Pedagogy

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ESTIMATING THE MENTAL AND PHYSICAL PERFORMANCE OF BORDER POLICE EMPLOYEES UNDER THE INFLUENCE OF SOME TECHNOLOGIES FOR RESTORATION AND RECREATION OF THE ORGANISM

Summary. *In the pedagogical experiment we established that the use of technologies for the restoration and recreation of the organism, proposed by us, provides an improvement in the indicators of the mental performance of border police employees, expressed in an increase in the productivity of intellectual work and the effectiveness of their visual analyzer, accompanied by the speed of processing visual information and the stability of attention. We found that these technologies improved the physical training of border police employees, which manifested itself in improved speed, general resistance of the organism and of the force capacities, in relation to the control group.*

Key words: *border police employees, pedagogical experiment, technologies for the restoration and recreation of the organism, mental performance, physical training, testing of motor qualities, mental performance testing.*

The actuality of the subject. The work of border police employees requires a high level of physical and intellectual training. Physical training is a mandatory component of the training process for border police employees, necessary to perform their functional duties and maintain their health, and the

specificity of intellectual work lies in the need to process a large volume of information from various sources, with the mobilization of optical and auditory analyzers, memory and attention [6]. Research shows that about 65% of the detentions of border violators, carried out by border police employees, have become possible due to the qualitative examination of documents and careful research of vehicles when crossing the state border. The remaining 35% of cases of stop offenders at the border are determined by an accurate assessment of the mental condition of the passengers, the border guard paying attention to all visible and less visible signals from passengers, vehicles and the environment, acts. Therefore, in order to detect deviations when crossing the border, the border guard must have a special sensitivity of the visual analyzer, its stability, the ability to subtly differentiate the smallest changes in the passport [8].

Analyzing the opinions of border police employees, regarding the methods for the restoration of the organism [5] we used some technologies to improve their intellectual and physical work capacity.

The professional activity of a border guard is characterized by a constant change in working conditions and meteorological factors acting on the body. Fluctuations of meteorological factors, mental and physical stress at work require constant improvement of its mechanisms of adaptation to the environment [4; 6; 9]. Therefore, in order to preserve the health of border police employees and maintaining physical condition at a high level, in our opinion, it is rational to use the appropriate technologies for the restoration and recreation of the organism, the effectiveness of which must be proved experimentally [4; 5; 9].

The hypothesis of the paper: we expected that the use of technologies for the restoration and recreation of the organism will ensure the improvement of mental and physical performance indicators of border police employees.

The aim of the paper: the physiological-hygienic estimation of the annual dynamics of the intellectual and physical work capacity of the border police

employees under the influence of some technologies for the restoration and recreation of the organism.

Research methods. At the beginning of the pedagogical experiment, the initial testing of the level of motor training of the border police employees from both groups was performed, and at the end of it - the final testing, using mathematical-statistical methods to process the obtained results, comparative analysis of results. The results of *running 100 meters*, *running 1000 meters* and *tractions at the fixed bar* were recorded [7].

The intellectual work capacity of the border policeman was assessed after the Burdon - Anfimov test, which allows the assessment of the quantitative and qualitative aspect of the intellectual activity.

Test execution methodology. In the Anfimov table it is required to cut all the letters H for 4 min. At the end of the test we calculated the total number of letters displayed (S), the number of letters cut (H), the number of letters H that had to be cut (N), the number of mistakes made (n). Based on these data we determined:

Coefficient of accuracy of test execution (A):

$$A = H/N \quad (1)$$

Intellectual productivity coefficient (P):

$$P = AS \quad (2)$$

Volume of visual information Q (bit):

$$Q = 0{,}5936 \times S \quad (3)$$

where:

0,5936 - the average volume of information, which belongs to a sign.

Information processing speed, bit/sec:

$$VPI = (Q - 2{,}807 \times n) / T \quad (4)$$

where:

2, 807 bits, loss of information for a missed sign;

T - task execution time, sec.

Attention stability (SA):

$$SA = S/N \quad (5)$$

We analyzed the results obtained in each group in annual dynamics, but also in a comparative way, as well as in relation to the values presented by other authors.

Research results:

Intellectual productivity. From Chart 1 we notice that at the initial testing there is no significant difference between the average values of both groups, they being in the limits of 944 - 945 u.c. These results are 6.66% better than in 13-14 year old students, in whom the average group values are 886 ± 44.8 u.c. [2].

