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The scientific electronic periodical journal 'Sports Science and Human Health' highlights the results of scientific research in different fields of sports, physical education, physical culture, sports medicine, physical therapy, ergotherapy, modern recreational and health-improving technologies, as well as research related to human health and those to be valuable for ensuring the innovative development of Ukraine.

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## COMPARATIVE CHARACTERISTIC OF COORDINATION ABILITIES DEVELOPMENT AMONG 7-9-YEAR-OLD SCHOOLCHILDREN AND THEIR AGEMATES DOING TAEKWONDO SYSTEMATICALLY

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### Author contribution:

A – study concept and design; B – data collection; C – data analysis and interpretation; D – paper writing; E – paper editing; F – paper final adoption

### Abstract

*Introduction.* Establishing schoolchildren's health and full development of their bodies is one of the major issues in nowadays society. Determining efficient methods of developing coordination abilities among schoolchildren by means of combat sports during extracurricular forms of physical education organization is quite important, as the need in searching for and using efficient methods aimed to develop physical, mental and intellectual characteristics among elementary school-aged children.

The *aim* is to determine the differences in the level of coordination abilities development among schoolchildren systematically training in the taekwondo class compared to the children training upon the standard program.

*Material and methods:* the analysis and synthesis of research and methodological resources and Internet data, questionnaire, pedagogical observation, pedagogical experiment, pedagogical testing, methods of mathematical statistics.

*Results.* The age of 5-7 years old is a sensitive period for coordination abilities development. The age of 7-11 years old gives the second effect in strength to these abilities' development. So, coordination abilities among elementary school-aged children require focused development, and the main means for rising coordination abilities are physical exercises of enhanced coordination complexity including some elements of novelty.

*Conclusions.* It was determined that among children not training in extracurricular sporting institutions an excessive muscle tension is observed. The results among untrained children and children-athletes approved underdevelopment of the first by the indicator of ability to voluntarily relax muscles (25.98%). By the results of comparative analysis of the level of abilities to coordinate movements among elementary school-aged children the following data was gained: among children-athletes the average result was  $21.92 \pm 0.8$  s, and among untrained children –  $30.19 \pm 1.83$  s. This shows low level of development of this coordination quality ( $p < 0.05$ ).

**Key words:** coordination abilities, physical health, physical performance, technical skills.



**Introduction.** Establishing schoolchildren's health and full development of their bodies is one of the major objectives of nowadays society [5, 7]. At all times, doctors, parents and teachers stated retardments, delayings, disorders, deviations or imbalances with the norms of development among schoolchildren and disability of their health. A range of the authors call on significance of coordination abilities' development [1, 3, 6, 13, 16], since high level of coordination abilities' development gives an opportunity to acquire new movement faster and complete them with the least energy expenditure. High level of coordination makes it possible to acquiring the right exercise technique faster and more efficiently, and to acquire the technique of the chosen sport faster.

Many authors [3, 18] suggest various methods of developing motion qualities among schoolchildren, notably, coordination abilities being tightly related to the technique of performing a motive action being able to regulate its independent parameters, use a motive action in various situations and combine their specific amount.

S.I. Marchenko [4], S.I. Marchenko, B.A. Berezhniak [5], O.V. Ivashchenko, T.S. Yermakova [18], O.M. Khudolii, S.S. Iermakov, K.V. Ananchenko [19] devoted their papers to studying patterns of motion qualities development and coordination moves development among elementary school-aged children. The researches on the peculiarities of coordination abilities development among elementary school-aged children are based on previously acquired knowledge on the fact that taking into account the patterns of age

development of motion abilities and their rational formation during the periods of natural growth has a remarkable significance for well round children's development, and create favorable background for successful activity as an adult [6, 7, 8].

The **aim of the research** is to determine the differences in the level of coordination abilities development among schoolchildren systematically training in the taekwondo class compared to the children training upon the standard program.

**Material and methods of the research.**

*Contingent of the research is:* 24 boys (12 taekwondo athletes) aged 7-9 years old and the students of gymnasium №315 (12 boys). The research took place based on Ivan Bohun Kyiv Military Lyceum and gymnasium №315 during taekwondo trainings and PE lessons.

*Methods of the research:* the analysis and synthesis of research and methodological resources and Internet data, questionnaire, pedagogical observation, pedagogical experiment, pedagogical testing, methods of mathematical statistics.

*Organization of the research:* the questionnaire among the teachers and trainers was held; the schoolchildren's motive activity was observed; the coordination abilities' testing among schoolchildren, and statistical processing of the gained data were conducted.

**Results of the research and discussion.** Our conducted questionnaire among the trainers and PE teachers approved that the concepts of coordination training covered in research and methodological literature



also occur in practice. Thus, 41.7% of the surveyed answered «yes» to the question «Do you think that coordination training is an independent type of an athlete's training?», 47.9% answered «no»; and 10.4% answered «don't know». At the same time, 75.5% of the responders suppose that coordination training should be included in the part «technical training», 15.6% do not agree with this statement, and 8.9% preferred not to answer.

