Journal of Physical Education and Sport ® (JPES), 17(4), Art 277, pp. 2472 - 2476, 2017
online ISSN: 2247 - 806X; p-ISSN: 2247 – 8051; ISSN - L = 2247 - 8051 © JPES

Original Article

Modern approaches to improving body constitution of female students within physical education classes

VITALII KASHUBA[1], MYKOLA KOLOS[2], OLEKSANDR RUDNYTSKYI [3], VLADIMIR YAREMENKO[4], VICTOR SHANDRYGOS[5], MIHAIL DUDKO[6], OLENA ANDRIEIEVA[7]
[1,7]Scientific-Research Institute of the National University of Physical Education and Sport of Ukraine, Kyiv, Ukraine
[2,4] National University of State Tax Service of Ukraine, Irpin, Ukraine
[3]National University of Physical Education and Sport of Ukraine, Kyiv, Ukraine
[5]TernopilVolodymyrHnatyuk National Pedagogical University, Ternopil, Ukraine
[6]Vadym Hetman Kyiv National Economic University, Kyiv, Ukraine

Published online: December 30, 2017
(Accepted for publication November 30, 2017
DOI:10.7752/jpes.2017.04277

Abstract:
The paper examines the modern approaches to improving the body constitution of female students within physical education classes. A technology for improving the body constitution of female students using the means of health-enhancing fitness within physical education classes was developed and justified. The technology includes three phases: preparatory, interventional, and supportive. The technology consists of 15 complexes of physical exercises, which have different focuses and take into account the type of body constitution.
Key words: correction, female students, body constitution, physical education.

Introduction

In recent years in Ukraine, there is a tendency to a reduction in the volume of physical activity of students occurred against a backdrop of the intensification of educational process in higher educational institutions, that adversely affects their physical development, physical fitness, and health (Dutchak, 2015).

Over the last decade, the levels of health and physical fitness of students have deteriorated. In 90% of cases, applicants to higher education institutions have health issues (Futornyi, 2014). According to the experts, the worsening health condition of the students is attributed to low physical activity, improper feeding, harmful habits (smoking, alcohol abuse, drug use), and stresses. The above necessitates the search for the means to improve the low health level (Kolos, 2010; Futornyi, 2014).

The numerous studies in the field (Kashuba, 2003; Kashuba et al., 2016; Kashuba, Adel, 2005; Martyniuk, 2011) have justified and proven that body constitution is one of the characteristics of physical development. Body constitution gives a reliable idea of the morphological components of the human body, its proportions and constitutional features. Deviation of the physical characteristics of the body from the optimal values negatively affects the physical and mental status of female students (Rudnytskyi, 2016). Research results (Martyniuk, 2011; Kashuba et al., 2016) indicate that the presence of excess body weight increases the risk of concomitant diseases: essential hypertension and coronary heart disease, atherosclerosis, and diabetes mellitus. This issue is also confirmed by the fact that about half of students have various functional disorders of the musculoskeletal system (Martyniuk, 2011; Aleshina, 2016, Lopatskyy, 2016; Kashuba, Dudko, 2016).

Currently, the most popular and effective means for correction of disorders of the musculoskeletal system is various systems of health-enhancing physical activity (Rudnytskyi, 2016.)

However, there is still no justification of scientific and methodological aspects of the practical use of these systems within the classes of physical education for female students of higher educational establishments.

Materials and methods

The studies involved 214 students of Vadym Hetman Kyiv National Economic University.

The following methods were used: analysis of scientific and methodological literature; methods of anthropometry (studying morphological characteristics of the body and identifyingthe body type of female students); sociological methods (assessing the motivation of female students to the participation in health-enhancing fitness classes), pedagogical observation (identifying scientific-theoretical and methodological aspects of organization of the process of physical education of female students); pedagogical experiment (conducting ascertaining and formative experiments); pedagogical testing (assessing the level of general endurance, physical performance, static and dynamic strength endurance, and flexibility).

