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APPLICATION OF VARIOUS FITNESS TECHNOLOGIES IN PHYSICAL EDUCATION AND SPORTS ACTIVITIES OF FEMALE STUDENTS OF MEDICAL UNIVERSITY

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Abstract. Objective of the study: to evaluate the indices of physical fitness and the morpho-functional status of female students during strength fitness and body conditioning classes. To achieve this goal, this survey used anthropometric measurements, functional tests and tests to determine the speed and strength abilities of girls. In the work carried out, the indices of the morphofunctional status and physical fitness of female students during body-conditioning and strength training classes are assessed. A tendency towards an increase in body mass index and weight, the breathing test on inhale and a decrease in the heart rate recovery time after exercise in female students engaged in predominantly strength-oriented training was revealed. As a result of strength training classes during the autumn semester, female students had a higher level of speed-strength abilities, strength endurance and maximum strength in relation to the indicators of the body conditioning group.

Keywords: functional status, strength fitness, body conditioning, anthropometry, female students.

Introduction. In the current period of fitness industry development and trend for a sports lifestyle, people of different ages would like to start working out in a gym. In addition to traditional physical culture and sports, young girls and women choose new types of training, for example ABL (abdominal – buttocks – legs) and ABS (abdominal – back – spine) workout; Cycling (group cardio workout on exercise bicycles); Yoga (system of gymnastic and strength exercises for maintaining proper weight); Pilates (sets of exercises in a slow tempo for strengthening joints and muscles, posture correction, improving sleep) et al. Application of new types of training in a university significantly improves effectiveness of pedagogical influence. A number of studies demonstrated positive changes among female students in indices of different motor qualities, morphofunctional status, body composition [1-3]. Data from the specialized literature shows that, on average, shoulder girdle muscle strength is 40-70% weaker, and lower limb muscle strength is 25-30% weaker in women compared to men [4]. Physical development (PD) is considered as a set of morphological functions in close connection with physical

performance of a person accompanied with age-related individual characteristics, i.e. as a comprehensive anthropometric, biomedical and social interdisciplinary complex. Body mass, body length, body mass index (BMI) are the generally accepted parameters of PD, which in turn are supplemented by dynamometry, spirometry and ergometry, contributing to a more accurate update of experimentally obtained data for practical application in a wide range of specialist fields [5].

Objective of the study: estimate indices of physical fitness and the morphofunctional status of female students during strength fitness and body conditioning classes.

Study tasks:

- 1) to conduct anthropometric measurements and functional tests;
- 2) to assess the level of development of agility, strength endurance and maximum strength of test subjects;
- 3) to carry out a comparative analysis of the results obtained.

Methods and organization. The study took place in the Department of Physical Culture and Sports, Yaroslavl State Medical University during the first semester of the year

2022-2023. It included 97 1-3 year female students from different faculties. All the test subjects signed an informed consent for participation in the study. They were then divided into 2 groups: group I included students of the main department (n=82), regularly engaged in body conditioning (BC) during physical education classes in accordance with the academic curriculum without additional activity (sports clubs, national teams of the university). Group II included students of the sports department (n=15), who were engaged in strength fitness classes three times a week. Duration of classes in both groups was 1.5 academic quarters with load percentage of 80%. Classes for the group I were aimed towards a development of agility and speed-strength qualities, general physical fitness. A significant part of time (not less than 50%) of each class included running. Group II mainly used exercises for strength development (with weight resistance, dumbbells, stuffed balls, barbells, exercise machines). Cardio exercises were used mainly in the preparatory part (constituting 15-30% of the total duration).

For the comparative evaluation of speed-strength abilities of the students we used the following tests: dynamometry (back and wrist), squats, 100-meter run and push-ups. To evaluate the functional status, we measured height, weight, heart rate (HR), vital capacity of the lungs (VC) and used the respiration test on inhale and the functional test of 20 squats for 30 s (t_{recovery}). Taking into account the data received experimentally, we calculated BMI and relative strength. The statistical data analysis was carried out in Statistica 6.1. (StatSoft, Inc., 2004). We calculated mean values (M) and standard deviation ($\pm\sigma$) of the set parameters. The normality of distribution was identified with the Shapiro-Wilk test. Significance of differences was calculated by Student's T-test.

