

Psychomotor Development of the Middle School Age Children with Hearing Impairment in the Process of Physical Education

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ABSTRACT

The purpose of the study is to develop a scientifically grounded program of the psychomotor development of the 13-14 year-old children with hearing impairments and to experimentally verify its effectiveness. **Results:** The state of sensory, cognitive sphere and psychomotor of the specified contingent of children is determined, the results of components research underlying the psychomotor activity are worked out, the psychomotor structure is determined and the program of its development in the process of physical education is proposed. The stages of psychomotor development of the 13-14 year-old children with the corresponding tasks, features of the content, methods and methodical ways are determined, and their sequence and duration is expressed by the logic of the process of improving the psychomotor capabilities of this contingent of children. A group of means for the purposeful psychomotor development consists of breathe gymnastics, gymnastics for the eyes, relaxation exercises, tennis and darts games, psychological tasks adapted to the needs of psychomotor development in the process of physical education, and special technical means of training. **Conclusion:** The possibility of influencing the means of the physical education curriculum on the psychomotor sphere of children with hearing impairments by means of using methodical ways of separate and complex influence on their sensory and cognitive sphere is substantiated. The results of factor analysis and analysis of professionally important qualities allowed to optimally distribute the training time to influence the components of psychomotor activity of 13-14 year-old children with auditory processing disorder

1. Introduction

An important indicator of the level of education development in society is the provision of conditions for the development of children with disabilities through the organization of a special and meaningful educational process. There is a need to create the optimal conditions for life, providing opportunities for physical, social and mental

development, including the use of physical education and sports. Improvement of the educational process of children with psychophysical disabilities should realize the objectives of the program of physical education in a special school - the correction of individual disadvantages, the promotion of mental and physical development of pupils, preparing them for productive work and active participation in public life.

According to the World Health Organization, there are 278 million people in the world who are deaf or have hearing problems. As UNESCO notes, 42 million of them are children under the age of 14 who have severe hearing impairment. In addition, the number of children with hearing impairment does not decrease, and doubles every 15-20 years.

2. Literature Review

It was established that hearing impairment leads to speech defects, features of mental development [1; 2; 3] and psycho-functional abilities [4; 5], to deviations in the human motor sphere [6], low level of physical health [7; 8]. Deaf children are significantly behind their peers who are experiencing psychomotor development [9].

Effective way of improving the physical and mental condition of people with disabilities, its socialization is the pursuit of physical culture and sports [10]. Specialists note that corrective and compensatory activity should begin with childhood, and the development of a comprehensive specialized program of physical activity is a socially important thing [11; 12]. It is necessary to deepen knowledge that reflects specific motor manifestations in children with hearing impairments, studying them in relation to the nature of the main defect, the degree of existing secondary disorders of development (including motor), the level of biological maturity and taking into account the sensitive periods of development [6; 1]. Considering this, the ways of solving the problem of physical education of people with disabilities have been widely developed recently.

There are infinite forms of action and action conditions, and it is almost impossible to predict all variants of the solution of the motor problem. Everyone must be able to effectively use their physical abilities to independently form their own motor activities [13]. That is why it is necessary to purposefully form a higher level in the management of movements – psychomotor [14; 15]. The high level of psychomotor development accelerates the process of assimilation of motor actions, provides its more effective implementation in everyday life and in the process of labour activity, promotes faster socio-psychological adaptation [16; 17; 4], which compensates for the functional state of human with auditory processing disorder. Therefore, specialists in the field of physical education note that during the development of programs for the physical education of children with hearing impairments the need to develop their psychomotor should be taken into account [5; 18].

Thus, the need for the psychomotor development of children with the auditory processing disorder and the lack of research of the features of purposeful integrated influence on the psychomotor sphere of the specified contingent determined the relevance of the chosen topic of research.

The purpose of the study: to develop a scientifically based methodology of the psychomotor development of the 13-14 year-old children with hearing impairments and to experimentally verify its effectiveness.

