BIOLOGICAL PREREQUISITES FOR DEVELOPING THE CONCEPT OF CORRECTIVE AND PREVENTIVE TECHNOLOGIES IN THE PROCESS OF HEALTH FITNESS CLASSES FOR WOMEN OF THE FIRST PERIOD OF MATURE AGE WITH DIFFERENT STATES OF BIOMECHANICS OF THE SPATIAL ORGANIZATION OF THE BODY

БІОЛОГІЧНІ ПЕРЕДУМОВИ РОЗРОБКИ КОНЦЕПЦІЇ КОРЕКЦІЙНО-ПРОФІЛАКТИЧНИХ ТЕХНОЛОГІЙ У ПРОЦЕСІ ЗАНЯТЬ ОЗДОРОВЧИМ ФІТНЕСОМ ДЛЯ ЖІНОК ПЕРШОГО ПЕРІОДУ ЗРІЛОГО ВІКУ З РІЗНИМ СТАНОМ БІОМЕХАНІКИ ПРОСТОРОВОЇ ОРГАНІЗАЦІЇ ТІЛА

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Abstracts

Introduction. The development of the concept of corrective and preventive technologies in the process of health fitness classes for women of the first period of mature age with different states of biomechanics of the spatial organization of the body is an extremely urgent and multifaceted problem, covering the section of biomechanics, physiology, sports medicine and pedagogy.

The purpose of the study is to determine the biological prerequisites for developing the concept of corrective and preventive technologies in the process of health fitness classes for women of the first period of mature age with different states of biomechanics of the spatial organization of the body.

Research methods: theoretical analysis and generalization of literary sources; photography and posture analysis, pedagogical experiment, methods of mathematical statistics.

Results. Factor analysis was carried out on the basis of the matrix of intercorrelations of somatometric indicators (weight and body length, chest circumference (CC), shoulder, waist, pelvis, thigh and shin girths and their relative values with respect to body length, Quetelet, Rohrer, Pignet indices, waist circumference and hip circumference (CTC), joint hypermobility, the level of the biogeometric profile of posture (in the sagittal, frontal planes and as a whole) and the results of physical fitness tests. The factor analysis procedure was carried out using the principal component method to identify the main data structures. Factor analysis showed significant relationships between the biogeometric profile of posture, joint hypermobility, level of physical fitness and anthropometric indicators in women of the first period of mature age. The obtained results determine the key areas for further implementation of the research results in the practice of health fitness:

individualization of health fitness programs Development of personalized programs is critically important. Taking into account the unique biomechanical features of the spatial organization of the body of each woman will significantly increase the effectiveness of the health process, providing a targeted impact on the identified correlations;

priority of correction of posture disorders. Correction of the biogeometric profile of posture is a fundamental element of achieving optimal physical fitness and maintaining health. Programs focused on improving posture will contribute to effective injury prevention and improving the quality of life in the first period of adulthood.

The key aspect of transformational activity is the creation and implementation of scientifically based corrective and preventive technologies. This will allow integrating modern scientific approaches in the development of health fitness programs aimed at ensuring the long-term health of women in this age category.

Conclusions. Determination of biological prerequisites for the development of the concept of corrective and preventive technologies in the process of health fitness classes for women of the first period of mature age with different states of biomechanics of the spatial organization of the body is not just a scientific study, but a critically important step in transforming scientific knowledge into practical tools that will improve somatic health.

Key words: mature age, biological prerequisites, musculoskeletal system, posture, biogeometric profile, functional assessment of movements, physical fitness, corrective and preventive technologies, health fitness.

Вступ. Розробка концепції корекційно-профілактичних технологій у процесі занять оздоровчим фітнесом для жінок першого періоду зрілого віку з різним станом біомеханіки просторової організації тіла – це надзвичайно актуальна та багатогранна проблема, що охоплює перетин біомеханіки, фізіології, спортивної медицини та педагогіки.

Мета дослідження – визначити біологічні передумови розробки концепції корекційно-профілактичних технологій у процесі занять оздоровчим фітнесом для жінок першого періоду зрілого віку з різним станом біомеханіки просторової організації тіла.