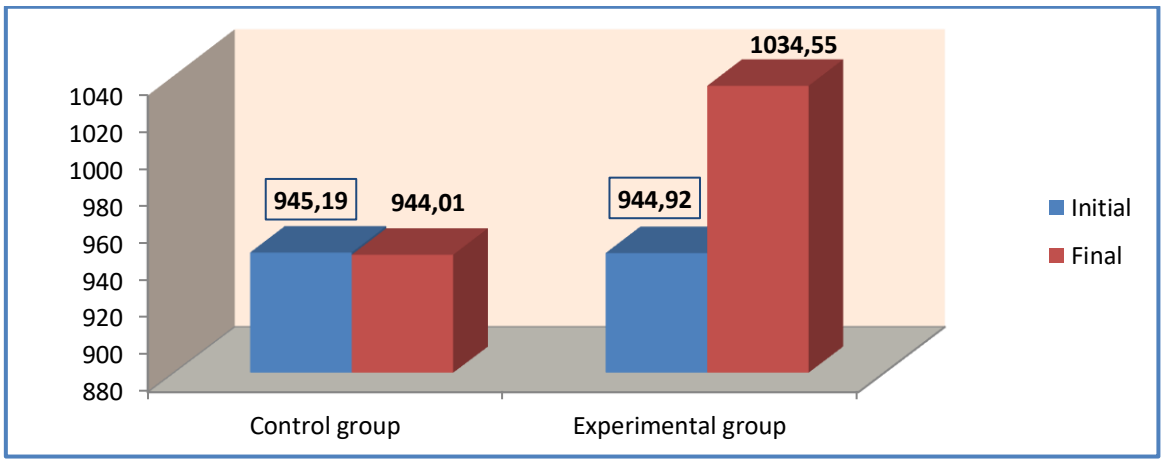


Chart 1. The annual dynamics of the intellectual productivity of the border police employees from the control and experimental groups, u.c.

At the final test, the average value of intellectual productivity in the experimental group is 1034.55 ± 33.32 u.c., it being 9.5% higher, both compared to the results of the initial test ($t = 2.73$; $P < 0.05$), as well as in relation to the final results of the control group ($t = 2.25$; $P < 0.05$). These results, in our opinion, express the beneficial influence of the stimulation and recovery methods, used in the experimental group to increase intellectual productivity.

Visual analyzer efficiency. At the initial testing, the difference between the mean values of the control and experimental groups is insignificant (Chart 2), they being respectively 577.21 ± 23.11 u.c. and 590.79 ± 31.11 u.c. (P>0.05).

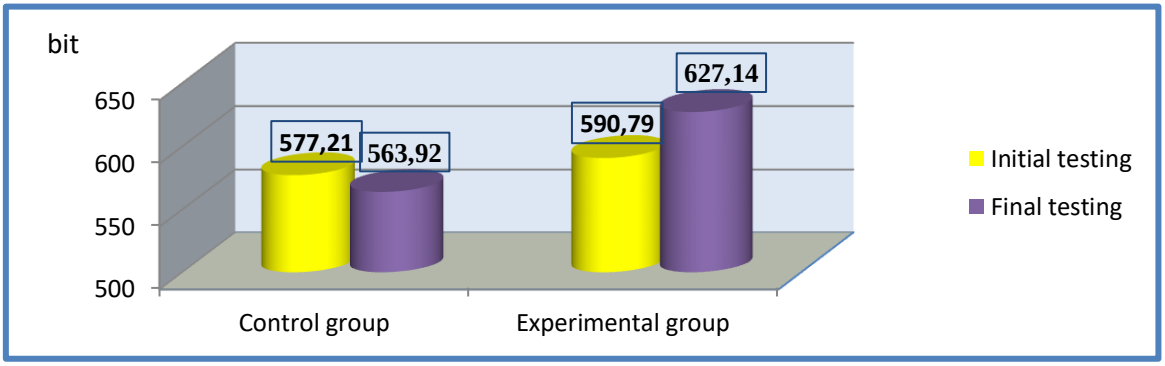


Chart 2. Comparative presentation of the performance of the visual analyzer to the border police employees from the control and experimental groups in annual dynamics, bits

At the same time, at the final testing, in the experimental group, there is an increase in the efficiency of the visual analyzer by 6.2%, compared to the initial testing, which probably expresses the positive influence of stimulation and recovery methods on the body of people in the experimental group.