Objectives of the study:

- Theoretically substantiate the technique of psychomotor development of the 13-14 year-old children with hearing impairments in the process of physical education.
- To study the state of psychomotor development of the 12-15 year-old children with hearing impairments and informative methods of its identification.



- Determine the structure of psychomotor of the 12-14 year-old children with the auditory processing disorder.
- Determine the means and methods of physical education and pedagogical conditions of psychomotor improvement of the 13-14 year-old children with hearing impairments.

3. Material & Methods

The following research methods were used to solve the tasks: the analysis of scientific sources; poll; testing; pedagogical, psychological and med-biological tests; pedagogical observation; pedagogical experiment; methods of mathematical statistics.

In order to study the state of psychomotor development during the lessons of physical training and the peculiarities of the practice of physical education of children aged 13-14, teachers of physical education in 40 Ukrainian specialized secondary education schools for children with hearing impairment have been polled.

The results of the survey showed that in the educational process of children with hearing impairments, teachers are mainly guided by educational programs developed for the secondary schools, although their content does not take into account the peculiarities of the development of children with the auditory processing disorder and does not create conditions for the comprehensive and full development of their motor opportunities. In the process of physical education, the purposeful development of psychomotor of children with hearing impairments is not carried out. As noted by 85% of respondents, there is a need to develop a new content of the subject "Physical Culture" for children with hearing impairments, taking into account the need for the development of their psychomotor. An absolute majority (95%) of the polled experts believe that the use of sign language at physical education classes in educational institutions for the deaf and children with hearing disorders will contribute to the development of psychomotor.

The research was conducted on the basis of the Ternopil Communal Special Secondary Boarding School for the Children with Hearing Loss. In the examination of psychomotor, sensory and cognitive sphere, pupils aged 12-14 with a diagnosis of "*Sensorineural hearing loss* (SNHL) of the III stage" took part.

The results of the confirmatory experiment showed that in the examined pupils the development of components of the cognitive sphere corresponds to low and very low levels. The state of individual sensor components is characterized as unsatisfactory. Violation of the functioning of the vestibular system has been documented. The level of development of articulation of the pupils is insufficient. However, high is the result of testing muscle sensations, and the acuity of children with the auditory processing disorder meets the norm. Quantitative evaluation of the remaining sensory components showed that children with hearing impairments binocularly much better (in 6-7 times) perceive the distance between different objects rather than monocular. Tactile feelings are best developed at the fingertips. Less is the sensitivity of the palm and the back side of it. The average indicator of the visual field of the surveyed is 57°. The results of integrative psychomotor tests of children with hearing impairments indicate that the average errors during the reproduction of the seven-meter distance and the accuracy of hits to the vertical target are respectively 49.6 ± 4.1 cm and 34.3 ± 1.5 points, and the difference between overcoming 30 - meters distance requiring a certain rhythmic structure of running and with an average maximum speed of 2.16 ± 0.14 sec.

The analysis of the structure of psychomotor of children aged 12-13 with a diagnosis of "*Sensorineural hearing loss* (SNHL) of the III stage", showed the presence of six factors, the sum of contributions in the total dispersion is 83.8%, which indicates a significant influence of certain elements on the psychomotor activity of the surveyed.

The use in literary sources the recommended integrative tests to determine the state of psychomotor revealed

the difference between the results, which required the specification of the informative of these tests. The results of the determination of the correlation between the indicators of the seven-meter test, the accuracy tests and the ability to reproduce the rhythm with the indicators of the development of components underlying the psychomotor activity, showed the highest number of cases of correlation indicators of the development of the ideomotor sphere and the sensors of the examined pupils with their sensations of rhythm. Thus, for a specified contingent of pupils, the test of determining the state of psychomotor is called the most informative.

