greatest impact. Instead, among women of regular body type, physical fitness and physical development have a leading position. Factors that make a significant contribution to the overall sample variance include indicators of women's posture.

The study of the factor structure of indicators of physical development, motor activity and physical fitness of women of the first period of a mature age revealed the leading directions of intended influence on the body of women. The observed patterns were taken into account when developing the structure of the means of influence in the process of health-improving activities for women of the first period of a mature age.

The shift of the accents of the content of aqua fitness exercise towards the means of prevention and correction of postural disorders is conditioned by the inherent motor regime of modern women of a mature age, working conditions and peculiarities. The studied contingent is characterized by a large number of women with manifestations of functional disorders of the musculoskeletal system, especially among the representatives of the asthenic body type.

The training program included a combination of distance swimming, aqua fitness, and performing special tasks, conducting theoretical lessons on a healthy lifestyle, and enhancing motivation. The training program was implemented over a period of nine months.

The structure of the training program included three sessions per week, lasting forty-five minutes, with variant modeling of physical activity and the ratio of physical education means. Methodological features of the classes were determined for women with different types of posture disorders and included different ratio of aqua fitness and distance swimming, exercising in different conditions (near the pool side, without fixation, in deep and shallow water).

The key provisions of the training program included taking into account the functional imperfection of the trunk muscles as a whole and the violation of the symmetry of the tone of the muscles of the individual groups. For example, the women with round shoulders and round back are characterized by the weakened muscles of the torso and a slightly reduced tone of the muscles of the shoulder girdle. The women with round concave back have weak gluteal and back thigh muscles, and general functional imperfection of the muscles of the abdomen. The women with flat back are characterized by low muscle tone of the back and shoulder girdle. The women with functional disorders of the posture in the front plane have unequal muscle tone on the right and left side of the torso (Swede, 2018).

The structure of motor activities for women of the first period of a mature age in the aquatic environment was determined in regard to the type of postural disorders and in accordance with the peculiarities of the location of individual body bio-links under the influence of functional disorders of the musculoskeletal system. For women with round shoulders and round back, backstroke was used; for women with flat and concave backs – crawl and butterfly strokes. For the contingent of women with scoliotic posture, the content of the classes was supplemented by swimming with symmetrical motor actions (breaststroke, butterfly stroke). In the case of excessive lumbar lordosis in women of the first period of a mature age, a swimming board was placed under the abdomen.

Aqua fitness exercises were implemented in the training program according to the type of postural disorders and individual characteristics of women's physical development, and were determined by the body type (Table 2).

Namely, within one session, the means directed on the development of no more than two motor qualities were used. According to these principles, the following combinations were proposed: exercises for the development of strength and flexibility; coordination and power exercises; exercises for the development of endurance only, power and speed-power exercises.

In the course of the research, we examined the posture of women of the first period of a mature age under the influence of aqua fitness, taking into account the body type.

Thus, according to the obtained data, before the experiment, 23.9% of the participants had normal posture, 23.9% had round back, 19.6% had round-concave back, and scoliotic posture prevailed with the share of 32.6%. After the experiment, the distribution changed as follows: normal posture – 45.7%, round back – 19.6%, round-concave back – 15.2%, scoliotic posture – 19.6%. Additional calculations using the

Table 2. Distribution of aqua fitness exercises according to the body type of women of the first period of a mature age

Posture type	Aqua-fitness exercises (effects on women's body)
Asthenic	Aqua building, aqua forming (development of maximum muscle strength of major muscle groups and their endurance)
	Aqua stretch, hydro relaxation (development of flexibility and mobility in the joints, regulation of muscle tone, stimulation of recovery processes)
	Aqua gym, aqua dynamics (development of strength abilities and coordination of movements)
Regular	Aqua tonics (support of the muscle tone)
	Aqua gym (development of strength endurance and coordination of movements)
	Aqua karate (exercises for the development of strength, coordination and speed of movement)
	Aqua stretch, hydro relaxation (development of flexibility and mobility in the joints, regulation of muscle tone, stimulation of recovery processes)
	Aqua step (development of aerobic and strength endurance, flexibility and coordination of movements)
Hypersthenic	Aqua jogging, aqua dance, aqua rhythmics (development of aerobic and strength endurance, flexibility and coordination of movements)
	Aqua gym (development of strength endurance and coordination of movements)
	Aqua stretch, hydro relaxation (development of flexibility and mobility in the joints, regulation of muscle tone, stimulation of recovery processes)
	Aqua flipper, aqua motion (development of general endurance, strength endurance)

Fisher's angular test made it possible to prove that the proportion of women with normal posture under the influence of aqua fitness training, taking into account the body type, increased statistically significantly ($p < 0.05$).