Corresponding Author: VITALII KASHUBA, E-mail: khmeln@list.ru

Results

The study revealed that 15% of female students were of asthenic type of constitution, 20% of the students were of pyknic type, and 65% of the students were of normosthenic type. Furthermore, 57% of second-year female students were of normosthenic type, 28% of the students were of pyknic type, and 16% of the students were of asthenic type. An analysis of physical development indicators gave the following results (Table 1).

Table 1.Physical development of first-year female students (n=104)

Somatometric indicators	Body type Asthenic		Pyknic		Normosthenic	
	$\bar{x}$	S	$\bar{x}$	S	$\bar{x}$	S
Body weight, kg	54.5	2.0	63.4	3.9	58.0	3.8
Height, cm	168.9	4.1	164.7	4.7	166.9	4.6
Chest circumference, cm	77.4	4.4	91.6	3.8	85.5	4.6
Upper arm circumference, cm	23.5	1.4	28.1	1.3	26.5	1.8
Waist circumference, cm	63.9	1.8	75.1	2.0	68.0	4.3
Hip circumference, cm	88.8	2.5	97.7	5.5	94.7	3.2
Upper leg circumference, cm	52.1	1.9	58.3	2.1	55.0	2.4
Lower leg circumference, cm	33.3	1.8	35.9	1.3	34.6	1.3

- female students of the pyknic type had the highest body weight ($\bar{x}$; S) 63.4; 3.9 (kg) and the shortest height ($\bar{x}$; S) 164.7; 4.7 (cm);

- female students of the asthenic type had on average the smallest body weight ($\bar{x}$; S) 54.5; 2.0 (kg) and the highest height ($\bar{x}$; S) 168.9; 4.1 (cm);

- female students of the normosthenic type had an average height of ($\bar{x}$; S) 166.9; 4.6 (cm) (Table 1).

The students of the asthenic type showed the smallest values of circumferences of the body and extremities.

Anatomical angles were determined in an ascertaining experiment to quantify the posture in female students with different types of constitution. In particular, five postural angles were determined for the students to identify postural deviations. The study showed that only 20 % of the students of the asthenic type of constitution had a normal posture. The most common postural deviations in asthenic female students were kyphosis-lordosis observed in 13% of students and sway back observed in 27 % of students. It should be noted that the postural abnormalities in the frontal plane make up the largest percentage of deviations (40%) in asthenic female students. Among the pyknic female students, 29% had the normal posture, 43% had the scoliosis posture, and 14% had kyphosis-lordosis or sway back posture. Among normosthenicfemale students, 38% had the normal posture, 29% had the scoliosis posture, 15% had kyphosis-lordosis, and 18 % had sway back posture. We found the postural changes in the students observed in the average values of postural angles such as the angle formed by the vertical and the line connecting the C7 spinous process and the center of mass of the head (gaze angle, α_1); the angle formed by the vertical and the line connecting the spinous processes of the C7 and L5 vertebrae (trunk angle, α_3); the angle between the horizontal and the line passing through the right and left inferior scapular angles (scapular balance angle, α_5).The average values ($\bar{x}$; S) of gaze angle (α_1) in first-year female students with a normal posture were as follows: 30.93; 0.64° in asthenics, 30.50; 2.00° in pyknics, and 29.85; 0.88° in normosthenics. The trunk angle (α_3) in first-year female students with a normal posture was on average equal to: 2.47; 0.06° in asthenics, 2.05; 0.54° in pyknics, and 2.06; 0.59° in normosthenics. The scapular balance angle (α_5) in first-year female students with a normal posture was on average equal to: 2.3; 0.20° in asthenics, 2.4; 0.10° in pyknics, and 2.3; 0.40° in normosthenics.

On the basis of the obtained data, a technology was developed to improve postural deviations in the female students. The technology had a strong health-enhancing focus. The structural components of the technology were the goal, objectives, principles, means and techniques, as well as the stages of its implementation into practice. The technology included a set of workouts and their modifications that allow to provide the targeted pedagogical impact and to perform summative assessment of the effectiveness of the corrective activities carried out in the process of physical education of students.