4. Results

The results of the theoretical research, analysis of the documentary materials and the recording experiment are the basis for the development of the experimental program. The content of psychomotor development of the 13-14-year-old children with hearing impairments was determined by the curriculum for physical education for the 7th grade of secondary schools. Also, according to the structure of psychomotor and features of the physiological, physical and mental development of children with the auditory processing disorder for the direct influence on the sensory, motor and cognitive sphere in the process of physical education the means represented in Fig. 1 have been used.

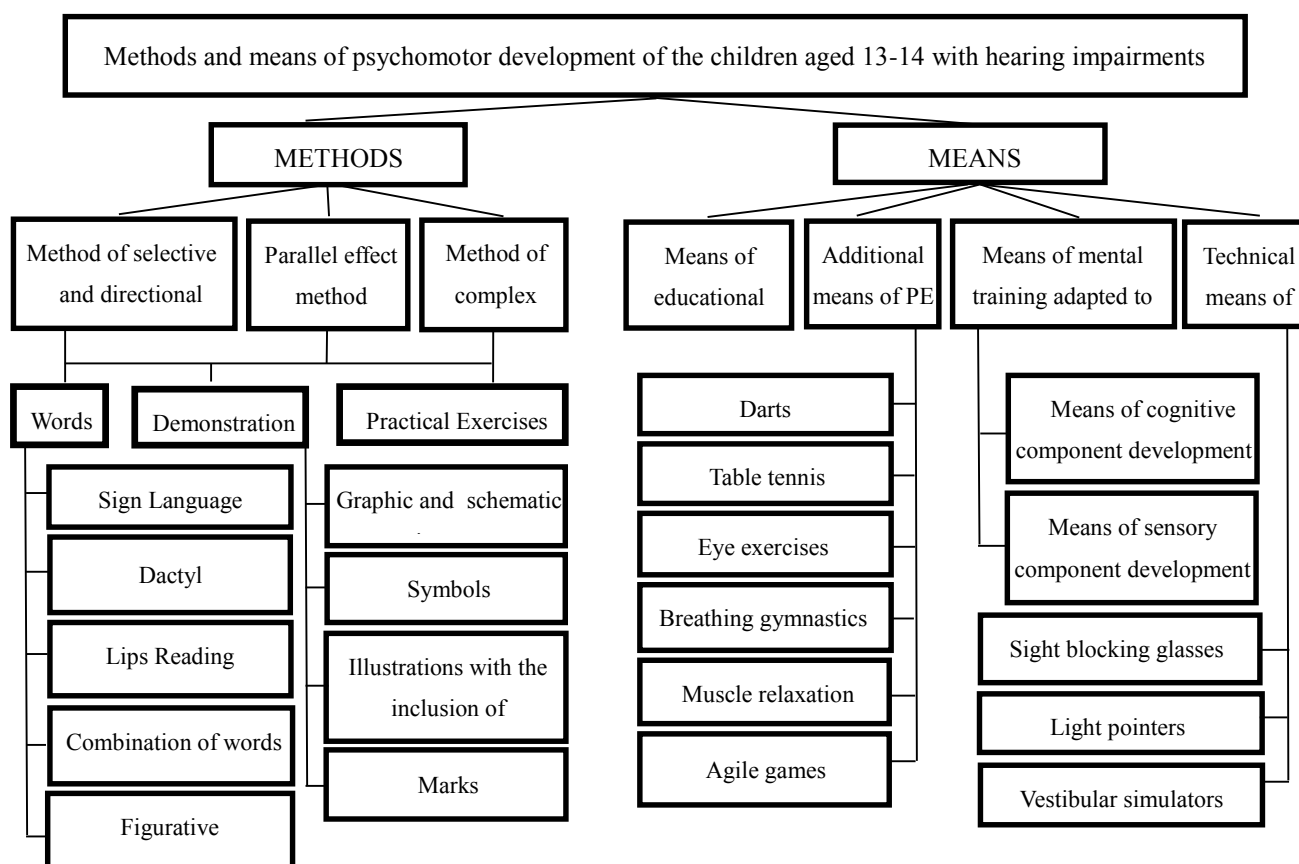


Fig. 1. Methods and means of psychomotor development of the children aged 13-14 with hearing impairments

Means of mental exercise were used as independent exercises for the development of psychomotor elements and included in the content of individual physical exercises, mobile games and relay races.