A more detailed study of medical cards data allowed to determine the peculiarities of posture of women of the first period of mature age, depending on their body type before and after the experiment, and to evaluate the impact of aqua fitness on the posture of the subjects.

The research has established that both before and after the introduction of the authors' aqua-fitness program, the type of posture without violations prevailed among women of regular type. Before the experiment, their share was 26.5% and after the experiment – 47,1%.

It has been found that by the start of the experiment, asthenic-type women were 6.5% ($p > 0,05$) less likely to have a normal posture type and hypersthenic-type women 12.2% ($p > 0,05$) less than regular-type women were. However, the highest proportion of women with round back was found among women with hypersthenic type: it was 40%, and the smallest proportion, which was 14.3%, was recorded among women of asthenic type. These changes had a favorable trend but were not statistically significant.

The majority of women with round-concave back (28.6%) ($p > 0,05$) were women of hypersthenic type. At the same time, the proportion of asthenic-type women with such postural impairment was 8.6% ($p > 0,05$) less, and of regular type – 11% ($p > 0,05$) less.

In addition, among women of hypersthenic type, the largest proportion, amounting to 42.9%, was characterized by scoliotic posture. At the same time among women of asthenic type this disorder was found in 20%, and among women of regular type – in 32,4%, and statistically significant ($p > 0.05$) proportions of women with this type of disorder did not differ.

The study has showed the positive impact of aqua fitness on the posture of women of the first period of a mature age, regardless of the type of body.

Thus, the proportion of asthenic-type women with normal posture increased by 28.6% ($p > 0,05$), regular – by 20.6% ($p > 0,05$), and hypersthenic – by 20.0% ($p > 0,05$). Therefore, taking into account the body type, aqua fitness has the maximum impact on women of the first period of a mature age of asthenic type.

In addition, the study has showed that after the introduction of the authors' program among the participants of the experiment, the proportion of hypersthenic-type women with round back, regular-type women with scoliotic posture, as well as asthenic-type women with round back and scoliotic posture decreased the most. Their shares were 20.0%, 14.8% and 14.3% respectively ($p > 0,05$). However, the proportion of women of asthenic and hypersthenic type with round-concave back did not change.

The obtained data make it possible to testify to the positive dynamics that occurred in the posture of women of the first period of a mature age under the influence of the authors' aqua fitness program.

The further analysis of changes in posture of women of the first period of a mature age under the influence of the proposed means of aqua fitness was carried out through the distribution of the studied contingent by levels of posture and direct scoring of visual screening of the posture by the method (Kashuba et al., 2016).

Statistical processing of the experimental material allowed establishing the following changes:

asthenic body type

- assessment of the level of the bio-geometric profile of the posture in the frontal plane statistically significantly ($p < 0.05$) increased by 26.9% from (7.43; 1.62) points to (9.43; 2.07) points;

- an increase in the sagittal plane by 10.5% from (8.14; 2.79) points to (9.00; 2.71) points, however, no statistically significant ($p > 0.05$) differences were detected;
- overall assessment of the posture bio-geometric profile statistically significantly ($p < 0.05$) increased from (15.57; 4.39) points to (18.43; 4.65) points;

regular body type

- with respect to the frontal plane, the indicator of the level of the posture bio-geometric profile after the experiment was statistically significantly ($p < 0.05$) higher by 24.7% than at the beginning ((10.09; 1.90) against (8.09; 1.58) points);
- a statistically significant ($p < 0.05$) increase of 10.4% (10.03; 2.34) points to (9.09; 2.59) points was registered in the sagittal plane;
- a statistically significant ($p < 0.05$) increase from (17.18; 4.06) points to (20.12; 4.06) points in the overall assessment of the bio-geometric profile of the posture was recorded;

