

MEDICINE

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STUDENTS' PHYSICAL PREPAREDNESS ASSESSMENT

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Abstract

This article deals with the results of the exercises of the all-Russian Sports Complex "Ready for Labor and Defense", performed by students and aimed at controlling the development of the main physical qualities: strength, endurance, speed, coordination, flexibility. The research has been done among 314 students (1-4 courses) of main and preparatory PE groups. The indicators of adaptive capacities of human body, determined by the method of R.M. Bayevsky, have been used for revealing the 4 levels of health, recommended by V.P. Kazanchev. The results show, that the weakest point of the students' physical preparedness is endurance, shown in running. The "standing long jump" exercise has been failed by half of the students. Among students with 1-2 health levels have more correspondences to the levels of "golden" and "silver" badges, than those with 3-4 levels (not counting the "standing long jump"). In order to improve the physical skills it is necessary to arouse the students' interest in towards physical exercises in the context of the "Ready for work and defense", creating all the necessary facilities.

Keywords: students, adaptation, health, physical preparedness, all-Russian Sports Complex "Ready for Labor and Defense"

The relevance of research

According to the results of many research works, which show strong correlation between adaptation and health, four

adaptation levels can be pointed out: satisfactory adaptation; the intensity of adaptation mechanisms; dissatisfactory adaptation; failure of adaptation [1]. According to R.M. Bayevsky, the index of functional changes is to be determined as the criterion of adaptation capacities of human body [2]. Medical pre-screening, based on index evaluation, provides the system approach to the assessment of the functional state of circulatory system as an indicator of adaptive capacities of human body. According to V.P. Kaznacheev, the levels of human body adaptation to the environment are to be considered as "levels of health":

- first level - satisfactory adaptation state;
- second level - the intensity of adaptation mechanisms;
- third level - dissatisfactory state of adaptation, when there is a misalignment between the individual mechanisms of the body;
- fourth level - failure of adaptation, the state of disease or pre-existing disease [3].

Physical education and sports help young people to adapt to the conditions of severe competition and social upheavals in order to make the best use of their potential abilities in all spheres of life [4,5].

The all-Russian Sports Complex "Ready for Labor and Defense" has made a significant contribution in this sphere among students. The reestablishment of the Ready for Labor and Defense" system is stated in the President Order No.172 "Ready for Labor and Defense health and fitness program" from March 24, 2014 (All-Russian Sports Complex "Ready for Labor and Defense") [6]. The standards of the Complex are aimed at ensuring the objective control of the level of development of basic physical qualities: strength, endurance, speed, coordination, flexibility, and level of mastery in applied skills. The standards are based on the instructions, stated in the concept of the difficulty of performing the standards of the Complex: 70% of the tested have to correspond to the standards of the bronze badge, 60% - to the silver and 20% - to the golden badge of the Complex [7]

The aim of the research is to perform the comparative analysis of the physical preparedness of students with different level of health judging by the results of the exercises of the Complex.

Methods and materials

The research has been done among 514 students (1-4 courses) of main and preparatory PE groups.

The index of functional changes is determined by the following formula:

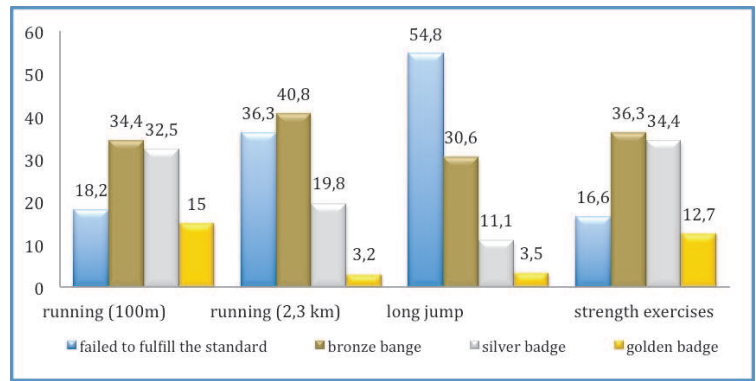
Index of functional changes = 0.011of “MHR” + 0,014 “SBP” + 0.008 “DBP” + 0.014 “A” + 0.009 “WB” – 0,009 “LB” – 0.27 (transliteration), where “MHR” means heart rate, “SBP” and “DBP” - systolic and diastolic blood pressure, “WB” and “LB” – weight and length of the body, “A” – age. The assessment of the Index of functional changes is divided into 4 levels of adaptation capacities (according to R.M.Bayevsky) and 4 health levels (according to V.P. Kaznacheev) respectively.

