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PHYSIOLOGICAL BASIS OF PHYSICAL EXERCISES USED IN THERAPEUTIC PHYSICAL EDUCATION

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Abstract
This article provides information on how physical exercises can be used to treat and prevent various diseases in the growing generation. Additionally, therapeutic physical education involves the conduction of exercises aimed at general stimulation of the patient, which improves the transmission of sensory and motor impulses, enhances the blood supply to the affected area, strengthens weakened muscles, and helps to relax contracted muscles.

Keywords: Therapeutic physical education, diseases of the nervous system, therapeutic physical exercises, physiological characteristics of physical exercises, nervous system diseases and injuries, trophic effect of physical exercises.

Introduction

The health of students has been recognized as the primary direction of the physical education process. Accordingly, its content and organizational forms have been aligned with this strategic goal.

In a short period, the organizational foundations of physical education and sports management have been improved. The Uzbekistan National Olympic Committee, which is part of the International Olympic Committee based on equal rights, and republican federations for various sports have been established.

Physical exercises and natural methods from nature, used for healing purposes, are the primary means of therapeutic physical education. The physical exercises used in therapeutic physical education consist of gymnastics, sports, and games.

Conditions for maintaining and strengthening the health of the population of the Republic of Uzbekistan, extending life expectancy, and preventing diseases are being created and are under development. To this end, educating the population about a healthy lifestyle and therapeutic physical education, which are essential for developing athletes, has become one of the key requirements of the time.

The main causes of nervous system diseases and injuries include trauma, infection, poisoning, disturbances in blood circulation (both organic and functional), convulsions, endocrine gland secretion issues, and metabolic disorders. Excessive fatigue and negative emotions can also lead to diseases. One of the key indicators of nervous system diseases and injuries is movement

disorders. The absolute loss of movement is called paralysis, while the partial loss of movement (reduction in strength and size) is called paresis (paresis is partial paralysis).

Therapeutic physical education is primarily conducted for the general stimulation of patients. As a result of physical exercises, the transmission of sensory and motor impulses improves, the blood supply to the affected area is enhanced, weakened muscles are strengthened, and contracted muscles are relaxed. Exercises prevent joint contractures and restore movement coordination.

The early application of therapeutic physical education helps prevent complications resulting from prolonged bed rest, such as pneumonia, pressure sores, and constipation. If the spinal cord is completely severed or torn, movement cannot be restored. In such cases, muscles with preserved innervation are exercised. Patients are encouraged to perform activities of daily living, use wheelchairs, and rely on orthopedic devices.

Often, due to trauma or convulsions, the spinal cord is not completely severed. In such cases, to achieve good results, both the instructor and the patient need to work intensively over an extended period (up to one year or even longer) on restoring movement. Even during the recovery phases, after two years or more, therapeutic physical education, in combination with physiotherapy treatments and occupational therapy, may yield positive results.

In these cases, therapeutic gymnastics is primarily used. The main task of physical exercises is to strengthen and restore muscles in a weakened state, as well as to encourage the control of muscles in spastic conditions. Thus, movement disorders are addressed through various forms of exercises, which are selected according to the nature of the movement impairment (see Table 1).

Each session of therapeutic physical education begins with the movement of the healthy limbs—legs and arms.

In the process of restoring movement, various techniques are used, including the transmission of impulses, passive exercises, and a combination of passive and active exercises. Relaxation exercises are performed for tense muscles. Once the first active exercise is introduced, passive exercises and therapeutic positioning should continue to be incorporated into the treatment.

During therapeutic gymnastics sessions, the intensity of movements is gradually increased (for example, with knees and palms placed on the floor, leaning on the knees on the bed, lowering one leg down, standing on both feet, or walking with the help of an artificial support). When the spinal cord is injured, the patient lies on their side or back, depending on the injury site. Therapeutic gymnastics exercises should begin in these positions.

Passive exercises are performed with both legs and arms synchronously, at the same tempo, in the same direction, and with equal intensity, assisted by two instructors.

Movement Exercises and Massage Techniques in Therapeutic Physical Education

Movements are performed at a moderate and slow pace, repeated 3–4 times throughout the day. In paired massage, two masseurs simultaneously and synchronously apply the same techniques to massage different parts of the body, such as both thighs, both calves, or both palms.

In some cases, four masseurs may work on a single patient at the same time. When the patient is lying on their back, two masseurs work on the arms and the chest area, while the other two focus on massaging the legs on either side of the body. Then, the patient is turned onto their stomach, and the four masseurs massage the back, pelvis, and legs in the positions described earlier.

This combination of movement exercises and massage is intended to improve circulation, restore muscle tone, and enhance overall recovery.