In the control group, there is a tendency to reduce the efficiency of the visual analyzer in annual dynamics by about 2.3%, which, in our opinion, reflects a certain state of fatigue of the visual analyzer.

Speed of visual information processing. Also, given that border police employees ensure the verification of passports of travelers crossing the border and monitor the behavior of citizens in the border area, the speed of processing visual information (V) is an important indicator of their work. Chart 3 compares the speed of visual information processing by border police employees in control and experimental groups. From Chart 3 we see that the results of both groups improved in annual dynamics, but differently. In the control group, the speed of visual information processing increased by 16.57%, compared to the initial data, and in the experimental group by 68.74%, the difference between the results being significant from a mathematical-statistical point of view.

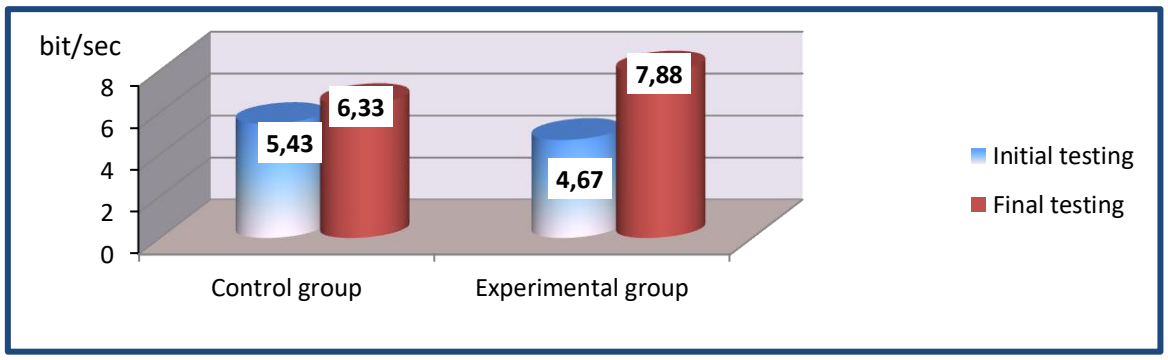


Chart 3. Annual dynamics of the speed of visual information processing by border police employees in control and experimental lots, bits / sec

At the same time, the final test established a significant increase in the speed of information processing in the experimental group, compared to the control group, which confirms, in our opinion, the role of recovery and recreation technologies used by us in optimizing the intellectual performance of border police employees. For example: for students of the Faculty of *Law*, this index varies in the range of 2.37-3.95 bits/sec.

Stability of attention. The comparative analysis of the results from the control group in annual dynamics (Chart 4) shows the tendency to improve the results, but these changes are not true ($t = 1.0$; $P > 0.05$) from a mathematical-statistical point of view. At the same time, the values of the experimental group increase significantly, both in relation to the initial figures and to the control group ($t = 2.0$; $P > 0.05$), which, in our opinion, is due to the methods of stimulation and recovery of the body, used in this batch during the pedagogical experiment.

Running at 100 m. At the initial test there is no true difference between the results of the evaluation of the border police employees from both groups ($P>0.05$), the average group values being, respectively, for the control and the experimental group 15.82 ± 0.22sec and 15.57 ± 0.11sec (Chart 5), the difference between them being insignificant from a mathematical-statistical point of view ($t = 1.04$; $P>0.05$).