The standards of the Complex performed in the following exercises: standing long jump, running (100m and 3 km), pull-ups from on a bar, body lifting from lying position. All the exercises were performed in accordance with the Complex.

The “EXCEL v8.00” personalized database has been created to show the results of the research. For fulfilling the tasks of the study, variation statistics methods and the method of assessing the reliability of the results (χ^2 criterion) with the confidence interval of $p < 0.05-0.001$ have been used [8]

Results of the research

The results of “Running (100m)” exercise show that 81.8% of the students have managed to meet the standards of the Complex for this test (see picture 1), 34.4 % of which reached the level of the bronze badge, 32.5 – of the silver and 15.0% - the gold badge.



Picture1. The results of the exercises of the Complex, done by the students, %

The “running 2 km (female students) and 3 km (male students)” show that 36.3% of students failed this test. Only 3.2 % of the students reached the level of the gold badge, 19.8% - of the silver

and 40.8% - of the bronze badge; the “standing long jump” exercise appeared to be even more difficult. 54.8% of the students didn’t manage to reach the level even of the bronze badge. Other researches also revealed the difficultness of this exercise. Among those, who performed the “pull-ups on a bar” (male students) and “body lifting from lying position” (female students), 16.6 % failed to fulfill this norm; 36.3% reached the level of the bronze badge, 34,4% - of the silver and 12.7 – of the gold badge.

The studies of the physical state of students from 30 Russian universities, including the male students of preinduction age, performed by the Scientific and Methodological Council of Physical Education and Sports under the Ministry of Education and Science of the Russian Federation, show that the average result in running (3000 m) is 13.41 minute (which, according to the table of the approximate program of “Physical Education” discipline, makes 2 points); the average result in running (100 m) is 13.9 seconds (3 points); the average result in the pull-up from hanging position at a high bar is 12 times (4 points). The results of all-Russian tests have been compared with the data of the own studies (see table 1 and 2).

Table 1
Comparing the results of the exercises of the Complex, performed by male students (%)

| Types of exercises | Gold badge | | Silver badge | | Bronze badge | | Failed | |
|----------------------|------------|------|--------------|------|--------------|------|--------|------|
| | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| Running 100 m (sec) | 48 | 11,2 | 28 | 39,8 | 12 | 37,8 | 12 | 11,2 |
| Running 3 km (min) | 4 | 6,1 | 16 | 23,5 | 20 | 39,8 | 60 | 30,6 |
| Long stand jump (cm) | 36 | 7,1 | 32 | 20,4 | 12 | 28,6 | 20 | 43,9 |
| Pull-up (times) | 28 | 14,3 | 20 | 41,8 | 16 | 30,6 | 36 | 13,3 |

Note: 1 – the results of all-Russian studies, 2 – the results of own studies

Table 2
Comparing the results of the exercises of the Complex, performed by female students (%)

| Types of exercises | Gold badge | | Silver badge | | Bronze badge | | Failed | |
|----------------------|------------|------|--------------|------|--------------|------|--------|------|
| | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| Running 100 m (sec) | 48 | 16,7 | 28 | 29,2 | 8 | 32,9 | 16 | 21,3 |
| Running 3 km (min) | 36 | 1,9 | 28 | 18,1 | 8 | 40,7 | 28 | 39,4 |
| Long stand jump (cm) | 16 | 1,8 | 44 | 6,9 | 20 | 31,5 | 20 | 59,7 |
| Pull-up (times) | 28 | 12,0 | 36 | 31,0 | 28 | 38,9 | 8 | 18,1 |

Note: 1 – the results of all-Russian studies, 2 – the results of

own studies

The results show, that the weakest point of the students' physical preparedness is endurance, shown in running (2 and 3 km), where the most important part is played by cardiovascular and respiratory systems. The same results correlate with the low level of physical health. Such tendency is seen in the most part of the Universities (89%), which took part in the study.