hypersthenic body type

- the indicator of the level of the bio-geometric profile of the posture in the frontal plane statistically significantly ($p < 0.05$) increased (by 27.0% from (7.40; 1.52) points to (9.40; 2.07) points);
- notwithstanding the absence of statistically significant ($p > 0.05$) differences between the index in the sagittal plane, there was a positive tendency for its growth, where the increase was 17.1%, and the indicator increased from (8.20; 3.27) points to (9.60; 2.07) points;
- overall assessment of posture bio-geometric profile statistically significantly ($p < 0.05$) increased from (15.60; 4.56) points to (19.00; 4.06) points.

The research has established that the proportion of women with average level increased by 5.88% and the proportion of women characterized by a high level of bio-geometric profile of posture increased by 17.65% women regular body type. This increase was due to the changes among women with low posture bio-geometric profile, the proportion of whom decreased by 23.53%. At the same time, among the surveyed asthenic body type, there was an increase by 28.57% in the proportion of women with a high level of posture bio-geometric profile due to a decrease by 14.29% in the proportion of women with average and low levels in each case (Fig. 1).

During the experiment, asthenic-type women underwent changes in the distribution of the bio-geometric profile of the posture:

- the proportion of women with low and average levels decreased by 14.29%, respectively;
- the proportion of women with high levels increased by 28.57%.

For women of regular body type, such changes in the distribution of the bio-geometric profile of the posture were characteristic:

- the proportion of women with low level decreased by 23.53%;
- the proportion of women with average level increased by 5.88%;
- the proportion of women with high level increased by 17.65%.

The following positive changes in the distribution of the bio-geometric profile of the posture occurred among women of the hypersthenic body type:

- the proportion of women with low level decreased by 40%;
- the proportion of women with average level increased by 20%;
- the proportion of women with high level increased by 20%.

Discussion

The results of the analysis of scientific and methodological literature (Tomilina et al., 2018; Kashuba, Andrieieva, Goncharova, Kyrychenko, Karp, Lopatskyi, & Kolos, 2019b, Kashuba et al., 2020) indicate a significant number of posture disorders in adults, which is confirmed by the results of this research, in which 76.1% of women in the first period of a mature age had posture disorders. In addition, the results ob-

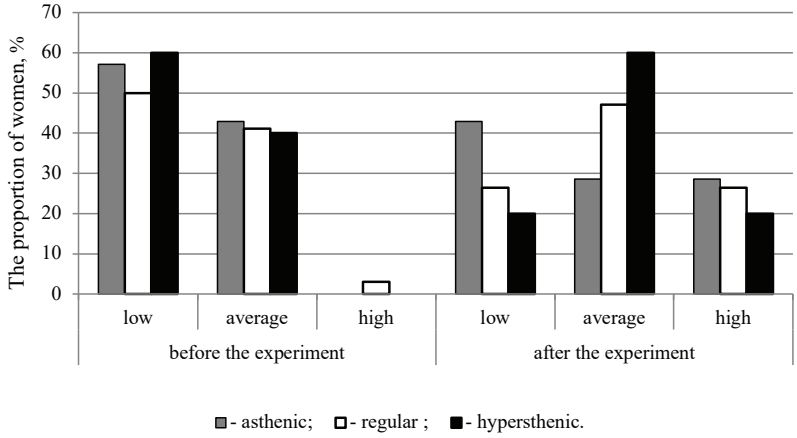

Fig. 1. Distribution of women of the first period of a mature age according to the bio-geometric profile of the posture

tained during the study are consistent with the results Bibik (2013), according to which only about 25 % of women of the first period of a mature age have normal posture, and the most common violation of posture among this contingent is a violation in the frontal plane – scoliotic posture.

Regular posture is an indicator that affects the activity of other organs and systems of the body (Ivchatova, 2010), which is confirmed by the results of factor analysis of physical development, physical fitness and motor activity of women in this study, where "Posture status" is 7.80% of the total variance of the sample.

