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THE HUMAN LOCOMOTOR SYSTEM IS THE FUNCTION OF THE NEUROMUSCULAR APPARATUS

G'ulomova Feruza Gayratovna
Teacher of public health technical college named after
Republic No. 1 Abu Ali Ibn Sina

Annotation: The human locomotor system is implemented through the interaction of the neuromuscular apparatus. This system controls body movements through complex connections between nerves and muscles. The nervous system sends signals to the muscles using nerve cells connected to the brain and spinal cord, and the muscles perform movements by executing these signals. The activity of the neuromuscular apparatus serves not only to perform movements, but also to maintain balance, control body position, and ensure accurate and efficient movement. Changes in the normal functioning of this system, impaired or altered movement may be associated with various diseases and injuries.

Keywords: nerves, muscles, movement, movement centers, quality and activity of movement.

The number of neurons in the brain is more than 100 billion. The length of the nervous tissue in the brain is between 93,200 and 112,000 miles (150,000 and 180,000 km). There are 186 million more neurons in the left hemisphere of the brain than in the right hemisphere. Nerve impulses travel through the brain at a speed of 170 miles (274 km) per hour.

Function of the neuromuscular apparatus.

Heterochronism of ontogenetic processes is manifested in the development of certain functions. For example, in newborns, muscle excitability is very low, but up to 6-7 years it increases very rapidly, after which relative stability begins. With increasing age, the threshold of excitability to electrical current increases, and to humoral factors, on the contrary, decreases.

The functional mobility of the neuromuscular system is usually determined by the functional state of neuromuscular synapses. The maturation of this structure occurs gradually and reduces the time of conduction of excitation from nerves to muscles by up to 4 times. The increase in functional mobility (lability) continues until the age of 14-16. The function of the muscles of newborns is characterized by the fact that they are constantly active and perform a thermoregulatory function without relaxation even during sleep. The transition from the thermoregulatory function to the period of dominance of the motor function occurs mainly during infancy. The constant activity of skeletal muscles is a factor stimulating the growth of their mass.

In the 1st month of life, muscle activity is characterized by the state of “flexible hyperdynamics of newborns” (flexed torso, limbs and head). At the age of 1-1.5 months, the (1st antigravity) reaction occurs, which consists in maintaining the head in a vertical position due to the maturation of reflex contractions of the neck muscles.

At the age of 2.5-3 months, the grasping reflex, which is one of the components of the posture, fades away, and at 4 months it is re-formed in the form of active grasping as one of the components of the reaching reflex. By 5-6 months, the sitting position (2nd antigravity reaction) is mastered, and by 11-12 months, the standing position (3rd antigravity reaction). The mastery of the vertical (standing) position of the body is one of the important stages of ontogenesis. At this time, the possibilities of performing motor reactions are formed. The activity of the motor activity increases in the form of leaps. Due to the mastery of the vertical position, muscle activity becomes the main one of the environmental factors influencing the course of ontogenetic processes. All the basic motor skills characteristic of humans (walking, running, jumping, etc.) are gradually formed in children. By the age of 4, some elements of walking are mastered and the temporal relationships between their elements are restored. The coordination of the arms and legs, performed together in a harmonious manner, is observed in 10% of children by the age of 3, 50% by the age of 4, 65% by the age of 5, and 80% by the age of 6-7.

From 7 to 10 years of age, the amplitude of movement increases due to a decrease in the pace during calm walking, and reciprocal ratios in the movements of the arms and legs are restored. As the child grows older, the angles of rotation of the metacarpal bones of the foot increase during walking, which ultimately provides increased stability and a decrease in the asymmetry of the metacarpal bones. By 11-12 years of age, the nature of deviations during walking differs little from the accuracy of adult movements on the field.

There are no differences in the kinematics of walking in preschool age between boys and girls. Gradually, the time indicators of walking and the length-duration of the step increase. After 7-8 years of age, the number of additional deviations of body mass in children decreases. The variation in the parameters of the work of the muscles involved in walking decreases.

Running differs from walking in that there are three phases of work, and this phase is mastered by the third year of children's life. By 10-11 years, the initial phase of running increases by 2 m or more. By 7-8 years, the length of the step during running increases by 3 times, by 10-11 years - by 4-5 times. This is primarily due to the shortening of the bones of the legs and increased mobility in the joints. By 10-11 years, the running speed is 4 times higher than the walking speed. The maximum walking speed is reached after 5-6 m / s and is about 4.5 m / s in children 7-8 years old, and 5.4 m / s in children 10-11 years old.

59% of thin children cannot perform a symmetrical jump on two legs by the age of 3. This indicates the immaturity of the spinal structures that provide coordination and movement. Only after 6 years do fully masterful jumps on two legs appear.

The formation of the basic motor skills necessary for everyday life of a person occurs mainly in preschool age.

The active period of children's free motor functions begins at the age of 3 and is inextricably linked with the formation of the second signal system. At this time, speech and speech gradually acquire the character of their own separate stimuli, replacing the direct conditioned signal that characterizes them. In 3-year-old children, the control of free movement is carried out on the basis of "return afferentation" ("feedback principle").

By 4-5 years of age, the ability to perform targeted efforts develops (the period of restoration of the first motor functions). A very important period in the development of motor analyzers is considered to be 6 years. During this period, the analysis of tactile-kinetic signals is significantly improved, and the integration of excitatory and inhibitory processes is accelerated. Children form a complex reaction of free motor actions. The higher nervous activity of children of senior school age is an important feature, which is significantly distinguished by the strength of the conditioned connections formed at this age and is preserved throughout a person's life. Preschool children have a high level of excitability, reactivity and plasticity of the nervous system and master quite complex motor skills much faster than adults. At this age, the correct formation of motor skills at once plays an important role, since they are difficult to retrain. At this time, it is necessary to teach children the technique of rational performance of physical exercises, to expand the range of various skills and abilities in them, which will be necessary to improve in later stages of life.

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