According to the received results, the comparative analysis of average data of the exercises, done by the student, has been made (table 3 and 4), according to which, neither male nor female students have progress in this aspects of the Complex in the age range of 18-20. The changes have contradictory character.

Table 3
Average results of the exercises of the Complex, done by male students ($M \pm \sigma$)

| Types of exercises | Norms of the Complex | | | Study results | | | |
|----------------------|----------------------|-------|-------|-----------------|-----------------|-----------------|-----------------|
| | 1 | 2 | 3 | 18 years | 19 years | 20 years | all |
| Running 100 m (sec) | 15,1 | 14,8 | 13,5 | 15,0±0,63 | 14,8±0,88 | 15,0±1,06 | 14,8±0,84 |
| Running 3 km (min) | 14,00 | 13,30 | 12,30 | 14,55±0,74 | 13,55±1,17 | 14,38±0,89 | 14,15±0,94 |
| Long stand jump (cm) | 215 | 230 | 240 | 206,4± 22,42 | 207,3± 25,70 | 207,0± 19,68 | 206,6± 23,43 |
| Pull-up (times) | 9 | 10 | 13 | 9,7±2,12 | 9,6±2,07 | 9,1±1,83 | 9,6±2,01 |

Note: 1 – bronze badge norms, 2 – silver badge norms, 3 – golden badge norms

Table 4
Average results of the exercises of the Complex, done by female students ($M \pm \sigma$)

| Types of exercises | Norms of the Complex | | | Study results | | | |
|----------------------|----------------------|-------|-------|---------------|-----------------|-----------------|-----------------|
| | 1 | 2 | 3 | 18 years | 19 years | 20 years | all |
| Running 100 m (sec) | 17,5 | 17,0 | 16,5 | 17,4±0,86 | 17,2±0,68 | 17,2±0,67 | 17,3±0,76 |
| Running 3 km (min) | 11,35 | 11,15 | 10,30 | 12,39±0,79 | 12,16±0,89 | 12,10±0,83 | 12,23±0,85 |
| Long stand jump (cm) | 170 | 180 | 195 | 157,4±15,58 | 158,7± 15,11 | 158,3± 18,85 | 157,9± 15,68 |
| Pull-up (times) | 34 | 40 | 47 | 36,4±6,16 | 38,2±6,64 | 38,6±5,43 | 37,3±6,43 |

Note: 1 – bronze badge norms, 2 – silver badge norms, 3 – golden badge norms

The average result of “running (100m)” exercise among male students is equal to the bronze badge (14.8±0.84 and 14.8

respectively); among male students - (17.3±0.76 and 17.5 respectively). The average result of endurance exercises - “running 2 km (female students) and 3 km (male students)” do not correspond to the level of the bronze badge; the same values have been received from the “standing long jump” exercise. The average results of strength exercises are equal to the bronze and close to the silver badge: pull-ups (male students) – 9.6±2.01 and 9 times respectively; “body lifting from lying position” (female students) – 37.3±6.43 and 34 times respectively.

Using the method of R.M.Bayevsky the students’ index of functional changes has been counted. In accordance with the results, the students have been divided into 4 groups. It has been determined that 36.9 % of the students have the first level of health (satisfactory adaptation; female students are 9.6 % more than male); 33.6% have the second level (the intensity of adaptation mechanisms; male students are 7.2 % more); 18.1% have the third level (dissatisfactory adaptation; male students are 3.8 % more); 11.4% of students have the fourth level (failure of adaptation; female students are 1.2 % more). The absence of gender differences between the number of male and female students in each group is confirmed by statistical calculations: $\chi^2=3.75$; $P=0.2903$.

The results of running (100m) show, that students with 1 and 2 health level have better results; among them there are more silver and golden badges (see table 5). The “running 2 km (female students) and 3 km (male students)” exercise shows significantly low results concerning students of 3 and 4 levels as there are no golden badges among them.