The developed technology addressed the following objectives:

– formation and enhancing health of students of a higher educational institution;

– improving the efficiency of the process of physical education towards posture correction taking into account the somatometric parameters and the body posture angles;

– increasing the level of development of the physical qualities of students through the use of modern means for improving fitness in the process of physical education;

– formation and maintenance of sustainable motivation to regular physical exercise;

– acquisition, by the students, of theoretical knowledge, practical skills and experience of the use of health-enhancing physical activities.

The structure of the technology consisted of three stages of practical implementation. The main objectives of the stages were:

– at the *preparatory* stage: identifying the body type and measuring the postural angles and physical fitness of female students; comparing the measurements with the appropriate reference data; informing students about the results of the study; adapting the students to physical exertions; and developing the sets of physical exercises;

– at the *corrective* stage: correcting the body shape of the students; improving the morphological status; enhancing physical fitness of students;

– at the *supportive* stage: studying the changes in the morphological status and the level of physical abilities of the students; maintaining of the achieved levels of morphological status and status of the musculoskeletal system as well as of physical fitness.

Based on the data obtained, we developed fifteen sets of physical exercises. The overall structure of workouts was built using the block-module principle.

Two sets of physical exercises were developed for the preparatory part of workouts that form the module "warm-up". For the final part of workouts, two sets of recovery exercises were also suggested. These exercise sets included breathing exercise and static balance exercises. Special attention was paid to the proper posture. These exercises addressed the objectives of corrective and supportive stages by focusing on the increase in static strength of various muscle groups and improvement of the posture of female students.

Eleven sets of physical exercises were designed for the main part of workouts. These exercises were included to the aerobic module, strength module, stretching module, and crossfit module. Crossfit system is currently classified as one of the areas of modern health-enhancing physical activity that combine strength, aerobic and plyometric exercises as well as other types of physical activity. Workouts with the inclusion of the crossfit exercises were organized using the following principles: inclusion of various types of physical exercises into the exercise sets; employment of a circuit methodology; exercises are performed for time on the basis of the principle of competition; the use in various workout conditions (training on apparatuses and without them, training with own weight; outdoor and indoor training).

Organizational-methodological guidelines for the introduced sets of physical exercises included the dosage of volume and intensity of physical activity for female students that took into account the type of constitution. For asthenic students, the training was focused on increasing the body weight and circumferences (of the upper arm, chest, hip, or upper leg), and improving the body posture angles. For pyknic students, the training was aimed at reducing the body weight, reducing the circumferences (of the upper arm, chest, hip, or upper leg), and improving the body posture angles. For normosthenic students, the training was focused on reducing the rate of body weight increase, reducing the circumferences, and improving the body posture angles. The content of the workouts provide the possibility to vary the volume and intensity of physical activity taking into account the peculiarities of the female body.

To assess the efficiency of the developed technology, the following criteria were used: somatometric parameters, the body posture angles and indicators of physical fitness of the students.

Discussion

To assess the effectiveness of the technology, the summative experiment was carried out. The experiment has lasted for one academic year. Two groups of students were studied: a control group and a test group. There was no significant difference between the two groups at the beginning of the experiment. After the experiment, the changes were found in the somatometric parameters both of the control and test groups. An improvement in body weight parameters occurred in the female students of the test group. In particular, a significant decrease in the average body weight was observed in pyknic students (before: ($\bar{x}$;S) 63.9; 3.5 kg; after: 61.5; 3.5 kg) and normostenic students (before: 59.9; 2.6 kg; after: 57.2; 1.2 kg). On the other hand, the average body weight increased in asthenic students (before: 54.9; 1.9 kg; after: 56.6; 0.9 kg) ($p<0.05$). In the control group, the average body weight of students also increased in asthenics and decreased in normosthenics, but the changes were insignificant ($p>0.05$). Furthermore, the average body weight increased in pyknic students of the control group.