Table 1: Therapeutic Physical Education Scheme for Different Types of Movement Disorders

Exercise Type	**In Weak Forms**	**In Spastic Forms**
Sending impulses	Necessary	Not very important
Massage	Deep, Active	Superficial
"Specifically allocated" exercises for partially paralyzed muscles	Not very important	Necessary when possible
Strong reflex movements with chest exercises	Not necessary	Necessary (important)
Exercises that bring muscle attachment points closer together	Used	Prohibited
Exercises that move muscle attachment points further apart	Prohibited	Applied
Tension exercises	Necessary	Prohibited
Correcting the situation	Necessary	Necessary
Movement in water (in a therapeutic pool)	Necessary	Very important
Developing the support function	Extremely necessary	Necessary

In peripheral nerve diseases and injuries, the following changes occur:

a) **Muscle tone decreases**: The muscles lose their usual firmness, and the ability to maintain muscle tension is weakened.

b) **Movement function is impaired**: This includes paralysis (complete loss of movement) and paresis (partial loss of movement).

c) **Sensory changes occur in the affected area**: Sensitivity in the injured region may increase or decrease, affecting the patient's ability to perceive stimuli.

d) **Nerve trophism is disrupted**: Muscle atrophy occurs as a result of poor nerve supply to the muscles, leading to weakening and shrinkage.

e) **Reflexes are lost or diminished**: Reflexes, which are involuntary movements triggered by stimuli, may be absent or weaker in the affected areas.

f) **Pain**: Patients may experience pain due to nerve injury or inflammation.

Therapeutic physical education is crucial in addressing these issues, helping restore movement, reduce pain, improve muscle tone, and increase sensory function. The specific exercises used depend on the degree of nerve damage and the patient's overall condition.

These symptoms are characteristic of mild paralysis (flaccid paralysis), and their manifestations depend on the severity, location, and spread of the nerve damage. For example, when the shoulder girdle is affected, there is atrophic paralysis, hand anesthesia, and the loss of all reflexes in the hand.

When the ulnar nerve is damaged, the ability to flex the palm weakens, the flexion of the 4th and 5th fingers is completely lost, and the flexion of the 3rd finger is partially lost. Additionally, the grasp and separation of the fingers, as well as the flexion of the thumb, may also be lost.

In cases of ulnar nerve injury, superficial sensitivity is lost on the palm side of the elbow, and proprioceptive sensation in the wrist joint is diminished. Changes in sensitivity in the affected area may lead to tingling, sweating disturbances, and a decrease in skin temperature. The atrophy of the palm muscles results in the deepening of the bone interspaces and the flattening of the inner surface of the palm, particularly at the base of the 5th finger.

In therapeutic physical education, general developmental exercises are widely used, as prolonged illness and inactivity can reduce the patient's overall tone. These exercises help improve muscle function, restore movement, and enhance overall vitality.

Physical exercises exert a trophic effect, stimulating the innervation mechanisms and preventing secondary contractures and joint deformities. In cases of ineffective treatment, physical exercises help develop compensatory mechanisms.

Exercises are performed for all muscles, except for those directly affected by the injury. For instance, in the case of injury to the deep peroneal nerve, the patient will be unable to perform movements such as extending the toes (particularly the big toe) or turning the foot outward. However, exercises for other joints can be applied as general developmental exercises to maintain and improve function in other areas.

The intensity and pace of the exercises are determined based on the condition of other body parts and the patient's physical readiness. These exercises are crucial in promoting overall muscle development, enhancing joint mobility, and supporting recovery by compensating for the loss of function in the injured area.

Along with general developmental exercises, special exercises are used to restore the function of the nerves in the injured limbs: voluntary active training, sending impulses to induce movement when active movements are lost, and simulating the performance of these exercises in the affected areas while performing exercises for healthy parts of the body. These exercises are similar to those used with passive exercises involving impulse transmission. Later, as signs of active movement appear, these exercises can be performed in easier positions.

As recovery progresses, the exercises are initially performed in basic positions, and later, more complex exercises involving loading and resistance are introduced.

Active exercises are repeated several times throughout the day and are performed in a detailed manner. Prolonged movements performed at once can cause inhibition of the nerve-muscle apparatus in the affected area. Active exercises include activities such as button manipulation and creating various objects with clay.

In cases of nerve damage, such as **neuritis** and **neuralgia** (with pain as the main symptom), the primary focus of the exercises is on working with the affected muscles. For example:

In **inflammation or injury of the ulnar nerve**, exercises should focus on strengthening the muscles responsible for extending the palm.

In **damage to the median nerve**, exercises should target the muscles responsible for flexing the palm, fingers 1-2, and the opposing muscles. In **damage to the deep peroneal nerve**, exercises should be aimed at extending the foot.

In **shoulder plexitis (damage to the shoulder joint)**, exercises for all the muscles of the shoulder and shoulder girdle should be performed.

In the case of intervertebral disc damage (disk hernia), therapeutic physical education begins with stretching the spine on an inclined surface. The angle of inclination is gradually increased from 150 to 400. The duration of the stretching varies from 2 minutes to 40 minutes.

In conclusion, I would like to emphasize that the topic of this article has become one of the most urgent issues of today: the promotion of health and its strengthening, popularizing sports, and using physical education to prevent and treat any diseases. I believe that understanding this should be one of the responsibilities of a newly graduated specialist starting their career in higher education institutions.

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