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THE STATE OF DEVELOPMENT AND RELATIONS OF COORDINATION ABILITIES OF PRIMARY SCHOOL PUPILS WHO BELONG TO SPECIAL MEDICAL GROUP

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The results of the study show that the indices of physical development of pupils who belong to special medical group are within the age norms. The correlative relations are found between the indices of physical state of pupils. The anthropometric indices that are within the limits (r = 0,50; r = 0,81) are the most interconnected. They have somewhat fewer number of dependencies with the indices of physical conditioning and functional capacity of the organism (r = 0,35; r = 0,55). Some reverse relations between the indices that are within the limits (r = - 0,51; r = - 0,54) show the necessary of the development and improvement of coordination abilities.

Keywords: coordination, primary school pupils, special medical group, physical development, functional ability, physical conditioning.

Introduction. National Doctrine for Development of Physical Culture and Sports of Ukraine points out the necessity to use different forms and means of physical education to improve and enhance physical development and health of different groups of Ukrainian population. The development of all important motor characteristics, especially coordination, is one of the promising trends in the system of physical education. These characteristics should be developed from preschool and early school age because the coordination abilities are very diverse and specific; the dynamics of the development of this ability in ontogeny has unique pattern of influence for every person [1; 3; 9; 14]. Bernstein, N.A. [2] states that coordination abilities are the foundation of agility. This point of view is supported by other scientists [5; 8; 16], who define the coordination abilities as a unity of two properties: the ability quickly to master new movements and the ability quickly and in coordination to rebuild motor activity in terms of immediate change of conditions.

The peculiarities of physiological and physical development of children aged 7-10 years old were studied by many scientists [4; 7; 9; 10; 16], who noted that this very age is functionally prepared for the development of coordination abilities. The early school age is the most crucial period in the process of formation of the vital functions and systems of the human organism. The acquisition of new unknown exercises and activities facilitates the health system strengthening and the development of physical qualities, which are necessary for efficiency in various forms of physical activity. When developing the coordination, the following should be considered: 1) the ability to evaluate and regulate dimensionally - time and dynamic parameters of movements; 2) the ability to remain steady (balance); 3) the sense of rhythm; 4) the ability to orient

oneself in space; 5) the ability to relax the muscles with ease; 6) the coordination of movements [12].

In the process of child development, the body changes itself as a whole; its structural and functional features are caused by the interaction of all organs and systems at different levels of integration. For this reason as the criteria for age periodization the integral indices such as growth and change of body form, morphofunctional differentiation of physiological systems and behavior peculiarities were used repeatedly [7].

Unfortunately, nowadays there are many factors that affect the development of the organism. Since the early school age, there is a trend of rapid enrollment of students to special medical group for physical education classes at schools. Therefore, we believe that the determination of the state of development and relations between the indices of coordination abilities of primary school pupils of special medical group is the urgent task today.

The **goal** is to determine the state and relations of coordination abilities of pupils of special medical group at primary school.

Materials and methods. To reach the goal, we have analyzed the scientific-methodological sources on the topic of research, carried out teaching testing and mathematical calculation of the results, conducted comparative analysis of the development of pupils in different age and sex groups; defined the relations between indices.

The study was conducted in 2013-2014 with primary school pupils of special medical groups at secondary schools in the cities Lutsk and Kherson. The total number of participants of the survey made 300 pupils, 143 boys and 157 girls. To determine the physical development, the anthropometric measurements of length and weight of the body and chest circumference at rest during the maximum inhalation and exhalation were taken. Functional abilities of the pupils were determined by measuring lung capacity, heart rate and blood pressure at rest [6]. When determining coordination abilities we used

differentiated tests offered [13] to measure the balance (static and dynamic), orientation in space, sense of time, as well as power indices.

The results of study and discussion. The results of the study show the level of physical development of boys, namely body length is 129.6 - 140.6 cm; chest circumference at rest is 65.4 - 68.8 cm; during the maximal inhalation it is 67 - 71.1 cm and during the maximal exhalation it makes 64.6 - 68.2 cm (Table 1).