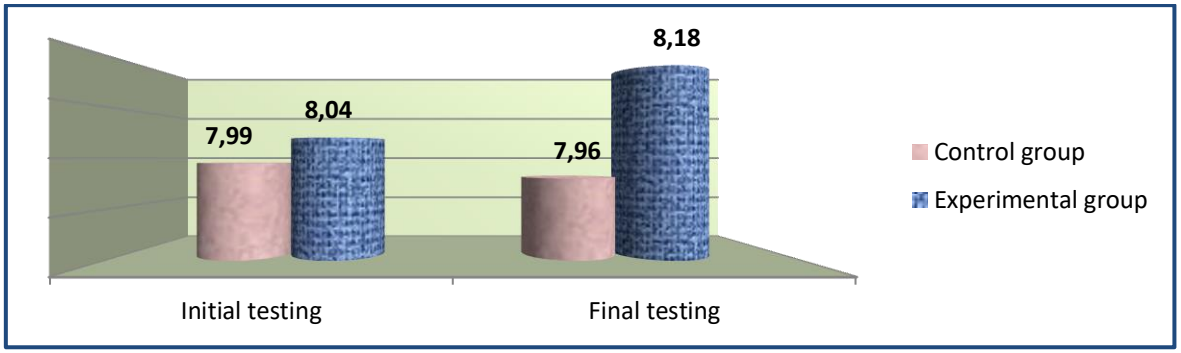


Chart 4. The annual dynamics of the stability of the attention of the border police employees from the control and experimental groups, u.c.

In the final test, the speed running results of the border police employees from both groups improved, but in a different way: in the control group the average distance of 100 m was 15.54 ± 0.28 sec, and in the group experimental 15,07 ± 0,25 sec, which, according to the scale for evaluating the respective quota, corresponds respectively to grades 8 and 9. In the control group, the difference between the results of the initial and final test is not mathematically statistically significant (t = 1.27; P>0.05), and in the experimental group it is true (P <0.05), at the significance threshold t = 2.63. Thus, unlike the control group, the experimental group truly improved its indicators in annual dynamics (t = 2.63; P <0.05), which indicates that in the process of their motor training special attention was paid to improving the quality speed. It is not excluded that on the final result left its mark and the weight loss of the border police employees from that batch, which had lost 2 kg of the initial weight by the final test.

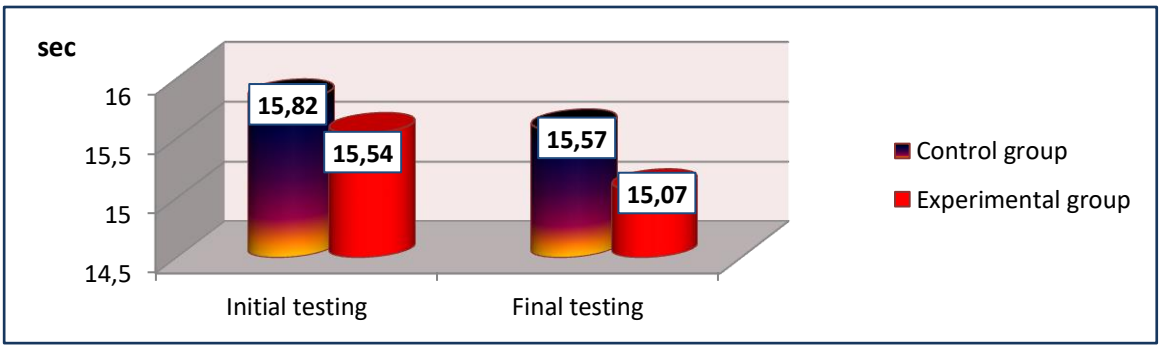
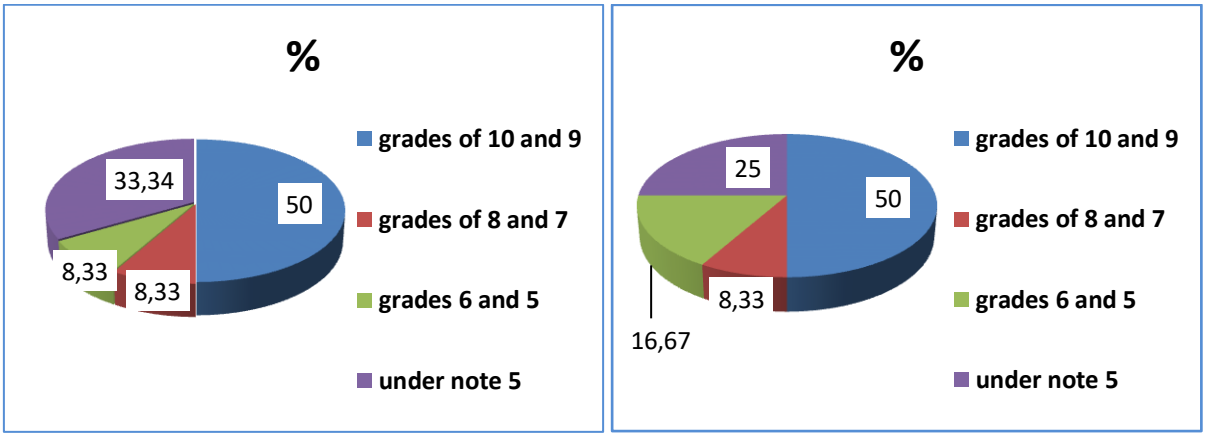