Методи дослідження: теоретичний аналіз і узагальнення літературних джерел; фотозйомка й аналіз постави, педагогічний експеримент, методи математичної статистики.

Результати. Факторний аналіз проводився на основі матриці інтеркореляцій соматометричних показників (маси та довжини тіла, окружності грудної клітини, обхвати плеча, талії, таза, стегна та гомілки та їхні відносні значення щодо довжини тіла, індекси Кетле, Рорера, Піньє, обхвату талії й обхвату стегон), гіпермобільності суглобів, рівня стану біогеометричного профілю постави (у сагітальній, у фронтальній площинах та загалом) та результатів виконання тестів на фізичну підготовленість. Процедура факторного аналізу здійснювалася із застосуванням методу головних компонент для ідентифікації основних структур даних. Факторний аналіз виявив значні взаємозв'язки між біогеометричним профілем постави, гіпермобільністю суглобів, рівнем фізичної підготовленості та антропометричними показниками у жінок першого періоду зрілого віку.

Отримані результати окреслюють ключові напрями для подальшого впровадження результатів дослідження в практику оздоровчого фітнесу:

індивідуалізацію програм оздоровчого фітнесу. Розробка персоналізованих програм є критично важливою. Врахування унікальних біомеханічних особливостей просторової організації тіла кожної жінки суттєво підвищить ефективність оздоровчого процесу, забезпечуючи цілеспрямований вплив на виявлені кореляції;

пріоритетність корекції порушень постави. Корекція біогеометричного профілю постави є фундаментальним елементом для досягнення оптимальної фізичної форми та збереження здоров'я. Програми, сфокусовані на покращенні постави, сприятимуть ефективній профілактиці травм та підвищенню якості життя жінок першого періоду зрілого віку.

Ключовим аспектом трансформаційної діяльності є створення та впровадження науково обґрунтованих корекційно-профілактичних технологій. Це дозволить інтегрувати сучасні наукові підходи у разі розробки програм оздоровчого фітнесу, спрямованих на забезпечення довгострокового здоров'я жінок цієї вікової категорії.

Висновки. Визначення біологічних передумов розробки концепції корекційно-профілактичних технологій у процесі занять оздоровчим фітнесом для жінок першого періоду зрілого віку з різним станом біомеханіки просторової організації тіла є не просто науковим дослідженням, а критично важливим кроком для перетворення наукових знань на практичні інструменти, які покращать соматичне здоров'я та якість життя вище зазначеного контингенту.

Ключові слова: зрілий вік, біологічні передумови, опорно-руховий апарат, постава, біогеометричний профіль, функціональна оцінка рухів, фізична підготовленість, корекційно-профілактичні технології, оздоровчий фітнес.

Introduction.

The first period of adulthood is unique because, on the one hand, it is the age of peak physical development and adaptive capabilities of the body [7; 20]. On the other hand, it is at this time that the foundations for future problems of the musculoskeletal system are laid, often due to the influence of the modern lifestyle. The first period of adulthood is often associated with high levels of stress (career, family, social pressure) [7; 15; 17]. Chronic stress leads to increased muscle tone (especially in the cervical-collar zone, lower back), which worsens posture [13; 19]. At this age, problems with posture are often not accompanied by acute pain or the pain is ignored. Women tend to pay attention to their health when problems become pronounced or limiting [9; 14]. The accumulation of dysfunctions, which over time become more stable and difficult to correct, increases the risk of developing serious diseases of the musculoskeletal system (for example, osteochondrosis, protrusions, hernias) at an older age [5; 10].

Each woman has a unique biomechanical profile of the spatial organization of the body [2]. The state of the biomechanics of the spatial organization of the body in women in the first period of mature age is a challenge of the pres-

ent, since it reflects the cumulative impact of the modern lifestyle [12; 16; 18].

The solution to this challenge requires a comprehensive approach: raising awareness, early diagnosis, development and implementation of scientifically based corrective and preventive technologies in health fitness, as well as encouraging the formation of healthy motor habits in everyday life.