Table 5
Distribution of the results of the exercises of the Complex: running (100m), running 2 km (female students) and 3 km (male students) (%)

| Health levels | Running (100m) | | | | Running (2 km and 3 km) | | | |
|---------------------|------------------------------|-------------|-------------|-------------|------------------------------|-------------|-------------|------------|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| first level | 14,8 | 25,6 | 42,2 | 17,4 | 18,1 | 45,5 | 30,6 | 5,8 |
| second level | 10,8 | 41,2 | 29,4 | 18,6 | 38,2 | 42,2 | 16,7 | 2,9 |
| third level | 26,3 | 42,1 | 26,3 | 5,3 | 50,9 | 40,3 | 8,8 | 0 |
| fourth level | 38,1 | 32,4 | 17,7 | 11,8 | 73,5 | 17,7 | 8,8 | 0 |
| all students | 18,2 | 34,4 | 32,5 | 15,0 | 36,3 | 40,8 | 19,8 | 3,2 |
| statistics | $\chi^2=30.45$ Df=9 P=0.0000 | | | | $\chi^2=59.23$ Df=9 P=0.0000 | | | |

Note: 1 – failed, 2 – reached the level of the bronze badge, 3 – reached the level of the silver badge, 4 – reached the

level of the golden badge

The “standing long jump” exercise appeared to be the most difficult. At the same time, there isn’t any significant difference among the received rates of the students with different adaptive capacities ($\chi^2=6.60$; $P=0.6789$). In the present distribution of the results (table 6) no correlation between the successfulness of exercise performing and health level can be found.

Table 6
Distribution of the results of the exercises of the Complex:
standing long jump, body lifting (female students) and pull-ups (male students) (%)

| Health levels | Standing long jump | | | | Body lifting, pull-ups | | | |
|---------------|------------------------------|------|------|-----|-------------------------------|------|------|------|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| first level | 50,4 | 33,1 | 11,5 | 5,0 | 10,7 | 30,6 | 43,0 | 15,7 |
| second level | 61,8 | 26,5 | 8,8 | 2,9 | 9,8 | 38,2 | 37,3 | 14,7 |
| third level | 47,4 | 36,8 | 14,0 | 1,8 | 24,6 | 47,4 | 22,8 | 5,3 |
| fourth level | 61,7 | 23,5 | 11,9 | 2,9 | 44,1 | 32,4 | 14,7 | 8,8 |
| all students | 54,8 | 30,6 | 11,1 | 3,5 | 16,6 | 36,3 | 34,4 | 12,7 |
| statistics | $\chi^2=6,60$ Df =9 P=0,6789 | | | | $\chi^2=58,19$ Df =9 P=0,0000 | | | |

Note: 1 – failed, 2 – reached the level of the bronze badge,
3 – reached the level of the silver badge, 4 – reached the level of the golden badge

Among the students, who performed the “pull-ups” exercise (male students) and body lifting from lying position (female students), the dependence of high results on health level has been revealed: among the student with 1-2 level much more “golden” and “silver” badges and less number of those who failed strength exercises have been found.

Conclusion.

Thus, according to the results, the following conclusions can be made:

- one third of the students got dissatisfactory marks for the endurance exercises (running 2 and 3 km respectively) which shows the low level of development of this quality and health in general;
- the level of preparedness to the “standing long jump” exercise is lower than stated in the "Ready for work and defense" Complex; the same results are found by other researches, which shows the incorrectness of this exercise for physiological abilities of

the major part of male and female students;

- according to the results of the tests, the students with 1-2 levels of health have more correspondences to the levels of “golden” and “silver” badges, than those with 3-4 levels.

In order to arouse the students' interest towards physical exercises in the context of the "Ready for work and defense" Complex the Government has prepared and signed some resolutions, aimed at creating the additional motivation for undergoing the tests of the Complex: after taking the tests, the student will not only have stronger health and moral satisfaction; while entering a university, those, who do sports and pass the tests of the Complex successfully, will have significant advantages over those who are indifferent to sports.

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