Chart 5. Annual dynamics of the results of the border police employees testing at "Running at 100 m", sec

According to bibliographic data [1], if the sensitive period for the development of a certain motor quality of the individual is missed, then it can no longer be developed at the highest level, this deficiency being felt throughout life. A number of morphophysiological and biochemical factors participate in the manifestation of speed quality: the length of the muscle sarcomere, the ratio between the number of white and red fibers in it (genetically determined), the content and reactivity of phosphate compounds in nerves and muscles, the content of which is influenced by training and nutrition. Also, in speed movement, based on a complex coordination of movements, it is important the state of the nervous system, its ability to switch excitation signals to those of inhibition and vice versa.



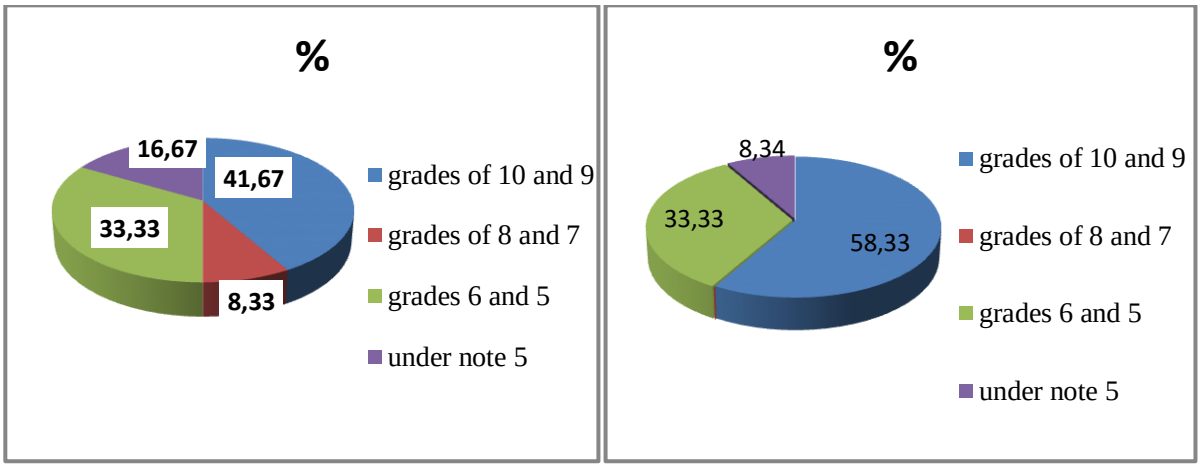
A B

Chart 6. Comparative presentation of the structure of the control group depending on the results of the evaluation of the motor test "Running at 100 m", at the initial test (A) and the final test (B),%

Chart 6 shows comparatively the structure of the control group at the initial and final test depending on the evaluation results of the motor test "Running 100 m". Analyzing the data presented in Chart 6, we notice that the share of people who took the initial test with grades of 10-9 and 8-7 is, respectively, 50% and 8.33%. These quotas do not change in annual dynamics, remaining the same at the final testing. On the other hand, the share of people

who obtained insufficient grades increased in annual dynamics, from 25% to 33.33% at the final test, ie by 8.33%.

The comparative analysis of the distribution of the persons from the experimental group, at the initial and final testing differs from that of the control group (Chart 7). Thus, at the final testing, the share of those with grades of 10 and 9 predominates, being 58.33%, exceeding the share of those persons from the initial testing (41.67%) by 16.67%, as well as the share of those in the group control (50%) by 8.33%. At the same time, the share of people with insufficient results decreased 2 times, compared to the initial testing, and 4 times compared to the results of the control group.



