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SELECTION CRITERIA FOR MILITARY AVIATION PENTATHLON ACCORDING TO THE SENSORIMOTOR COORDINATION OF ATHLETES

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Purpose: to analyze the initial indicators that characterize the level of development of sensorimotor coordination and physical (motor) readiness of cadets of higher educational estasblishment for further sports activities in military aviation pentathlon.

Material and methods: analysis of literature sources, questionnaires, testing, statistical analysis. The reseach involved 48 first-year cadets of the Kharkiv National University of the Air Force named after Ivan Kozhedub (men), aged 17-18 years old, of which 38 Candidates Master of Sports and 10 Masters of Sports.

Results: the initial indicators of candidates for further sports activities in military aviation pentathlon were analyzed. The distribution of candidates by sports such as game, cyclic, complex coordination and martial arts. Using the definition that sensorimotor coordination is an integrated indicator of the functioning of the body's sensory systems, tests were selected and systematized, the indicators of which characterize the coordination abilities. The analysis of results in the form of the

verbal description, tables, the analytical description of the received regularities is carried out.

Conclusions: determined the heterogeneity of the initial indicators of sensorimotor coordination of candidates for the national team in military aviation pentathlon. It is necessary to develop a single universal training algorithm with the definition of mandatory control points - periods of determining the leading opportunities and the development of a set of additional exercises to improve certain indicators of sensorimotor coordination in accordance with the sport in which the cadets was engaged before entering.

Keywords: military-aviation pentathlon, obstacle course, sports orientation, sensorimotor coordination.

Introduction

It is known that the components of international military aeronautical pentathlon are piloting (not included in the competition), shooting from a large-caliber pistol (revolver) at 25 meters, swimming at 100 m with obstacles, fencing, basketball test (4 exercises with ball) and overcoming the obstacle course and orienteering [1, 2]. The results of the competition are determined in individual and team competitions. Personal place is determined by the highest sum of points scored by the participant in each discipline. The final, decisive stage, which takes place on the last day of the competition, is overcoming the obstacle course and orienteering [3, 4]. Despite the fact that these two varieties exist separately as independent sports, in international military aeronautical pentathlon they are combined into a single stage, which is held on the last day of competition and is crucial in determining the level of training of athletes [5, 6] . It is when performing tasks that are mandatory when overcoming the obstacle course and combine the largest number of exercises that depend on the coordination capabilities of the athlete, as well as performed on the maximum possible speed and strength, the body functions at the limit of its own physical opportunities. Further "legend" that the athlete must go through during

further orienteering, also requires maximum speed and endurance, but also requires the athlete to involve his sensori-motor, cognitive and analytical abilities [7, 8].

Both theoretical and practical methods are important in preparation for competitions. Since "coordination" is overcoming the excessive degrees of freedom of our organs of movement, i.e. turning them into controlled systems [9], it is important not only to be able to perform tasks during training, but also to know all the sensory and motor components of basic exercises, at the appropriate level is crucial in the results of competitions, etc. [10]. When planning the stages and components of the training period, it is important to determine the initial, intermediate and maximum indicators of sensori-motor coordination, which in international military aeronautical pentathlon are the leading indicators that predict the outcome of the competition. Since the maximum realization of the abilities of this indicator occurs during the last decisive day of the competition - overcoming the obstacle course and orienteering - this segment was chosen to determine the purpose of the reseach.

Purpose of the reseach is to analyze the initial indicators that characterize the level of development of sensorimotor coordination and physical (motor) training of first-year cadets of higher education, who are candidates for the national team in international military aeronautical pentathlon.

Material and Methods of research

The research involved 48 first-year cadets of the Kharkiv National University of the Air Force named after Ivan Kozhedub (men), aged 17-18, including 38 candidates for Masters of sports and 10 Masters of sports. All candidates for further training in military aeronautical pentathlon were divided into four groups by sport, namely: game (group I - 12 cadets), cyclic (group II - 14 cadets), complex coordination (group III - 10 cadets), martial arts (group IV - 12 cadets). The cadets who participated in the research were randomized by age, anthropometric, and general health.

Testing was conducted during the first week of training (ie 01.09.2018 - 08.09.2018).

To solve the purpose and objectives of the research, we selected and systematized nine tests, the indicators of which characterize the coordination abilities of the subjects [6]. A feature or criterion of evaluation, which was chosen as the basis for the selection and systematization of tests for measuring and evaluating coordination abilities, was the definition of sensorimotor coordination as an integrated indicator of the functioning of sensory systems of the body [10].

