

Development of Intellectual Abilities Using Coordination Training in Schoolchildren with Different Nervous System

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ABSTRACT

Aim: To determine the impact of coordination training on the development of intellectual abilities of younger schoolchildren with different typologies.

Methods: In the pedagogical experiment was attended by children 7-8 years, who were engaged in physical education in a regular school. Before the experiment, schoolchildren were differentiated into three groups of 20 people. Intellectual abilities of schoolchildren were determined by the method of "Choose unnecessary", the level of development of coordination abilities was determined by the test "Shuttle run 3x10", the strength of the nervous system was determined by the method of "Tapping-test". "T-student" program "Excel" and "Biostat" were the main methods of statistical processing of the results.

Results: The pedagogical experiment lasted seven months and during its period there were changes in all groups. In KG intellectual ability to marginally have improved from 5.1 ± 0.4 to 5.3 ± 0.5 ($P > 0.05$). In the test for the level of development of coordination abilities indicators became worse by 0.1 ($P > 0.05$). In EG-1 in the test "Shuttle run" indicators increased from 10.3 ± 0.6 to 10.1 ± 0.5 ($P > 0.05$). Intellectual abilities improved significantly by 1.7 ($P < 0.05$). In EG-2, the level of coordination abilities increased from 10.3 ± 0.6 to 9.7 ± 0.5 ($P < 0.05$). Results in the "Choose unnecessary" test improved by 2.3 ($P < 0.05$).

Conclusion: Indicators of coordination and intellectual abilities of children 7-8 years will improve if in physical education classes for 12-15 minutes to perform coordination exercises and use a differentiated approach based on the typology.

Keywords: Differentiated approach, coordination abilities, schoolchildren, typology, intellectual abilities.

INTRODUCTION

Coordination ability - is the ability of a person to quickly perform motor tasks, especially complex and unexpected. The importance of coordination abilities in life, work and sport for a person is difficult to overestimate, such abilities allow you to rationally expend energy and perform complex operations on the accuracy of movements^{1,2}.

Among the variety of coordination abilities distinguish general special and specific³. A favorable period for the development of general coordination abilities is the primary school age, such abilities are the foundation for the development of the rest⁴.

In working with children, a differentiated approach is often used, which divides children into groups based on some feature^{5,6}. A number of studies show the effectiveness of this approach^{7,8}. Despite this, a differentiated approach based on typology is poorly understood and promising. In turn, the typology is the features of the manifestation of the properties of the nervous system, namely, the strength or weakness of the nervous system in the process of excitation. The effectiveness of this approach is reflected in some studies^{9,10}.

There are studies that focus on the relationship of mental and intellectual processes and physical abilities, such as speed of movement, coordination and some others^{11,12}. Despite this, we could not find data on the impact of coordination training on the intellectual abilities of children 7-8 years, engaged in physical culture and having different strengths of the nervous system.

The aim of the study is to determine the impact of coordination training on the development of intellectual abilities of younger schoolchildren with different typologies.

The hypothesis of the study: It is assumed that if you develop coordination abilities in each lesson of physical education in children 7-8 years, using a differentiated approach, which is based on the strength of the nervous system of schoolchildren the indicators of coordination of movement and intellectual abilities of schoolchildren will improve significantly.

METHODS

In the pedagogical experiment involved 60 schoolchildren 7-8 years, who were healthy and admitted to physical education classes in a regular school. All schoolchildren were differentiated into three equal groups¹³.

1) KG in this group, all children were according to standard methods - physical education for first graders¹⁴.

2) EG-1, in this group, children were engaged in the standard method¹⁴, but, at the same time, after a short warm-up, all children performed physical exercises to develop coordination abilities for 12-15 minutes. Coordination abilities were developed with the help of well-known and accessible for children exercises with objects-ball, stick, without objects-jumping, somersaults, running in different directions and many others. The difficulty of performing physical exercises increased due to the introduction of additional elements, due to the variability of the exercise, the introduction of additional tasks, by increasing the speed of the exercise¹⁵.

3) EG-2, in this group, schoolchildren were engaged in the standard method¹⁴, performed for 12-15 minutes exercises to develop coordination abilities, while using a differentiated approach based on the strength of the nervous system in the process of excitation. For children with a weak nervous system was the increased volume

load during exercise, and for children with a strong nervous system – increased intensity. At the same time, the intensity increased by reducing the rest time between exercises, and increasing the number of exercises. The volume of the load was increased by increasing the rest time and the number of repetitions of each exercise^{9,16,17}.

In total, during the period of the pedagogical experiment, 59 physical education classes were held. Each session lasted 45 minutes. There were two classes in all week. Before the beginning of the pedagogical experiment and after it all the schoolchildren passed control tests: choose unnecessary, shuttle run 3x10, tapping-test (for EG-2).

The method “Choose the extra” determines the intellectual abilities of schoolchildren¹⁸.

There are 50 drawings in front of the schoolchildren. 5 figures in a row, 10 rows. The figures are arranged so that in one line 4 figures are related to each other on some basis. For example, here is a picture of a car, train, airplane, ship, banana. It is necessary to identify the wrong drawing as soon as possible. In this case – banana. Time of exercise-20 sec. The result is the number of correctly selected figures.

