Available online at **www.ijmrhs.com**

ISSN No: 2319-5886

International Journal of Medical Research & Health Sciences, 2019, 8(3): 116-120

Development of Short-term and Long-term Memory of School Children with Different Nervous Systems through Coordination Exercises

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ABSTRACT

Background: *Coordination training of younger school children increases the level of coordination abilities and improves the performance of short-term and long-term memory, especially if physical education classes with children use a differentiated approach, which is based on the strength of the nervous system.* ***Aim of the study:*** *To determine the effect of coordination training on the development of short-term and long-term memory in younger school children with different typologies.* ***Subjects and methods:*** *The study involved children 7-8 years old from a regular school. Prior to the study, all school children were differentiated into 3 groups of 20 people.* ***Results:*** *During the 7 months of the study, the following changes in indicators occurred. In KG, school children worsened their performance in the test "shuttle run" from 10.3 ± 0.6 to 10.4 ± 0.6 ($p>0.05$) and in the test for long-term memory, the result deteriorated by 0.1 ($p>0.05$). In the short-term memory test, the results improved slightly from 6.1 ± 0.5 to 6.3 ± 0.4 ($p>0.05$). In EG-1 performance in all tests were improved. Short-term memory improved by 0.8 ($p>0.05$) and long-term memory improved by 0.6 ($p>0.05$). The EG-2 indicators have improved significantly in all tests. In short-term memory tests, the values were higher by 3.5 ($p<0.05$) and long-term memory improved by 2 points ($p<0.05$).* ***Conclusion and recommendations:*** *If physical education classes in children of 7-8 years develop coordination of movements, the indicators of coordination abilities improved and indicators of the properties of memory also increased, especially in those children who were engaged in differentiated taking into account the strength of the nervous system.*

Keywords: Memory properties, Differentiated approach, Movement coordination, Children

INTRODUCTION

Coordination of movements is the process of coordination of the activity of the muscles of the body, aimed at the successful implementation of motor tasks. Coordination capabilities facilitate efficient workflows at the ever-increasing requirements in the course of employment, increase human capabilities in the management of their movements, and allow efficient use of manpower [1-3]. The sensitive period of development of coordination of movement is the age group of 7-8 years [4,5].

Some studies have established a relationship between physical qualities or coordination abilities and mental processes such as memory, thinking, and attention [6-8]. Let's take a closer look at the properties of memory, which can be long-term and short-term. Short-term memory is characterized by very short storage of perceived information. This type of memory is observed after a single or very short perception. Long-term memory keeps all human knowledge and experience. The more often information is played, the stronger it is fixed in memory [9,10].

In working with children, a differentiated approach is often used, which allows revealing the inner physical and mental potential of a person [11,12]. At the same time, children can be differentiated into groups according to different criteria, such as age, physical or technical training, position on the ground and some others [13-15]. The typological criterion of differentiation of children into groups is poorly studied. It represents the features of the properties of the nervous system, one of which is the power of the nervous system in the process of excitation [16-18].

The aim of the study is to determine the effect of coordination training on the development of short-term and long-term memory in younger school children with different typologies. The hypothesis of the study is the assumption that

the development of coordination abilities will not only improve the coordination of movement of children (7-8 years) but also increase the performance of short-term and long-term memory. Especially those school children who were engaged in physical culture differentiated and taking into account the strength of the nervous system.

PATIENTS AND METHODS

Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Total 60 boys and girls of 7-8 years who were healthy and admitted to physical training took part in the pedagogical experiment. All school children were differentiated into 3 equal groups [19]

- KG children were engaged in the standard program of physical culture for first-graders [20]
- EG-1 children were engaged in the same program. The author according to the standard program, but after the warm-up exercise was performed to develop the coordination of movement for 12-15 minutes [1]
- EG-2 children were engaged in the standard program, performed coordination exercises, but in view of the differentiated load [20]

Children with a strong nervous system performed exercises with greater intensity and children with a weak nervous system with a large volume. The intensity was increased by increasing the number of exercises and reducing the rest time, and the volume was increased by increasing the rest time and the number of repetitions of the exercise [17,18,21,22].

During the period of pedagogical research, 59 classes were held. All physical education classes were held twice a week for 45 minutes. For the development of coordination of movement a variety of physical exercises with objects and without objects (jumping with turns, somersaults, ball movement, and others) were used. The complexity of the increased expenses of the introduction of new elements with several exercises or as an additional subject was observed [1].

