

EFFECTIVENESS OF INFLUENCE OF PHYSICAL REHABILITATION MEASURES ON INDICATORS OF PSYCHO-PHYSIOLOGICAL STATUS OF CHILDREN WITH SCOLIOSIS



Elena Dychko

*PhD., Associate Professor,
Physical Therapy, Physical Education and Biology Department,
SHEI «Donbass state pedagogical University»,
Sloviansk, Ukraine*



Irina Kushakova

*PhD., Associate Professor,
Physical Therapy, Physical Education and Biology Department,
SHEI «Donbass state pedagogical University»,
Sloviansk, Ukraine*

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Abstract. The article presents the results of the influence of the complex of rehabilitation physical education of sensorimotor reactions on the indicators of the psychophysiological status of children studying in a specialized comprehensive boarding school for children with scoliosis in Oleksiyev-Druzhkivka, Donetsk region, aged 7-17 years. It is shown that the performed complex of physical exercises in children with scoliosis has a positive effect on the test performance of children with scoliosis that characterize the reaction of children with scoliosis to a moving object and it can be recommended for widespread use among children aged 7-17 years suffering from scoliosis to improve the psychophysiological status of these children and to improve the quality of life.

Keywords: 7-17 years, children, scoliosis, exercise, psychophysical status, rehabilitation measures.

Introduction

Psychophysical status includes many concepts, which underlie the motor abilities of the individual, which provide an appropriate level of adaptation to various types of physiological activity. Psychophysical status is a combination of inborn anthropometric, morphological, psychological, physiological and biochemical characteristics of a person, which in one direction directly affect the success: physical or mental activity.

Psychophysical development is characterized by motility, mobility in joints, coordination ability of movements, formation in children of coordination abilities in the process of development, ability to control movements [1, 3, 7].

The analysis of recent research and publications. Considering the present state of this problem, it is difficult to get rid of the idea that with each new step in the progressive movement of medical science, its solution, as a horizon line, is displaced in proportion to scientific progress [2, 5].

Moreover, the analysis of vast clinical and experimental material indicates a clear preference for recently averaged, generalized assessments of the physical development and functional state of the human body, especially children [5, 6, 7].

The smooth development of morpho-functional systems of the body with some advantage of the rate of growth of the body relative to its mass is typically for children aged 7 to 17 years. At this age, ossification of the skeleton continues, although it still contains a significant amount of cartilage, forming the cervical and thoracic bends. The ligament apparatus has high elasticity, the flexor muscles outperform the extensors, the trunk muscles outweigh the limb muscles, and the relative strength of the extremities approaches adult indicators. At this age there is a restructuring of the cardiovascular, respiratory, hematopoietic, immune, endocrine, nervous and other systems of the body of children [4, 6, 8, 9].

Strength and balance of nervous processes of children, aged 7-17 years is relatively small, excitation predominates, neurophysiological basis for the development of speed abilities is mainly formed, improving the mechanisms of central regulation, increasing endurance. Changes in all indicators of psychophysical status are gradual, depending on age and gender [2, 3, 6, 7].

The common neurodynamic basis of various abilities is mobility, reaction rate, number of errors, stability of reaction, functional level of capabilities and others. These indicators form (constitute) a simple visual-motor response, which includes the following indicators: total number of errors, level of functionality, steadiness of the reaction, functional level of the system, speed of sensorimotor reactions.

Highlighting previously unresolved parts of a common problem. At this stage, there are no studies that highlight the problem of the impact of the complex of rehabilitation physical education of sensorimotor reactions on indicators of psychophysiological status of children aged 7-17 years with scoliosis.

The purpose of the study is to study the influence of the developed method of physical rehabilitation measures of sensorimotor reactions on external stimuli (reaction to a moving object, response of choice and reaction of distinction) of children aged 7-17 years with scoliosis.

The object and research methods. The bases for the study were: specialized boarding school for children with scoliosis, Aleksiyev-Druzhkivka, Donetsk region.

The study was conducted among 87 children aged 7-17 years with scoliosis (45 boys and 42 girls).

The stage of the research was to study the effectiveness of the use of the technique of a phased complex of rehabilitation physical measures for leading indicators of psychophysical status of boys and girls with scoliosis aged 7-17 years.

In order to expand the use of the developed complex of physical exercises for the rehabilitation of children suffering from scoliosis, it is studied the influence of the complex of physical exercises on the indicators characterizing the reaction to a moving object, the response of choice and the response of differentiation in children with scoliosis depending on age - 7-17 years.