The following tests were selected:

1. Test 1 - study of static balance of the body (Biryuk test). Performing the exercise: vertical stand on high toes, feet closed, arms up, eyes closed. Fix the position of the body for a long time (without getting up);

2. Test 2 - a study to assess vestibular sustainability in terms of dynamic equilibrium (Barany test). Exercise: sitting in Barany chair, head tilted to his chest (30 °), eyes closed. Perform ten turns of the chair clockwise for 10 seconds. After stopping the chair, get up and walk in a straight line of five meters, look in front of you, hands down. The arithmetic mean of the sum of six deviations of the body to the left and right of a straight line (cm) is calculated;

3. Test 3 - study of statodynamic sustainability of the body (test with forward tilts). Performing the exercise: squatting from the stop, perform five forward throws in the group for 5 s, followed by ten jumps on the spot, as high as possible, in the center of the circular calibration. Jumps are performed with closed feet, hands on the waist, looking forward. The arithmetic mean of the three largest deviations from the center of circular calibration was estimated;

4. Test 4 - a study of the level of development of coordination skills (coordination test in difficult conditions). Performing coordination exercises - from the starting position of the main rack: 1. Left hand on the belt. 2. Right hand on the belt. 3. Left hand-in-hand. 4. Right hand-in-hand. 5. Left hand up. 6. Right hand up. 7 - 8. Two applause. 1 - 6. Move your hands down in reverse order. 7 - 8. Two claps of the hands on the thighs. The exercise was evaluated by experts on a ten-point scale. For each incorrectly performed movement subtraction of 0.5 points was carried out;

5. Test 5 - study of spatial orientation in conditions of short-term weightlessness and proprioceptive sensitivity in changed conditions (test of spatial orientation). Exercise: Squeeze the dynamometer with a comfortable hand with a force of 200 N. Three attempts to perform with visual control and three attempts - without visual control when performing a deep jump with the adoption of a straight body position from a height of 3 m and hanging on bent legs at the top poles of bars of various height. Predominant irritation of the otolith analyzer. Assessment: the average of the three attempts should not exceed 10 N;

6. Test 6 - study of stable landing when performing a deep jump (landing test). Exercise: jump from a height of 3 m take a straight position of the body in the center of the circle on soft mats. The quality of landing and the nature of errors when landing on a 10-point scale were determined: a small error of 0.2 points, medium - 0.5 points, fall - 1 point. Score: average of three attempts;

7. Test 7 - study of dynamic equilibrium when passing the perimeter of a polygon (dynamic equilibrium test). Exercise: stand on one of the faces of the polygon, put your hands on your waist and start moving along the faces. Perform each step on only one side, look ahead. Movement is carried out until the first loss of balance (movement of hands, torso, touching the foot with support). ± The number of passed faces is taken into account.

Methods of parametric statistics were used to process the obtained data (Glanz S., 1999). Statistical processing of data entered in Excel spreadsheets was performed. Quantitative characteristics of the main functional indicators were processed statistically, namely, determined the arithmetic mean, the error of the mean. The significance of the obtained data was checked using Student's t-test (for $n < 100$) at a given level of reliability $p = 0.95$. To be able to use the Student's t test, the Fischer-Snedekor test was calculated - the ratio of the larger variance to the smaller. All mathematical operations and graphical constructions were performed using the software packages "Microsoft Office XP": "Microsoft XP Home" and "Microsoft Excel XP" on a personal computer (license numbers: 00049 153 409 442 and 74017 640 0000106 57664, respectively).

Results of the research

During the statistical analysis, the obtained data were entered into a table, on the basis of which a diagram of the dependence of the initial sensorimotor abilities of the subjects on sports activities, which was in them on the eve of admission to the university: game (group I - 12 cadets), cyclic 14 cadets), complex coordination (group III - 10 cadets) and martial arts (group IV - 12 cadets) (Tables 1, 2).

