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NEUROPSYCHOLOGICAL BASES OF COMPUTATIONAL ACTIVITY OF THE ELEMENTARY SCHOOL LEARNER: THEORETICAL ASPECTS

The article deals with the computational activity of elementary school students from the point of view of neuropsychological studies. On their basis, computational activity is attributed to higher mental functions that are inherent only to man and are formed throughout life. The regularities of constructing the process of formation and mastering of knowledge and skills in elementary school students are established. This process is ensured by the work of the cortex of the cerebral hemispheres. The computation, like any higher mental function, is provided by the integrative activity of the entire brain. The value of each part of the brain to the quality of the computational activity can be estimated only from the point of view of neuroscience. The study of local lesions of the brain makes it possible to establish various disorders of mental processes, due to the fallout of certain components of mental activity.

An important regularity discovered by neuropsychology is that the higher mental function does not fall out but its disintegration occurs. Local brain lesions do not lead to a direct "fallout" of one or another mental function. The pathological cell resulting from the damage disrupts the normal operation of a certain area of the brain that enters the functional system and leads to such restructuring of the stored brain sections, which makes it possible for a new way of performing impaired function.

Computational operations in the early stages of development are deployed and later transformed into actions that rely on internal spatial schemes. Such operations include multi-digit calculations, where the value of each digit is determined by its place in a set of digits, the execution of which is possible only if the numerical diagrams are stored in the memory.

Since computational activity, like any other activity, is an integral process, then, when it decays, this integrity is replaced by singularities and fragments. In this case, the activity is violated not only as a chain of actions, but as a hierarchical system. With the impact of individual sections of the brain, computational operations break down according to the laws of its content structure.

The research in the field of neuroscience proves that in the case of damage to various parts of the cerebral cortex, only centers of distortion can be established, and not centers of functioning, since a complicated intellectual function cannot be localized in a particular center.

In local brain lesions various forms of dysfunction of the computational function are inevitable, which may be broken in the defect of any of the links of its structure. And the form of decay depends on which of the elements of the structure suffers. Therefore, a violation of the calculations is possible in the defeat of almost any part of the brain.

Neuropsychologists (O. Luria, K. Monakov) believe that complex intellectual function cannot be localized in a particular center. In order to perform it, different parts of the vast brain area must be involved, the activities of which are combined in one temporary structure.

All this leads to the conclusion that a large part of the cortex or the entire cortex (the whole brain as a whole) is involved in complex psychic functions. Each part of it is involved in a holistic process in a specific way. For complex intellectual functions, there are no "centers" to produce them, but in the implementation of each of them certain areas of the brain play a very important role. Particularly significant for intellectual activity are the parts of the third frontal gyrus, the lower parietal and partly temporal, since their lesion causes the most serious disorders of higher mental functions.

It was found that the computation is performed by the joint work of the occipital, parietal and frontal systems of the brain that we will call the system of brain regions that provide computational activity. Moreover, the functional

value of a certain area of the cerebral cortex is uneven at different stages of the development of the individual, which is confirmed by the fundamental principle of the dynamic localization of higher mental functions. The essence of this principle is that working units of different zones and levels of the brain, providing a particular mental function may vary in the process of its formation. That is, the function changes in its structure with the development of a person. It also changes in relations with other mental processes, and, consequently, its localization varies, which differs sharply between the child and the adult. Computational operations are complex psychological processes of genesis, structure and flow, and therefore experience the greatest difficulty in teaching children in school.

As you can see, we can talk about the narrow localization in a functional system only in terms of its individual elements. Full-scale computing is ensured by the work of a number of integrated brain areas. Neuropsychological research on the systematic localization of computational activity as one of the higher mental functions provides an opportunity to determine the approach to the analysis of their disorders and the possibilities and ways of their detection and recovery.