For the rehabilitation of school-age children with scoliosis, we have used the exercise method for these children. Exercise plans have been developed taking into account age, sex and depth of indicators, etc. The first step in studying the effectiveness of using this method in children of all ages was to study the impact of rehabilitation measures on the indicators that characterize the response to a moving object. Initially, the definitions summarized the effect of measures on all children with scoliosis, and then separately on boys and girls, depending on age.

The results obtained were processed using the MUSTAT.12 (USA) applications. The reliability of the data for the independent samples is calculated by the t criterion student (when distributing arrays close to normal). The difference was considered significant at $P > 0.05$.

The work was carried out in accordance with bioethical norms in compliance with the relevant laws of Ukraine. All parents of the children gave written informed consent to their children's participation in the study.

The presentation of main material. The results of the study of indicators characterizing the response to a moving object in children with scoliosis aged 7-10 years are shown in table. 1.

Table 1

Response of the children to an object that moves with scoliosis aged 7-10 years

INDICATORS	Un. meas.	Boys		Girls	
		n - 17		n - 15	
		before rehabilitation	after rehabilitation	before rehabilitation	after rehabilitation
Average reaction time	ms	17,06±4,59	11,60±2,99	18,20±4,84	12,74±2,54
Number of outpacing	un.	7,76±0,41	6,99±0,35	8,13±0,45	7,24±0,30
Number of exact reactions	un.	13,47±1,42	15,90±1,60	12,13±1,56	14,44±1,39

Source: table compiled by the authors based on materials

It is shown that the developed complex of physical exercises used in children with scoliosis aged 7-10 years positively (improves) influences the performance of tests characterizing the reaction of children with scoliosis to a moving object. Under conditions of exercise, performing, boys' average reaction time is reduced by 47.07%, and girls with scoliosis - by 42.86%; the number of outbreaks in boys with scoliosis is reduced by 11.02%, in girls with scoliosis - by 12.29%. The number of precise reactions in boys is increased by 18.04%, in girls - by 19.04%.

The positive results of the indicators studying characterizing the response of children with scoliosis aged 11-14 years to a moving object and the impact on the performance of these tests conducted a complex of physical exercises are shown in table 2.

Table 2

Response of the children to an object that moves with scoliosis aged 11-14 years

INDICATORS	Un. meas.	Boys		Girls	
		n - 15		n - 16	
		before rehabilitation	after rehabilitation	before rehabilitation	after rehabilitation
Average reaction time	ms	13,73±4,91	8,65±2,69	13,81±4,67	8,98±2,39
Number of outpacing	un.	6,33±0,45	5,45±0,33	6,50±0,42	5,53±0,28
Number of exact reactions	un.	17,27±1,56	21,24±1,67	16,94±1,49	20,66±1,43

Source: table compiled by the authors based on materials

A complex program of rehabilitation measures of physical education in children with scoliosis aged 11-14 years has a positive effect on the performance of tests characterizing the reaction of children with scoliosis to a moving object. Thus, in boys with scoliosis after the course of rehabilitation physical exercises, the average reaction time is improved by 58.73%, in girls - by 53.79%. The improvement in the number of outperformance in boys with scoliosis aged 11-14 years by 16.15%, in girls with scoliosis by the same age - by 17.54%, and the number of accurate reactions in boys with scoliosis aged 11-14 years improved after the complex physical exercise by 22.99%, girls with scoliosis of the same age - by 21.96%.

The positive results obtained from the use of the proposed complex of physical exercises for children with scoliosis aged 7-14 years were the basis for the continuation of experiments using this complex among children with scoliosis aged 15-17 years. The results of studies in this area are shown in Table 3.

Table 3

Response of the children to an object that moves with scoliosis aged 15-17 years

INDICATORS	Un. meas.	Boys		Girls	
		n - 13		n - 11	
		before rehabilitation	after rehabilitation	before rehabilitation	after rehabilitation
Average reaction time	ms	7,69±1,41	5,15±0,74	8,55±1,62	5,55±0,62
Number of outpacing	un.	4,92±0,42	4,04±0,27	5,45±0,48	4,58±0,23
Number of exact reactions	un.	21,31±1,49	26,00±1,42	19,91±1,71	24,49±1,24

Source: table compiled by the authors based on materials

The performed complex of physical exercises in children with scoliosis aged 15-17 years gave positive expected results. Thus, in boys with scoliosis aged 15-17 years after the physical exercises provided by the developed complex, the average reaction time improved by 49.32% - in girls with scoliosis of the corresponding age - by 54.05%; The number of boys with scoliosis in the age group 15-17 years is also increasing by 21.78%, and in girls-peers with scoliosis - by 19.0%. The number of precise reactions in boys with scoliosis after the complex of physical exercises improved by 22.01%, in girls with scoliosis aged 15-17 years - by 23.0%.