A B

Chart 7. Structure of the experimental group depending on the results of the evaluation at "Running at 100 m", initial (A) and final (B) testing, %

The 1000 m run is a motor test that assesses the body's ability to perform moderate-intensity physical exertion for a long time, without showing signs of fatigue. The body's adaptation to effort takes place through the maximum involvement of the cardiovascular and respiratory systems, which ensure the body's ability to work during exercise. Muscle activity can last from tens of minutes to several hours. Global endurance plays an important role in optimizing life and is an important component of physical health.

At the beginning of the experiment, the border police employees from the experimental group showed a higher aerobic resistance, compared to those from the control group, the average group values being, respectively, 4.14 ± 0.28sec and 4.29 ± 0.15sec (t = 0.48; P>0.05), and this trend was maintained in the final testing, respectively, constituting 3.56 ± 0.22 and 3.96 ± 0.13sec (Chart 8).

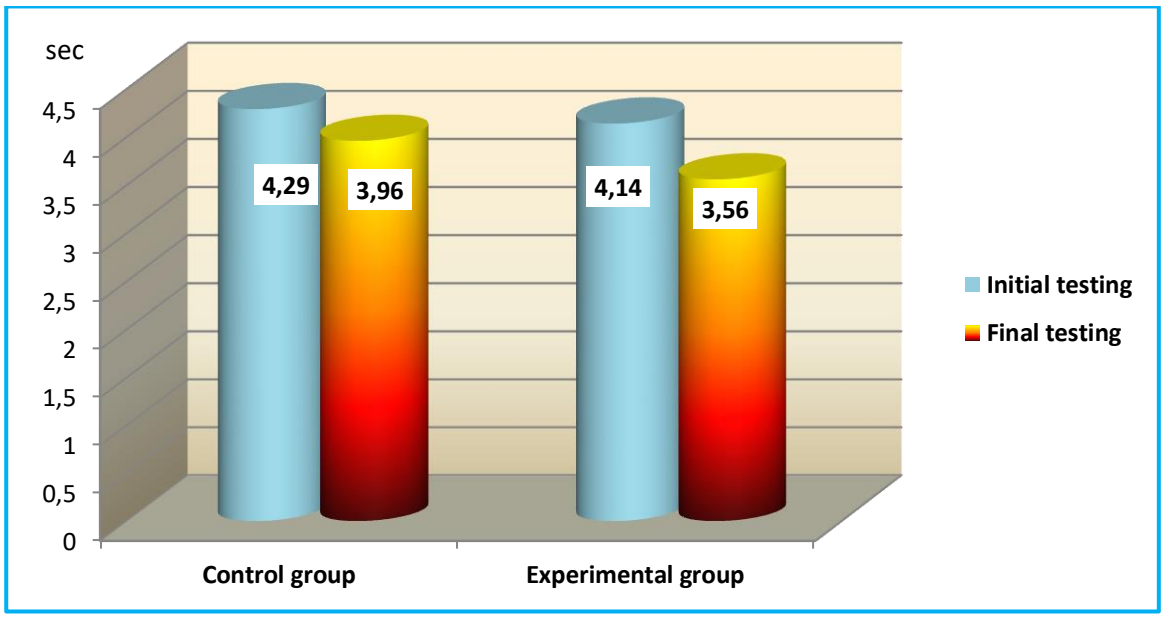


Chart 8. Annual dynamics of border police employees test results at "Running of 1000m", sec

Analyzing the results in annual dynamics, it was established that the border police employees from the control group registered a progress of about 8% (t = 2.36; P <0.05), and those from the experimental group of 14%, at the threshold of mathematical-statistical significance t = 2.67; P <0.05, which indicates that the body of the people in the experimental group adapted better and proved to be more resistant to moderate physical exertion, compared to those in the control group, and this result could be the result of the implementation in this group of technologies to stimulate and restore the organism.

In the structure of the results of the final evaluation of the experimental group, the quota of border police employees who took the test "Running at 1000 m" with grades 10-9 and 8-7 is 83.3%, and in the control group only 50%, which

indicates, in the opinion our, the improvement of the functional state of the organism of the border police employees, which led to the increase of the quota of the contingent resistant to the resistance efforts.

Traction at the fixed bar. From Chart 9 we notice that the average group value of the number of tractions performed by the border police employees from the control group at the initial test was 10.58 ± 0.55 repetitions, while the respective value in the experimental group was 10.42 ± 0.42 repetitions , the differences being insignificant from a mathematical-statistical point of view (t = 0.23; P>0.05).