As a result of our conducted research for determining the level of coordination abilities development among elementary school-aged children it was revealed that the level of development of all types of

coordination abilities among children not training in extracurricular sporting institutions compared to their agetates training in the taekwondo class for two years is considerably lower. The difference in indicators is substantial, the discrepancy is significant ( $p < 0.05$ ).

The biggest gap to the trained children's indicators was revealed upon the testing indicators showing the level of development of the spatial orientation ability and ability to keep static balance (*table 1*). Thus, the assessment of coordination abilities among the elementary school-aged children showed that they are retarded from the parameters of their agetates doing taekwondo according to all tests characterizing coordination abilities.

*Table 1*

**Comparative analysis of the level of coordination abilities development among elementary school-aged children (taekwondo athletes and schoolchildren)**

Coordination abilities	Tests	taekwondo athletes		schoolchildren		Difference in the level of development, %	Student's t-cr., P
		X	±m	X	±m		
Evaluation and regulation of spatiotemporal and dynamic motion parameters	beep test, s	14.22	0.22	18.11	0.45	27.35	<0.05
	throwing a tennis ball, m	10.36	0.14	5.86	0.25	34.40	<0.05
Keeping static balance	by Bondarevskiy method, (with eyes open), s	12.83	1.05	6.21	0.37	51.60	<0.05
	by Bondarevskiy method, (with eyes closed), s	6.24	0.28	2.69	0.18	56.89	<0.05
Keeping dynamic balance	turns on a gymnastic bench, number	4.00	0.19	2.50	0.16	37.50	<0.05

The difference in the level of coordination abilities development among schoolchildren ranges from 27.35% to 61.32%. The biggest retardment from the trained children's indicators was revealed by the testing indicators showing the level of development of spatial orientation ability and ability to keep static balance.

By the results of the conducted ascertaining experiment to determine the level of ability to assess and regulate spatiotemporal and dynamic parameters of movements among elementary school-aged children the retardment from their trained agetates' indicators was revealed. Such decline accounts for 34.62%



In the course of assessment the ability to evaluate and regulate spatiotemporal and dynamic parameters of movements among elementary school-aged children the results were obtained available in the table 1.1. Thus, by the results of the conducted «beep test» a relatively lower level of this indicator's development was revealed: the average result among taekwondo athletes –  $14.22 \pm 0.22$  s, among schoolchildren –  $18.11 \pm 0.45$  s. The difference between average values is statistically significant ( $P < 0.05$ ). The level of development by the given test accounts for 27.35%.

According to the data gained in the course of the experiment by the test «distance throwing a tennis ball», among the taekwondo athletes it was  $10.36 \pm 0.14$  m, and among schoolchildren –  $5.86 \pm 0.25$  m. The difference between the children's indicators within this category is substantial, the discrepancies are statistically significant ( $P < 0.05$ ). The development level's decline by this test accounts for 34.4%.

The results of our researches prove the data that the children having physical activity not enough for their age retard in development of movements from their trained agemates. In the course of conducting the test, while running excessive muscle tension among them was observed. Thus, among some children their heads were downcast; the movements of legs and arms were not always coordinated; their feet were put either wide or too close to each other; the running rate was not always even.

The results of the research to determine the level of coordination abilities development among untrained

elementary school-aged children given below are declarative of a considerable retardment of the static balance function being one of the complex body functions. The retardment of development level accounted for 52.24% (table 1.1).

By the test «one leg stand with eyes open» the average result among the trained children accounted for  $12.83 \pm 1.05$  s. The difference between the average values is statistically significant ( $p < 0.05$ ). The development level's decline by this test accounts for 51.6 %.

The evaluation of the static balance function with eyes closed revealed the average result among taekwondo athletes was  $6.24 \pm 0.28$  s. The difference in indicators is substantial, the discrepancy is statistically significant ( $p < 0.05$ ). The development level's decline by this test accounts for 56.89%. Completing the test with eyes closed, the children were losing balance so they opened their eyes earlier but still could not keep balance any more. Sometimes the children opened their eyes in advance in order not to lose balance [9, 14].

The obtained experimental data showed the decline of the level of development of a coordination ability to keep dynamic balance (table 1.1). The indicators' declining among elementary school-aged children compared to their trained agemates accounted for 37.5%.

During evaluating the dynamic balance functions while doing the test «turns on a gymnastic bench» the average result among elementary school-aged children accounted for  $2.5 \pm 0.16$  times. Among the children training in the taekwondo class it was  $4 \pm 0.19$  times. The discrepancies



between the indicators are significant ( $p < 0.05$ ). A relatively lower level of the indicators among elementary school-aged children by this type of coordination abilities accounted for 40.63% (table 1).

By the test «rhythmic tapping hands», the average result among the schoolchildren accounted for  $5.86 \pm 0.28$ . The difference in indicators is substantial, the discrepancy is significant ( $P < 0.05$ ).