The purpose of the study is to determine the biological prerequisites for developing the concept of corrective and preventive technologies in the process of health fitness classes for women of the first period of mature age with different states of biomechanics of the spatial organization of the body.

Materials and methods of research. *Participants of the study.* The study involved 36 women aged 25–34. The studies were conducted in compliance with the requirements of the Helsinki Declaration of the World Medical Association "Ethical principles for medical research involving human subjects". *Research methods.* Analysis of literary sources, pedagogical experiment. Photographing the biogeometric profile of posture [1]. The analytical data obtained during the experiment, reflecting certain types of posture disorders, were subsequently processed by an orthopedic doctor to formulate a conclusion about the type of posture of the experimental women of the first period of mature age [3; 4; 6]. The planned identification of the characteristics of physical fitness of women of the first period of mature age in the study involved the use of a system of tests – the functional assessment of movements (FMS) [8]. To identify the most significant factors influencing the state of biomechanics of the spatial organization of the body and physical fitness of women in the first period of mature age, factor analysis was performed using the principal component method with Kaiser normalization and Varimax rotation. Statistically, the results of the study were processed using IBM SPSS Statistics 21 software, and graphic material was prepared in Microsoft Excel.

Results. Factor analysis was carried out on the basis of the matrix of intercorrelations of somatometric indicators (body weight and length, CC, shoulder, waist, pelvis, thigh and shin girths and their relative values relative to body length, Quetelet, Rohrer, Pignet, CTC indices), hypermobility of the frontal plane joints and in general) and the results of physical fitness tests. The factor analysis procedure was carried out using the principal component method to identify the main structures of the data. Varimax then performed rotation to make the results clearer and easier to interpret. As a result of this approach, two to four main factors were identified in each group. Attention was focused on those factors that had the greatest impact on the overall changeability of the data, since they turned out to be the most informative.

Some of the identified factors were bipolar, which means that they contained opposing influences, and we considered these factors as an interaction of opposing forces.

Thus, in a group of women aged 25–29 with normal posture (n=6), we obtained a structure that explained 89,7% of all the variability of the features. This structure consisted of 4 factors and corresponded to the Kaiser criterion, i.e. the eigenvalues of these factors were greater than one (Table 1).

Analyzing the content of the factors, we will point out that the first of them, "Biogeometric profile and physical activity" (33.74% of the total variance of the features), contains two poles. The positive pole concentrates indicators reflecting the general state of the biogeometric profile of posture and physical activity, in particular, joint mobility and the ability to perform certain physical exercises. The level of the state of the biogeometric profile of posture, if its values are high, they indicate a good state of posture, the basis for any fitness program, which should include exercises that maintain and improve posture.

The In Line Lung test and the Shoulder Mobility test show the need to include functional exercises that support joint mobility. A negative thigh circumference value indicates the possibility of excessive thigh size, which may be associated with fat deposits, and therefore the need to include cardio and strength training to reduce fat mass and improve muscle tone.

In general, high values of the factor indicate better posture and high mobility. While the pole

of negative correlations indicates that excessive values of the hip circumference may create certain physical limitations.

Factor 2 "Strength and flexibility of the upper limbs" (19.26%). It includes the following indicators: shoulder girth, positive values of which indicate good muscle mass of the upper limbs, which emphasizes the importance of including exercises to support the strength and muscle tone of the upper limbs in training programs for women aged 25–29 with normal posture. A positive load of the joint hypermobility indicator indicates excessive joint mobility, which requires stability and movement control exercises to avoid injury. A negative value of the push-up test (Trunk Stability Push Up) indicates insufficient stability or strength of the core and the need to include exercises to strengthen the stability of the trunk and shoulder girdle.

Therefore, this factor describes the strength and flexibility of the upper limbs. High values for the shoulder girth and joint hypermobility indicate high strength and flexibility, while negative values for the push-up test and the shoulder girth index may indicate weaknesses in the physical fitness of this category of women.

The third factor, Rotational Stability (19.03%), focuses on central stability and waist circumference. High values for Rotational Stability and Waist Circumference Index indicate good central stability, while high values for Waist Circumference indicate excess weight or lack of muscle support in the central part of the body.