For the purpose of psychomotor development different ways of interaction between the teacher and pupils with

hearing problems were used. An important element of the experimental method was the use of the parallel effect method, which provided for the development of components of psychomotor in the process of physical education and education of physical qualities. In the first two stages, the method of selective direction was used through the use of techniques that contributed to a distinct effect on the components of psychomotor. At the final stage, the method of integrated exercises was used through the use of techniques of general influence on the sensory and cognitive domains of pupils. Due to the different terms of a specially organized corrective impact on pupils' performance of certain tasks, it required the use of an individual approach.

The peculiarities of the use of word and demonstration methods were determined by the tasks of stimulating the psychomotor sphere and the specifics of the psyche of children with hearing impairments. Thus, the use of the word method during the physical training anticipated various ways of transmitting information: verbal communication, dactyl, sign language, lip reading, facial expressions and gestures. The development of psychomotor facilitated the use of methods of demonstration. Illustrated materials used to provide pupils with information (in conjunction with the method of the word); visual aid was a part of special psychological tasks; the use of visual guidance has become an important influence on the cognitive and sensory domains.

After the implementation of the experimental method in control and experimental groups, changes in the indicators of development of components underlying the psychomotor activity of the 12-15 year-old pupils with hearing impairments and changes in the results of integrative psychomotor tests were recorded.

According to the difference in the growth of the results of the study of the cognitive sphere (Table 1), sensory (Table 2) and the results of integrated psychomotor tests (Table 3) of 12-15 year-old children with hearing impairments EG and CG, positive changes were found for all indicators. Thus, at the first stage, the proposed technique was effective in terms of attention stability, motor and short-term memory ($P < 0.05$), as well as selective and sustained attention, tactile sensations, monocular depth perception and visual field ($P < 0.01$). At the second stage, the difference in changes in the indicators of development of cognitive components of the representatives of EG and CG was based on the results of the study of attention stability, conception memory, thinking of the time of reproduction of simple figures and monocular depth perception, muscular and joint motion sensations ($P < 0, 05$), as well as motor and short-term memory, visual field, binocular depth perception, vestibular stability and tactile sensations ($P < 0.01$). Only changes in visual acuity due to experimental effects were unreliable.

Table 1. Experimental methodology efficiency on indicators of the development of components of the psychomotor cognitive sphere of children aged 12-15 with hearing impairments

Cognitive components		Selective attention (points)		Sustained attention (points)		Attention stability (c.u.)		Motor memory (number of attempts)		Conception memory (c.u.)		Short-term memory (c.u.)		Thinking (simple figures) (s.)		Thinking (complex figures) (s.)	
		C G	E G	C G	E G	CG	EG	C G	E G	C G	EG	C G	E G	C G	E G	CG	EG
First stage	Initial result	- 3,4	- 1,2	5,6	5	211,4	216	8,2	10,5	2,6	2,3	3,8	4,1	77,8	83	271,6	278
	Result change \bar{x}	1	6,64	- 0,4	- 1,5	27	60,93	1	- 1,78	0,7	0,26	0,18	0,67	- 6,8	- 15,6	- 27,6	- 63,1

