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Dynamics of indices of reserve and functional abilities of the 1st-3rd course students' organism at Izhevsk State Agricultural Academy

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Abstract. Nowadays scientists still search for the ways of physical training optimization among students of higher educational establishments. Among them we define: the use of elements of different kinds of sport, exercises with dumb-bells, interval and circular training, active games. It is a well-known fact that the base of physical training is physical qualities development, among which one of the most important one for students are different kinds of endurance, quickness and power oriented qualities. These qualities development is possible only in terms of influence on their physiological basis and in particular on the mechanisms of muscle activity energy supply. **Materials.** Studying the dynamics of the 1st-3rd course students' organism reserve and functional abilities indices at Izhevsk State Agricultural Academy. **Research Methods.** Information sources analysis and summarizing, method of express-diagnostics of the functional state and reserve abilities of an organism «D&K Test». The method of express-diagnostics of the functional state and reserve abilities of an organism «D&K Test» helps to estimate indirectly not only propensity for aerobic or anaerobic work (the prevalence of slow or quick fibers). It helps to also estimate power oriented characteristics of alactate-anaerobic, lactate-anaerobic and aerobic systems of energy supply for an effective use at physical culture lessons.

Keywords: physical qualities, reserve and functional abilities of an organism, students.

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INTRODUCTION

Nowadays scientists still search for the ways of physical training optimization among students of higher educational establishments. Among them we define: the use of different kinds of sport elements, exercises with dumb-bells, interval and circular training, active games. It is a well-known fact that the base of physical training is physical qualities development. One of the most important for students are different kinds of endurance, quickness and power oriented qualities. These qualities development is possible only in terms of influence on their physiological basis and in particular on the mechanisms of muscle activity energy supply.

In most works, which are dedicated to students' physical training, there is no sufficient

information. It characterizes the peculiarities of muscle activity energy supply and their use for physical training process differentiation.

MATERIALS AND METHODS

The students of the 1st-3rd course (girls and boys) from three medical groups (main, preparatory, special) took part in the research – 175 female and 175 male students from Izhevsk State Agricultural Academy in Izhevsk, Russia. As the initial results we took the reserve and functional abilities of the 1st course students.

The method of express diagnostics of the functional state and reserve abilities of an organism [4,5,6,7] was used in order to define the students' bioenergetics types [8-12]. The program analyzed

the height of R and S waves of electrocardiogram. It was taken in standard and group leads. As a result the indices are calculated, which characterize power, capacity, efficiency of anaerobic and aerobic systems of muscle activity energy supply:

1. ANAMC – capacity of anaerobic energy supply source, characterizes the ability to fulfill the load in the 3rd, 4th and the 5th zones of intensity.

2. ANAMC% – capacity of anaerobic utilization, characterizes propensity for anaerobic work in percentage.

3. AMC – capacity of aerobic source of energy supply, characterizes the ability to fulfill the load in the 1st and the 2nd zones of intensity.

4. AMC% – capacity of aerobic utilization, characterizes propensity for aerobic work in percentage.

5. GMC – general metabolic capacity, characterizes general working capacity of an organism.

6. PCP – power of creatine phosphate source of energy supply, characterizes speed-power oriented abilities.

7. PGS – power of glycolytic source of energy supply, characterizes speed and power oriented endurance.

8. PASES – power of aerobic source of energy supply, characterizes the ability to demonstrate general endurance and to realize rehabilitation after anaerobic work.

9. WTANM – threshold of anaerobic metabolism, characterizes the effectiveness of aerobic source of energy supply use.

RESULTS AND DISCUSSION

During the research we received positive results, presented by pictures 1-11. Let's consider the analysis according to the separate indices. Anaerobic metabolic capacity is the index. It characterizes the ability to fulfill the load in the 3rd, 4th and the 5th zones of intensity. Picture 1 presents the indices of anaerobic abilities increase among girls and boys. Among the girls of the 2nd course anaerobic abilities increased in the main group by 34,8%, at the 3rd course we revealed the indices decrease by 1,8%.

In the preparatory group we also revealed the indices increase: in the girls from the 2nd course by 14,8%, in the girls from the 3rd course by 31% (in terms of the 1st course). In a special medical group in the girls of the 2nd course anaerobic abilities

decrease, but insignificantly, by 0,5%. In the girls of the 3rd course the indices increase till 4,5%. Anaerobic metabolic capacity (anaerobic abilities) (c.u.) in boys of the main group decreases by 11,3% by the 2nd course, at the 3rd course in comparison with the 1st course it decreases by 9,5%. In the boys of the preparatory group there is anaerobic abilities increase by 11,4% at the 2nd course, at the 3rd course by 20,2%. In the boys from the special group this index decreases by 1,79% at the 2nd course, at the 3rd course by 3,96%.