Therefore, training programs for women aged 25–29 with normal posture should include exercises to maintain and improve rotational stability, cardio and strength training, as well as exercises aimed at reducing body fat and strengthening the abdominal muscles.

The last factor in the structure "Somatometric parameters of the body" (17.69%) reflects the anthropometric parameters of the body and

Table 1

Factor structure of physical development indicators, level of biogeometric profile of posture, manifestation of joint hypermobility and physical fitness of women aged 25–29 with normal posture

Positive load pole indicators	Factor loadings	Factor name; % of explanatory variance	Negative load pole indicators	Factor loadings
Level of the biogeometric profile of posture as a whole	0.99	Factor 1 "Biogeometric profile and physical activity"; 33.74%	Hip circumference, cm	-0.90
Level of the biogeometric profile of posture in the sagittal plane	0.98			
Level of the biogeometric profile of posture in the frontal plane	0.97			
Test 3. In Line Lung	0.95			
Test 4. Shoulder Mobility	0.95			
Shoulder girth, cm	0.92	Factor 2 "Strength and flexibility of the upper limbs"; 19.26%	Test 6. Push-ups (Trunk Stability Push Up)	-0.92
Joint hypermobility	0,92		Shoulder girth index, conventional units	-0.91
Test 7. Rotary stability	0.96	Factor 3 "Rotational Stability"; 19.03%	Waist circumference, cm	-0.88
Waist circumference index, conventional units	0.94			
CC, cm	0.99	Factor 4 "Somatometric parameters of the body"17.69%	Deviation of actual mass from ideal, kg	-0.85
Ideal body weight, kg	0.91			

the correspondence of its weight to ideal values. High values for CC and ideal body weight indicate harmonious development of the body, while negative values for deviation from ideal body weight indicate excess or insufficient weight. Analysis of the content of this factor allows us to conclude that balanced training to maintain ideal body weight and nutrition, with the inclusion of components for weight correction, are important for maintaining the physical fitness of women of this age with normal posture.

Characteristic factors help to determine the main biological prerequisites that should be taken into account when developing the concept of corrective and preventive technologies in the process of health fitness classes for women aged 25–29 with normal posture: 1) maintaining the biomechanical profile of posture and general physical activity, including joint mobility; 2) developing strength and flexibility of the upper limbs; 3) developing central stability and correcting waist circumference to reduce the risk of injury; 4) monitoring the compliance of body weight with the ideal value for maintaining health and increasing the effectiveness of physical exercises. Taking them into account will help create sets of physical exercises aimed at improving the biomechanics of the spatial organization of the body, developing strength and flexibility.

The factor structure in the group of women aged 25–29 with a round back (n=9) was able to explain 70.9% of all variations and contained 3 factors (Table 2).

The table shows that the most informative factor was "Physical fitness and posture profile" (25.91%), which showed that high values for it indicate good physical development and correct posture, which are key to maintaining health and preventing injuries. The content of the factor demonstrates that innovative corrective and preventive technologies should include exercises to strengthen muscles and develop endurance, flexibility and stability, improving the biogeometric profile of posture, especially in the frontal plane.

The "Shoulder Girth" factor (23.44%) reflects the strength and girth of the shoulders, where the high values of the shoulder girth index, as well as negative correlations with the absolute measurement of the girth of the shoulder indicate insufficient strength or muscle volume. Consequently, the inclusion of exercises aimed at increasing muscle mass and shoulder strength, muscle volume control and corresponding to the achieved results, the correction of the training program should be an integral part of the healing fitness for this category of women.

