Analysis of anthropometric indicators during the study of female students' general health, functional state, and physical fitness level

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Abstract

Purpose: The aim is to improve the physical fitness and health of female students who are not pursuing studies in physical education and sports at higher education institutions by utilizing integrative exercise methods during their free time, as well as to develop practical recommendations and proposals for this purpose.

Methods: The research employed methods including analysis and synthesis of relevant scientific and methodological literature, questionnaire surveys, special "Physical Fitness Level" tests, pedagogical observations, anthropometry, bioimpedance analysis, pedagogical testing, pedagogical experimentation, and mathematical-statistical techniques.

Results: The forearm circumference length was 26.79 cm in the control group and 26.95 cm in the experimental group, with a confidence level of ($P > 0.6$). The thigh circumference measured 53.60 cm in the control group and 53.83 cm in the experimental group ($P > 0.8$). Shoulder width in the control group was 39.74 cm, while in the experimental group it was 40.05 cm, with a confidence level of ($P > 0.7$). (See Table 1)

Conlcusion: Thirdly, the implementation of integrative training methods has shown a positive impact on the anthropometric indicators of female students, further confirming its importance. This demonstrates the necessity of a comprehensive approach to promoting a healthy lifestyle, taking into account individual needs for physical activity, physiological cycles, and overall health status. Such methods contribute to the development of individuals who are physically active, socially adaptable, and maintain a healthy lifestyle.

Keywords: physical education, sports, physical education classes, health status, exercise regimen, women's health, pedagogical research, anthropometric indicators, control group, research group.

Introduction

Currently, in many countries, raising a healthy young generation, developing physical education and sports, and especially improving women's health are among the most pressing issues. The complex processes unfolding in the world today make it even more urgent to strengthen the human immune system and improve mental well-being. As a result, there is a growing need to enhance the health of the population, particularly women, and increase physical activity. In several countries, physical education and sports training in higher education institutions play a crucial role in fostering the need to develop the physical qualities of female students [8,9]

Extracurricular physical education and sports activities organized for female students in higher education institutions contribute to the formation of a healthy lifestyle, regular increase in physical activity, and realization of their personal potential. These activities are typically organized outside the curriculum, and students participate in them voluntarily. Nevertheless, their benefits in health, education, and social life are highly valued.[7,10]

Analysis of the experience of developed countries demonstrates that physical activity and sports play a crucial role as a priority factor in shaping students' healthy lifestyles. For example, in higher education institutions of countries such as the USA, Japan, Germany, and South Korea, extracurricular physical activity and sports programs have become an integral component of institutional policy.

Golovina I.Yu. and Merkulova A.A. emphasize that modern approaches to students' physical education play an important role in enhancing the effectiveness of the educational process and fostering a healthy lifestyle among young people. [16]

In recent decades, due to the widespread adoption of a sedentary lifestyle and the resulting serious health problems, attention to a lifestyle based on physical activity has increased significantly. [1] The prevalent use of traditional, sedentary learning activities disregards evidence from modern neuroscience showing that physical activity is linked to cognitive functions and the learning process. [2,3] According to the World Health Organization, this issue is considered urgent, as a large proportion of children and adolescents worldwide do not adhere to the recommendations of engaging in at least 60 minutes of moderate to vigorous physical activity daily. [14]

Studies show that as a result of physical exercises, the musculoskeletal system strengthens, body weight decreases, fat metabolism is activated, cholesterol levels in blood serum decrease, blood pressure normalizes, and the function of the central nervous system improves. Additionally, the body's endurance level in-

creases and its resistance to various extreme factors strengthens. In general, physical exercises have a positive effect on almost all organs and functional systems of the body, but their impact on the cardiovascular system is of particular importance. [11]

Physical education and sports training are an integral part of the general educational process and play an important role in strengthening human health and increasing labor productivity. As an important factor contributing to the comprehensive development of the individual, they improve physical fitness, contribute to cultural and spiritual enrichment, and also support various socio-pedagogical processes.[7]

Anthropometric research methods are used to assess the physical development of female students. The general and individual body measurements of female students are determined. General measurements include body height, body weight, shoulder circumference, and chest circumference.

Body weight is determined using medical scales. Body height is measured using a height measuring device. The body mass index is used to identify cases of underweight, normal weight, and overweight.

Chest circumference is measured at rest (while holding breath), during deep inhalation, and during deep exhalation. The difference between chest circumference measurements during deep inhalation and maximum exhalation is considered an indicator of chest expansion.

Table. Comparison of the main statistical characteristics of anthropometric indicators recorded at the beginning of the pedagogical experiment for subjects in the control (n=42) and experimental (n=42) groups.

Indicators	Control group			Experimental group			AF	NF	t	P
	$\overline{X}$	σ	V, %	$\overline{X}$	σ	V, %				
Body height (cm)	164.14	3.63	2.21	164.62	4.16	2.52	0.48	0.29	0.56	>0.5
Body weight	59.24	3.76	6.34	59.94	4.26	7.11	0.70	1.17	0.79	>0.4
Chest circumference (at rest), (cm)	87.24	4.96	5.69	88.60	4.93	5.57	1.36	1.56	1.26	>0.2
Chest circumference (during inhalation), (cm)	91.40	7.18	7.86	92.90	6.93	7.46	1.50	1.64	0.97	>0.3
Chest circumference (during exhalation), (cm)	84.95	5.60	6.60	86.81	5.71	6.58	1.86	2.19	1.50	>0.1
Difference	6.45	1.13	17.52	6.29	1.15	18.35	0.17	2.58	0.67	>0.5
Arm length (cm)	70.21	3.11	4.43	70.90	3.38	4.77	0.69	0.98	0.97	>0.3
Leg length (cm)	92.81	4.81	5.18	92.10	5.34	5.79	0.71	0.77	0.64	>0.5
Forearm circumference (cm)	26.79	1.93	7.21	26.95	1.99	7.37	0.17	0.62	0.39	>0.6
Thigh circumference (cm)	53.60	7.58	14.14	53.83	7.47	13.88	0.24	0.44	0.14	>0.8
Shoulder width (cm)	39.74	3.92	9.87	40.05	3.70	9.24	0.31	0.78	0.37	>0.7