Table 1

Indices of physical development and function abilities of primary school pupils of special medical group, $\overline{X}$

Age	Sex	Показники								
		Body length (cm)	Body weight (kg)	CC (cm)	CC during inhalation (cm)	CC during exhalation (cm)	VC (ml)	Heart rate (bpm)	Blood pressure (systolic mmHg)	Blood pressure (diastolic mmHg)
7	B	129,6	28,4	65,4	67,8	64,6	1416,6	94,3	100,4	61,2
	G	128,2	27,5	63,2	65,6	62,5	1118,7	93,7	100,4	60,06
8	B	131,8	30,9	65,6	67,9	64,9	1294,6	92,3	99,9	61,01
	G	130,3	28,7	64,9	67,1	64,3	1218,1	90,4	100,8	62,4
9	B	137,2	35,7	68,8	71,3	68,1	1510,2	92,2	103,6	62,8
	G	135,2	31,4	65,5	67,9	64,7	1420,8	88,7	100,1	61,4
10	B	140,6	35,8	68,8	71,1	68,2	1671,1	91,1	102,2	62,1
	G	139,9	36,1	68,6	71,1	67,6	1556	89,2	102,3	62,6

Describing the results of girls, it may be noted that the average body length makes 128.2 - 139.9 cm that is 1.4 - 0.7 cm less than boys have. Body weight in the age of 7 was 27.5 kg. It increased by 10.51 kg (36.01 kg) in the age of 10. Indices of chest circumference at rest increased from 63.2 to 68.6 cm. Overall indices of physical development are within the age norms. To determine coordination abilities we used specially selected tests, results of which are shown in the Table 2.

Table 2

The indices of coordination abilities development of pupils of special medical group aged 7-10 years old

Indices of tests	Age, sex							
	7		8		9		10	
	B	G	B	G	B	G	B	G
Test 1 (the number of jumps, m)	315,8	324	355,8	342,5	388,3	361,1	401,6	358,2
Test 2 (turns on the gym bench, s)	19,8	22,2	21,4	19,6	20,3	20,4	21,9	22,6
Test 3 (leans with various parts of the body, s)	14,5	16,7	18	17,4	17,1	15,8	20,7	17,6
Test 4 *'Flamingo'*	9,91	8,37	11,4	8,43	9,69	8,68	9,36	8,08
Test 5 (walking with closed eyes, cm)	202	165,1	203,6	167,9	172,6	202,2	211,8	217,5
Test 6 (turns and walking with closed eyes, cm)	353,7	330	375,5	347,1	379	372,1	393,5	387,1
Test7(dynamometry of the right hand, kg)	7,75	5,5	7,96	6,52	9,20	8,39	10,9	9,36
Test 8 (dynamometry of the left hand, kg)	6,33	3,62	6,10	5,22	7,56	6,25	9,23	7,46
Test 9 (long jump, cm)	109,2	109,1	118,4	113,4	125,2	119,7	131,6	118,2
Test 10 (reproduction of time in 30 s)	10,85	12,3	11,6	11,5	11,2	10,8	9,72	9,25
Test 11(movement in space, s)	1,49	2,23	1,71	1,87	1,71	1,90	1,67	2,20

Comparing the average data and number of jumps, it can be noted that boys and girls have the gradual change of indices at each age period, but at the age of 7 the number jumps of girls was better by 8.2 cm in contrast to the performance of boys. In case of turns on the gym bench, the time spent on exercise by 7-year-

old boys was 19.8 s. At the age of 8-10 this dynamic balance became worse and in average made 21.9 s. The results of girls remained almost the same in a static balance exercise in the test *'Leans'* from 16.7 to 17.6 s and in the test *'Flamingo'* from 8.37 to 8.08 s. The best straightness of walking with closed eyes was observed in 7-8-year-old girls and made 165,1-167,9 cm. Boys had the minor difference of 172 cm only at the age of 9. After turns and walking with closed eyes the average meaning that girls had was 330-347,1 cm and 7-year-old boys had 353.7 cm.

When analyzing differentiation of power indices during the dynamometry of the right and left hands the increase of results of all pupils is observed. However, the overwhelming number of boys aged 7 to 10 years old have the best indices of dynamometry of the right hand that make 7,75 -10,9 kg and dynamometry of the left hand that make 6,3-9,2 kg. For girls, these indices make 5,5-9,3 kg for right hand and 3,6-7,4 kg for left hand. Comparing long jumps of 7-year-old boys and girls, the same results (109.2 and 109.1 cm) are observed.

Regarding the comparison of results with those of the other authors [10; 14], they generally do not differ significantly. One can only note their results are somewhat lower for children aged 8 to 10 years old.

Determining the ability to sense the time in the test *'Reproduction of time'*, the smallest difference is observed for girls aged 10 years old and it makes 9.25 s and for boys of the same age it makes 9.72 sec. But 7-year-old boys and 8-year-old girls have better sense of time in space. The analysis of the data of differentiated tests helped us discover the dynamics in the development of the certain types of coordination of primary school children of special medical group and to establish that the coordination abilities development runs differently because of the age and sex.