The third factor, "Anthropometric indices" (21.48%), includes anthropometric indicators and indices that are important for assessing the general physical condition of women. High values of body length and the Pigner index indicate harmonious physical development, while nega-

Table 2

Factor structure of physical development indicators, level of biogeometric profile of posture, manifestation of joint hypermobility and physical fitness of women aged 25–29 with a round back

Positive load pole indicators	Factor loadings	Factor name; % of explanatory variance	Negative load pole indicators	Factor loadings
Physical fitness	0.93	Factor 1 "Physical Fitness and Posture Profile"; 25.91%		
Level of the biogeometric profile of posture in the frontal plane	0.88			
Level of the biogeometric profile of posture as a whole	0.85			
Test 5. Active Straight Leg Raise	0.82			
Shoulder girth index, conventional units	0.89	Factor 2 "Shoulder Girth"; 23.44%	Shoulder circumference, cm	-0.93
Body length, cm	0.89	Factor 3 "Anthropometric indices"; 21.48%	Rohrer index, conventional units	-0.82
Pinier index, conventional units	0.85			

tive values of the Rohrer index may indicate disproportions in the body. These data show that the inclusion of complex training that promotes the uniform development of all muscle groups, regular measurement of anthropometric indicators, and constant monitoring and adjustment of the training program will allow achieving optimal results in the development of the physical form of these women.

Taking into account the data of factor analysis, the following conclusions can be made for the development of corrective and preventive technologies in the process of health fitness classes for women aged 25–29 with a round back: 1) focus on improving physical fitness and correcting posture, including exercises to strengthen the main muscle groups, supporting the mobility of the plane; 2) strengthening the shoulder girdle, increasing muscle mass and strength; 3) maintaining harmonious physical development. This means that the development of health fitness programs should be individual, take into account the biomechanical features of the spatial organization of the body and aimed at improving the motor skills of women with a round back.

With respect to the group of women aged 25–29 with scoliotic posture (n=3), according to the results of factor analysis of the data obtained in it, a structure of 2 factors was formed, explaining 100% of the total variance of the features. Table 3 shows their content in the form of a number of indicators that had the greatest loads on these factors.

The table shows that factor 1 "Body weight and girth" (51.07%) reflects the ratio of actual body weight to ideal, as well as various anthropometric indicators, including shoulder, shin and chest girths. High values of this factor indicate a significant deviation of the actual mass from the ideal and large muscle mass of the shoulders, while low values indicate small shin and chest girths.

Formulating the biological significance of the factor for the development of corrective and preventive technologies in the process of health fitness, we note that it consists in correcting body weight, strengthening the muscles of the shoulder girdle and chest, and improving the biogeometric profile of the posture.

That is, for women aged 25–29 with a scoliotic type of posture, it is extremely important to include in the program of corrective and preventive technologies components for normalizing body weight (cardio training for weight loss or strength training for gaining muscle mass), exercises to increase the girth of the shoulders and chest, as well as those aimed at improving posture, especially in the sagittal plane.

The second factor "Joint hypermobility" (98.43%) consists of joint hypermobility indicators, body length and the Pigner index, which is an indicator of general physical development and body weight to height ratio. The importance

Table 3

Factor structure of physical development indicators, level of biogeometric profile of posture, manifestation of joint hypermobility and physical fitness of women aged 25–29 with scoliotic posture

Positive load pole indicators	**Factor loadings**	**Factor name; % of explanatory variance**	**Negative load pole indicators**	**Factor loadings**
Deviation of actual weight from ideal, kg	0.99	Factor 1 "Body weight and girth"; 51,07%	Shin circumference, cm	-0.99
Shoulder girth index, conventional units	0.99		CC, cm	-0.99
Level of the biogeometric profile of posture in the sagittal plane	0.93		Shoulder circumference, cm	-0.99
Joint hypermobility	0.99	Factor 2 "Joint hypermobility"; 48.93 %		
Body length, cm	0.98			
Pigner index, conventional units	0.89			

of the factor for the development of corrective and preventive technologies is the need to control hypermobility and maintain harmonious physical development.

Therefore, the development of corrective and preventive technologies in the process of health fitness classes for women aged 25–29 with scoliotic posture should take into account the specific physical and biomechanical characteristics of this group. The main focuses of the technologies should be: 1) weight correction and maintaining ideal body weight through a balanced diet and exercise; 2) strengthening the muscles of the shoulder girdle and chest to maintain correct posture; 3) control of hypermobility and strengthening of joints to prevent injuries; 4) maintaining harmonious physical development through complex exercises and regular monitoring of anthropometric indicators; 5) development of functional strength and flexibility for overall improvement of motor skills and reduction of the risk of injury.