Table 1

The results of the initial testing of first-year cadets with the definition of sensorimotor parameters, + m

№	Test	Group I (n_1=12)	Group II (n_2=14)	Group III (n_3=10)	Group IV (n_4=12)
1	Test 1, c.	7,11±0,42	7,61±1,72	8,48±0,37	7,42±1,61
	Test 1: t, p	$t_{1,2}$=1,53 ($p_{1,2}$>0,05); **$t_{1,3}$=2,45 ($p_{1,3}$<0,05);** $t_{1,4}$=1,62 ($p_{1,4}$>0,05); $t_{2,3}$=1,32($p_{2,3}$>0,05); $t_{2,4}$=1,48 ($p_{2,4}$>0,05); $t_{3,4}$=0,52 ($p_{3,4}$>0,05)			
2	Test 2, см	20,41±1,42	18,24±1,81	12,17±1,67	14,21±1,26
	Test 2: t, p	$t_{1,2}$=1,63 ($p_{1,2}$>0,05); **$t_{1,3}$=3,76 ($p_{1,3}$<0,01); $t_{1,4}$=3,26 ($p_{1,4}$<0,01); $t_{2,3}$=2,47 ($p_{2,3}$<0,05); $t_{2,4}$=2,75 ($p_{2,4}$<0,05);** $t_{3,4}$=1,51 ($p_{3,4}$>0,05)			
3	Test 3, см	24,62±2,72	22,8±2,10	14,31±1,64	13,94±1,92
	Test 3: t, p	$t_{1,2}$=0,53 $p_{1,2}$>0,05; **$t_{1,3}$=3,24 $p_{1,3}$<0,05; $t_{1,4}$=3,22 $p_{1,4}$<0,01; $t_{2,3}$=3,19 $p_{2,3}$<0,01; $t_{2,4}$=2,41 $p_{2,4}$<0,05;** $t_{3,4}$=0,34 $p_{3,4}$>0,05			
4	Test 4, бали	9,72±0,47	9,81±0,74	9,86±0,27	9,81±0,24
	Test 4: t, p	$t_{1,2}$=0,10 ($p_{1,2}$>0,05); $t_{1,3}$=1,41 ($p_{1,3}$>0,05); $t_{1,4}$=0.28 ($p_{1,4}$>0,05); $t_{2,3}$=0,22 ($p_{2,3}$>0,05); $t_{2,4}$=0,12 ($p_{2,4}$>0,05); $t_{3,4}$=0,66 ($p_{3,4}$>0,05)			
5	Test 5, N	218,17±6,81	221,49±6,40	204,31±4,60	206,82±6,44
	Test 5: t, p	$t_{1,2}$=0,31 ($p_{1,2}$>0,05); **$t_{1,3}$=2,57 ($p_{1,3}$<0,05);** $t_{1,4}$=1,62 ($p_{1,4}$>0,05); **$t_{2,3}$=2,18 ($p_{2,3}$<0,05);** $t_{2,4}$=1,42 ($p_{2,4}$>0,05); $t_{3,4}$=0,38 ($p_{3,4}$>0,05)			

When analyzing the data in Table 1, during the assessment of static balance by Biryuk breakdown, it was determined that the most effective was the possession of body stability in the subjects of group III, i.e. cadets who trained in complex coordination sports, which was 8.48 ± 0.37 s., The worst were the figures of this indicator in group I - game sports - 7.11 ± 0.42 s., Which indicates the mandatory additional inclusion in the training process for cadets of this group of exercises to improve stability body.

Table 2

The results of the initial testing of first-year cadets with the definition of sensorimotor parameters, abs. (%)

№	Test	Group I (n_1=12)	Group II (n_2=14)	Group III (n_3=10)	Group IV (n_4=12)
1	**Landing test (Test 6)**				
	- a small mistake	7(58%)	8(57%)	9(90%)	9(75%)
	- average error	4(34%)	4(29%)	1(10%)	3(25%)
	- fall	1(8%)	2(14%)	0	0
2	**Dynamic equilibrium test (Test 7)**				
	- 0-14 circles	0	0	0	0
	- 15-29 circles	2(16%)	4(28%)	1(10%)	5(41%)
	- 30-45 circles	10(84%)	10(72%)	9(90%)	7(59%)

In determining the vestibular sustainability on the breakdown of Barany, it was determined that, despite the high achievements in sports on the eve of admission to the university, in the vast majority of all studied after turns there is a discoordination of vertical body position: the worst indicators were in group I - playing sports (20 , 41 ± 1.42 cm), and group II cyclic sports (18.24 ± 1.81 cm), the best in group III - complex coordination sports (12.17 ± 1.67 cm) and group IV - martial arts (14.21 ± 1.26 cm). Thus, vestibular sustainability, as an important element of overcoming the obstacle course and orienteering, at the initial level of cadets aspiring to the national team in international military aeronautical pentathlon is compromised and requires additional introduction into the training process of exercises that would affect its further development and improvement.