According to the data of dynamic equilibrium determination (Test 1, Test 2) between boys and girls in the age of 7-10 years old we can affirm that higher increase is found for boys and makes 27.2% and 10.6%. Girls seem to have

slightly lower performance with the number of jumps, changes in the increase showed 10.6% and in case of turns on the gym bench it made just 1.8% (Figure 1).

Static balance at the age of 7 - 10 years old (test 3) increased by 42.2% for boys and only by 5.4% for girls. Minor changes of improvement occurred during the test no. 4 '*Flamingo*'. For boys it makes 5.9% and for girls – 3.6%.

If you compare the ability of orientation in space, namely the deviation from the given norm, the worse situation is observed for girls while walking with closed eyes (test 5). For boys, compared to girls during the test 5, the deviation was only 4.9% and then after the turns and walking made 11.3%.

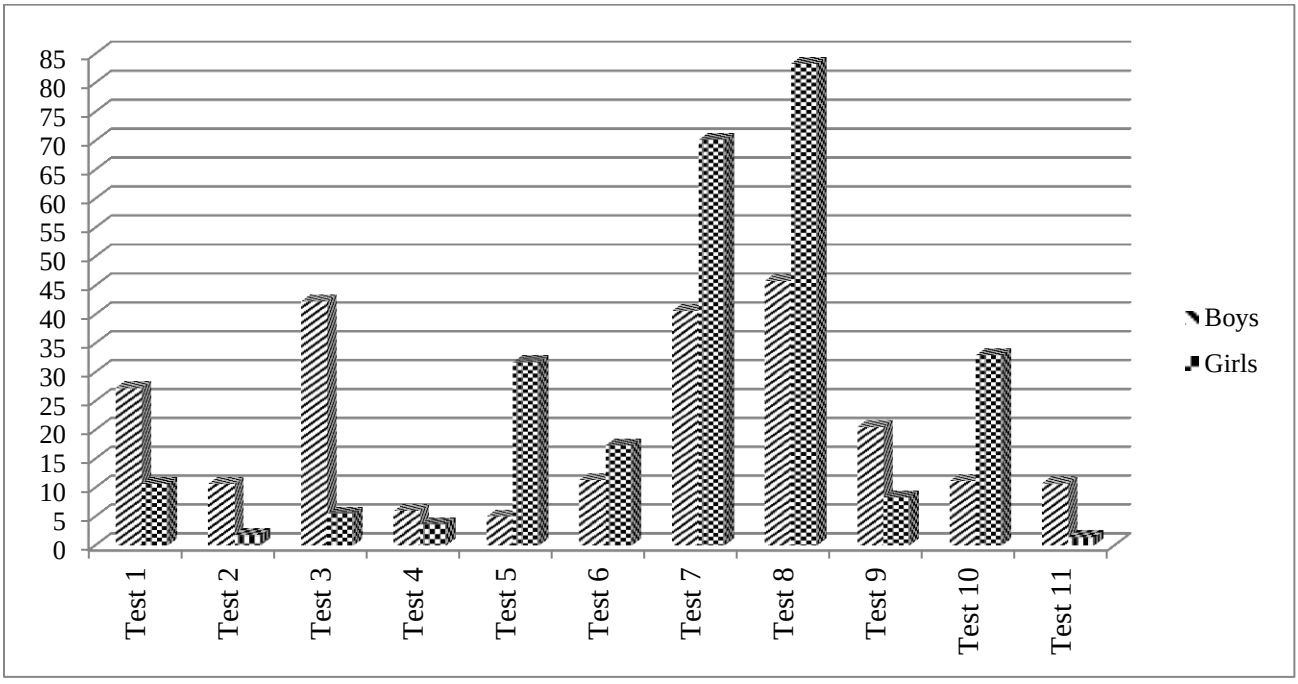

Fig.1. The dynamics of coordination abilities development between 7-10-year-old pupils of special medical group

The most intensive development while determining the power indices takes place during dynamometry of the right and left hands (70.1% and 83.3%) for girls. For boys, the increase was 40.6% and 45.8%. But even bigger increase by 20.5% is observed when measuring the long jump compared to the index of

8.3% for girls. The indices for sense of time for 7-10-year-old pupils point out the reduction of the difference during the reproduction of time by girls (32.9%) and by boys (11.1%).