The capacity of anaerobic utilization (anaerobic genotype) characterizes propensity for anaerobic work. In the girls from the medical groups there is the indices increase, both at the 2nd and the 3rd courses. The greatest index was revealed in the girls of the main group at the 2nd course (28,8%), preparatory group – 1,5%, special – 28,2%. By the 3rd course the propensity for anaerobic work in girls decreases in the main group till 9,1%, in special group – till 22,8%. In the preparatory group it insignificantly increases by 3%.

The index of anaerobic utilization capacity in boys from the main group at the second course decreases by 7,38%, in the boys from the 3rd course by 15,6%. In the boys from the preparatory group at the 2nd course it decreases by 23,2%, in the boys from the 3rd course it decreases by 12,3%. In the special group in boys of the 2nd and the 3rd course this index decreases by 8%.

Results of aerobic metabolic capacity indices increase in girls and boys. This index characterizes the ability to fulfill the load in the 1st and the 2nd zones of intensity. In the girls from the main and the special medical groups this index increases at the 2nd and the 3rd courses.

In the main medical group the index of aerobic abilities in girls increases by 4,9% at the 2nd course, by the 3rd course – by 26,7% in terms of the 1st course.

Among the girls from the special medical group this index increases by 23% at the 2nd course and by 10,6% at the 3rd course. In the preparatory medical group this index increases by the 2nd course by 0,5% and decreases by the 3rd course by 6,5%.

Aerobic metabolic capacity (aerobic abilities) in the boys from the main medical group at the 2nd course increases by 4,5%, in the 3rd course boys it decreases by 1% in comparison with the indices of the boys at the 1st course, in the boys from

the preparatory group at the 2nd course this index decreases by 3%, in the boys at the 3rd course it decreases by 1,6%. In special group in the boys at the 2nd course the index of aerobic abilities decreases by 0,17%, in boys at the 3rd course this index increases by 3,13%.

The capacity of aerobic utilization (aerobic genotype) characterizes propensity for aerobic work. This index in girls of the main medical group increases at the 3rd course by 2,4%, in girls of the special group at the 2nd and the 3rd courses by 10,7% and 17,3%. At the 2nd course in the girls of the main medical group this index decreases by 8,6%, in the girls of the preparatory group it decreases by 4,9%, in the girls at the 3rd course by 1,1%.

The indices of capacity of aerobic utilization in the boys of the 2nd course of the main medical group increases by 3,7%, in the boys at the 3rd course increases by 10%. In the preparatory group in the boys of the 2nd course this index decreases by 6,1%, in the boys of the 3rd course it decreases by 4,2%. In the special group in the boys of the 2nd and the 3rd courses the index of aerobic genotype increases by 6,8% and 8,6%.

General metabolic capacity (the level of working capacity) (c.u.) characterizes general working capacity of an organism. During the results analysis in the girls this index increases in all medical groups. In the main medical group at the second course it increases by 10,8%; by the 3rd course –17,7%; in the preparatory group at the 2nd course –24,9%; at the 3rd course –21,1%; in the special medical group at the 2nd course –18,9% at the 3rd course –3,1%.

The index of working capacity index in the boys at the 2nd course in the main group decrease by 4,5%, in the boys from the 3rd course decrease by 9% in comparison with the results of the 1st course students. In the boys of the preparatory medical group this index decreases by 1%, in the boys of the 3rd course decreases by 0,94%. In the boys of the special group at the 2nd course the index of working capacity level decreases by 2,2%, in the boys of the 3rd course increases by 0,36%.

Results of power endurance indices increase in girls and boys at Izhevsk State Agricultural Academy. Power endurance, or the power of creatine phosphate source of energy supply, characterizes the speed of power ability. In the girls power endurance decreases at the 2nd course by 18,9% (main medical

group); at the 3rd course by 22,2% (special medical group) in comparison with the power endurance of the girls at the 1st course. But there is the abilities increase in the preparatory group at the 3rd course 12,1%.

The indices of power endurance in boys of the main medical group increases by 18,2%, in the boys of the 3rd course – 11,5%. In the boys of the preparatory group at the 2nd course the index of power endurance decreases by 4,1%, in the boys of the 3rd course it increases by 11,7%. In the boys of the special group at the 2nd and the 3rd course this index decreases by 1,38% and 13,8%.

Power of glycolytic source of energy supply (speed endurance) (c.u.), characterizes speed and power oriented endurance. In girls the indices of speed endurance decrease at the 2nd and the 3rd courses in all medical groups.

In the boys of the 2nd course at the main group the index of speed endurance increases by 5,4%, in the boys of the 3rd course –2,2%. In the boys of the 2nd course in the preparatory group this index increases by 14,1%, in the boys of the 3rd course – by 22,3%. In the special group this index decreases in students of the 2nd course by 2,3%, in the students of the 3rd course –8,76%.