Before and after the pedagogical experiment, all the children passed the tests. Short-term and long-term memory was determined by the method of "memorizing words". Coordination abilities were diagnosed by the "shuttle run" test. In EG-2 school children passed "tapping test", which differentiated them into groups based on the strength of the nervous system.

The Method of Memorizing Words

- Short-term memory: The teacher slowly tells the school children 15 different and unrelated words (for example wood, car, apple, table, man, bird, candy, stone, sea, bumblebee, lamp, figure, silver, zebra, magnet) [9]. After the teacher has finished the pronunciation, the school children orally reproduce all the words that he/she has memorized (in any order). The result is the number of correctly reproduced words by the school children
- Long-term memory. After 45 minutes, after the physical training session, ask the school children again what words he remembers. The result will also be a number of words

Shuttle Run Test

From the start line to the finish line 10 meters, the school children must cover the distance 3 times by touching the line with his hand. The result is time with an accuracy of 0.1 s [20].

The Method of Tapping-Test

A sheet of A4 paper was divided into 6 identical squares [23]. The command "go" the school children with a maximum speed affix the dots in a single square. For each square is given 5 seconds. After the 6^{th} square, the exercise ends. By the number of points a graph was built and the strength of the nervous system was diagnosed.

Mathematical and statistical processing of the results of the study was carried out using the parametric T-student test. The result was significant at $p<0.05$. Correlation analysis was performed using the Bio-stat 2009 program. The arithmetic mean was calculated using Excel 2016 [24,25].

RESULTS

Prior to the study, the coordination abilities indices in all groups were approximately the same (p>0.05). School children from EG-2 were differentiated into 2 subgroups according to the strength of the nervous system. After the study, the following results were obtained (Table 1).

Table 1 Change of indicators the coordination abilities and memory schoolchildren 7-8 years (M ± m)

Indicators	Group	Before	After	p-value
Shuttle run 3 × 10 m (second)	KG	10.3 ± 0.6	10.4 ± 0.6	>0.05
	EG-1	10.3 ± 0.6	10.1 ± 0.5	>0.05
	EG-2	10.3 ± 0.6	9.7 ± 0.5	<0.05
Memorizing words (amount) Short-term memory	KG	6.1 ± 0.5	6.3 ± 0.4	>0.05
	EG-1	6.5 ± 0.4	7.3 ± 0.6	>0.05
	EG-2	6.2 ± 0.5	9.7 ± 0.7	<0.05
Memorizing words (amount) Long-term memory	KG	5.2 ± 0.6	5.1 ± 0.6	>0.05
	EG-1	5.5 ± 0.5	6.1 ± 0.5	>0.05
	EG-2	5.3 ± 0.4	7.3 ± 0.3	<0.05

Table 1 shows that there have been changes in all indicators during the period of the pedagogical experiment. In KG, the children were engaged in a program of physical education for first-graders of ordinary school. After the end of the study, school children worsened their performance in the test "shuttle run" from 10.3 ± 0.6 to 10.4 ± 0.6 (p>0.05) and in the test for long-term memory, the result deteriorated by 0.1 (p>0.05). In the short-term memory test, the results improved slightly from 6.1 ± 0.5 to 6.3 ± 0.4 (p>0.05).

In EG-1, children were engaged in the standard program, but at the same time, performed physical exercises for 12-15 minutes for the development of coordination abilities. From the beginning to the end of the study, the indicators in all tests were improved. For example, in the "shuttle run" test, the result improved from 10.3 ± 0.6 to 10.1 ± 0.5 (p>0.05). Short-term memory improved by 0.8 (p>0.05) and long-term memory improved by 0.6 (p>0.05).

In the EG-2 children were engaged in a standard program, performed coordination exercises, while using a differentiated approach based on the strength of the nervous system in the process of excitation. Performance improved significantly in all tests. For example, in the "shuttle run" test, the values improved from 10.3 ± 0.6 to 9.7 ± 0.5 (p<0.05). In short-term memory tests, the values were higher by 3.5 (p<0.05) and long-term memory improved by 2 points (p<0.05).

The results of the study indicate the unconditional effectiveness of coordination training in physical education classes for younger school children, and the use of a differentiated approach in training based on the strength of the nervous system in the process of excitation.