In the final test, both groups improved their results, reaching values of 11.33 ± 0.65 repetitions in the control group and 11.82 ± 0.53 repetitions in the experimental group, at the threshold of statistical mathematical significance t = 1.44 ; P>0.05 - in the control group and t = 3.50; P <0.01 - in the experimental group.

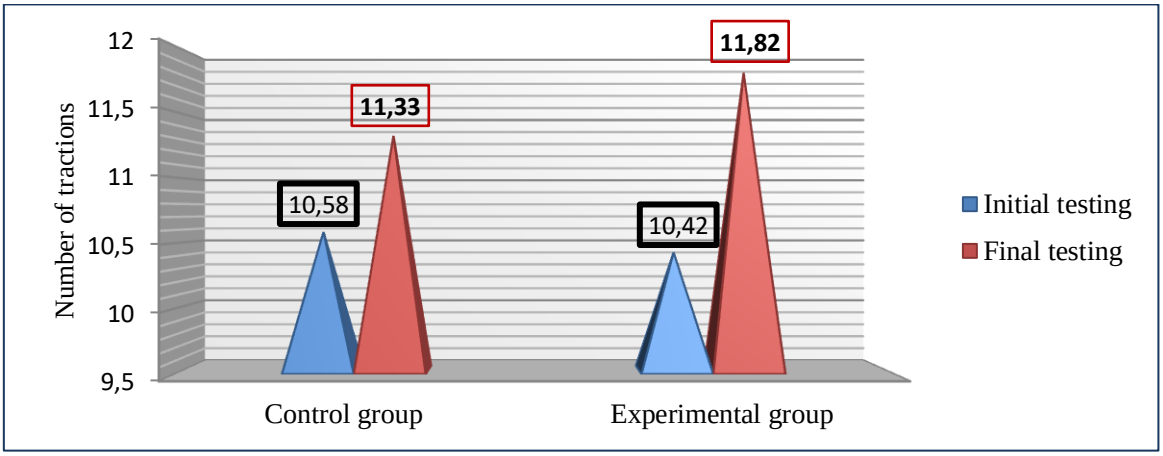


Chart 9. Annual dynamics of the results of the border police employees testing at the "Traction at the fixed bar" test, number of repetitions

At the initial testing, the maximum numbers of the experimental group were 14 - 16 tractions, and with grades of 10 and 9, 33.33% of the border police employees were evaluated. At the final test this share increased to 50%. These results express the tendency of border police officers to continuously develop and improve their qualities of strength, especially necessary for professional

activity, from the perspective of combating border crime and ensuring the security of the state borders of the Republic of Moldova.

Conclusions:

1. The border police employees from the experimental group, who used during the pedagogical experiment technologies for the restoration and recreation of the organism, *significantly improved the productivity of intellectual work, the efficiency of the visual analyzer, speed of processing visual information and stability of attention.*

2. At the final test, the border police employees from the experimental group obtained better results, compared to the results of the initial test. Thus, the number of *tractions at the fixed bar* increased by 13% ($t = 3.50$; $P < 0.01$), the speed of *running distance at 100 m* - decreased by 3% ($t = 2.63$; $P < 0.05$), and the one from *running at 1000 m* - by 14% ($t = 2.67$; $P < 0.05$).

3. The evaluation of the results of the test of motor qualities in annual dynamics shows that in the experimental group:

- the quota of people who took the test "Running at 100 m" with grades 9 and 10 increased from 41.67% - at the initial test, to 58.33% - at the final test;
- at the final testing the quota of the persons who took the test "Running at 1000 m" with grades 10-9 and 8-7 is 83.3%;
- the quota of people who took the test "Traction at the fixed bar" on grades 9 and 10, increased from 33% - at the initial test, to 50% - at the final test.

4. The comparative analysis of the results of the initial and final testing of the level of motor training of the border police employees in the control and experimental groups allowed us to find that the technologies for the restoration and recreation of the organism, used by us in the pedagogical experiment, contribute to improving the degree of their physical training.

5. The technologies for the restoration and recreation of the organism have contributed to the improvement of mental and physical performance indicators of border police employees, which indicates the need for their implementation in their daily activities.

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