Factor analysis of physical development indicators, the level of the biogeometric profile of posture, manifestations of joint hypermobility and functional assessment of movements of women aged 30–34 with different states of biomechanics of the spatial organization of the body was carried out in the same way. In the group of women aged 30–34 with normal posture (n=4), the factor structure was represented by three factors, which together explained 100% of the total variance (Table 4).

The "Body circumference" factor (42.31%) reflects various body circumferences and indices characterizing the general physical shape and body proportions. High values for the shoulder, abdomen and shin circumference indicate good muscle mass and physical development, while negative values for the pelvic circumference may indicate a smaller circumference in this area.

It is important for developing health fitness programs, since it determines the direction for strengthening the muscles of the upper limbs and trunk, increasing muscle mass and strength in the shoulder, abdomen and shin area, regular monitoring of changes in body circumferences, and balanced training to ensure proportionality and balance.

"Biogeometric profile of posture" is the name given to the second factor in terms of explanatory strength (38.05%). This factor characterizes the general state of the biogeometric profile of posture, physical fitness and compliance of body weight with ideal indicators. High values indicate good posture, high physical fitness and optimal body weight. Therefore, for the development of health fitness programs for women

Table 4

Factor structure of physical development indicators, level of biogeometric profile of posture, manifestation of joint hypermobility and physical fitness of women aged 30–34 with normal posture

Positive load pole indicators	Factor loadings	Factor name; % of explanatory variance	Negative load pole indicators	Factor loadings
Shoulder circumference, cm	0.99	Factor 1 "Body circumference"; 42.31%	Pelvic girth, cm	-0.99
Abdomen circumference index, conventional units	0.96		Shoulder girth index, conventional units	-0.91
Shin circumference, cm	0.95			
Level of the state of the biogeometric profile of posture	0.99	Factor 2 "Biogeometric profile of posture"; 38.05%	Waist circumference index, conventional units	-0.99
Level of the state of the biogeometric profile of posture in the sagittal plane	0.98			
Level of the state of the biogeometric profile of posture in the frontal plane	0.96			
Physical fitness	0.93			
Hip circumference, cm	0.94	Factor 3 "Hip circumference"; 19.64%	Hip circumference index, conventional units	-0.90

aged 30–34 with normal posture, it is important to include exercises to support and improve the biogeometric profile of posture, complex training aimed at developing endurance, strength and flexibility, as well as correction and maintenance of body weight, including recommendations on healthy eating.

The third factor "Hip circumference" (19.64%) characterizes the size and proportions of this part of the body. High values indicate a larger hip circumference and low values of the corresponding index may indicate a certain disproportion of the body in accordance with the height. Therefore, it makes sense to include exercises to strengthen the muscles of the lower extremities, such as squats, lunges and exercises on simulators, adapt training programs in accordance with the achieved results and use exercises aimed at ensuring proportionality between different parts of the body.

Taking into account the following factor analysis data, we can draw the following conclusions for developing corrective and preventive technologies in the process of health fitness classes for women aged 30–34 with normal posture: 1) focus on supporting proportional physical development; 2) inclusion of exercises to maintain and improve posture, stretch and strengthen the back muscles; 3) development of physical fitness and maintenance of ideal body weight; 4) strengthening the muscles of the lower extremities, regular monitoring of changes in hip circumference and adaptation of training programs in accordance with the achieved results. That is, we are talking about an approach that will promote overall physical development and preservation of somatic health of women.

In the group of women aged 30–34 with a round back (n=7), the resulting structure contained 4 factors that explained 91.4% of all the variability of the characteristics (Table 5).