	ge	S	0,6 1	0,5 6	0,2 7	0,2 4	7,5 6	13, 63	1,1 7	0,6	1,1	0,1 9	0,1 7	0,1 5	5,4 2	5,4 6	22, 5	18, 4
Result change on the first stage, %			-29, 4	-55 3	-7,1	-30	12, 8	28, 2	12, 2	-17	26, 9	-11, 3	4,7	16, 3	-8,7	-18, 8	-10, 2	-22, 7
t			6,794		-3,037		2,17		-2,117		-0,857		2,145		-1,149		-1,223	
Seco nd stage	Initial result		5,4	-1	3,5	5,2	277	238	9,2	8,7	2,1	3,3	4,8	4	67, 5	71	214, 6	244
	Resu lt chan ge	\bar{x}	1,8 6	4,4	-0,0 7	-1	5,6 4	99, 2	0,9 3	-2,8	0,7 1	-1,4 2	-0,0 4	0,4	1,3 6	-22	11, 1	62, 6
		S	0,5 7	1,9 9	0,2 3	0,6 1	6,7 5	38, 31	0,4 7	0,4 2	0,3 5	0,8 6	0,1 7	0,0 7	4,8	8,4 9	12, 6	41, 54
Result change on the second stage, %			34, 4	44 0	-2	19, 2	41, 7	10, 1	32, 2	33, 8	-43	-	0,8	10	-2	-31	-5,2	-25, 7
t			1,23		-1,42		2,405		-5,944		-2,31		3,436		-2,116		-1,186	

Notes: 1. t-critical - 2.898 at P = 0.01;

2. t-critical - 2.109 at P = 0.05

Table 2. Experimental methodology efficiency on indicators of the development of components of the sensor of children aged 12-15 with hearing impairments

Components of sensory		Visual acuity		Visual field(°)		Monocular depth perception (mm)		Binocular depth perception (mm)		Tactile sensations (mm)		Muscular sensation (d)		Joint motion sensations (%)		Vestibular stability (points)		
		CG	EG	C G	EG	C G	EG	C G	EG	C G	EG	C G	EG	C G	EG	CG	EG	
First stage	Initial result		0,8	1,1	65, 1	54, 5	15, 7	16, 3	4,2	2,3	5,2	5	2,1	2	16, 6	13, 2	2,2	2,7
	Resu lt chan ge	\bar{x}	-0,0 2	0,0 6	2,6	7,4 6	-1,0 2	6,1 9	0,4 8	0,5 4	0,1 2	-0,8 8	-0,1 2	-0,5	-3,4	4,8 2	0,0 5	0,5 4
		S	0,0 5	0,0 4	0,7	1,4 9	0,3 8	1,3 1	0,6 7	0,3 6	0,1 8	0,1 7	0,2 3	0,1 2	1,5 7	1,3 3	0,4 5	0,2 9
Result change on the first stage, %			-2,5	5,5	4	13, 7	-6,5	-38	-11, 4	23, 5	2,3	17, 6	-5,7	25, 0	20, 5	36, 5	-2,3	20
t			1,18		2,946		-3,802		0,073		-4,02		-1,471		-0,691		1,092	
Seco nd stage	Initial result		1,1	0,8	62	67, 7	10, 1	14, 6	1,8	3,7	4,2	5,3	1,5	2	8,4	13, 2	3,3	2,1
	Resu lt chan ge	\bar{x}	-0,0 2	0,0 15	-1,6 1	6,4 5	0,8 6	-2,5	0,6 4	-1	0,7 4	-1,0 4	-0,0 7	-0,7	1,4 9	7,8 6	0,1 3	0,5
		S	0,0 13	0,0 17	0,8 1	1,4 5	1,0 3	1,1 6	0,2 9	0,4 1	0,4 2	0,3 8	0,0 6	0,2 9	0,9 8	2,7 8	0,0 85	0,1 8
Result change on the second stage, %			-2,1	1,9	-2,6	9,5	8,5	17, 1	35, 6	27, 0	17, 6	19, 6	-4,7	35, 0	17, 7	59, 5	-3,9	23, 8

t	1,822	4,854	-2,167	-3,283	-3,143	-2,158	-2,159	3,187
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Notes: 1. t-critical - 2.898 at P = 0.01;

2. t-critical - 2.109 at P = 0.05.