However, scientists agree that, unfortunately, already during the first period of a mature age, women experience deterioration of well-being, pain in the cervical, thoracic and lumbar parts of the spine, which gradually becomes further deteriorated (Samoshkin, Liadska, Denisenko, & Riapasova, 2014; Tomilina et al., 2018; Hakman, Andrieieva, Kashuba, Omelchenko, Ion, Danylchenko, & Levinskaia, 2019), which requires the development of the means of influence.

In the course of the research the peculiarities of posture disorders in women with different body type were clarified, the largest number of posture disorders was observed in women with asthenic body type. These results confirm the research of other scientists (Ivchatova, 2010).

The analysis of scientific and methodological literature (Ivchatova, 2010; Ivanchykova et al., 2018; Hakman et al., 2020) allowed defining means of physical education, which are applied in the course of physical fitness for the contingent of women of the first period of a mature age for the purpose of prevention and correction of posture disorders. Aqua fitness occupies a special place among these means.

In particular, there is evidence of the effective use of aqua fitness in the physical education of students (Zhuravlev & Malikov, 2019). For example, Usova et al. (2014) states that aqua fitness exercises not only provide a higher health effect than other types of fitness, promotes the resistance of female students to the effects of temperature fluctuations, but also have significant health and strengthening effect in preventing spine distortions and forming the correct posture. Considering health-promoting aqua aerobics as a means of hydro rehabilitation for students of special medical groups, Balamutova et al. (2011) draws attention to the effectiveness of its use in order to strengthen virtually all muscle groups and correct posture without the risk of injury. The peculiarity of the proposed authors' approach to the aqua fitness classes is the differentiation of means depending on the posture of women of the first period of a mature age and their body type, the effectiveness of which has been proven in the process of pedagogical experiment.

Conclusions and perspectives of further research

The results of factor analysis of the factor structure of physical development, physical fitness, and motor activity of women of the first period of a mature age indicate the presence of six factors (60.03% of the total variance). The "Posture status" of women (7.8%) and "Body type" (5.46%) make a significant contribution to the content of the factor structure, which determines the directions of influence during the programming of physical fitness activities for this contingent.

The research has proposed the program of aqua fitness classes, the content of which is differentiated in accordance with the peculiarities of posture and body type of women of the first period of a mature age.

The study of the effectiveness of an aqua fitness program based on the body type of women of the first period of a mature age shows that women had positive changes in posture. If, at the beginning of the experiment, only 23.9% woman had normal posture, then after the experiment their proportion increased statistically significantly ($p < 0.05$) to 45.7%.

It should be noted that both before and after the experiment, the proportion of women with normal posture was the highest among women of regular body type, namely 26.5% at the beginning and 47.1% at the end of the pedagogical experiment. Moreover, the most common violation recorded in the examined women was scoliotic posture, 32.6% among all study participants.

The aqua fitness program had the greatest effect on asthenic-type women with round back (the number of women decreased by 14.3%; $p > 0.05$) and scoliotic posture (decreased by 14,3 %; $p > 0.05$), regular-type women with scoliotic posture (decreased from 32,4 % to 17,6 %; $p < 0.05$), and hypersthenic-type women with round back (decreased from 40 % to 20 %; $p > 0.05$).

This study has shown that the proportion of subjects with normal posture in the total sample significantly increased at the end of the experiment ($p < 0.05$), however this changes in each of the groups of women with different body types were statistically insignificant ($p > 0.05$).

The analysis of the dynamics of the bio-geometric profile of posture confirms the improvement of posture in representatives of different somatotypes: for women of asthenic type, the assessment of the bio-geometric profile of posture increased statistically significantly ($p < 0.05$) from (15.57; 4.39) to (18, 43; 4.65) points, for women of regular type there was a statistically significant ($p < 0,05$) increase in the indicator from (17,18; 4,06) to (20,12; 4,06) points, and in representatives of hypersthenic type, a statistically significant ($p < 0.05$) increase from (15.60; 4.56) to (19.00; 4.06) points.

Therefore, it can be argued that aqua fitness has a positive effect on the posture of women of the first period of a mature age, regardless of their body type.

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Conflicts of interest

The authors declare that there are no conflicts of interest.

