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PHYSICAL REHABILITATION OF PRESCHOOLERS WITH CEREBRAL PARALYSIS BY MEANS OF HIPPOTHERAPY

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Abstract

Social integration and comprehensive rehabilitation of people with disabilities with cerebral palsy occupies one of the leading places in physical rehabilitation. In all corners of the globe, medical workers and specialists of therapeutic physical culture constantly use the means of hippotherapy (Equine-assisted therapy) as a rehabilitation of people with cerebral palsy. The authors developed and tested the technique of hippotherapy in the process of development of motor functions and the formation of skills of household self-care in children aged 4-6 with the manifestation of a spastic form of infantile cerebral palsy. Subjects had different degrees of motor disorders; the average assessment of the degree of clinical manifestations prior to the start of the experiment was 2.2 points. The technique includes three stages of conducting exercises with the performance of exercises riding on the horse, aimed at normalizing the pathological muscle tone, the formation of the correct motor stereotype, the stimulation of tactile and proprioceptive sensitivity, the development of motor skills and the reduction of dysarthria, increasing the level of motor functions, which contributes to social rehabilitation of children with this disease. A low degree of social adaptation is due to the age of sick children and the short duration of mastering skills, as well as excessive guardianship by parents.

Keywords: Cerebral palsy, spastic form, rehabilitation, 4-6 year old children, hippotherapy, health effect.

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1. Introduction

The problem of rehabilitation of children suffering from infantile cerebral palsy has attracted special attention of specialists of various profiles for many years. The number of centers engaged in the treatment of this complex and serious disease is increasing, and usually the work in them is aimed only at correcting violations in the physical sphere. Significant differentiation of the directions of correctional activity, separation of the tasks of upbringing and treatment by different institutions leads to an inevitable decrease in the effectiveness of rehabilitation (Badalyan, Zhurba, 2009; Pilosyan, Karpov & Skorosov, 2016).

2. Problem Statement

According to the World Health Organization, there are 13 to 15 cases of cerebral palsy registered per 1000 newborns. Spastic forms come to the fore in frequency of occurrence. The problem of rehabilitation and social adaptation is of particular relevance due to the increase in the number of disabled people. At the heart of childhood disability, there are diseases that occur before the age of 15 per 10 000 children in 52.45 cases - the nervous system and sensory organs; mental disorders - in 31.2 cases; mental retardation - in 21.88. In 28.2 cases, there are congenital anomalies of development (Denisenkov et al., 2004).

Being a natural-biological method of therapy, social integration and comprehensive rehabilitation of people with disabilities with cerebral palsy occupy one of the leading places in physical rehabilitation (Mastyukova, 1991). The uniqueness of hippotherapy as a means of rehabilitation lies in the direct impact of the rhythmically ordered motor and sensory loading on the sick person when making close contact with the horse, due to which a consistently pronounced wellness effect is realized (Gridneva, 2011; Denisenkov et al., 2004). Strauss (2000), noting the variety of different biomechanical influences and the highest emotional effect in hippotherapy, expresses the opinion that it is impossible to obtain such effect when using other means of adaptive physical culture.

Tsverava D.M., giving the definition of hippotherapy, considers it as a means and a unique form of therapeutic physical training (LFK), where the instrument of rehabilitation is a horse, as well as various initial assumptions taken by a person during riding. Among Russian and foreign scientists, DM. Tsverava, M.Sh. Loria, Anais Atmadzhan, N.S. Robert and others were engaged in the scientific development of the problems of rehabilitation of patients with cerebral palsy with the use of horse riding and equestrian sports.

3. Research Questions

The presented research is designed to answer the following questions: by what indicators with a sufficiently high degree of objectivity can one evaluate the effectiveness of the rehabilitation program and set realistic goals? What physical exercises are aimed at the development of motor functions in the process of hippotherapy? How does the presented technique affect the development of the child's motor functions, improve the work of the vestibular apparatus, increase the motor activity of children, stimulate speech and manipulative functions, increase the emotional background of the child?

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4. Purpose of the Study

The aim of the research is to develop and test the methods of using hippotherapy in the process of development of motor functions and the formation of habits of self-service for children aged 4-6 with the manifestation of a spastic form of infantile cerebral palsy.