Test “Shuttle run 3x10” determines the level of development of coordination abilities¹⁴.

Lines are drawn on a flat surface. The distance between them is 10 m. 1st line – start, 2nd – finish. At the signal the schoolchildren runs from the start line to the finish line and touches her hand. Then returns to the start line and touches her hand. After that, he finishes. The result is an indicator of the time in which the schoolchildren overcame the distance (accuracy 0.1 sec.).

The method of “Tapping-test” the strength of the nervous system was used to differentiate children in EG-2 into subgroups with strong and weak nervous system¹⁹.

On a sheet of paper are six squares. At the signal, the schoolchildren begins to quickly put a point in the first square for five sec, then moves to the second square. After the sixth square exercise ends exercise should be performed with maximum intensity. The result is a graph and determined by the strength of the nervous system.

Mathematical and statistical processing of the research results was carried out using the parametric t-student test. The arithmetic mean was calculated using Excel. The result was significant at P<0.05. Correlation analysis was performed using the software Biostat²⁰.

The analysis of table 1 shows that after the pedagogical experiment there were changes in all groups. In KG, in which schoolchildren were engaged in the standard program of physical culture for first-graders, intellectual abilities slightly improved from 5.1±0.4 to 5.3±0.5 (P>0.05). In the test for the level of development of coordination abilities indicators and did become worse by 0.1 (P>0.05).

In EG-1, in which children performed coordination exercises for 12-15 minutes, performance improved in both tests. In the “Shuttle run” test, the values increased from 10.3±0.6 to 10.1±0.5 (P>0.05). Intellectual abilities improved significantly by 1.7 (P<0.05). That speaks about unconditional efficiency of use of coordination training for younger schoolchildren.

In EG-2, in which schoolchildren used a differentiated approach based on the typological features of the manifestation of the properties of the nervous system, when performing coordination exercises for 12-15 minutes, the indicators improved significantly in both tests. The level of development of coordination abilities increased from 10.3±0.6 to 9.7±0.5 (P<0.05). Results in the “Choose unnecessary” test improved by 2.3 (P<0.05). This indicates the effectiveness of the coordination training and the use of a differentiated approach, which is based on the strength of the nervous system by the excitation process.

RESULTS

Prior to the pedagogical experiment, the coordination abilities of all sixty schoolchildren were approximately the same (P>0.05). After 3 groups of 20 people were identified, children from EG-2 were differentiated according to the strength of the nervous system into 2 subgroups of 10 people. After the end of the pedagogical experiment the following results were obtained (table 1).

Table 1: Indicators of coordination and intellectual abilities of schoolchildren 7-8 years before and after the pedagogical experiment (M±m)

Indicators	Group	Before	After	P
«Shuttle run» (s)	KG	10,3 ± 0,6	10,4 ± 0,6	p>0,05
	EG-1	10,3 ± 0,6	10,1 ± 0,5	p>0,05
	EG-2	10,3 ± 0,6	9,7 ± 0,5	p<0,05
Choose unnecessary (number)	KG	5.1±0.4	5.3±0.5	>0.05
	EG-1	4.2±0.4	5.9±0.4	<0.05
	EG-2	4.3±0.3	6.6±0.5	<0.05

DISCUSSION

The speed of performance of any action depends on the level of development of coordination abilities, as well as on the level of development of intellectual abilities. Intellectual skills enable a person to quickly solve a motor problem in the head, and coordination skills to enable you to execute the decision to move. Not unimportant is not only the speed of the solution and execution of the motor problem, but also its accuracy^{1,2,21}.

It is mandatory to use a differentiated approach in working with children, as it allows to reveal their potential,

internal hidden reserves of their body^{7,8}. At the same time, the criteria for differentiating children into groups when performing physical exercises can be very diverse, for example, gender, age, height, level of physical fitness and many others^{5,6}.

The novelty of the study is that the relationship of the influence of coordination training on the intellectual abilities of children 7-8 years, engaged in physical culture in school. Of course, there are studies that show the relationship of mental and intellectual processes with physical and coordination abilities^{11,12}. However, our study established for the first time not only the positive effect of

coordination training on the development of intelligence, but also proved the effectiveness of the use of a differentiated approach based on the strength of the nervous system in the process of excitation.

The effectiveness of the typological approach as a criterion of differentiation of children into groups is proved. At the same time, the concept of typology, laid features of the properties of the nervous system, namely, the strength of the nervous system in the process of excitation. Weakness of the nervous system does not mean that the schoolchildren who have it – weak. Children with different types of nervous system go to the same goal in different ways. For example, in working with children with a strong nervous system, it is more effective to use verbal methods of training, intensive load, competitive method. With schoolchildren who have a weak nervous system, it is better to use a repeated method, volumetric load and visual methods^{9,10,16,17}.

Thus, for the first time the effectiveness of coordination training influence on coordination and intellectual abilities of 7-8 years old children engaged in physical culture at school was revealed. Such results suggest that the goal of the study is achieved, and the hypothesis is completely solved.