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КОРЕКЦІЯ ПОРУШЕНЬ ПОСТАВИ ЖІНОК ЗРІЛОГО ВІКУ З УРАХУВАННЯМ ТИПУ ТІЛОБУДОВИ В ПРОЦЕСІ ЗАНЯТЬ АКВАФІТНЕСОМ

Наталія Гончарова[1ABCD], Віталій Кашуба[1ABCD], Анна Ткачова[1ABCD], Тамара Хабінець[1ABCD], Ольга Костюченко[1ABCD], Марія Пімоненко[1ABCD]

[1]Національний університет фізичного виховання і спорту України

Авторський вклад: A – дизайн дослідження; B – збір даних; C – статаналіз; D – підготовка рукопису; E – збір коштів

Реферат. Стаття: 10 с., 2 табл., 1 рис., 34 джерела.

Мета роботи розробка та перевірка ефективності програми занять аквафітнесом для жінок першого зрілого віку із різним типом тілобудови з метою покращення стану їх постави.

Матеріали та методи. В педагогічному експерименті брали участь 46 жінок першого періоду зрілого віку, які попередньо надали згоду на участь у дослідженні. Методи дослідження передбачали аналіз та узагальнення науково-методичної літератури, даних мережі Internet та методів математичної статистики із застосуванням кутового критерію Фішера, який дозволяє здійснювати співставлення вибірок за розподілом ознаки (за Byshevets et al., 2019), проводилась оцінка стану постави жінок на основі методики візуального скринінгу постави із визначенням сумарної бальної оцінки (за Kashuba et al., 2016). До проведення оцінки стану постави жінок також було залучено лікаря хірурга. У процесі здійснення факторного аналізу були проаналізовані дані антропометричних досліджень, оцінки фізичної підготовленості, рівня рухової активності.

Результати. Встановлено розподіл жінок першого зрілого віку за типами порушень постави та його зміни під впливом занять аквафітнесом з урахуванням типу тілобудови. У дослідженні прийняло участь 46 жінок за-

значеної категорії, причому 73,9 % з них склали жінки нормостенічного, 15,2 % – астенічного, а 10,9 % – гіперстенічного типу тілобудови. Встановлено, що у жінок, які займалися аквафітнесом з урахуванням типу тілобудови, відбулися позитивні зрушення у стані постави. Частка жінок з астенічним типом тілобудови, які характеризуються нормальною поставою, зросла на 28,6%, з нормостенічним типом – на 20,6%, а гіперстенічним типом – на 20,0 %. Відбулись зміни у рівні стану біогеометричного профілю постави.

Висновки. Дослідження підтверджує ефективність застосування засобів аквафітнесу в процесі оздоровчих занять з метою профілактики та корекції порушень постави.

Ключові слова: жінки, аквафітнес, постава.

Information about the authors:

Goncharova Nataliia: nataliinfiz@gmail.com; https://orcid.org/0000-0002-3000-9044; Department biomechanics and sport metrology, National University of Ukraine on Physical Education and Sport, Fizkultury St, 1, Kyiv, 03150, Ukraine.

Kashuba Vitalii: kashubavo@gmail.com; https://orcid.org/0000-0001-6669-738X; Department biomechanics and sport metrology, National University of Ukraine on Physical Education and Sport, Fizkultury St, 1, Kyiv, 03150, Ukraine.

Tkachova Anna: swimbill043@gmail.com; http://orcid.org/0000-0002-8199-6940; Department biomechanics and sport metrology; National University of Ukraine on Physical Education and Sport, Fizkultury St, 1, Kyiv, 03150, Ukraine.

Khabinets Tamara: tamarakhabinets@gmail.com; https://orcid.org/0000-0001-8395-5635; Department biomechanics and sport metrology, National University of Ukraine on Physical Education and Sport, Fizkultury St, 1, Kyiv, 03150, Ukraine.

Kostiuchenko Olha: oljakosta@gmail.com; https://orcid.org/0000-0003-4538-2498; Department biomechanics and sport metrology, National University of Ukraine on Physical Education and Sport, Fizkultury St, 1, Kyiv, 03150, Ukraine.

Pymonenko Mariia: rosmaripim@gmail.com; https://orcid.org/0000-0002-2399-6424; Department biomechanics and sport metrology, National University of Ukraine on Physical Education and Sport, Fizkultury St, 1, Kyiv, 03150, Ukraine.

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