The effectiveness of the experimental methodology is confirmed by indicators of integrative psychomotor tests (Table 3). Improvement of the results of the control test to determine the rhythm of the surveyed pupils, as well as changes in the performance indicators of the seven-meter test - in the second stage of the experiment and accuracy - in the first stage (P <0,05) is recorded.

Table 3. Experimental methodology efficiency according to the integrative indicators development of the psychomotor abilities of children aged 12-15 with hearing impairments

Integrative psychomotor tests			The seven-meter test (cm)		Rhythm sensation (s.)		Accuracy (points)	
			CG	EG	CG	EG	CG	EG
First stage	Initial result		37,46	48,1	1,9	2,3	40,2	34,4
	Result change	\bar{x}	-6,04	-10,5	-0,14	-0,57	-0,8	3,57
		S	1,85	4,08	0,04	0,065	0,55	1,097
Result change on the first stage, %			-16,1	-21,8	-7,4	-24,8	-2	10,4
t			0,997		-5,558		3,564	
Second stage	Initial result		43,4	52,92	1,7	1,7	35,7	33,2
	Result change	\bar{x}	1,1	-9,46	0,27	-0,36	-0,29	4,2
		S	1,97	4,37	0,06	0,07	0,98	2,58
Result change on the second stage, %			2,5	-17,9	15,9	-21,2	-0,8	12,7
t			-2,2		-6,615		1,624	

Notes: 1. t-critical - 2.898 at P = 0.01;

2. t-critical - 2.03 at P = 0.05.

5. Discussion

In the course of the study three data groups were obtained: those that confirm the results of the work of other authors (first group); data supplementing the information available in scientific sources (second group); new data from the research topic (third group).

The first data group is the results of the study, which confirmed the information about the structure of psychomotor, which are components of the sensory and cognitive sphere; the necessity to take into account the peculiarities of development during the selection and use of test methods in working with children with hearing disorders; low level of development of components of the sensory system among children of the secondary school age with hearing impairments; negative influence of the functioning of the auditory system on the cognitive sphere of the child; interconnection of cognitive, sensory and motor abilities; the predominant dependence of the level of development of children with hearing disorders on the term and quality of corrective influence, and not on the age of

the surveyed; wide possibilities of effective influence on the sensory and cognitive sphere of children with the auditory processing disorder by means of physical education; the effectiveness of the use of methods of partial regulation in the process of physical education and psychomotor improvement of children with hearing impairment; the importance of using sign language in the process of physical education of pupils with hearing impairments; the slow development of components of psychomotor without specially organized purposeful corrective influence.

The second group includes data that supplemented the information from scientific sources about the peculiarities and sequence of use and the list of methodical techniques that scientists recommend to use for purposeful psychomotor development of pupils, improving the motor action of pupils with hearing impairments; the state of components of sensory and cognitive sphere and the level of psychomotor development of children with hearing impairments aged 12-14.

The third data group includes new research findings. Using factor analysis, the significance of individual sensory and cognitive elements in the functioning of psychomotor of children with hearing disorder aged 12-14 is determined.

On the basis of the results of correlation analysis, informational integrative tests of the development of psychomotor abilities of children aged 12-14 with hearing impairments is determined. So, the most acceptable for determining the state of psychomotor is a test of the ability to reproduce the rhythm. A technique for the development of psychomotor of children aged 13-14 with the auditory analyzer processing disorder is formed due to the influence on the components underlying the psychomotor activity, the effectiveness of which is confirmed by methods of mathematical statistics.

Based on the analysis of scientific sources, the stages of psychomotor development of children aged 13-14 with hearing impairments characterized by the corresponding tasks, features of the content, methods and methodical ways are determined, and their sequence and duration expresses the logic of the process of improving the psychomotor capabilities of the specified contingent of children.