Thus, the conducted complex of physical exercises among children with scoliosis has a positive effect on the performance in children with scoliosis between the ages of 7-17 years tests that characterize the reaction of children with scoliosis to a moving object and it can be recommended for wide use in children of age 7-17 year olds suffering from scoliosis to improve the psychophysiological status of these children and improve the quality of life.

The next stages of studying the influence of the developed complex of physical exercises on the indicators of psychophysiological status of children with scoliosis aged 7-17 years were to establish the use of the complex of physical exercises on the response of choice and distinction in children with scoliosis aged 7-17 years, depending on the age group.

The results of the study of the influence of the stage-by-stage complex of physical culture in children with scoliosis aged 7-10 years on the choice response are shown in table 4.

Table 4

Response of choice of children with scoliosis aged 7-10 years

INDICATORS	Un. meas.	Boys		Girls	
		n - 17		n - 15	
		before rehabilitation	after rehabilitation	before rehabilitation	after rehabilitation
The total number of errors	un.	14,47±1,08	12,16±0,87	14,73±1,19	12,97±0,79
The average value of the reaction time	ms	510,41±27,02	408,33±20,72	522,73±29,76	444,32±18,98

Source: table compiled by the authors based on materials

It is shown that the use of a complex program of rehabilitation of psychophysiological status in children with scoliosis aged 7-10 years has a positive effect on the performance of choice reaction tests. In this case, the total number of choice reaction errors in boys with scoliosis 7-10 years decreases by 19.00%, in girls-peers with scoliosis - by 13.57%, and the average value of the reaction time of choice decreases in boys with scoliosis 7- 10 years decreases by 25,00%, for girls with scoliosis at this age - by 17,65%, which is evidence of the effectiveness of using the developed complex of physical exercises in children with scoliosis aged 7-10 years.

The results of the study of the effectiveness of the influence of the rehabilitation complex of physical exercises on the choice response in children with scoliosis aged 11-14 years are shown in table 5.

Table 5

Response of choice of children with scoliosis aged 11-14 years

INDICATORS	Un. meas.	Boys		Girls	
		n - 15		n - 16	
		before rehabilitation	after rehabilitation	before rehabilitation	after rehabilitation
The total number of errors	un.	11,80±1,19	9,56±0,84	12,00±1,13	10,32±0,77
The average value of the reaction time	ms	411,40±37,20	312,66±24,61	423,19±35,41	351,25±23,16

Source: table compiled by the authors based on materials

In boys with scoliosis aged 11-14 years after the conducted exercise complex the total number of errors in the test of choice decreases by 23,43%, in girls with scoliosis of the same age - by 16,28%, and the average value of reaction time of choice decreases in boys with scoliosis aged 11-14 years by 31.58%, in girls with scoliosis of the same age - by 20.48%.

The results of studying of the influence of a complex of physical exercises on the choice response in children with scoliosis in the following category of children (15-17 years) are shown in Table 6

Table 6

Response of choice of children with scoliosis aged 15-17 years

INDICATORS	Un. meas.	Boys		Girls	
		n - 13		n - 11	
		before rehabilitation	after rehabilitation	before rehabilitation	after rehabilitation
The total number of errors	un	9,69±0,91	7,95±0,58	9,91±1,05	8,22±0,51
The average value of the reaction time	MS	331,23±26,66	264,98±16,63	341,45±30,53	276,58±14,51

Source: table compiled by the authors based on materials

The use of the rehabilitation complex of physical culture in children with scoliosis aged 15-17 years also plays a positive role in maintaining the psychophysiological status. After performing physical rehabilitation measures in boys with scoliosis aged 15-17 years, the total number of errors decreased by 21.89%, in girls with scoliosis of the same age - 20.56%, and the average response time in boys with scoliosis aged 15 -17 years has improved by 25,00%, in girls with scoliosis - by 23,45%.

Thus, the use of a complex of rehabilitation exercises in children with scoliosis between 7 and 10 years of age leads to an improvement in the response of choice in both boys and girls with scoliosis and depends partly on age.

The results of the study of the effect of rehabilitation measures of physical culture on the indices of the response of distinction in children with scoliosis aged 7-10 years are shown in table 7.

