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Psychological And Physiological Foundations Of Sensorimotor Development In The Process Of Ontogenesis

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Abstract: This article examines in detail the process of sensorimotor development in children, that is, the coordination of sensory (sensation, perception) and motor (movement) functions. The study is based on the fact that the formation of sensory and motor areas is linked to brain activity and environmental influences. Drawing on the ideas of scientists such as G.A. Uruntaeva, A.V. Zaporozhets, and V.V. Tonkova-Yampolskaya, the stages of child development are described – functional changes from infancy to preschool age. Psychomotor development, pre-speech activity, the importance of auditory and visual analyzers, the emotional sphere, the development of fine motor skills and hand movements are examined in detail. Important stages of child development, age-related characteristics of fine motor skills and visual-motor coordination, as well as their impact on speech and cognitive activity are analyzed in detail. The conclusion emphasizes that normal sensorimotor development is the foundation for a child's overall mental and intellectual development.

Keywords: Sensorymotor, psychomotor development, speech, sensorimotor functions, fine motor skills, visual-motor coordination, stages of child development, auditory and visual analyzers, emotional sphere, cognitive activity.

Introduction: Sensory-motor development is the mutual coordination of the activities of the sensory and motor spheres. Sensory processes include sensation and perception. Sensation is a reflection in the human mind of individual properties and qualities, objects and phenomena that directly affect his feelings. Perception is the process of combining individual sensations, objects and phenomena into integral images in the human mind. Motorics is the movement activity of the body or individual organs. The development of the motor and sensory spheres is associated with the formation of the corresponding zones of the brain.

Information about the features of the development of the sensorimotor sphere in ontogenesis has been sufficiently studied by many scientists in the psychological and pedagogical literature. Uruntayeva Galina Anatolievna (a well-known psychologist) distinguishes three periods of sensorimotor development: infancy, early childhood and preschool age. The fact that there are optimal periods for the formation of each function during the development of children is supported by V.V. Tonkova-Yampolskaya, A.V. Zaporozhets, G.L. Rosengard-Pupko, A.A. Leontyeva, V.N. Avanesova and others.

The development of a child up to one year of age can be divided into approximately 5 main stages: I - infancy; II - 1-3 months; III - 3-6 months; IV - 6-9 months; V - 9-12 months. At each stage, specific developmental indicators are formed, specific functions are formed, depending on the age of 1 year. To identify psychomotor developmental disorders in the first year of life, it is necessary, first of all, to know the main stages of development of a healthy child. The first period of pre-speech development is unconditioned reflex, in which unconditioned feeding and protective reflexes are of great importance for the vital activity of

the organism. They appear with the birth of a child during normal development, and then gradually decrease and disappear.

The development of conditioned reflexes that are part of the first signal system: visual, auditory and tactile stimuli, is a necessary condition for the development of speech.

A. Peiper, V.G. Ananyeva, M.M. According to Koltsova's research, the visual analyzer is the central apparatus of cognitive activity. According to A.M. Fonareva, newborns have an innate eye movement reflex in the visual field, which is formed in a healthy child in the first week of life under the influence of the external environment.

The auditory analyzer is one of the most important analyzers of the nervous system. The peripheral part of the auditory analyzer is ready to perceive sounds at the birth of a child, but is not yet fully formed (Polikanova R.I., Krasnogorsky N.I.). According to the opinions of A.M. Fonareva, A.I. Bronstein, A. Peiper, a child does not have a reaction to target in space, that is, to turn the eyes and head in the direction of the sound. This reaction develops by 3-3.5 months. At four months, the child hears the voice of adults, begins to look in the direction of the sound and responds with noise, laughter and cooing. From five months, children begin to distinguish the tone of the voice by hearing. At 8-12 months, the initial understanding of directed speech is formed. According to a number of scientists, phonemic hearing begins to form at 6 months, and its formation usually lasts up to 1 year and 7 months.

Emotional sphere development. The role of emotional state in the child's behavior is very important. Emotional reactions arise and develop as a result of exposure to the sensory organs during emotional communication with the child (I.M. Sechenov, N.L. Figurin and M.P. Denisova). By establishing emotional contact with the child in the first months of life, it is possible to evoke a smile reaction in him. M.Yu. Kistyakovskaya emphasizes that “A smile is not an innate social reaction, but arises when the child’s gaze is directed at the face of an adult or at something.”

