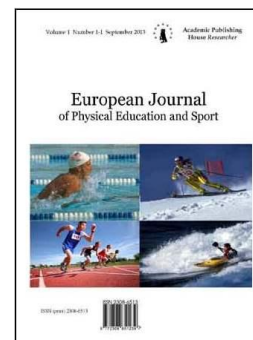


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## **Adaptive Physical Training as a Means of Rehabilitation of Patients With Cerebral Palsy: a Literature Review**

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### **Abstract**

The literature review considers available means and methods of adaptive physical training in the treatment and rehabilitation of cerebral palsy (CP). The use of therapeutic physical training, manual therapy, and various training devices is one of the promising directions of movement correction for cerebral palsy. Despite the fact that it is impossible completely cure the disease, however, in the course of rehabilitation we can develop a child's motor, speech, thinking skills, ability to study and communicate with others.

**Keywords:** cerebral palsy, adaptive physical education, physical rehabilitation, therapeutic physical training.

### **Relevance**

Adaptive physical education (APE) is a set of actions of a sports nature, aimed at rehabilitating and adapting to a normal social environment of people with disabilities, overcoming the psychological barriers, that interfere to feel a full sense of life and realizing of the need for his personal contribution to the social development of society [1]. Thanks to the fact that APE includes at least three fields of knowledge - physical culture, medicine and correctional pedagogy, it is a much more capacious and broad concept in comparison with medical physical culture (physical therapy) and physical education of children with deviation in development.

The term cerebral palsy (CP) represents a group of non-progressive disorders of poses and movements, caused by damage to the central nervous system of the fetus or child occurred in the antenatal, intrapartum and neonatal periods. These motor disorders are often accompanied by sensitivity defects of cognitive and communicative functions, perception and / or behavioral and / or convulsive disorders" [2, 3]. Cerebral Palsy is considered the main cause of child disability, which for this reason is 2-2,5 cases per 1000 children. [4]

Depending on the type of movement disorder, severity of associated neurological disorders, there are various classifications of the disease. They are based on the prevailing movement disorders in the form of the presence of the main types of cerebral palsy (spastic, athetoid, atactic and mixed) or categories of motor disorders (spastic, dyskinetic, ataxic) [5, 6].

Cerebral Palsy is characterized by a variety of clinical manifestations, for overcoming of which for many years with greater or lesser degrees of success, the efforts of specialists in various fields have been directed. Treatment begins with the first months of a child's life, right after diagnosis. Throughout the child's life rehabilitation played a leading role, which uses a set of measures that reflect different aspects of the problem: drug [7-10], physical [11-13], neuroorthopedic [13-16], physical therapy [17-20], psychological [11, 21], the pedagogical [11, 22] and others.

### **Methods of physical rehabilitation**

One of the most important method in the physical rehabilitation of cerebral palsy is a physical therapy that begins immediately after diagnosis. At the same time a complex of exercises that prevent the weakening and atrophy of muscles, the development of contractures and promotion of child's motor development [23, 24]. Physical rehabilitation includes both active and passive treatments as hydrotherapy, mechanotherapy, massage, manual therapy, reflexology with a good therapeutic effect [11, 13, 18].

AFC means are widely used in rehabilitation activities for cerebral palsy. Analysis of the results of research conducted on the basis of department of rehabilitation treatment "Rosinka" Surgut, showed that the use of exercise in rehabilitation of patients with cerebral palsy is effective. So, after going through a series of classes, improvement in children's musculoskeletal system, muscle tone, posture, decreasing of contractures, increasing of motor skills were noted [25].

In the case of this disease, physical therapy sessions with special trainers are used. The complex rehabilitation of children for the development of coordination abilities successfully used the simulator «Bosu» [26]. "Mioneyroton-bike" and "Akorda-Multimiostim" are reported to be high efficiency functional electrical stimulation devices for patients with cerebral palsy in the form of spastic diplegia [27]. A method for comprehensive rehabilitation was developed, including physical therapy with newly created and enhanced simulators [28, 29], allowing to work in a vertical position with patients and to develop their new motor skills by increasing the range of motion in the joints of the upper and lower extremities [23, 24].