Table 7

The response of differentiation children with scoliosis aged 7-10 years

INDICATORS	Un. meas.	Boys		Girls	
		n - 17		n - 15	
		before rehabilitation	after rehabilitation	before rehabilitation	after rehabilitation
The total number of errors	un.	3,35±0,27	2,95±0,23	3,93±0,37	3,42±0,24
Number of outpacing	un.	3,06±0,27	2,63±0,22	3,13±0,22	2,66±0,14
The average value of the reaction time	MS	454,12±27,02	404,16±23,05	493,33±29,76	444,00±20,09

Source: table compiled by the authors based on materials

According to the data obtained from the study of the effectiveness of the developed complex of rehabilitation physical exercises in children with scoliosis aged 7-10 years, a positive impact on children with spinal pathology can be seen, which contributes to the improvement of psychophysiological status. During the complex, the total number of mistakes made by boys with scoliosis aged 7-10 years is reduced by 13.56%, in girls with scoliosis - by 14.91%; the number of outgrowths in boys with scoliosis aged 7-10 years is reduced by 16.35%, in girls with scoliosis - by 17.67%, and the average response time of the distinction in boys with scoliosis aged 7-10 years is improved by 12, 36%, for girls with scoliosis of the same age - by 11.11%.

The results of the study of the indicators characterizing the influence of the conducted complex of physical exercises on the performance of tests of the response of differentiation children with scoliosis aged 11-14 years are shown in table 8.

Table 8

The response of differentiation children with scoliosis aged 11-14 years

INDICATORS	Un. meas.	Boys		Girls	
		n - 15		n - 16	
		before rehabilitation	after rehabilitation	before rehabilitation	after rehabilitation
The total number of errors	un.	2,27±0,30	1,95±0,22	2,38±0,28	2,02±0,19
Number of outpacing	un.	1,87±0,15	1,51±0,10	1,94±0,14	1,63±0,09
The average value of the reaction time	MS	383,33±26,04	322,00±19,04	390,63±24,79	343,75±17,19

Source: table compiled by the authors based on materials

The performed complex of physical exercises in children with scoliosis aged 11-14 years improves all indicators characterizing the level of performance of tests of the distinction reaction. The use of a complex of physical exercises in boys with scoliosis aged 11-14 years leads to a decrease in the total number of errors by 16,41%, in girls with scoliosis of the same age - by 17,82%; to a decrease in the number of outgrowths of boys by 23.84%, in girls - by 19.02%, and also decreases the average value of the response time of differentiation in boys with scoliosis aged 11-14 years by 19.05%, in girls with scoliosis of the same age - by 13.64%.

The results of the study of the influence of a complex of physical exercises on the indicators characterizing the response of differentiation in children with scoliosis aged 15-17 years are shown in table 9.

Table 9

The response of differentiation children with scoliosis aged 15-17 years

INDICATORS	Un. meas.	Boys		Girls	
		n - 13		n - 11	
		before rehabilitation	after rehabilitation	before rehabilitation	after rehabilitation
The total number of errors	un.	1,46±0,25	1,18±0,16	1,55±0,19	1,28±0,09
Number of outpacing	un.	1,38±0,25	1,08±0,15	1,45±0,29	1,18±0,14
The average value of the reaction time	MS	296,15±20,76	248,77±13,60	304,55±23,78	261,91±12,00

Source: table compiled by the authors based on materials

It is shown that at the age of 15-17 years in children with scoliosis the developed complex of physical exercises has a positive influence on the improvement of the psychophysiological status of these children. In boys with scoliosis aged 15-17 years, the total number of errors is reduced by 23.73%, in girls with scoliosis aged 15-17 years - by 21.09%. Under the influence of exercises, the number of outstrips in boys with scoliosis also decreases by 27.78%, and by 22.88% in girls with scoliosis, and also decreases the average time of the response to differentiation in boys with scoliosis aged 15-17 years by 19,05%, for girls - by 16,28%.

Conclusions

Thus, the use of the developed complex of physical education in children with scoliosis aged 7-10,11-14 and 15-17 years has a positive effect on the psychophysiological status and promotes better performance of tests of children with scoliosis at that age, characterizing the reaction of children to the object moving, choice reaction, and distinction reaction. The level of influence depends on the age and gender.

The foregoing requires the researches and development of tools and measures for the possible correction of simple visual-motor disorders in children with scoliosis aged 7-17 years. But in order to search for corrective measures it is necessary to study the indicators of motor abilities in children with scoliosis.

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