5. Research Methods

The authors chose the following research methods: analysis of scientific and methodological literature; pedagogical observation; pedagogical experiment; medical and pedagogical testing (assessment of severity of clinical manifestations); pedagogical testing (functional category of walking, characteristics of stability of the vertical posture, hand motility); methods of mathematical statistics. The study was conducted in the Adler district of Sochi, at the School of Adaptive Physical Education of Dobiezhyny. 15 children aged 4-6 with the diagnosis of cerebral palsy with a spastic form of the disease took part in it. The necessary materials for the research were studied: personal files of each child, findings of an examination of a children's neurologist; diaries of rehabilitation. Pedagogical observation was used in the description of the characteristics of motor disorders and self-care in children with cerebral palsy in the process of rehabilitation under conditions of playing activity, which allowed obtaining data on the level of their intellectual and physical abilities. The observation was carried out by researchers and specialists of the center with the direct participation of parents. The experimental procedure involved three stages (Rogov, 2006; Sokolov, 2002).

The purpose of the introductory stage is to increase the readiness of the child to perform a set of exercises of the second stage and to achieve a decrease in the pathological muscle tone. At this stage, horseback riding was applied using the positions of passive packing and neurophysiological landing. The duration of the introductory stage may vary depending on the decrease in the pathological tone in the child after the first block of studies. Classes of the second stage are aimed at the development of the child's motor functions according to the ontogenetic scheme (Rogov, Yerkomashvili, 2007; Bykovskaia, 2005). The task of the researcher at this stage is to reduce the pathological muscle tone and to promote the development of fine motor skills of the hands. For this, a set of physical exercises performed in the ontogenetic sequence was used.

At the third stage, the effect of reducing the pathological tone, possible reduction of its relapses, as well as confidential communication with the horse, was secured. The tasks of securing the habit of passive walking, reducing the pathological tone, developing proprioceptions were solved. At the final stage, the means of influencing the child was horse riding in the position of neurophysiological planting and feeding the horse from the palm (Denisenkov, 2012; Ionatamishvili, 2000). The dosage at each stage was 4 to 5 series of 6-8 exercises, the motor density of the exercise was at the level of 55-60%, which is the optimal level for children with disabilities (Noe'mi, 2000).

6. Findings

Before the scientific experiment, the level of development of motor functions and habits of self-care for children with a spastic form of cerebral palsy of 4-6 years old was revealed (Pilosyan, Karpov,

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Sergeeva, 2016). The therapeutic and prophylactic effect of hippotherapy on the human body is based on the influence of psychogenic factors: the patient's motivation and his personal interest in the results of activity, and biomechanical factors: the influence of vibrations during riding, in three mutually perpendicular planes. All the children participating in the experiment after the hippotherapy course were repeatedly tested for determining the severity of clinical manifestations. Table 1 reflects the obtained average data of the evaluation of the severity of clinical manifestations for children before and after the pedagogical experiment.

Table 01. Assessment of the severity of clinical manifestations of a spastic form of infantile cerebral palsy in children before and after the experiment (n = 15)

Tests (Scores)	Before the course of hippotherapy Xav.± σ	After the course of hippotherapy Xav.± σ	Significance level P*
Evaluation of motor functions	2.0±1.03	2.5±1.35	P>0.05
Assessment of the degree of social adaptation	1.7±0.7	2.3±1.1	P>0.05
Assessment of speech disorders	2.3±1.11	2.9±1.03	P>0.05
Comprehensive assessment of severity of clinical manifestations	2.2±1.03	2.7±1.08	P>0.05

The group scored the least points in the test for assessing social and domestic adaptation. Most likely this is due to the age of the group and little experience in mastering these skills, as well as hyper-care from adults.

At the end of the course, the following results were obtained: the evaluation of motor functions increased by 25% (P> 0.05), the assessment of the degree of social adaptation increased by 35% (P> 0.05). The assessment of speech disorders has changed by 26% (P> 0.05). And a comprehensive assessment of the severity of clinical manifestations increased by 22% (P> 0.05), which indicates a positive dynamics of the impact of courses.

The children who participated in the experiment repeatedly underwent testing for changing the functional categories of walking. According to the results obtained during the study, the number of children in the "Not able to walk" category has not changed before and after the experiment. In the category "Dependent, Level 2" before the start of the experiment, there were 7 children. After the hippotherapy course, 5 children were treated, which means improvement of motor functions for two children. In the category "Dependent, Level 1", there were 2 children. After the hippotherapy course, 1 child was treated. In the category "Independent for walking on an even surface", after the hippotherapy course, there were two children. Improvement in the functional category of walking after the course occurred for 6 children; for all other children the indicator did not change. The indicator of walking is one of the criteria for assessing the coordination of movement, since the test itself is aimed at estimating not the amount of walking, but a qualitative indicator indicating balance in movement, the ability to move with one or two supports. To determine the change in the work of the vestibular apparatus, repeated testing of the stability of the vertical posture was applied. As the analysis of the test results showed,

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before the hippotherapy course, the vertical posture for children according to the gradation "Can not stand" included 5 children. After the experiment in this graduation, there were three children. In the gradation "Can stand with feet astride less than 30 seconds" before the experiment, there were 6 children; after the experiment – 7 children belonged to this group. This is due to the fact that several children have experienced improvements in the functional state of the musculo-ligament apparatus of the trunk.