In turn, the vestibular load, which we determined during the experiment on the breakdown with forward rolls, also determined a large difference in performance between groups, which depended on the type of sports activity the day before. Thus, the worst dynamic sustainability was determined in groups I and II, where after five twists the subjects were unable to perform ten jumps in the center of the graduated circle and jumped out of it and made a fall at a distance of 24.62 ± 2.72 cm and 22 , 8 ± 2.10 cm, respectively. In groups III and IV, this figure was 14.31 ± 1.64 cm and 13.94 ± 1.92 cm, respectively, which is better than in cadets of groups I and II. Thus,

it can be noted that game and cyclic sports to a lesser extent develop adaptation to the vestibular load than complex coordination and martial arts. Given the difference between the indicators of groups I and II from the indicators for this breakdown in groups III and IV, it is important to introduce additional exercises into the training process, which would increase the resistance of athletes to vestibular load.

When determining the level of development of coordination skills when performing a test for coordination in difficult conditions, take into account the level of average and above average, as low level of development of these abilities cannot be at all when achieving high results in sports regardless of its type [10]. Therefore, during the analysis of this indicator in the studied all four groups a high level of coordination abilities was determined, the figures in groups I, II, III and IV were 9.72 ± 0.47 points, 9.81 ± 0.74 points, 9.86 ± 0.27 points and 9.81 ± 0.24 points, respectively, without any differences between them. Thus, it can be noted that during the training process, given the initial level of this indicator as high, there is no need for additional introduction of special exercises that would affect the development of coordination skills, i.e. when planning an algorithm for training an athlete in international military aeronautical pentathlon these abilities only need to be improved.

During the tests to determine the ability of spatial orientation, the subjects of groups I and II made excessive muscle effort, which is confirmed by exceeding them by more than 10% of 200 N - 218.17 ± 6.81 N and 221.49 ± 8 , 40 N, respectively. In the studied groups III and IV, these indicators were 204.31 ± 8.60 N and 206.82 ± 8.44 N, which coincides with the possible deviation and meets the standard. Therefore, athletes who have achieved achievements in game and cyclic sports the day before, when intending to be a member of the national team in international military aeronautical pentathlon, should pay attention to increasing the level of adaptation to spatial orientation.

Data from the results of a complicated coordination test show that the best indicators of stable landing when performing a deep jump in groups III and IV, where a small error was found in 90% and 75% of cadets, respectively, in groups I and II a

small error was in 58% and 57% of subjects, respectively. Only cadets of groups I and II had falls, 8% and 14% of them. But the exaggeration of the number of cadets in each of the groups, who almost did not make a mistake when performing a complex test for coordination confirms the preliminary data that indicate the need for additional introduction of special exercises that would affect the development of coordination skills in the main training program military aeronautical pentathlon.

In the analysis of dynamic equilibrium during the passage of the faces of the polygon, in contrast to the data of the previous test, the worst indicators were in the subjects of group IV, where the maximum number of circles (30-45) passed only 59% of them. At the same time, in group III this indicator was the highest - 90% of cadets overcame the maximum number of laps. In groups I and II the data were identical, the greatest distance was covered by 84% and 72% of cadets, respectively.

Conclusions / Discussion

Given the heterogeneity of the starting capabilities of the body of athletes in determining the composition of the national team in military aeronautical pentathlon, it was determined that the selection for the team requires a more thorough assessment the day before. Although the results of the initial analysis confirm the importance of each of the categories of sports (game, cyclic, complex coordination, martial arts), it is important to determine the modal characteristics of the components of training, comparison with the results for each category of sports and development of training programs for each group. categories) of athletes to increase their performance in accordance with the modal.

Introduction of sensorimotor-coordination abilities testing to the national team of international military aeronautical pentathlon during the process of selection of athletes is an important point in determining the appropriate algorithm for further training. The data that provide the most objective assessment of the athlete's abilities depending on the sporting achievements the day before (sport) provide an opportunity to timely and maximally promote the inclusion of the athlete in the training process to prepare for international military aeronautical pentathlon. Overcoming the obstacle course and sports orientation requires the presence of the maximum number of

sensorimotor qualities in one athlete per unit time, thus being the most demanding stage of training.

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