DISCUSSION

Coordination skills play a significant role in human life and activities [2,3]. Despite their diversity, they tend to develop comprehensively [26,27]. A favorable period for the development of general coordination abilities is the primary school age [4,5].

Despite the well-known patterns and multiple meanings of information about coordination abilities, we have not found data that reflect the impact of such abilities on the memory of school children. In our study, this relationship was established for the first time. Of course, there are studies that reflect the relationship of physical qualities, mental processes [6-8]. Our study fully confirms this relationship. The higher the level of coordination abilities, the better the performance of short-term and long-term memory.

Mental processes can have a classification, for example, memory, attention, and thinking. Thanks to memory, a person has an idea of previously perceived things or phenomena, as a result of which the content of his consciousness is not limited to the sensations and perceptions, but also includes the experience and knowledge acquired in the past [9,10].

A differentiated approach to work with children is the most important factor of their individual development, this approach can reveal the maximum possible potential of each child [11,12]. The authors often use criteria for differentiation into groups, such as age, weight, height, technical or physical training, and some other indicators [13-15].

This study confirms the fact that the differentiation of children into groups, taking into account the typological characteristic, plays an effective role in the full disclosure of their potential [17,18,28]. Load, which is offered to children during exercise should be differentiated by the strength of the nervous system. The load for children with a strong nervous system will be effective-intensive, and for a weak nervous system-volume [21,22]. At the same time, it is necessary to understand that people with a weak nervous system are not weak in principle, on the contrary, they have a number of advantages, for example, they are more sensitive and receptive to everything new, the function of working out is better developed than people with a strength nervous system.

Thus, for the first time, the influence of coordination training on the development of memory processes (short-term and long-term) in children aged 7-8 years was revealed. The aim of the study was achieved, and the hypothesis was solved.

CONCLUSION

Several conclusions can be identified in the study. In each lesson of physical culture in children of 7-8 years, should take 12-15 minutes for the development of movement coordination. The high level of coordination ability has a positive effect on the level of mental processes such as short-term memory and long-term memory. In classes with children, it is necessary to use a differentiated approach, which allows revealing their potential. One of the effective criteria for differentiation of children into groups is a typological criterion, namely, the strength of the nervous system.

New results of pedagogical research can be interesting and useful for coaches, teachers, and athletes. The study is promising for the study of new influences and relationships of mental processes and physical qualities and abilities.

DECLARATIONS

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

REFERENCES

[1] ZhK, Holodov, and V. S. Khuznetsov. “Theory and methodics of physical training and sports.” *Moscow: Akademia*, 2009.

[2] Jerzy, Sadowski, et al. “Structure of coordination motor abilities in male basketball players at different levels of competition.” *Polish Journal of Sport and Tourism,* Vol. 21, No. 4, 2015, pp. 234-39.

[3] Issurin, V. B., and I. L. Vladimir. “Coordination abilities of athletes: Basics of manifestation, evaluation and elucidation: A review.” *Journal of Athletic Enhancement,* Vol. 6, No. 2, 2017, pp. 1-8.

[4] Feoktistov, M. F. “Periods of sensitivity of development of physical abilities among various contingents of pupils at average school age.” *Uchenye Zapiski Universiteta Imeni PF Lesgafta,* Vol. 62, No. 4, 2010, pp. 118-20.

[5] Ljach, W. I., and Z. Witkowski. “Development and training of coordination skills in 11-to 19-year-old soccer players.” *Human Physiology,* Vol. 36, No. 1, 2010, pp. 64-71.

[6] Greig, Matt, et al. “A continuous mental task decreases the physiological response to soccer-specific intermittent exercise.” *British Journal of Sports Medicine,* Vol. 41, No. 12, 2007, pp. 908-13.

[7] Vespalec, Tomas, Weimo Zhu, and Martin Zvonar. “Relationship between physical activity and coordination: A middle-age adult study 2847 board# 133 May 30, 330 PM-500 PM.” *Medicine and Science in Sports and Exercise,* Vol. 46, No. 5, 2014, p. 770.

[8] Radwan, Shawkat Gaber. “The impact of development of the special coordination abilities on the general skill ability for table tennis juniors under 12 years old.” *International Journal of Science Culture and Sport,* Vol. 2, No. 2, 2014, pp. 30-42.

[9] Nemov, R.S. “Psychology. Psychodiagnostics. Introduction to scientific psychological research with elements of mathematical statistics.” Moscow: Vlado, 2003.