The largest factor weight (25.93%) was demonstrated by the factor "Anthropometric parameters of the body", reflecting the general physical condition of women. Considering the data that none of them were overweight, high values of the Rohrer and Quetelet index indicated good physical fitness and body weight corresponding to height. A high result in the "Lunge" test indicated good physical fitness and mobility. A negative value of body length indicates short

Table 5

Factor structure of physical development indicators, level of biogeometric profile of posture, manifestation of joint hypermobility and physical fitness of women aged 30–34 with a round back

Positive load pole indicators	Factor loadings	Factor name; % of explanatory variance	Negative load pole indicators	Factor loadings
Rohrer index, conventional units	0.99	Factor 1 "Anthropometric parameters of the body"; 25,93%	Body length, cm	-0.83
Test 3. In Line Lung	0.98			
Quetelet index, kg/m^2	0.95			
Abdominal girth index, conventional units	0.97	Factor 2 "Body girth"; 22.67%	Pelvic girth, cm	-0.85
Calf girth, cm	0.81			
CC, cm	0.97	Factor 3 "Biogeometric profile of posture"; 22.57%		
Test 1. Deep Squat	0.94			
Ideal body weight, kg	0.94			
Level of the biogeometric profile of posture in the frontal plane	0.89			
Level of the biogeometric profile of posture	0.89			
Physical fitness	0.81			
Shoulder girth, cm	0.97	Factor 4 "Shoulder Girth"; 20.23%	Shoulder girth index, conventional units	-0.92
			Test 5. Active Straight Leg Raise	-0.89

stature. Therefore, first of all, when working with this category of women, attention should be paid to maintaining good physical shape, including cardio and strength exercises, monitoring body weight, and using exercises aimed at improving endurance.

The second factor "Body circumference" (22.67%) characterizes various body circumferences and indices reflecting the physical structure of women. High values of the abdominal circumference index (respectively low pelvic circumference) and large shaved circumference indicate a certain disproportionality of the lower body. Biological prerequisites for developing health fitness programs taking into account such a ratio consist of the need to correct body proportions, which should include exercises to strengthen the pelvic muscles, flexibility and mobility to improve overall coordination and proportionality of the body.

Factor 3 "Biogeometric profile of posture" (22.57%) reflects the general state of the biogeometric profile of posture and the physical fitness of women. High values for chest circumference and squat test indicate good physical fitness, and acceptable indicators for the level of the biogeometric profile of posture indicate good motor skills. Therefore, maintaining correct posture, improving its biogeometric profile, complex training aimed at developing endurance, strength and flexibility, recommendations for healthy nutrition occupy the third place in the priorities for corrective and preventive work in the process of health fitness classes with women aged 30–34.

The last factor "Shoulder Girth" (20.23%) contains data on the strength and flexibility of the upper limbs. High values for the shoulder girth indicate good muscle strength. A negative value for the straight leg raise test indicates insufficient flexibility or strength. Therefore, when developing health fitness programs for these women, it is important to include exercises to increase muscle mass and strength in the shoulder area, improve flexibility.

That is, the biological prerequisites for developing corrective and preventive technologies in the process of health fitness classes for women aged 30–34 with a round back should include: 1) maintaining optimal body weight in accordance with height using balanced nutrition and exercise programs; 2) increasing muscle mass and strength in the abdominal area; 3) correcting the biogeometric profile of posture, especially in the frontal plane; 4) functional training aimed at developing endurance, strength and flexibility. These specific factors will help develop individual health fitness programs that take into account the biological characteristics of women with a round back, promoting their overall physical development and maintaining health.

In conclusion, let us turn to the factor structure in the group of women aged 30-34 with scoliotic posture (n=7), which consisted of 4 factors, cumulatively covering 89.7% of the entire explanatory variance (Table 6).

Factor 1 "Weight-height ratios" (27.11%) reflects body weight and anthropometric indicators that are important for assessing the general physical condition. High values indicate that body weight and height correspond. Therefore, its importance for developing health fitness programs lies in monitoring body weight, including cardio and strength training to maintain optimal body weight, developing individual nutrition plans to support it, as well as complex exercises to improve physical fitness.

The second factor "CTC" (23.51%) includes body circumferences and indices reflecting the physical constitution of women. The content of this factor shows the importance of strengthening the muscles of the upper limbs (exercises to increase muscle mass and strength in the shoulder area), correcting body proportions, and reducing waist circumference.