The changes in the average circumferences of the body and extremities of female students of the test group compared to those of the control group also demonstrate the positive impact of the proposed technology. A statistically significant decrease was observed in the average waist circumference (before: ($\bar{x}$;S) 75.1; 1.7 cm;

after: 72.1; 1.9 cm) and the average upper leg circumference (before: 58.3; 2.2 cm; after: 56.3; 1.2 cm) of pyknic students and the average waist circumference (before: 69.5; 2.8 cm; after: 66.9; 4.1 cm) and the average upper leg circumference (before: 56.3; 1.8 cm; after: 54.5; 2.1 cm) of normosthenic female students, as well as an increase in the average chest circumference (before: 76.3; 4.2 cm; after: 77.5; 2.9 cm) and the average upper arm circumference of asthenic students and the average chest circumference (before: 85.2; 3.8 cm; after: 88.7; 4.7 cm) and the average upper arm circumference (before: 26.5; 1.8 cm; after: 27.7; 1.1 cm) of normosthenicstudents ($p<0.05$). Examination of the students of control group also showed improved circumferences of the body: the average waist circumference were significantly decreased in pyknic students, whereas in asthenic and normosthenic students, the positive changes occurred in all morphological parameters, however all these changes were statistically insignificant ($p>0.05$).

The efficiency of the introduced technology was also confirmed by the results of the study of body posture angles of the students. A comparative analysis of the measurements done before and after the experiment allowed us to identify the positive trend to statistically significant reduction in the average values of all the studied body posture angles of the students of the test group regardless of the body type ($p<0.05$) (table 2).

Table 2.The results of goniometric measurements in female students

Bodytype	Control group (n=54)					Experimental group (n=60)				
	before the study		after the study			before the study		after the study		
	$\bar{x}$	S	$\bar{x}$	S	p	$\bar{x}$	S	$\bar{x}$	S	p
The angle formed by the vertical and the line connecting the C7 spinous process and the centre of mass of the head (α_1), °										
asthenic	31.71	0.6	30.89	0.5	p>0.05	31.77	1.0	30.73	0.7	p<0.05
pyknic	29.73	0.6	31.96	1.1	p<0.05	30.17	0.9	28.42	1.1	p<0.05
normosthenic	31.52	0.5	32.34	1.4	p<0.05	31.87	1.2	30.96	1.4	p<0.05
The angle formed by the horizontal and the line connecting the frontal eminence and mental eminence (α_2), °										
asthenic	89.60	0.7	89.90	0.5	p>0.05	90.04	1.2	89.41	1.2	p<0.05
pyknic	89.92	0.7	90.10	0.8	p>0.05	90.84	0.6	90.02	0.7	p<0.05
normosthenic	89.64	0.5	89.88	1.2	p>0.05	90.60	1.0	89.43	1.0	p<0.05
The angle formed by the vertical and the line connecting the spinous processes of the C7 and L5 vertebrae (α_3), °										
asthenic	2.96	0.14	3.01	0.21	p>0.05	2.89	0.07	2.63	0.05	p>0.05
pyknic	2.82	0.13	2.93	0.07	p>0.05	2.88	0.15	2.32	0.12	p<0.05
normosthenic	2.84	0.06	2.77	0.07	p>0.05	2.92	0.12	2.84	0.14	p>0.05
The angle between the horizontal and the line passing through the right and the left acromions (α_4), °										
asthenic	3.45	0.4	3.57	0.2	p>0.05	3.22	0.4	3.17	0.1	p>0.05
pyknic	3.35	0.1	3.47	0.3	p>0.05	3.17	0.2	2.76	0.4	p<0.05
normosthenic	3.18	0.1	3.12	0.2	p>0.05	3.28	0.3	2.71	0.2	p<0.05
The angle between the horizontal and the line passing through the right and left inferior scapular angles (α_5), °										
asthenic	3.20	0.1	3.43	0.2	p>0.05	3.21	0.3	2.75	0.1	p<0.05
pyknic	3.08	0.2	3.22	0.4	p>0.05	3.31	0.1	2.83	0.1	p>0.05
normosthenic	2.85	0.1	2.93	0.2	p>0.05	2.97	0.3	2.83	0.3	p>0.05