[10] Furley, Philip, and Daniel Memmert. “Creativity and working memory capacity in sports: working memory capacity is not a limiting factor in creative decision making amongst skilled performers.” *Frontiers in Psychology,* Vol. 6, 2015, p. 115.

[11] Bakulev, S. E., O. A. Dvejrina, and A. S. Savvina. "Differencirovannyj podkhod k opredeleniiu sportivno vazhnykh koordinacionnykh sposobnostej boksera [Differentiated approach to determination of important in sports coordination abilities of boxer]." *Uchenye Zapiski Universiteta im. PF Lesgafta,* Vol. 20, 2006, pp. 3-9.

[12] Santos, Sara, et al. "Differential learning as a key training approach to improve creative and tactical behavior in soccer." *Research Quarterly for Exercise and Sport,* Vol. 89, No. 1, 2018, pp. 11-24.

[13] Shakhanova, Angelina Vladimirovna, et al. "Effect of team sports on aerobic performance of human body in view of somatotype." *Indian Journal of Science and Technology,* Vol. 9, No. 42, 2016, p. 104257.

[14] Holienka, Miroslav, et al. "Motor performance of young soccer players based on their biological age." *Journal of Physical Education and Sport,* Vol. 17, No. 4, 2017, pp. 2508-12.

[15] Ion, Carp, Sîrghi Serghei, and Ciorba Constantin. "Differentiated physical training within the framework of a yearly training cycle of young footballers specialized on the position of goalkeeper." *Journal of Physical Education and Sport,* Vol. 18, No. 1, 2018, pp. 270-75.

[16] Kostyunina, L. I., and L. A. Kiryanova. "AnisimovaYA. Special features of the manifestation of nervous system typological properties among sprint track and field athletes." *Uchenye Zapiski Universiteta Imeni PF Lesgafta,* Vol. 62, 2010, pp. 38-42.

[17] Serova, L. K., and A. A. Voronov. "Dependence of individual style of activity in table tennis on typological properties of the identity of athletes." *Uchenye Zapiski Universiteta Imeni PF Lesgafta,* Vol. 95, 2013, pp. 140-43.

[18] Drozdovski, Aleksandr K. "The connection between typological complexes of properties of the nervous system, temperaments, and personality types in the professions and sports." *Open Access Journal of Sports Medicine,* Vol. 6, 2015, p. 161.

[19] Shklyar, B. M. "Usage of statistical methods in the pedagogical researches." *Science Rise,* Vol. 5, 2015, p. 39.

[20] Lyakh, V. I., and A. A. Zdanevich. "Work program on physical culture, grade 1-4." *Moscow: Education*, 2010.

[21] Polevoy, Georgiy. "The spatial orientation of the players with different type of nervous system." *International Journal of Applied Exercise Physiology,* Vol. 6, No. 4, 2017, pp. 1-6.

[22] Georgy, Polevoy. "The development of the ability to equilibrium football players 10-11 years with different nervous system." *Pakistan Journal of Medical and Health Sciences,* Vol. 12, No. 1, 2018, pp. 496-99.

[23] Raygorodsky, D. Ya. "Practical psychodiagnostics." *Methods and Tests*, 2017.

[24] David, F.N., Cramer, H. "Mathematical methods of statistics*." Biometrika*, Vol. 34, 1947, p. 374.

[25] Oldham, J. "Statistical tests, Part 3, pp. Non-parametric tests." *Nursing standard, Royal College of Nursing, Great Britain,* Vol. 7, No. 45, 1993, pp. 28-30.

[26] Dveyrina, O. A. "Coordination abilities: Definition, concepts, classification of forms of manifestation." *Uchenye Zapiski Universiteta Imeni PF Lesgafta,* Vol. 35, No. 1, 2008, pp. 35-38.

[27] Alexandrova, V. A., and V. V. Shian. "Some types of the coordination abilities of the athlete-dancers." *Uchenye Zapiski Universiteta Imeni PF Lesgafta,* Vol. 112, No. 6, 2014, pp. 12-17.

[28] Makarov, Y. M., and A. T. Hussain. "Typological profile of person properties of the basketball players aged 16-18 years old depending on the style of game activity." *Uchenye Zapiski Universiteta Imeni PF Lesgafta,* Vol. 73, 2011, pp. 122-24.