During the formation of an experimental technique, the content of physical education provided by the program for secondary school, used during working with the deaf and children with hearing loss, was supplemented with the means of purposeful development of psychomotor. The last group formed by the respiratory gymnastics, gymnastics for the eyes, relaxation exercises, tennis and darts games, psychological tasks adapted to the needs of psychomotor development during the physical training, and special means of technical training. The possibilities of influencing the curriculum of physical education on the psychomotor sphere of children with hearing impairments through the use of methodical techniques of isolated and complex influence on their sensory and cognitive spheres were confirmed.

Results of factor analysis and analysis of professional qualities allowed to optimally distribute the training time to influence the components of psychomotor activity of 13-14 year old pupils with the auditory processing disorder, and on the basis of data from their own observations of objective and subjective signs of fatigue the parameters of loads of means of influence on their psychomotor is determined.

The results of the study of scientific data on the peculiarities of the mental sphere of the children with hearing impairments and the recommendations of specialists on the process of their physical education, as well as data from questionnaires and their own pedagogical observations helped to identify the following pedagogical conditions for the development of psychomotor during the physical training: 1) a comprehensive approach to the diagnosis and development of psychomotor of children with hearing impairments; 2) positive psychological environment; 3) pedagogical support for the linguistic environment.

6. Conclusions

Among researchers there is no single position in determining the concept and structure of psychomotor, ways of improving it. There are a large number of psychomotor abilities based on the manifestation of ideomotor, sensomotor and motor components of psychomotor. At the heart of sensomotor is the activity of sensory systems, ideomotor determines the state of cognitive capabilities of human, and the motor is identified with proprioception; physical education has a wide range of opportunities for effective influence on the psychomotor sphere of a child with hearing impairments, but there are no techniques for purposeful development of their psychomotor; children of the age of 12-14 with hearing impairments are characterized by lower, in comparison with healthy peers, indicators of physical condition, sensory and cognitive sphere, emotional-volitional features.

- The level of development of components of the cognitive sphere of children with hearing impairments of the age of 12-14 is low. At the same time, cognitive abilities were better in girls than in boys ($P < 0.05$), except of the level of development of short-term memory, which in the last was higher, and thinking (by the time of reproduction of simple figures) and motor memory, where the results of the surveyed both sexes were identical. Most of the studied components of sensory are better developed in 12-14 year-old male students ($P < 0.05$). Exceptions were the monocular depth of perception, muscular and tactile sensations. The advantage of boys in indicators of sensory development is probably caused by the beginning of puberty of the representatives of the opposite sex, which is accompanied by a decrease in the functional activity of sensory systems. The results of integrated psychomotor tests showed the superiority of the boys on the parameters of the seven-meter test and the accuracy test, and the rhythm sensation was practically the same for the representatives of both sexes ($P < 0.05$).

- From the recommended by the scientists integrative psychomotor tests, the control of the test of rhythm sensation is the most informative in order to determine the state of psychomotor of 12-14 year-old pupils with hearing impairments. The results of its implementation correlate with the average and high values with the seven indicators of the development of components of the ideomotor sphere and the sensory of the surveyed, of which in six cases it is significant ($P < 0.05$).

- Structural components of psychomotor of 12-14 year-old pupils with hearing impairments are components that underlie ideomotor, sensomotor and motor skills. According to the results of factor analysis, their contribution to the total variance is 83%. The proportion of the factor determining the results of testing the depth of vision and thinking over the time of reproduction of simple and complex figures was 21.5%; indicators of sustained attention, motor, short-term and conception memory - 19,2%; results of tests of tactile and muscular sensations and selective attention - 13%; visual field - 9.3%; results of tests that characterize visual acuity and joint motion sensations - 9.3%; indicators of attention development and vestibular stability - 11,5%.