Power of aerobic source of energy supply (maximum oxygen consumption) (ml./kg) characterizes the abilities to demonstrate general endurance and to realize rehabilitation after anaerobic work.

In the girls at the 3rd course in the main group the indices of MOC increase by 12,5%; in the girls in the preparatory group at the 2nd course MOC indices increase by 30,8%; in the girls of the 3rd course –6,6%; in the respondents from the special medical group at the 2nd course MOC increases by 9,9%; in the girls at the 3rd course –14,8%. Only at the 2nd course in the main medical course this index decreases insignificantly by 1,8%.

Power of aerobic source of energy supply (maximum oxygen consumption MOC) in the boys of the 2nd course in the main medical group decreases by 2,2%, in the boys of the 3rd course by 2,9%. In the boys of the 2nd course in the preparatory group it increases by 2,5%, in the boys of the 3rd course it decreases by 2,3%. In the boys of the special group at the 2nd and the 3rd courses MOC index decreases by 2,6% and 1,4%.

Threshold of anaerobic metabolism

(efficiency, technicality, learning capability) (c.u.) characterizes the effectiveness of aerobic source of energy supply use. In the girls at the 2nd course in the main and special medical groups this index decreases by 1,1% and 1,8%, and in the preparatory medical group at the 3rd course – by 5,8%. This index increases in the main medical group at the 3rd course by 1,7%; in preparatory group at the 2nd course– by 10,9%; in special medical group at the 3rd course– by 8,3%.

Threshold of anaerobic metabolism (efficiency, technicality, learning capability) (c.u.) in boys in the main group at the 2nd course increases by 0,87%, in the boys of the 3rd course decreases by 2%. In the boys in the preparatory group at the 2nd course this index decreases by 1,68%, in the boys of the 3rd course – by 3,4%. In the boys of the special group at the 2nd and the 3rd courses the index of threshold of anaerobic metabolism decreases by 2,1% and 0,5%.

Heart rate TANM (effectiveness criterion of aerobic source use) (HR/TANM) increases in the girls of the 3rd course in the main medical group by 2,1%, in preparatory group– by 4,4%; in special medical group – by 5,3%, in preparatory and special medical groups – by 15,6% and 4,6%. At the 2nd course in the girls in the main medical group this index decreases by 1,2% in comparison with the indices of the same medical group at the 1st course.

Heart rate at TANM in boys of the 2nd and the 3rd course of the main medical group decreases by 1,5%. In the boys of the preparatory group at the 2nd course this index increases by 2,7%, in the boys of the third course decreases by 1,1%. In the boys of the special group at the 2nd course decreases by 0,1%, in the boys of the 3rd course increases by 0,06%.

General energetic atmosphere (c.u.). This index among girls of the main medical group decreases at the 2nd course (4,6%) and insignificantly increases at the 3rd course (0,05%); in the preparatory and special groups the situation is opposite – at the 2nd course the index increases by 6,6% in preparatory medical group; by 3,3% in special medical group. By the 3rd course the index of general energetic atmosphere decreases in the preparatory group by 2,9%; in special medical group – by 0,2%.

General energetic atmosphere among boys of the 2nd course in the main medical group increases by 1,45%, in the boys of the 3rd course – by 0,45%. In the boys of the preparatory group at the 2nd course

it increases by 1,3%, in the boys of the 3rd course decreases by 1,5%. In the students of the special medical group at the 2nd course the index decreases by 2,7%, in the boys of the 3rd course increases by 0,05%.

CONCLUSION

During the research we revealed the dynamics of reserve and functional abilities of the students' organism at Izhevsk State Agricultural Academy and the differences in the students' indices at the 2nd and the 3rd courses in comparison with the indices in girls and boys of the 1st course.

This research work analysis showed that the female students of the 2nd course, who belong to the main medical group, have the highest index of anaerobic, aerobic abilities and the capacity of anaerobic utilization (anaerobic genotype). The capacity of aerobic utilization (aerobic genotype) prevails among female students of the 3rd course in a special medical group. In the girls of the 2nd course in the preparatory group some indices are higher: the level of working capacity, maximum oxygen consumption, threshold of anaerobic metabolism, criterion of aerobic source use, general energetic atmosphere. Power of creatine phosphate source of energy supply (power endurance) is higher in the 3rd course female students in special medical group.

This analysis according to 9 indices among boys revealed that most boys of the main group at the 1st-3rd courses have higher values of the indices, that in the preparatory and special groups.

Boys of the 1st course in the main group have higher results, than boys of the 2nd and the 3rd course of the main group according to the following indices: anaerobic abilities, anaerobic genotype, the level of working capacity and HR TANM. In the following indices: aerobic abilities, power and speed endurance, general energetic atmosphere the values are higher among the students of the main group at the 2nd course. In the index of aerobic genotype we revealed high values among the students of the 3rd course in the main group.

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