Factor 3 "Hip circumference" (21.34%) reflects the hip circumference and other indices characterizing the physical development of women. High values indicate a disproportion between the hip and chest areas. Therefore, exercises to increase muscle mass and strength in the hip area, to ensure proportional development of all parts of the body should be included in the program of corrective and preventive technologies in the process of health fitness classes for women aged 30–34 with scoliotic posture.

In last place is the factor "Biogeometric profile of posture" (17.74%), which combines the level

Table 6

Factor structure of physical development indicators, level of biogeometric profile of posture, manifestation of joint hypermobility and physical fitness of women aged 30–34 with scoliotic posture

Positive load pole indicators	Factor loadings	Factor name; % of explanatory variance	Negative load pole indicators	Factor loadings
Quetelet index, kg/m2	0.98	Factor 1 "Weight-height ratios"; 27.11%	Body length, cm	-0.93
Rorer index, conventional units	0.98			
Body weight, kg	0.96			
Deviation of actual weight from ideal, kg	0.92			
Waist-to-hip ratio, conventional units	0.96	Factor 2 "CTC"; 23.51%	Shoulder circumference, cm	-0.97
Shoulder girth index, conventional units	0.95			
Waist girth, cm	0.89			
Hip girth index, conventional	0.984	Factor 3 "Hip circumference"; 21.34%	Hip circumference, cm	-0.944
CC, cm	0.965			
Pelvic girth, cm	0.879			
Test 2. Hurdle Step	0.811	Factor 4 "Biogeometric profile of posture"; 17.74%	The level of the state of the biogeometric profile of posture in the sagittal plane	-0.936
			Calf circumference, cm	-0.855

of its condition in the sagittal plane and mobility. Negative values for the biogeometric profile and the bridle coverage indicate significant limitations of the disorder, while a high result in the hurdle step test indicates good mobility. Its biological significance in the aspect of health fitness is revealed due to the importance of including exercises to correct posture, especially in the sagittal plane, to increase muscle mass in the calf area.

As we can see, for women aged 30–34 with scoliotic posture, it is important to consider the following specific factors when developing corrective and preventive technologies: 1) maintaining optimal body weight in accordance with height; 2) strengthening muscles, correcting body proportions (increasing muscle mass and strength in the shoulders, thighs, and calf); 3) correcting posture disorders, especially in the sagittal plane.

Discussion. Although many "corrective" exercises are intuitive, their long-term effectiveness in changing the biomechanics of the body's spatial organization and preventing problems is often insufficiently studied at the level of large, randomized controlled trials [1; 2; 5]. What specific biological mechanisms (changes in muscle architecture, bone density, joint stability, neural connections) provide a lasting corrective effect? Conducting fundamental [13; 14] and applied [15] research confirming the effectiveness of corrective and preventive technologies not only in terms of subjective indicators (pain reduction), but also at the biomechanical and physiological levels requires the development of validated, reliable and scalable tools and protocols for assessing changes in motor patterns, strength topography, and force topography. The development of a concept of corrective and preventive technologies for women in the first period of mature age with different states of biomechanics of the spatial organization of the body requires the unification of knowledge in various disciplines: biomechanics, kinesiology, physiology, anatomy, sports medicine, nutrition, psychology and information technology. It should be noted that even the most advanced technologies will be ineffective if women do not comply with them. Motivation, awareness, life circumstances and psychological comfort play an important role [7; 20].

Conclusions. Based on factor analysis, relationships were identified between the level of the biogeometric profile of posture, joint hypermobility, level of physical fitness and anthropometric indicators of women in the first period of mature age. These findings determine the following directions for further implementation of the research results:

individualized approach to fitness: developing personalized health fitness programs is critical. Taking into account the unique biomechanical characteristics of each woman will significantly increase the effectiveness of the health process;

priority for Correcting Postural Disorders: correcting the biogeometric profile of posture is the cornerstone of achieving overall fitness and maintaining health. Programs that focus on improving posture will help prevent injuries and improve quality of life;

innovative corrective and preventive technologies: a key aspect of transformational activities is the development and implementation of scientifically based corrective and preventive technologies. This will allow integrating modern scientific approaches to the creation of health fitness programs to ensure long-term health of women.

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