The rate of motor development of each child may also differ from each other: some children begin to walk independently at 9-12 months, while others walk at 12-15 months. However, in all cases, a certain sequence is maintained in the development of motor functions. In ontogenesis, the development of hand movements is as important as the development of general body movements. M.Yu. Kistyakovskaya identifies four periods of development of the child's hand movements in the first half of life, that is, the formation of purposeful movement of the hand in relation to the object, its grasping and holding:

1) at the age of 3-4 weeks, separate movements of the hands disappear and irregular movements of the hands appear;

2) at the age of 1-3 months, the first differential hand movements appear: children bring their hands to their mouths, suck their fists, make fists;

3) at the age of 3-4.5 months, the regulatory role of tactile and visual analyzers increases. As a result of the interaction of visual, tactile and kinesthetic stimuli, coordinated movements of the hand towards the object and palpation movements appear;

4) after 5-6 months, the visual analyzer becomes important in the development of differential hand movements (the child transfers toys from one hand to the other).

Among other motor functions, finger movements are of particular importance, since they have a great influence on the development of the child's higher nervous activity. According to V.M. Bekhterev, hand movements are always closely connected with speech and contribute greatly to its development.

The first motor function of the hand is grasping. Like other motor movements, grasping initially manifests itself as an innate reflex (Robinson's grasping reflex). At 4-5 months, he can grasp objects, but he grasps them by placing all his fingers and the palm of his hand on the object, which is also called "monkey grasping". From the age of 9 months, the child begins to pick up objects with his fingers, and at 11-12 months, the first attempts to use objects for their own purposes appear: drinking from a cup, eating porridge with a spoon, combing his hair, etc. E.M. Mastyukova classified the age-related features of the development of fine motor skills of the hands and visual-motor coordination.

Age-related features of fine motor development in children.

Age	Acquiring skills
1-2 years old	Holds two objects in one hand; draws with a pencil, turns pages in a book. Stacks 2 to 6 cubes on top of each other.
2-3 years	Opens a box and turns the contents inside out. Plays with sand and

old	clay. Opens lids, uses scissors, paints with fingers. Can tie a shoelace.
3-4 years old	Holds a pencil with a finger, distinguishes shapes by several features. Assembles 9-cube buildings. Draws with pencil or colored chalk. Folds paper more than once.
4-5 years old	Puts his hand in a bag and identifies the names of objects by palpation, makes figurines from plasticine (2 to 3 parts), ties boots.

In the development of hand and finger movements, the period when the child can move the thumb in opposition to the others is of particular importance. From this time on, the movements of the remaining fingers become more free. Fine motor skills of the hand are the coordinated activity of the small muscles of the eye and hand. Fine motor skills of the hand help the child to study, compare, classify objects around him, and thus allow him to better understand the events in the world in which he lives. Fine motor skills help the child to independently serve himself, express himself through play, art, and help increase the child's self-esteem.

Manipulative activities, object and game activities are of great importance in the development of speech activity. (M.I. Lisina, F.I. Fradkina). M.I. Lisina noted that among cognitive reactions up to six months of a child's life, eye movements take the main place, and after six months, hand-motor reactions take the main place. Holding objects in a neutral hand position helps the child to increase his ability to visually control the movements of the thumb and other fingers. Visual control of hand movements helps the child to develop more coordinated grasping techniques using the thumb to hold an object.

Ye. F. Arkhipova showed in her research the age-related characteristics of visual-motor coordination. In this, she fully classified what skills a child acquires through the coordinated activity of visual-motor coordination from 3-6 months to 6 years of age.

CONCLUSION

In conclusion, sensorimotor development is the basis for the development of a person's general mental activity. Cognitive activities begin to form through the perception of phenomena and objects in the environment. All forms of cognitive activity - memory, thinking, imagination - are formed through the processing and perception of information. Also, the development of a child's motor functions is a complex process, which depends on the gradual formation of the central nervous system, on the one hand, and on various environmental influences, on the other.

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