By the data of the conducted ascertaining experiment to determine

the level of coordination abilities development among elementary school-aged children, it was revealed that the biggest retardment in the trained agetates' indicators was observed by the test indicators demonstrating the level of development of the ability for spatial orientation [13]. This declining accounted for 58.86 %.

By the results of the tests demonstrating the level of development of the ability for spatial orientation among elementary school-aged children, the data is given in the table 2.

Table 2

**Comparative analysis of the level of coordination abilities development among elementary school-aged children (taekwondo athletes and schoolchildren)**

Coordination abilities	Tests	taekwondo athletes		schoolchildren		Difference in the level of development, %	Student's t-cr., P
		X	$\pm m$	X	$\pm m$		
Rhythm reproduction	rhythmic tapping hands, number	9.87	0.51	5.86	0.28	40.63	<0.05
Spatial orientation	walking straight with eyes closed, cm	103.57	10.26	64.20	7.78	61.32	<0.05
	throwing the ball on target, points	2.67	0.38	1.14	0.24	57.30	<0.05
Voluntary muscle relaxation	body turning, points	3	0.23	2.0	0.24	31.0	<0.05
Movement coordination	ten «eights», s	21.92	0.8	30.19	1.83	37.73	<0.05

By the test «walking straight with eyes closed» among the children training in the taekwondo class, the average result accounted for  $103.57 \pm 10.84$  cm, and among the schoolchildren  $64.2 \pm 7.78$  cm, respectively. The difference between the values is statistically significant ( $P < 0.05$ ). The difference in the level's development by this test accounted for 61.32%.

By the results of the test «throwing the ball on target standing with their back to it» the following data was obtained: among the athletes  $2.67 \pm 0.38$  points, and among the schoolchildren –  $1.14 \pm 0.24$  points. The difference in indicators

is substantial, the discrepancies are statistically significant ( $P < 0.05$ ). The development level's decline by this test accounts for 57.30%.

By the results of the test «running to the balls» the average result among the untrained children was  $19.81 \pm 0.9$  s, and among the taekwondo athletes –  $12.64 \pm 0.4$  s. The difference between average values is statistically significant ( $p < 0.05$ ). The development level's decline by this test accounts for 56.72%.

Among the children not training in extracurricular sporting institutions an excessive muscle tension is observed. Thus, the comparative experimental





research of coordination abilities among untrained children and children-athletes showed retardments of the first by the indicator of ability to voluntarily relax muscles. A relatively lower level accounted for 25.98%.

These researches approved that by the results of this type of coordination abilities untrained elementary school-aged children yield their agemates-athletes (*table 2*). The average result accounted for  $3 \pm 0.23$  points. The difference in indicators is substantial, the discrepancies are statistically significant ( $p < 0.05$ ).

By the results of the comparative analysis of the level of developing the ability of movement coordination among the elementary school-aged children (*table 2*) the following data was obtained: among children-athletes the average result was  $21.92 \pm 0.8$  s, and among the untrained children –  $30.19 \pm 1.83$  s, showing low level of development of this coordination quality ( $p < 0.05$ ).

By the results of the conducted ascertaining experiment in determining the level of coordination abilities development among the elementary school-aged children a substantial declining of the indicators of development of general movement coordination ability was revealed among untrained children compared to their agemates doing taekwondo. The retardment of indicators accounted for 37.73%.

It is known that in a child's body considerable morphofunctional and psychophysiological transformations occur in response to the measure of growth and development being the base for motion abilities' development and improvement in general, and notably,

coordination abilities [8, 15]. Unequal pace of coordination abilities development is the result of different period of morphofunctional body systems' formation. Substantial individual discrepancies in coordination abilities' development among the elementary school-aged children, (according to V.I. Liakh [2, 3] and L.P. Serhiienko [12, 13]) show a considerable coordination abilities' conditionality in respect of hereditary factors.

### Conclusions:

1. The age of 5-7 years old is a sensitive period for coordination abilities development. The age of 7-11 years old gives the second effect in strength to these abilities' development. So, coordination abilities among elementary school-aged children require focused development, and the main means for rising coordination abilities are physical exercises of enhanced coordination complexity including some elements of novelty.

2. According to the data gained in the course of the conducted experiment, among children not training in extracurricular sporting institutions an excessive muscle tension is observed. The results among the untrained children and children-athletes approved underdevelopment of the first by the indicator of ability to voluntarily relax muscles (25.98%). By the results of comparative analysis of the level of abilities to coordinate movements among elementary school-aged children the following data was gained: among children-athletes the average result was  $21.92 \pm 0.8$  s, and among untrained children –  $30.19 \pm 1.83$  s showing low level of development of this coordination quality ( $p < 0.05$ ).



**Prospects for further research** are based on continuing the study of physical development and physical

qualities among elementary school-aged children in extracurricular forms of organization.

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