Conclusions

Analysis and generalization of special scientific and methodological literature gives grounds to argue that individual morphological characteristics of the organism determine its anatomic and physiological uniqueness. It is believed that the body constitution is a hereditary trait that is unchangeable. Nevertheless, the body constitution is not a fixed characteristic of an individual. Its development is affected by endogenous and exogenous factors. It was found that the specifics and conditions of studying may place demands on students which often do not fit their individual age and physical abilities. To date, the considered problem is still far from a solution. In the special literature, there are a few publications, which justify the technologies, programs and approaches to using the means of health-enhancing physical activity focused on the improvement of the body constitution of female students that take into account the specifics of physical education classes in high educational establishments. The above mentioned information makes the scientific justification of the technology for improving the body constitution of female students through the means of health-enhancing physical activity a relevant scientific and practical task of theory and methodology of physical education.

An important condition for the successful implementation of physical education is scientifically justified differentiation that involves the division of students into the typological groups according to certain characteristics and taking into account the goals and objectives of the educational process.

The scientific justification of the technology for improving the body constitution of female students using the means of health-enhancing physical activity enabled the identification of its major components:

– the basis of the technology that includes the aim, objectives, and principles of its practical implementation in the process of students' physical education;

– the practical implementation that is represented by three stages: preparatory, corrective and supportive, each of which addresses the respective objectives;

– the methodological basis of the technology that consisted of 15 complexes of physical exercises combined in 8 models of workouts, which have different focuses and take into account the type of body constitution.

– the criteria to evaluate the effectiveness of the technology that involves detailed analysis of somatometric parameters and body posture angles of the students.

The performed pedagogical experiment confirmed the effectiveness of the technology for improving the body constitution of female students using the means of health-enhancing physical activity. The obtained results allow to recommend the technology for the use in the process of physical education in higher educational institutions.

Reference

Rudnytskyi O.V. (2016). Correction of body constitution of female students through the means of health-enhancing fitness. *Thesis for the degree of Candidate of Science in physical education and sport*. Kyiv, 24 p.

Dutchak M.V. (2015). Paradigm of health-enhancing physical activity: theoretical justification and practical applications. *Theory and methods of physical education and sport*, 2, pp.44-52.

Kashuba V.A. (2003). Biomechanics of posture. Kiev, 248 p.

Kashuba V., Rudnytskyi A., Voronina A. (2016) Technology for correcting students' physique through the means of health-enhancing fitness. «Sport. Olimpism. Sanatate» *Materials of the International Scientific Congress. Chisinau*: USEFS, (Moldova), 2, pp. 530-536.

Kashuba V.A., Bondar E.M., Goncharova N.N., Nosova L.N. (2016). Formation of motor skills in an individual in the process of ontogenesis. Lutsk: Vezha-Druck, 232 p.

Futornyi S.M. (2014). Health-maintaining technologies in the process of physical education of students. Kiev, Sammit-kniga, 296 p.

Kashuba V.A., Adel B.J. (2005). Prevention and correction of disturbances of the spatial organization of the human body in the process of physical education. Kiev, Znaniia Ukrainy, 160 p.

Lopatskyy S.V. (2016). Correction of postural impairments in the students in the process of physical education taking in consideration the biogeometric profile. *Avtoreferat of the thesis for the degree of Candidate of Science in physical education and sport*. Ivano-Frankivsk, 25 p.

Kolos N.A. (2010). Correction of functional disorders of the musculoskeletal system in students in the process of physical education. *Avtoreferat of the thesis for the degree of Candidate of physical education and sport*. Dnipropetrovsk, 15 p.

Kashuba V.A., Dudko M.V. (2016). Technology for preventing postural impairments in students in the process of physical education. *Science and Sports*: Current Trends, 2 (11), pp. 24-31.

Martyniuk O. A. (2011). Correction of disturbances of the body's spatial organization in female students in the process of physical education. *Avtoreferat of the thesis for the degree of Candidate of physical education and sport*. Kyiv, 24 p.

Aleshina A.I. (2016). Prevention and correction of functional disorders of the musculoskeletal system in children and youth in the process of physical education. *Avtoreferat of the thesis for the degree of Candidate of physical education and sport*. Kyiv, 40 p.