Such means of APE as fitball gymnastics [29, 30], the simulator "Gross" [31], medical suits "Gravistat" and "Adele" [32], neuro-orthopedic rehabilitation jumpsuit "Phaeton" [33] found the widespread use. N.A. Gross notes that the feature of the proposed system of physical rehabilitation is a priority use of physical culture as a form of motor activity, which allows in the best way to form a vital motor skills, to ensure the normal functioning of body systems, to enhance mental abilities, optimize health and performance [31]. That is why he offers to use training devices as wide as it possible, which allow to increase the range of motor skills.

"Simulator Gross" is widely used in many rehabilitation centers for several years, which gradually adapts to the child with cerebral palsy to rehabilitation activities, particularly in the absence of skills of independent walking. As a rule, in conjunction with the "simulator Gross" method of dynamic proprioceptive movement correction using the therapeutic loading costumes such as "Adele", "Gravistat", "DC", "Spiral" is used, contributing to the normalization of posture and movements of a child with cerebral palsy. Such suits are the product of space technology and can create the dynamic longitudinal load on the axis of the body using the special rod-shock [34].

Y. Kovaleva said that the greatest efficiency and safety of the resulting effect can be expected when the classes in costume "Adele" in a comprehensive system of gradual rehabilitation, individually adapted to each individual child, taking into account his age, shape and degree of severity of the disease, leading pathological link, and emotional state intellectual spheres. The use of costume "Adele" leads not only to significant improvement in the test results, but also to changes in the factor structure of the functional abilities of children, indicating that the process of differentiation occurring in the central nervous system under the influence of training [34].

In addition, special classes are held with the help of functional bicycle equipment, which has the positive effect on the correction of abnormal movement patterns. Using a special function of bicycle equipment in complex sanatorium treatment of children with cerebral palsy contributes to early recovery of motor activity, a rapid adaptation and formation of a new more physiological correct movement pattern [35].

Hardware method of functional rehabilitation, submitted therapeutic exercise equipment brand MOTomed® (RECK Medizintechnik GmbH, Germany) are used. Such simulators are "combined simulators that help electronically metered mechanical stress when performing cyclic motions and simulate acts locomotor movements of upper and lower extremities" [36].

An analysis of the scientific and methodological literature indicates widespread use of methods of "motor re-education," such as Vojta Therapy and Bobath therapy. The Voigt-based therapy is the so-called reflex locomotion in which the therapist has focused on certain zone pressure of the patient, resulting in a coordinated, rhythmic activation of the entire skeletal muscles and reacting different levels of integration of the central nervous system. An alternative to this method is usually considered Bobath therapy. The first school Bobath therapy was opened in London (UK), the founders of the concept are Karel and Berta Bobath. As a professor of neurology and psychiatry, K. Bobath scientifically proved the practical experience of his wife, who worked as a physiotherapist in a rehabilitation center with adult patients with stroke or injury to the central nervous system [37].

In the physical rehabilitation of patients with cerebral palsy the procedure of massages is used, which differs in variety of techniques of implementation. There are classic, pinpoint, relaxing massage stimulus antagonist muscles, as well as author's techniques such as deep therapeutic massage reflex muscle that are used to prevent the consequences of perinatal lesions of the nervous system [16]. It is reported that fixation massage developmental gymnastics, beneficial effect on lung function in children with cerebral palsy are used [17]. For patients with speech disorders such as dysarthria erased form, a flow chart is developed for the differentiated speech therapy massage [38]. Special massage techniques allow to choose adequately the techniques that will be effective against spasticity articulation muscles, mixed type or hypotension.

### Conclusion

Taking everything into account the means and methods of the APE are selected individually, as the clinical picture of cerebral palsy depends on the location of the damage, and pathological processes, affecting different areas of the brain, determine the form of motor disorders of cerebral palsy and related diseases. The effectiveness of physical rehabilitation is largely determined by regular employment, a positive emotional attitude and desire to achieve results. Permanent, comprehensive treatment can achieve the best results.

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