SPORTS MEDICINE

Effects of Recreational Aerobics on Adaptation of Female First-Year Students from Urban Area and Rural Area to Conditions of Higher School Education

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Experiments proved beneficial effects of additional classes for recreational aerobics on the realization of morphophysiological mechanisms of adaptation to the education in Higher School in female first-year students.

Key Words: *adaptation; female first-year students; motor activity; recreational aerobics*

Development of the theoretical basis and scientific rationale of adaptation to various environmental factors in female students of first years of education is a timely problem of contemporary human physiology, age-specific physiology and sports medicine [1-4].

The objective of the study was to investigate adaptation peculiarities in first-year female students from rural areas or urban areas to the conditions of higher school education with consideration for different levels of physical activity.

MATERIALS AND METHODS

This study included 60 female students of the Faculty of Preschool and Correctional Pedagogics and Psychology, I. Ya. Yakovlev Chuvash State Pedagogical University (age of 17-20 years) divided into 3 groups 20 subjects in each. Girls from all the groups performed physical training according to the program of basic medical group, but girls of the same age from groups 2 and 3 additionally had recreational aerobics classes. Group 2 comprised girls from rural areas and group 3 girls were from urban areas. Group 1 (control) was mixed. To assess the level of physical development of first-year students in the beginning (September, February) and at the end (December, May) of I and II semesters, anthropometrical and hematological profiles and the state of cardiorespiratory system were assessed.

The data was processed by conventional statistical methods using Microsoft Excel 2007 software.

RESULTS

Analysis of obtained anthropometric data showed that height of first year students gradually increased from the beginning to the end of the academic year (160.2±1.4-162.8±1.8 *vs.* 160.8±1.2-164.7±0.5 cm). In addition, students from group 3 at all terms of the II semester were taller than girls from groups 2 and 3 by 2.5-2.4 and 1.9-1.7%, respectively ($p<0.05$).

Body weight dynamics in the groups generally corresponded to the height dynamics. At the end of first year, group 3 students had higher body weight than students of groups 1 and 2 by 9.1-10.0% ($p<0.05$). Similar relationship was observed in the pattern of

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Quetelet index changes. Moreover, the maximum values at the end of first year were found in the students from urban areas (21.7±0.3 kg/m^2), and the minimum values were detected in the students from rural areas (20.5±0.1 kg/m^2). Height-weight index increased with age in a wave-like manner from 319.0±9.6-333.0±6.8 to 337.0±4.3-348±8 g/cm and during II semester was significantly higher in group 3 students than in other groups.

It was noted that chest circumference values also increased with the student's age from 80.0±1.1-84.8±2.9 to 82.8±0.4-86.4±1.4 cm. Moreover, this anthropometric parameter in first-year students from rural areas significantly surpassed the corresponding values in the control group at the end of I semester (January) and in the middle of II semester (April) by 5.0 and 4.3%, respectively (p<0.05). Force index of response hand wavy increased in students from the beginning to the end of first year (44.9±2.2 *vs.* 54.9±1.4%) and was higher in group 2 girls at all terms of the study.

Absolute value of fat component slowly decreased with the age from 10.9±0.3-12.5±0.1 to 10.8±0.2-12.0±0.3 kg. Moreover, its maximum value at the end of first year was observed in students from urban areas, and its minimum value was noted in students from rural areas (p<0.05). Dynamics of relative value of fat component fully corresponded to the dynamics of its absolute value. Moreover, more pronounced decrease was noted in girls from experimental groups under conditions of additional motor activity.

Absolute muscle component mass in students gradually increased during the first year (19.6±0.3-21.6±0.2 *vs.* 20.2±0.2-23.1±0.1 kg). Moreover, this parameter at the end of I and II semester was significantly higher in group 3 students at all terms of the study. The dynamics of relative muscle component generally corresponded to its absolute values. Another trend was observed for the dynamics of absolute bone component. Thus, this parameter was virtually unchanged during the first and second semesters. It should be noted, that relative bone component changed proportionally to the body mass.

Blood erythrocyte count in girls gradually decreased and was within narrow fluctuation range from 4.4±0.2-4.5±0.4 to 4.1±0.2-4.2±0.2 million per μl (p>0.05). Similar trend was noted for leukocyte count (4.8±0.2-4.9±0.3 *vs.* 4.7±0.3-5.0±0.2 thousand per μl; p>0.05). In all groups, hemoglobin concentration gradually decreased with age from 132.9±0.3-137.3±2.1 to 131.2±1.1-134.1±1.9 g/liter (p>0.05). It should be noted that erythrocyte sedimentation rate, alternatively, steadily increased from the beginning of first year to its end (3.8±0.3-4.0±0.3 *vs.* 4.4±0.4-4.6±0.6 mm/h) and was slightly higher in group 2 than in groups 1 and 3 at all terms (p>0.05).

In all groups, globular value had a trend to a slight decline with age from 0.99±0.00 to 0.98±0.00 arb. units.

