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Significance of Results and Methods of Stereognosis Study in the Morph Functional Organization of the Tertiary Cortex Zones in Children

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Abstract: Morphofunctionally stereognosis is formed by the association of three cortical zones and indicates normal development of the brain cortex in 6-7-years-old children. Age periods of stereognosis development has not been studied yet, the technique for is investigation has hot been worked out. Steognosis was studied in 109, 291 and 35 children of 7,6 and 4-5 year-old, respectively Sterectively. Stereognosis formation was njted in 7-year-old children.
Keywords: tertiary fields, stereognosy, cortex, brain.

RELEVANCE

Tertiary fields are the most distant from the projection zones overlapping the cortical ends of individual analyzers. They are related primarily to the amodal analytical activity of the cortex, which provides the highest mental functions of a person in their most complex intellectual and speech manifestations. Tertiary associative fields of the cortex are characteristic only for the human brain and occupy in total almost half of the entire area of the cortex. Their functional maturity in the process of child development comes at the latest and only in a favorable environment.

In the human cerebral cortex, 3 zones are morphofunctionally distinguished, piled one above the other: projection (cortical nuclei of the analyzers), which begin to function soon after birth; projection-associative, morphofunctionally forming, at the 1-2th year of postnatal ontogenesis; anterior and posterior tertiary, which are functionally formed later than the projection and projection-associative zones. Localization of the anterior zone corresponds to the premotor zone of the frontal cortex (6 Brodmann's field), and the posterior-inferior parietal lobe (40 Brodmann's field). Tertiary fields are distinguished by clear functional asymmetry relative to the right and left hemispheres and the amodal nature of their functional manifestations. The tertiary cortical fields are distinguished by the greatest subtlety of the neural structure. This can be regarded as a morphological expression of the particular complexity of the functional differentiation of these fields, which are responsible for highly specialized functional connections and interactions between analyzers.

Getting acquainted with the world around, the child begins to acquire skills, to distinguish many objects, phenomena, their spatial, temporal and causal relationships. In the formation of such a complex relationship between the child and

of the surrounding world, the morphological usefulness of the projection and projection-associative zones of the cerebral cortex is of paramount importance (1,2,7,10). In the tertiary zones of the cortex, morphologically formed at the age of 3-7 years, there is an analysis, synthesis, processing, sorting and combining of different-modal afferentations into complexes - images of overlaps. Stereognosy is one of the earliest higher cortical functions of the tertiary areas of the cerebral cortex. The center of the posterior tertiary zone is localized in the phylogenetically young inferior parietal lobe, which is the carrier of the higher cortical functions characteristic of humans (2,7,11). In the anterior (premotor region of the frontal cortex) and posterior (inferior parietal lobe) tertiary zones, the associative system of the cortex reaches the highest degree of complexity. This is due to the integration of functions, without exception, of all projection zones of the cerebral cortex (3,4,5,6,11). Therefore, the functional formation of stereognosy has a prognostic value and allows one to judge the morphofunctional usefulness of the development of the cerebral cortex in a child. However, we were unable to find works devoted to the timing of the formation of stereognosy and the methodology of its study in childhood.

In adults, the study of stereognosy (the ability to recognize objects by touching them) is as follows. The examinee closes his eyes, an object (a coin, key, button, pin, pen, etc.) is placed on his palm, which he must determine or describe his shape and the material from which it is made, if he has not previously encountered this object. Then the subject opens his eyes and is convinced of the correctness of his answer. The child, in response to a request to close his eyes, displays alertness and fear, a desire to spy, which affects the objectivity of the research results. Therefore, this technique is unacceptable for studying stereognosy in children. When assessing the state of the functional organization of the areas of the cerebral cortex in children 6-7 years of age, in our opinion, the object of the study should be the higher cortical functions of the tertiary areas of the cerebral cortex initially formed in postnatal ontogenesis. Focal disorder of the higher cortical functions in preschool children is described very briefly, in general terms, since the abundance of relevant observations has hardly been subjected to a combined neurological and neuropsychological analysis. The study of the clinic of disorders of higher cortical functions in focal brain lesions in young children as a whole is a task for the future (2,7,8,9).

Purpose of the work: to study the morphofunctional organization of the tertiary zones of the cerebral cortex in preschool children.

Tasks: to assess the morphofunctional organization of the tertiary zones of the cerebral cortex of 4-7-year-old children using a device designed by us for the study of stereognosy.

MATERIALS AND METHODS.