- Experimental technique for the development of psychomotor of 13-14 year-old children with hearing impairments during the physical training assumed:

- Stages of influence on psychomotor: informational studying, singular development of psychomotor components, improvement of interfunctional interactions in the structure of psychomotor elements. Priority, content and duration of stages expresses the logic of the process of improving the psychomotor capabilities of the specified contingent of children;

- means provided by the program of physical education for secondary schools, as well as breathing gymnastics, eye exercises, relaxation exercises, table tennis and darts games, psychological tasks adapted to the conditions of physical education, and special technical means of training;

- teaching methods, among which: the method of parallel impact, which provided for the development of components of psychomotor in the process of physical education and education of physical qualities; selectively directed exercise through the use of techniques that contributed to a distinct effect on the components of psychomotor; the method of complex exercising through the use of techniques of general influence on the components that underlie the psychomotor activity; words and demonstrations, peculiarities of which during the development of psychomotor of children with hearing impairments were expressed through the use of different ways of information transmission (verbal communication, dactylization, sign language, lips reading, facial expressions and gestures), a broad combination of visibility and word, and the use of visual aid as a component of special psychological tasks, the use of visual guidance as a means of influencing the cognitive and sensory spheres.

- To determine the duration of performance and the number of repetitions of exercises aimed at the development of components of the sensory and cognitive spheres and the improvement of interfunctional interactions between them, were guided by the results of observations on the presence of signs of fatigue, which is an objective indicator of the adequacy of exercises to activate mental processes. Affecting the components of the cognitive sphere, we were focused, mainly on subjective indicators of fatigue. An objective indicator of the sufficiency of exercising such an orientation was the number of errors during the solution of problems. The criteria for the adequacy of exercises for the development of analyzers were factors that are affected by the over excitation or depletion of a particular analyzer.

- Pedagogical experiment has revealed that as a result of the implementation of the experimental method in the EG, the results of the study of sensory and cognitive abilities of the 13-14 year-old children with hearing impairments have increased. Thus, in the first stage there was an improvement in the range of 11.3-553%, and in the second - 10-440% of the components of the cognitive sphere. Accordingly, the indicators of the state of sensory have increased in the range of 5.5-36.5% and 1.9-59.5%. In CG, the growth of indicators for the development of components underlying the psychomotor activity was significantly lower, and in some cases, negative changes were recorded. At the first stage, improvement of the state of components of the cognitive sphere of psychomotor was observed at the level of 4.7-29.4%. Thus, the state of conception and motor memory was deteriorated by 11.3% and 12.2%. At the second stage, the growth of cognitive parameters was observed at 2-5.2% for the deterioration of the selectivity of attention and all types of memory within the range of 0.8-34.4%. Similar tendencies were observed during the study of sensors representatives of CG. In the first stage, the growth of the sensory component from 4% to 25% was recorded for a slight deterioration in visual acuity, tactile sensations and vestibular stability (2.3-2.5%). In the second stage, only the motor component (4.7-17.7%) was recorded. Other indicators of development of sensor elements deteriorated within the range of 2.1-35.6%.

An effective experimental technique was found on the results of the study of integrative indicators of the state of psychomotor. So, in EG1 and EG2 there was an increase according to 10,4-21,8% and 12,7-21,2% of indicators of performance of a seven-meter test, sensation of rhythm and accuracy. In CG1 deterioration of accuracy (by 2%), and in CG2 the decrease of all indicators in the range of 0, 8-15, 9% was recorded.

- During the pilot study, reliable changes were identified to all integrative indicators of the development of psychomotor abilities and sensory and cognitive components in the representatives of the EG regarding the representatives of the CG, indicating the effectiveness of the proposed methodology for the development of psychomotor of the 13-14 year old pupils with hearing impairments in the process of physical education.

Further studies of this problem can be carried out in the following areas: definition of sensitive periods of

psychomotor development of pupils with hearing impairments; development of psychomotor of children with such nosology for other age groups; definition of peculiarities of influence on the psychomotor sphere of pupils of different stages of *sensorineural hearing loss*; comparison of indicators of psychomotor development of children with hearing impairments and their hearing peers.

Conflict of interests

The authors declare that there is no conflict of interest.

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