2 children were assigned to the group "Can stand with feet astride more than 30 seconds» prior to the experiment; after the experiment, in this group there was 1 child. Before the pedagogical experiment, 2 children were classified as "able to stand in the normal stand position less than 30 seconds", after the experiment in this group, there were also only two children left. In the characteristic "Can stand in the normal stand position for more than 30 seconds", no child was determined before the experiment. After the hippotherapy course, one child was assigned to this group. For eight children, the indicator did not change, which is due, above all, to the fact that these children have an average degree of clinical manifestations. For a comparative evaluation of the information on the manipulative activity of the hands of children aged 4-6, with the disease of infantile cerebral palsy, the "Button" test was repeated after a pedagogical experiment.

During the "Button" test when buttons were fastened for 20 seconds, no buttons were buttoned up by 6 children, after the experiment 5 children did not fasten buttons. 1 button was fastened by 2 children before and after the experiment. 2 buttons were buttoned up by 4 children. After the hippotherapy course, 2 buttons were fastened by 1 child. 3 buttons were buttoned up by 1 child before the experiment, after the experiment, two children accomplished buttoning up 3 buttons. And also four buttons were buttoned up by two children, and after the experiment, three children were able to fasten 4 buttons. Before the experiment, 5-6 buttons were not fastened by any of the children. After the hippotherapy course, 5 and 6 buttons were buttoned up by one child. The performance of the test for the manipulative activity of hands under the room conditions for some children caused great difficulty. At the same time, when performing exercises on horses, using objects in the form of toys, no difficulties with the execution of the grasp and manipulation with various objects were observed. The authors found an explanation for this in the fact that in connection with the biomechanical effect when walking a horse, there is a decrease in the overall hypertension of the child's muscles. Spasm of the flexor of the palm and fingers, which do not allow performing the grasping, is neutralized by the retained object and it becomes possible to perform the exercise. At the same time, it is noticed that in the place of confinement the length of the girth of the object should be commensurate with the distance between the tips of the child's thumb and the index finger.

Analyzing the results of testing, one can assume that possible improvements have occurred in connection with the formation of new motor reflexes. And especially it concerns the formation of the central link of the reflex arc, that is, the improvement of the associative links of the brain between centers responsible for targeted motor actions, such as red nucleus, pale balloon, black substance, amygdala, Broca's speech zone from the anterior precentral and posterior precentral convolutions of the brain, responsible for the muscular tone, purposeful movement. And also there could be an improvement in the connections between these centers and the frontal lobes responsible for thinking. And since in the verticalization of the posture, such morphofunctional structures as the cerebellum and the vestibular

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apparatus participate in addition to the muscle tone, then in the case of hippotherapy, it is possible that these connections also improve.

7. Conclusion

It is necessary to use hippotherapy for improvement of the manipulative activity of the hands under the room conditions. At the same time, when performing exercises on horses, using objects in the form of toys, there were no difficulties in the execution of the grasp and manipulation with various objects. The authors found an explanation for this in the fact that in connection with the biomechanical effect when walking a horse, there is a decrease in the total hypertension of the child's muscles. Spasm of the flexor of the palm and fingers, which do not allow performing the grasping, is neutralized by the retained object and it becomes possible to perform the exercise. At the same time, it is noticed that in the place of confinement, the length of the girth of the object should be commensurate with the distance between the tips of the child's thumb and the index finger.

Analyzing the results of testing, one can assume that the results were achieved with the formation of new motor reflexes and especially with the formation of the central link of the reflex arc, that is, such centers of the brain as red nucleus, pale balloon, black substance, amygdala, Broca's speech zone. From the viewpoint of anterior precentral and posterior precentral convolutions of the brain, responsible for the muscular tone, purposeful movement, there can be an improvement in the connections between these centers and the frontal lobes, responsible for thinking. And, since such morphofunctional structures as the cerebellum and the vestibular apparatus participate in the verticalization of the muscle tone, it is possible to state that hippotherapy practices improve these connections as well. One can conclude that in most test scores, a positive trend was achieved: the assessment of motor functions increased by 25%, a comprehensive assessment of the severity of clinical manifestations by 22%. At the same time, the indicators of the degree of social and domestic adaptation increased by 35% and verbal violations - by 26%.

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