CONCLUSION

The results of the new study allow us to make several conclusions. First, in physical education classes with younger schoolchildren should be within 12-15 minutes to devote to the development of General coordination abilities. Secondly, there is a need for a differentiated approach in working with children. Third, when performing physical exercises to coordinate movements, children should be differentiated into groups, taking into account the typological features of the manifestation of the properties of the nervous system, namely, the strength of the nervous system in the process of excitation. At the same time give different loads. For children with a strong nervous system it will be intense, and for children with a weak – volume. Fourth, the higher the level of development of coordination abilities, the higher the intelligence of children 7-8 years.

New results of the study will be of interest to coaches, teachers and athletes. The study is promising for exploring new influences and relationships of mental or intellectual processes and physical qualities or coordination abilities.

REFERENCES

- Issurin VB, Lyakh VI. Coordination abilities of athletes: basics of manifestation, evaluation and elucidation: a review. *Journal of athletic enhancement* 2017; 2. <https://doi.org/10.4172/2324-9080.1000255>
- Jaakkola J, Watt A, Kalaja S. Differences in the Motor Coordination Abilities Among Adolescent Gymnasts, Swimmers, and Ice Hockey Players. *Human Movement* 2017; 1:44-50. <https://doi.org/10.1515/2017-0006>
- Dveyrina OA. Coordination capacities: definition, classification, forms. *Uchenye zapiski universiteta imeni P.F. Lesgafte* 2014; 35:35-38. <https://doi.org/10.5930/1994-4683.2008.01.35.p35-38>
- Starosta W., Hirtz P. Sensitive and critical periods of motor co-ordination development and its relation to motor learning. *Journal of human kinetics* 2002; 7, 19-28.
- Fiorilli G, Mitrotasios M, Iuliano E, Calcagno G, Di Cagno A. Agility and change of direction in soccer: Differences according to the player ages. *Journal of Sports Medicine and Physical Fitness* 2017; 57(12): 1597-1604. doi: 10.23736/S0022-4707.16.06562-2
- Holienka M, Babic M, Doležajová L, Šelinger P, Musilová E. Motor performance of young soccer players based on their biological age. *Journal of Physical Education and Sport* 2017; 17(4):2508-2512.
- Bakulev SE, Dveyrina OA, Savvina AS. Differentiated approach to the determination of major sports coordination abilities boxer. *Uchenye zapiski universiteta imeni P.F. Lesgafte* 2006; 20:3-9 <https://doi.org/10.5930/issn.1994-4683.2006.20.p3-9>
- Santos S, Coutinho D, Gonçalves B, Schöllhorn W, Sampaio J, Leite N. Differential Learning as a Key Training Approach to Improve Creative and Tactical Behavior in Soccer. *Research Quarterly for Exercise and Sport* 2018; 89 (1):11-24. DOI: 10.1080/02701367.2017.1412063
- Drozdovski AK. 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* 2015; 6:72-161. DOI:10.2147/OAJSM.S75612
- Makarov YM, Hussain A-T. 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 P.F. Lesgafte* 2011; 73:122-4.
- Greig M, Marchant D, Lovell R, Clough P, McNaughton L. A continuous mental task decreases the physiological response to soccer-specific intermittent exercise. *British Journal of Sports Medicine* 2007; 41(12): 908-913. doi: 10.1136/bjism.2006.030387
- Vespalec T, Zhu W, Zvonar M. Relationship between physical activity and coordination: a middle-age adult study. *Medicine & science in sports & exercise* 2014; 46:770. DOI: 10.1249/01.mss.0000495808.88582.1f
- Shklyar BM. Usage of statistical methods in the pedagogical researches. *Science Rise* 2015; 5:39. <https://doi.org/10.15587/2313-8416.2015.57049>
- Lyakh VI, Zdanevich AA. Work program on physical culture, grade 1-4. Moscow: Education 2010; 80 p.
- Holodov ZhK, Khuznetsov VS. Theory and methodics of physical training and sports. Moscow: Akademia 2009; 480 p.
- Polevoy G. The spatial orientation of the players with different type of nervous system. *International Journal of Applied Exercise Physiology* 2017; 6(4):1-6. DOI: <https://doi.org/10.22631/ijaep.v6i4.175>
- Polevoy G. The Development of the Ability to Equilibrium Football players 10-11 years with different Nervous System. *Journal of Medical and Health Sciences* 2018; 12(1):496-499
- Nemov RS. Psychology. Psychodiagnostics. Introduction to scientific psychological research with elements of mathematical statistics – Moscow: Vldos 2003; 640 p.
- Raigorodskiy DJ. Practical psychodiagnostics. Methodics and tests. Samara: Bakhrakh-M 2017; 672 p.
- Kim TK. T test as a parametric statistic. *Korean Journal of Anesthesiol* 2015; 68(6):540–546. doi: 10.4097/kjae.2015.68.6.540
- Furley P, Memmert D. Creativity and working memory capacity in sports: working memory capacity is not a limiting factor in creative decision making amongst skilled performers. *Movement Science and Sport Psychology* 2015; 6:115. DOI: 10.3389/fpsyg.2015.00115