The final task was to determine the relations between the indices of physical development and coordination abilities of boys and girls who belong to special medical group. Results of the study showed the correlation between body length and chest circumference at rest (r = 0,50); circumference of chest during the inhalation (r = 0,51); circumference of chest during the exhalation (r = 0,52) and vital capacity (r = 0,48). Body weight of boys correlates closely with chest circumference: at rest (r = 0,74); during the inhalation (r = 0,73); during the exhalation (r = 0,76) and such index as systolic blood pressure (r = 0,45).

Positive relations occur between dynamic balance (the number of jumps) and vital capacity (r = 0,46); '*Leans with various parts of the body*' has a great relation to turns on the gym bench (r = 0,67). Power indices (dynamometry of the right hand) correlates with vital capacity (r = 0,40) and static balance, namely with leans with various parts of the body (r = 0,42).

The dynamometry of the left hand has significant relations with the chest circumference at rest (r = 0,45); during the inhalation (r = 0,43); during the exhalation (r = 0,42); vital capacity (r = 0,50) and dynamometry of the right hand (r = 0,67). It should be noted that long jump has only positive correlation with the dynamic balance (the number of jumps) (r = 70) and turns on the gym bench (r = 0,43). The sense of time (15 s) has direct connection with the sense of time in 30 seconds. (r = 0,43).

A higher number of negative relations are found between the indices of physical conditioning, functional abilities and anthropometric data, namely the turns on the gym bench with vital capacity (r = - 0,47); leans with various parts of the body (r = -0,53) and the number of jumps (r = - 0,50). The orientation in space correlates with the body length (r = - 0,37); chest circumference at rest (r = - 0,43), during the inspiration (r = - 0,44), during the exhalation (r = - 0,46)

and vital capacity (r = - 0,57). The negative relations are observed between dynamometry of the left hand and orientation in space (r = - 0,41).

The correlation of anthropometric data of girls and boys do not differ significantly. The body length of 8-year-old girls has a direct relation to the body weight (r = 0,53), chest circumference at rest (r = 0,56), circumference of the chest during the inhalation (r = 0,57), circumference of the chest during the exhalation (r = 0,52) and vital capacity (r = 0,55). Body weight with the same indices has very high correlation with the chest circumference at rest, during the inhalation and exhalation (r = 0,81). Moderate connection is observed with systolic blood pressure (r = 0,35). That is the length and weight of the body that directly affect the chest circumference at rest and during the maximal inhalation and exhalation.

High relations between static and dynamic balance are observed (the turns on the gym bench (r = 74)) analyzing the results of test *'Flamingo"* (r = 0,66). Walking with closed eyes has the same average correlation with turns on the gym bench and leans with various parts of the body (r = 0,50). Dynamometry of the left hand correlates with vital capacity (r = 0,44); dynamometry of the right hand correlates with leans with various parts of the body (r = 0,50) and dynamometry with he left hand (r = 0,52). Long jumps has the relations with a number of jumps (r = 0,75). Reverse relations are observed between the number of jumps and body length (r = - 0,40); body weight (r = - 0,51) and chest circumference (r = - 0,58).

Vital capacity negatively correlates with the turns on the gym bench (r = - 0,55); leans with various parts of the body (r = - 0,59), turns on the circle *'Health'*, walking in a straight line (r = - 0,54) and test '*Flamingo*' (r = - 0,61). The results of the long jump have no relations with body weight (r = - 0,55); chest circumference at rest (r = - 0,54) and during the maximal inhalation (r = - 0,53). The ability to reproduce the time negatively correlates with dynamometry of the left hand (r = - 0,51).

Thus, these results confirm the existence of specific manifestations and relations between all performance indices of primary school pupils who belong to special medical group and state the necessity for purposeful development.

Conclusions. The results of the study show that the indices of physical development of pupils who belong to special medical group are within the age norms. Altogether, the pattern of gradualness was revealed, not a straight increase of functional abilities and physical conditioning of pupils.

Dynamic and static balance develops most rapidly for boys. Girls have better positive changes in orientation in space.

The correlative relations are found between the indices of physical state of pupils. The anthropometric indices that are within the limits (r = 0,50; r = 0,81) are the most interconnected. They have somewhat fewer number of dependencies with the indices of physical conditioning and functional capacity of the organism (r = 0,35; r = 0,55). Some reverse relations between the indices that are within the limits (r = - 0,51; r = - 0,54) show the necessary of the development and improvement of coordination abilities.

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