We have designed a special device with four sets, five items in each (Patent RUz. FAR 00153. 20.01.03). It has a light-tight truncated cone body. The upper, larger, base is equipped with a lid. A partition with a hole is installed from the inside of the body parallel to the bases. The cover is fixed in the body by means of two locks - external and internal. Conducting an express study using this device makes it possible to judge the morphological and functional

usefulness of the tertiary zones of the cerebral cortex and the readiness of 6-7-year-old children to go to school. When using this device to study stereognosy, the need to close your eyes is eliminated. The examinee is asked to open the lid of the device without prompting, then sequentially first with the right and then with the left hand to touch the named object on the bottom of the device, take it out and show it. The criterion for evaluating the result of the study is the quick and correct solution of the problem (C = D +, S +). The research result is entered into the protocol. Solving problems slowly with errors is denoted as C = D +, S- or C = D-, S +; impossibility of solving the test problems –C = D-, S-.

To establish the term of the functional formation of stereognosy, 535 pupils (285 boys and 250 girls) from 18 kindergartens in various districts of Tashkent were examined. 291 children are 6 years old, 209 children are 7 years old, 15-4 years old, 20-5 years old.

RESULTS AND DISCUSSION.

It should be noted that all the surveyed coped with the task. According to the research results, all children of 7 years old completed it quickly and without errors. However, among 6-year-old children, 84.4% found and showed all the above items correctly, 15.2% completed the task with errors, 33.3% and 66.6% among 4-year-old children, respectively, 60% and 40 of 5-year-olds %.

According to the literature, in postnatal ontogenesis, the most pronounced cytofibroarchitectonic changes in the ensemble grouping of neurons in all layers of the cerebral cortex occur at certain age periods. The cerebral cortex of newborns contains small neurons, their axons and dendrites are poorly developed, they are located in columns. During the first year of life, there is a typification of the form, an increase in the size of pyramidal, stellate cells, an increase in the development of axons, dendrites, and expansion of intra-assembly connections along the vertical. There is a morphological and functional improvement of the projection zones. Subsequently, there is a clear formation of nested neural ensembles, vertical bundles of fibers, an increase in the size of spindle-shaped, stellate cells, and the distribution of their axonal collaterals in the vertical direction.

At the age of 5-6, the horizontal system of connections is strengthened due to the growth in length and branching of the lateral and basal dendrites of Betz cells, the lateral terminals of their apical dendrites develop. External polymorphism of cells increases, as well as the density of capillary networks in the III, V layers of the cerebral cortex.

In 7 year old children 4 and 6, Brodmann's fields have all the morphological structures characteristic of adults. A significant complication of the structure of short-axonal neurons, an expansion of the network of axonal collaterals of all forms of interneurons, which form clearly structured vertical fibers in large ensembles, are noted. The width of cell groupings and the volume of radial fiber bundles increase. The structure of the interneuronal apparatus becomes more complex, the system of horizontal connections is intensively developing. Postnatal cytofibrogenesis lasts up to 20 years.

In the tertiary zones (overlapping zones), the morphofunctional integration of all three zones of the cortex is gradually becoming more complicated and the formation of new higher cortical functions characteristic of tertiary zones with the child's age. Among them is stereognosy.

As the results of the study show, the functional formation of stereognosy is completed by the age of 7 and is due to the age-related morphological maturation of the cytofibroarchitectonic structures of the posterior tertiary zone of the cerebral cortex. The differences in the results of examining children of the same age are apparently due to the variability in the maturation of the morphological structures of the tertiary zones of the cortex, the nature and quality of social reinforcing factors in postnatal ontogenesis. Tertiary associative fields of the cortex are characteristic only for the human brain and occupy in total almost half of the entire area of the cortex. Tertiary fields are distinguished by clear functional asymmetry relative to the right and left hemispheres and the amodal nature of their functional manifestations.

Their functional maturity in the development process occurs most late and only in a favorable social environment.

CONCLUSIONS:

1.The functional formation of stereognosy is one of the important indicators of the age-related morphofunctional maturity of the posterior tertiary zone of the cerebral cortex of 6-7 year old children.

2. Unsatisfactory results of the study of stereognosy in 4-5 year old children in the absence of clinical signs of organic brain damage indicates the morphological and functional immaturity of the tertiary zones of the cerebral cortex at this age.

3. Negative results of the study of stereognosy in children of 7 years old indicate the need for inpatient neurological examination.

4. Tertiary zones are characteristic only of the human cerebral cortex. The functional formation of tertiary zones is gradually becoming more complicated, with age, the quality of socially reinforcing factors affecting a person, acquiring a creative character.

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