Results and discussion. The analysis of the data obtained has revealed identical parameters of age, height and HR in the observed groups (table 1). At the same time, we have found significant differences in the results of motor tests (table 2).

Table 1

Morphofunctional status of the girls (n=97), $M\pm\sigma$

Indicator	Group I (n=82)	Group II (n=15)	P
Age, years	19.4 $\pm$ 1.2	19.8 $\pm$ 1.2	-
Height, cm	165.3 $\pm$ 5.9	165.1 $\pm$ 4.7	-
Weight, kg	56.4 $\pm$ 7.9	60.1 $\pm$ 10.6	-
BMI, kg/m ² ,	20.6 $\pm$ 2.5	21.9 $\pm$ 3.5	-
HR, beats/min	83.2 $\pm$ 10.6	86.3 $\pm$ 17.3	-
VC, ml ³	3727.8 $\pm$ 536.2	3262.5 $\pm$ 442.7	<0.005
Respiration test on inhale, s	47.6 $\pm$ 12.9	52.8 $\pm$ 17.7	-
t_{recovery} , S	91.6 $\pm$ 33.1	87.3 $\pm$ 14.4	-

Note: BMI – body mass index; HR – heart rate; VC – vital capacity of the lungs

Table 2

Speed-strength and strength fitness of the girls, $M\pm\sigma$

Indicator	Group I (n=82)	Group II (n=15)	P
100-meter run, s	18.6 $\pm$ 1.6	16.9 $\pm$ 1.7	<0.001
Squats, squats/min	57.1 $\pm$ 6.8	62.5 $\pm$ 10.3	<0.01
Push-ups	12.2 $\pm$ 5.9	10.0 $\pm$ 5.3	-
Back strength, kg	48.695 $\pm$ 15.5	58.3 $\pm$ 13.1	<0.03
Wrist strength, kg	26.2 $\pm$ 3.9	25.9 $\pm$ 4.6	-
Relative strength, r.u.	0.86 $\pm$ 0.3	0.97 $\pm$ 0.2	-

Results of testing agility, strength endurance and maximum strength of group II students significantly exceeded the same parameters of group I. The latter corresponds with the data on the positive effect of strength training on physical fitness of girls [6-9]. Our study shows that speed abilities of group II ("strength fitness") were 10% higher compared to group I. Muscle work during sprinting requires maximum effort in the shortest time, therefore the level of development of explosive strength of the lower limb muscles (calf, quadriceps, gluteal muscles) and trunk muscles (intercostal muscles, biceps, etc.) is the main indicator of speed and strength [10]. In the study, we registered the highest (by 9.5%) strength endurance indices of leg flexor and extensor muscles in the group II according to the squat test. We have also found higher (by 19.7%) value of back strength in the group II compared to group I, as well as a tendency for increasing relative strength. The statistical processing of the push-up test has not revealed statistically significant differences between the groups. In addition, average values of the push-up test results in group I (Ready for Work and Defense (GTO), stage VI), corresponded to the silver badge and to the bronze one in group II. Therefore, it is advisable to include additional set of exercises for the shoulder girdle and chest muscles for further physical development of the female students in both groups.

The comparative analysis of the morpho-functional status parameters of the test subjects

revealed a tendency for increasing body mass, BMI, values of the respiration test on inhale and decreasing HR recovery time after activity in group II compared to group I. The latter corresponds with studies on the effect of different types of training (including those based on strength) on the improvement of the functional status of the respiratory and cardiovascular systems of students [11-12]. VC of girls in group I was 12.5% higher than in group II ($p < 0.005$). Presumably, this phenomenon was associated with the external respiration activation of female students as a result of long-term adaptation after greater running activity in group I.

Conclusion:

1) As a result of strength fitness classes during the first semester, the female students engaged in strength fitness have a higher level of speed-strength abilities, strength endurance and maximum strength compared to the indices of body conditioning group. At the same time, it will be reasonable for the strength fitness group to include 5-8 exercises aimed at improving strength endurance and strengthening the shoulder girdle muscles.

2) Functional fitness and anthropometric characteristics in both groups were within the physiological norm. We have found a tendency for increasing results in the respiration test, BMI and body mass and decreasing HR recovery time after activity of students engaged in strength fitness. Additionally, we have recorded statistically higher VC in group I students.

Conflict of interest. The authors declare no conflict of interest.

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