Analysis of cardiovascular parameters revealed a decrease in HR at rest from 76.0±2.1-79.0±1.3 bpm (September) to 74.0±1.8-77.0±2.8 bpm (June). Moreover, at the end of the first semester and at the beginning of the second semester, HR in groups 2 and 3 was significantly lower than control values. HR dynamics after functional load revealed a different trend: this parameter steadily decreased with age from 114.0±2.1 to 110.0±3.7 bpm and from 117.0±2.3 to 112.0±3.9 bpm in groups 1 and 3, respectively, whereas it was virtually unchanged in girls from rural areas (118.0±2.7 *vs.* 118.0±3.5 bpm).

Values of resting pulse pressure in first-years students gradually increased from the beginning (35.8±2.3-37.7±1.9 mm Hg) to the end (38.7±2.1-39.9±1.9 mm Hg) of I semester and subsequently steadily decreased at the end of II semester (33.4±1.1-35.2±2.5 mm Hg). Fluctuation of pulse pressure values after physical load during first year of education were insignificant in all students. Moreover, in group 2 these values were significantly higher than in groups 1 and 3 during II semester.

Resting systolic BP values in investigated groups decreased from 107.1±2.1-109.7±1.9 to 101.7±2.0-102.6±1.8 mm Hg during the first year of study (p>0.05). Systolic BP after functional load generally corresponded to the pattern of its changes at rest and was lower in group 3 in comparison with groups 1 and 2 by 7.3-9.1% (p<0.05).

Diastolic BP at rest steadily decreased with age from 69.1±3.2-75.6±3.5 to 62.9±1.3-68.2±1.4 mm Hg. Moreover, in group 1 these values were significantly lower than in groups 2 and 3 during the second semester. Diastolic BP after functional load varied from 74.1±1.2-76.0±2.1 to 65.6±1.1-80.0±1.9 mm Hg. In addition, in February and May, this parameter in group 1 was higher in comparison with groups 2 and 3 by 17.4-21.9 and 10.5-14.2%, respectively.

Different dynamics was observed for systolic blood volume at rest. In group 1, it varied from 62.1±1.5 to 63.1±1.6 ml, while in groups with additional classes of recreational aerobics this parameter wavy increased (59.2±1.6-59.7±2.0 *vs.* 59.7±1.8-60.1±1.7 ml) and at beginning of the second semester (February) it was higher in group 1 than in groups 2 and 3 by 6.4 and 6.6%, respectively (p<0.05). Changes of systolic blood volume after load generally corresponded to its resting values. Thus, in students from rural areas they were significantly higher than in other groups by 13.7-14.2% (p<0.05) in February and May.

Resting cardiac output values substantially increased from the beginning to the end of the first se-

mester (4497.2±186.4-4899.5±255.8 *vs.* 4692.5±256.1-5082.9±187.9 ml) with subsequent decrease at the end of the second semester (4253.8±245.3-4679.8±239.2 ml) with no significant differences between groups. The pattern of cardiac output changes after standard load generally complied with its dynamics in resting conditions. In group 2, this parameter was significantly higher than in groups 1 and 3 during the second semester.

Resting mean dynamic pressure decreased with age in all groups from 81.4±2.1-83.2±2.3 to 72.5±1.9-78.9±2.1 mm Hg. In addition, this values in group 2 at the end of 1 year were significantly higher in comparison to other groups ($p<0.05$). Mean dynamic pressure after standard load increased in control groups in zigzag manner from 89.9±2.6 to 93.2±1.9 mm Hg, whereas in experimental groups they steadily decreased (87.8±2.1-91.9±2.4 *vs.* 81.5±2.4-83.8±1.9 mm Hg).

Double product and endurance coefficient wavily decrease in first-year students as they grew up from 82.9±3.5-83.9±2.6 to 73.7±2.5-78.6±2.1 arb. units and from 2.10±0.16-2.40±0.14 to 2.10±0.13-2.20±0.15 arb. units ($p>0.05$). Opposite trend was observed for vital lung capacity dynamics. Thus, vital lung capacity steadily increased in students during both semesters from 2720.0±60.4-2796.0±44.3 to 2792±69-2995.0±54.1 ml. In addition, this parameter values in group 2 significantly exceeded corresponding values in groups 1 and 3 in the beginning (February) and the end (May) of the theoretical education.

Adaptive potential index, which is integral parameter of the organism adaptation, decreased in investigated students from the beginning of I semester to the end of II semester (1.83±0.09-1.91±0.06 *vs.* 1.62±0.04-1.64±0.06 arb. units). It should be noted that in group 2 this index exceeded control values by 7.4% ($p<0.05$).

Thus, we experimentally proved beneficial effects of additional classes of recreational aerobics on anthropometric, hematological profiles and cardiac-respiratory systems in first-year students, what associated with considerably effective realization of morphophysiological mechanisms of adaptation to the conditions of higher education, particularly in young students from rural areas.

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