It is crucial to consider the individual needs and interests of female students when engaging them in physical education and sports activities at higher education institutions, as well as to place them at the center as active social participants in this process.

From this perspective, the content of classes should align with students' motivations, needs, and contemporary views on physical development. If a student adopts achieving their ideal appearance as a life goal, this ideal transforms into a powerful internal motivation.

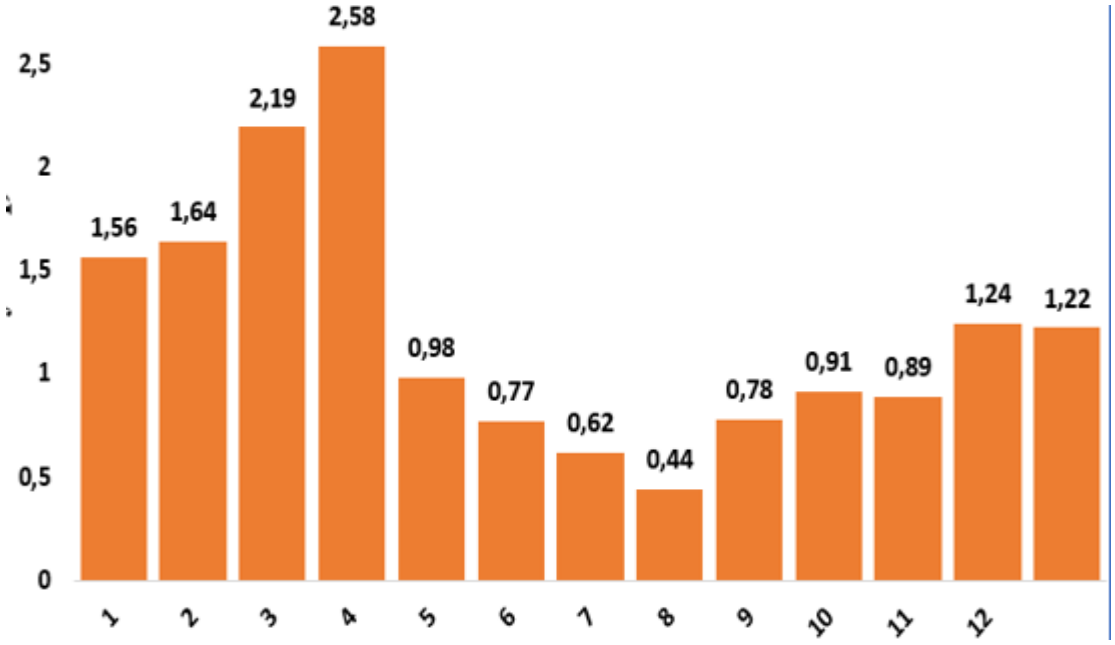
Results and discussion

Leg and arm length determine body structure types and are classified as short, medium, or long.

In our study, anthropometric measurements of female students were determined at the beginning of the pedagogical experiment. 42 female students were selected for each experimental group (EG) and control group (CG).

The average height in the control group was 164.14 cm, and in the experimental group - 164.62 cm, with a confidence level of ($P > 0.5$). The average body weight in the control group

Figure 1. Diagram showing the relative differences (in percentages) of the arithmetic mean values of anthropometric indicators among female participants aged 18-22 in the control and experimental groups at the start of the pedagogical experiment.



was 59.24 kg, in the experimental group 59.94 kg, with a confidence level of (P > 0.4).

Chest circumference at rest was 87.24 cm in the control group and 88.60 cm in the experimental group, with a significance of (P > 0.2). Chest circumference during inhalation was 91.40 cm in the control group and 92.90 cm in the experimental group (P > 0.3). The chest circumference during exhalation was 84.95 cm in the control group and 86.81 cm in the experimental group (P > 0.1). The difference between these measurements (excursion) was 6.45 cm in the control group and 6.29 cm in the experimental group, with a confidence level of (P > 0.5). Arm length averaged 70.21 cm in the control group and 70.90 cm in the experimental group, with a significance of (P > 0.3). Leg length in the control group was 92.81 cm, in the experimental group 92.10 cm (P > 0.3).

Conclusion

Firstly, the results of the conducted pedagogical research demonstrated that anthropometric indicators serve as an important diagnostic criterion for assessing the physical fitness and healthy development of female students. Parameters such as body composition, height, weight, and body mass index allow for a clear understanding of students' health and physical condition. These indicators are crucial for monitoring developmental trends and developing individualized approaches to physical education and health improvement.

Secondly, the use of anthropometric indicators in forming control and experimental groups ensures equality of initial conditions between the groups. This enhances the objectivity of the research results and helps confirm that the changes observed during the experiment are indeed the result of the applied interventions. Such an approach is a vital factor in drawing scientifically based conclusions and accurately analyzing the effectiveness of the applied methods.

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